Studies On The Atalla Fishery Of The Lower Anambra River, Nigeria

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Abstract

The *atalla* lift net fishery of the lower Anambra river was investigated from May, 1998 to March, 1999 by sampling commercial fishers' catches and obtaining from fishers information relating to fishing time, catch, income and preservation of catch. The species composition of the total catch showed that there were 40 species of fin fish, two decapod crustaceans and a mollusc. *Pellonula leonensis* was the most abundant fish species by number and weight followed by *Parailia pellucida*. *P. leonensis* and *P. pellucida* exhibited inverse numerical relationship. The target clupeids and schilbeids constituted over 68% and 55% by number and weight respectively of the overall catch. A total of 23 *atalla* fishing units operated in the lower Anambra river and over 91% of them were operated by Ijaw migrant fishers. The net of *atalla* was made up of two ply and 10 mm mesh size or plastic mosquito gauze. The canoe was planked and there was a close relationship between the base of the *atalla* lift net and the length of the canoe (r^2=0.91). The total annual catch was estimated at 155 t excluding the quantity consumed by the fishers' families. Smoking was the main method of preservation. It took 2±0.04 days to dry a batch of *elem* and smoked fish were packaged in small baskets lined with cement paper. *Atalla* fishery appeared not to be detrimental to the fisheries of the relatively large-sized fish species and it should be encouraged to harvest the abundant clupeids and schilbeids in the mixed species fishery of the lower Anambra river. Mesh regulation is not relevant in the management of *atalla* fishery.

Key words: *Atalla* fishery, catch, species composition, abundance, preservation, Anambra river

Introduction

Atalla is the local name of a lift net employed in the exploitation of many species of fish collectively called *elem*. *Elem*, sold in heaps in fresh, smoked/sun-dried or powdered form, is patronized predominantly by the poor who are unable to compete with the rich for the choice fish, such as *Gymnarchus niloticus* (Cuvier, 1829), *Lates niloticus* (L., 1762), *Heterobranchus* spp. and *Clarias* spp. Nevertheless, it is an essential source of scarce animal protein for the rural poor. In aquatic ecosystems, *elem*, particularly the clupeids and schilbeids, is an important link in the trophic inter-relationships.

The *atalla* lift net is a creation mainly of the Ijaw and Aimu people (Reed *et al*., 1967) but is now widely used, very popular and productive in all water systems in Nigeria where conditions are suitable for its operation. The gear is operated seasonally or all the year round (Awachie and Walson, 1977; Otobo, 1974) but peak activity occurs during the flood phase of the hydrological cycle especially under riverine conditions. The duration of peak activity with the gear depends on the receding flood, which occurs in the last quarter of the year in the upper reaches, and the first quarter of the following year as one approaches the delta, of the lower Niger drainage basin (Pers. obs.). Some professional *atalla* fishers take advantage of this phenomenon by maximally exploiting *elem* as they migrate with the receding flood towards the lower reaches of River Niger.

In Anambra river, the lift net fishery is dominated by migrant fishers and their families. The fishery targets the abundant clupeids (Otobo and Imevbore, 1977) and schilbeids although juveniles of other fish species, which presumably grow to large size, are frequently exploited (Awachie and Walson, 1977). But despite the commercial and ecological importance of *atalla* fishery in Nigeria, the only major studies on aspects of this fishery are those of Otobo (1974), Otobo and Imevbore (1977) and Awachie and Walson (1977). These workers failed to show temporal species composition and abundance, problems of *atalla* