African Journal of Biotechnology Vol. 6 (20), pp. 2419-2423, 18 October 2007
Available online at http://www.academicjournals.org/AJB
ISSN 1684–5315 © 2007 Academic Journals

Full Length Research Paper

Abundance and gill net selectivity of *Pellonula leonensis* in the Lower Nun River, Niger Delta, Nigeria

Kingdom, T.* and Allison, M.E.

Department of Fisheries Technology and Livestock Production, Niger Delta University, Wilberforce Island, P.O. Box 071, Yenagoa, Bayelsa State, Nigeria.

Accepted 24 September, 2007

The abundance of *Pellonula leonensis* in relation to location, photoperiod, depth, tide, season and gill net selectivity was studied from May 2001 to April, 2002 in the Lower Nun River, Niger Delta. Three sets of gill net with stretched mesh sizes of 8, 12 and 15 mm respectively were used each measuring 35 m in length and 3 m in depth having a surface area of 105 m^2. Abundance was least in September and highest in February and *P. leonensis* was more dominant in the convex area of the river and lowest in the concave section. There was no significant variation (P > 0.05) in abundance of *P. leonensis* with photoperiod, water depth, tide and season. There was gillnet selectivity with the medium mesh size (12 mm) gill net as more effective constituting 68.77% of the total catch of *P. leonensis* in the Lower Nun River.

Key words: Abundance, gill net selectivity, *Pellonula leonensis,* Lower Nun River, Niger Delta.

INTRODUCTION

Pellonula is essentially a riverine fish (present in West African rivers from Senegal to Niger), which can inhabit both fast flowing and calm, muddy habitats (Lowe - McConnell, 1987). They inhabit areas closer to the shore (Turner, 1994). Factors affecting fish distribution and abundance have already been reported by different workers. Availability of food, spawning rates, breeding grounds coupled with shelter, presence of current, vegetation, depth of water, breeding habits migration and low predation have been suggested as major limiting factors affecting the distribution and abundance of various fish families in Kainji Lake, Nigeria (Imevbore and Bakare, 1974; Lelek and El - Zarka, 1973; Willoughby, 1974; Akintunde, 1976; Olatunde, 1977; Ita, 1978). Allison et al. (1997) also reported that fish catch varied with type of gear used, tidal condition and period of capture, diurnally and seasonally. Otobo (1977) observed *Pellonula leonensis* as more abundant in the dry season in Kainji Lake while, Idodo - Umeh (2003) reported it as more abundant in rivers and lakes during the rainy season.

In the East of the Niger, particularly in Bonny estuary, gill net constituted more than 50% of the gear deployed by fishers (IPS, 1989, 1990; Chindah and Osuamkpe, 1994). However, in fishing for Clupeids, particularly *Pellonula*, the use of the *atalla* lift net has been reported in Jebba (Reed et al., 1967), Kainji Lake (Otobo, 1974; Otobo and Imevbore, 1977; Ita, 1993) and Anambra River (Ezenwaji, 2004), all in Nigeria. Also, Ita (op.cit.) reported the emergence of Dala (a mosquito netting open water seine net) introduced by the migrant Malian fishers in the early eighties. It has been found to be very effective in harvesting clupeid stock in Kainji Lake (Ita, 1993; Yaro, 2003). This study on distribution and abundance and gill net selectivity of *P. leonensis* is aimed at providing ecological and fishery information to ensure rational exploitation of *P. leonensis* to sustain its fishery in the Lower Nun River.

MATERIALS AND METHODS

This study was carried out in the fresh water reaches of the Lower Nun River around Anyama Community in Southern Ijaw Local Government Area of Bayelsa State, Niger Delta, Nigeria covering an area of about 2,180 Km^2 Lat. 4° 51' N and 4° 54' N; Long 6° 11' E,

*Corresponding author. E-mail: orotonbarapagha@yahoo.com.

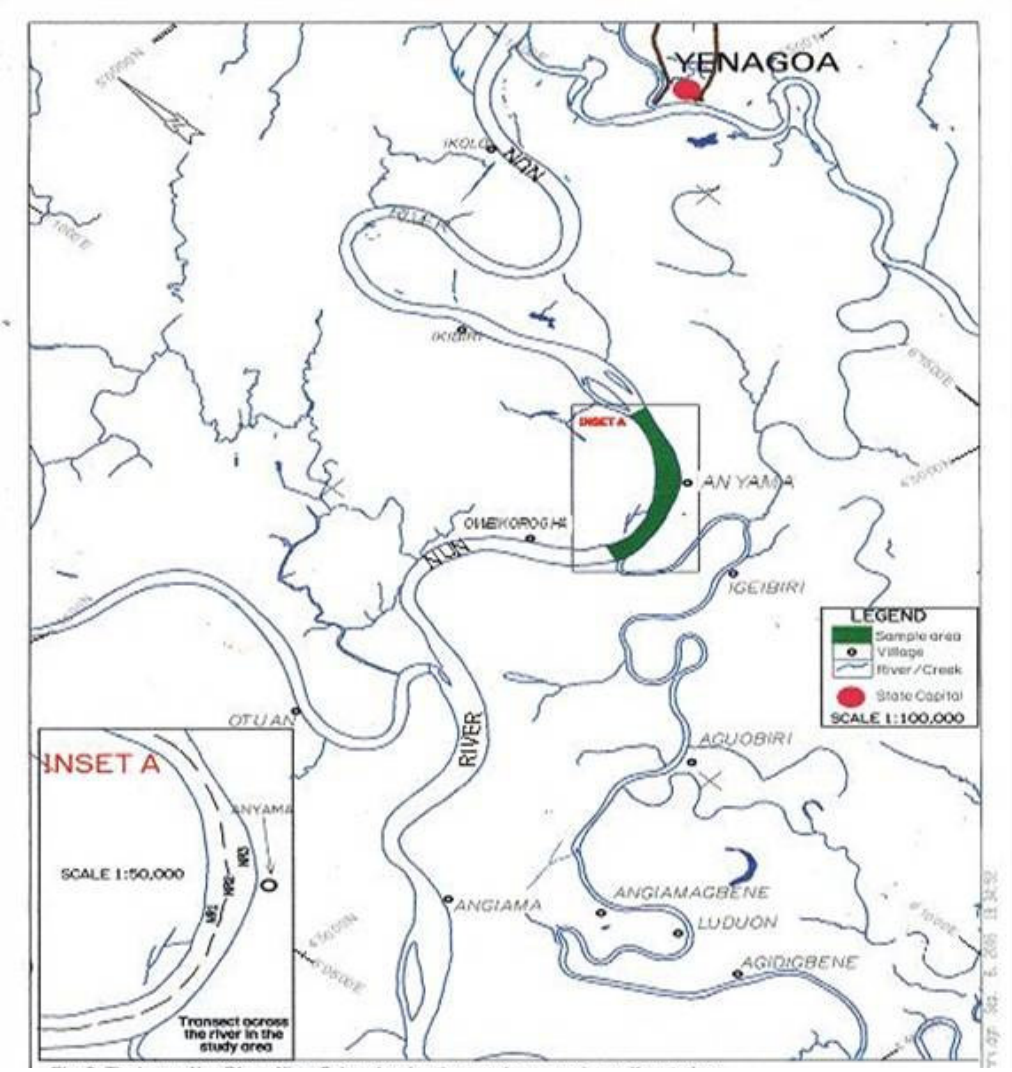

Figure 1. The Lower Nun River, Niger Delta, showing the sample area and sampling stations.

and 6° 13' E, (Figure 1). The Nun River is one of the numerous low land rivers in the Niger Delta.

Sampling procedure

Sampling was carried out for twelve calendar months biweekly (May 2001 – April 2002) using three sets of gill net with stretched mesh sizes of 8, 12 and 15 mm classified as (small, medium and large gill net) respectively each measuring 35 m in length and 3 m in depth with a surface area of 105 m^2. Sampling was done at three locations: the concave, central and convex sections of the study area. The three gill nets were operated simultaneously from 3 fishing canoes. At each location, sampling covered surface, mid-water and bottom by a simple manipulation of the float line and the weighted bottom line to keep the net at the desired depth; this was done to determine distribution and abundance of the fish in the study area. Sampling consisted day and night to determine the effect of photoperiod on abundance and biomass of *P. leonensis* as well as during low and high tides to determine tidal variations in abundance and biomass of the fish. The monthly mean catches of *P. leonensis* were pooled to determine the seasonal variation.

Statistical analyses (ANOVA, DMRT) was carried out using the SAS computer package to determine significance in the mean catches with depth, photoperiod, location, tidal levels, months, seasons and gill net mesh sizes. Also, regression and correlation analyses were carried out to determine if there were any relationships between the respective parameters and abundance of *P. leonensis* in the Lower Nun River.

RESULTS

The mean monthly and seasonal catch of *P. leonenesis* is shown in Table 1. The fish was caught almost through out the year except in the month of August. Abundance was least in September 2001 and highest in February 2002 ($P < 0.01$). Abundance was relatively higher in the dry season but was not significantly different from that of

Table 1. Mean monthly and seasonal catch of *P. leonensis* in the Lower Nun River.

Month/Year	Number ± S.E	Weight ± S.E (g)
May 2001	552 ± 334^{bc}	841 ± 412^{bcd}
Jun.	404 ± 54^{bc}	616 ± 45^{cd}
Jul.	20 ± 11^{c}	78 ± 61^{cd}
Aug.	0^{c}	0^{d}
Sept.	4^{c}	3^{d}
Oct.	22 ± 2^{c}	40 ± 16^{d}
Nov.	31 ± 27^{c}	43 ± 38^{d}
Dec.	310 ± 99^{c}	327 ± 99^{cd}
Jan. 2002	588 ± 30^{bc}	561 ± 3^{cd}
Feb.	1609 ± 660^{a}	2290 ± 839^{a}
Mar.	822 ± 155^{abc}	1196 ± 313^{ac}
Apr.	1164 ± 200^{ab}	1859 ± 362^{ab}
Season		
Wet	389 ± 144^{a}	617 ± 224^{a}
Dry	563 ± 186^{a}	743 ± 264^{a}

Different letters (a, b, c, d) in the same columns indicate significant differences at P < 0.01.

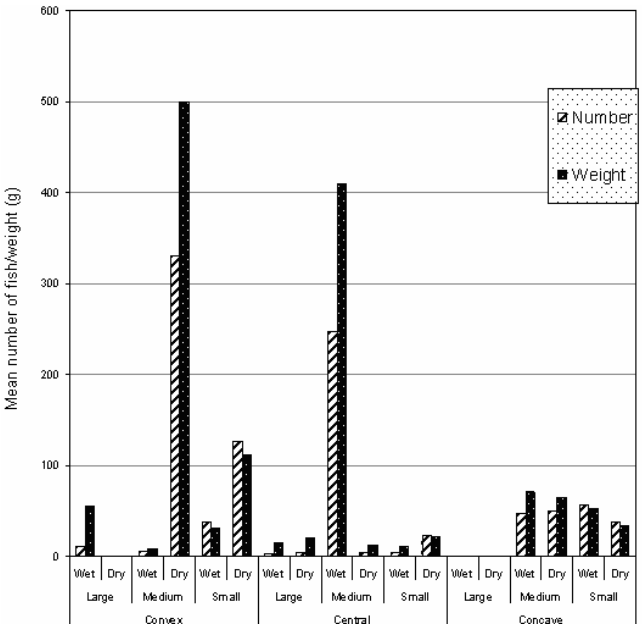

Figure 2. Effect of surface distribution, mesh size and season on the abundance of *P. leonensis* in the Lower Nun River.

the rainy season in the Lower Nun River. There was no difference in the catches between day (77 ± 24 individuals; 110 ± 37 g) and night (77 ± 21 individuals; 108 ± 32 g), neither was there any significant difference in the interaction between photoperiod and mesh size, photoperiod and months, and photoperiod and season.

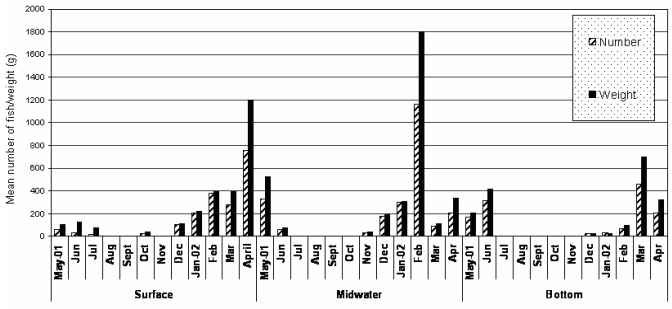

Figure 3. Effect of depth and months on the abundance of *P. leonensis* in the Lower Nun River.

Table 2. Effect of tide on the catch of *P. leonensis* in the Lower Nun River.

Tidal period	Number (Mean ± S.E)	Weight (g) (Mean ± S.E)
Low	76.7 ± 19.99^{a}	107.77 ± 29.88^{a}
High	106.55 ± 28.80^{a}	152.53 ± 43.94^{a}

Different letters in the same columns indicate significant difference at P < 0.05.

Figure 2 shows the effect of surface (i.e. horizontal) distribution, mesh size and season on the abundance of *P. leonensis*. There was significant interaction between location and mesh size (P < 0.01), location and months (P < 0.001), location and season (P < 0.001), and location, mesh size and season (P < 0.001). *P. leonensis* occurred in all transects of the river without any significant linear relationship between location (surface distribution) and the catches.

The effect of depth, and months on the catches of *P. leonensis* is given in Figure 3. The interaction between depth and month was very highly significant in number and weight (P < 0.001) with the highest catch found at the mid-water in February. There was no significant linear relationship between depth and abundance of *P. leonensis* in the Lower Nun River. The effect of tide on the catches of *P. leonensis* is given in Table 2. There was no significant difference in the catches between the two tidal periods (P > 0.05) neither was there any significance in the interactions between mesh size and tide, season and tide, and mesh size, tide and season. There was no linear relationship between tide and catch of *P. leonensis*.

Gill net selectivity

The catches of *P. leonensis* from the three different gill nets are presented in Figure 4. There was gillnet selectivity with the medium mesh size gillnet being the most

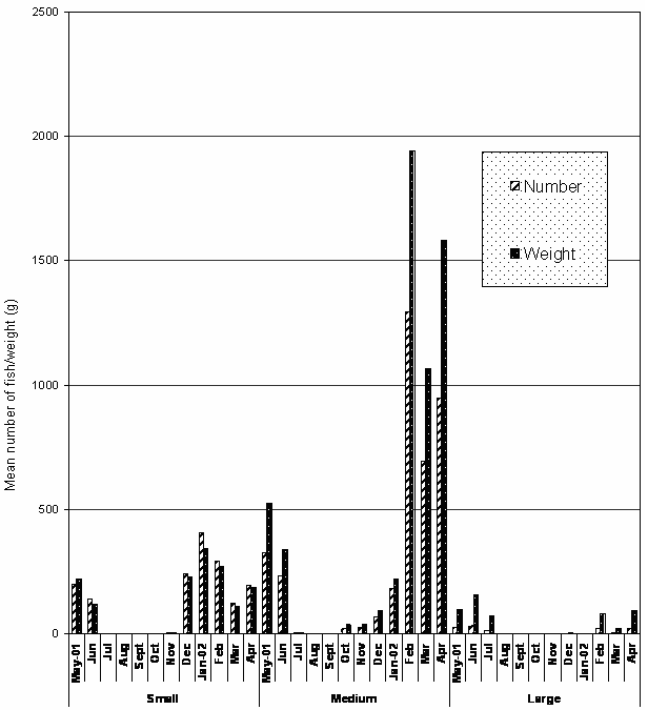

Figure 4. Effect of mesh size and month of catch of *P. leonensis* in the Lower Nun River.

efficient, accounting for 68.77% and weight of 74.41% of the total catch followed by the small gillnet with the least from the large mesh gill net ($P < 0.001$). There was also monthly variation ($P < 0.001$) but no seasonality in the gill net catches ($P > 0.05$). The interaction between mesh size and months was very highly significant ($P < 0.001$) with the highest mean catch of 1,295 ± 460 specimens weighing 1939 ± 706 g observed in February from the medium mesh size gill net.

DISCUSSION

The observed peak catches in February in this study was also reported for *P. leonensis* in Nun River and Taylor Creek (Otobo, 1995). The all year round catch of *P. leonensis* in the Lower Nun River was also experienced in Warri River (Ikomi, 1995) and Anambra River (Ezenwaji, 2004), however, there was no seasonal dominance as reported by other workers (Ikomi, op. cit.; Ezenwaji and Offiah, 2003). The all year round presence may be related to reproductive success, which is partly assured through early sexual maturity and all year round breeding (Ezenwaji and Offiah, op. cit). They also suggested that abundant food might as well permit rapid growth and high recruitment.

The non variation in abundance with photoperiod of *P. leonensis* in this study is at variance with Allison et al. (2007) who observed significantly higher catches ($P < 0.05$) of *P. pellucida* by night (62.7%) than day (37.3%) in the study area. This may be attributed to differences in feeding regimes / migration patterns which is an exhibition of species dependent mutually exclusive tendencies in the same ecological environment. However, the non effect of tide on abundance agrees with Allison et al. (op. cit.) but contradicts Allison et al. (1997) report of higher abundance during the low tide in Elechi Creek (brackish water environment) in Rivers State, Nigeria. This may be due to the difference in geographical locations/ecological environments.

The observed highest catch of *P. leonensis* in the convex area is in agreement with the report of Ita (1978) who observed that Cichlids were restricted in distribution to the shallow inshore waters. This suggests that the convex area is capable of providing enough food, shelter and breeding sites for *P. leonensis.* Allison et al. (2007) made a similar observation.

The gillnet selectivity result of this study seem to be the baseline result as far as the use of gill net in harvesting clupeids is concerned. This is because *atalla* has been the most popular gear used for clupeids in most studies. However, the efficiency of the *atalla* is limited by water depth and water turbulence (Otobo, 1974, 1977) meaning that only partial harnessing is possible with the *atalla* especially as clupeids are known to migrate vertically (Reynolds, 1969) and may go beyond the reach of the gear. The use of gillnets especially the medium sized will therefore be useful in fishing in the lower depths for clupeids particularly *P. leonensis*. The significant interaction between mesh size and months shows that February to April is the best time to use the medium mesh sized gill net to achieve maximum catch.

Conclusion

The use of medium mesh size gill nets (12 mm) is recommended for harvesting clupeids such as *P. leonensis* especially in the inshore and mid-water areas in the Lower Nun River.

REFERENCES

Allison ME, Gabriel UU, Inko-Tariah MB, Davies OA, Uedeme-naa B (1997). The Fish Assemblage of Elechi Creek, Rivers State, Nigeria. Niger Delta, Biologia 2 (1): 90-96.

Allison ME, Sikoki FD, Hart AI, Abowei JFN, Ansa EJ (2007). Distribution and Abundance of *Parailia pellucida* (Boulenger,1901) (Schilbeidae) in the Fresh Water Reaches of the Lower Nun River. Int. J. Trop. Agric. Food Syst. 1(1): 30-36.

Akintunde EA (1976). The biology of Tilapia and *Sarotherodon species* of Lake Kainji. Nigeria with special reference to *Sarotherodon galilaeus. M.Sc. Thesis*, University of Ife, Ile-Ife, Nigeria, p. 200.

Chindah AC, Osuamkpe A (1994). The fish assemblage of the Lower Bonny River. Afr. J. Ecol. 32: 58-65.

Ezenwaji HMG (2004). Studies of the Atalla fishery of the Lower Anambra River, Nigeria. Bio-Research, 2(1): 82-90.

Ezenwaji HMG, Offiah FN (2003). The Biology of *Pellonula leonensis* Boulenger, 1916 (Osteichthyes: *Clupeidae*) in Anambra River, Niger; Bio-Research, 1(2): 33-50.

Idodo-Umeh G (2003). Freshwater Fishes of Nigeria: (Taxonomy, Ecological Notes, Diet and utilization). Idodo Umeh Publishers Ltd. pp. 19-20.

Ikomi RB (1995). Studies on the ecology of the clupeid (*Pellonula leonensis* Regan, 1917) in the River Warri (Niger Delta, Nigeria). Acta Hydrobiol, 35: 381 - 398.

Imevbore AMA, Bakare O (1974). A pre-impoundment study of swamps in the Kainji Lake basin. Afr. J. Trop. Hydrobiol. Fish 3: 79-93.

Institute of poll0ution studies (IPS) (1989). Environmental data acquisition at some NNPC Operational areas. 3. Biological studies. Rivers State University of Science and Technology, Port Harcourt, Nigeria. Institute of pollution studies RSUST/IPS/TR/89/03. p. 393.

Institute of pollution studies (IPS) (1990). Baseline ecological studies of Bonny South (field) location. Final reports. Rivers State University of science and Technology, Port Harcourt, Nigeria. Institute of Pollution Studies, RSUST/IPS/TR/89/02. p. 288.

Ita EO (1978). An analysis of fish distribution in Kainji Lake, Nigeria. Hydrobiologia 58: 233–244.

Ita EO (1993). Inland Fishery Resources of Nigeria. CIFA Occasional Paper No. 20. Rome, FAO. p. 120.

Lelek A, El-Zarka S (1973). Ecological comparison of the pre - impoundment of fish faunas of the River Niger and Kainji Lake, Nigeria. Geophys. Monogr. 17: 655-660.

Lowe-McConnell RTH (1987). Ecological studies in tropical fish communities. Cambridge University Press. p. 382.

Olatunde AA (1977). Studies on the biology of the family *Schilbeidae* (Osteichthyes: Siluriformes) in Lake Kainji, Nigeria. Ph. D. Thesis, University of Reading

Otobo FO (1974). The potential for Clupeid Fishery in Lake Kainji, Nigeria Afr. J. Trop. Hydrobiol. Fish 3: 123-134.

Otobo FO (1977). The Biology of the Clupeid fishes in Lake Kainji, Nigeria. Ph. D. Thesis, University of Ife, Ile - Ife, Nigeria, p. 272.

Otobo FO, Imevbore AMA (1977). The development of a Clupeid fishery in Nigeria Proceedings of the International Conference on Kainji Lake and River Basins development in Africa. Kainji Lake Research Institute, New Bussa. Vol. II: 288-291.

Otobo AJT (1995). The Ecology and Fishery of the Pygmy Herring *Sierrathissa leonensis* (Thys Van den Audenaerde (1969). (Clupeidae) in the Nun River and Taylor Creek of the Niger Delta. *PhD Thesis*. University of Port Harcourt p. 221.

Reed W, Buchard J, Hopson AJ, Taro I (1967). Fish and Fisheries of Northern Nigeria. Ministry of Agriculture Northern Nigeria, p. 226.

Reynolds JD (1969). The biology of Clupeids in the New Volta Lake. In: (Obengi LE ed.). Man - made lakes*:* the Accra Symposium. Ghana University Press Accra, pp. 195-203.

Turner GF (1994). Lake Kainji Fisheries Statistic and Stock Assessment. Nigerian/German (GTZ) Kainji Fisheries Promotion Project. p. 40.

Willoughby NG (1974). The ecology of the genus *Synodontis* (Pisces: Siluroidei) in: lake Kainji, Nigeria. *Ph. D. Thesis*, University of Southampton, p. 288.

Yaro I (2003). An overview of the clupeid fishing gear of kainji Lake. In: Eyo, A. A. and E.A. Ajao (Eds). Proceedings of the 16th Annual Conference of the Fisheries Society of Nigeria (FISON*)* Mainduguri, 4th - 9th Nov. 2001. pp. 132-136.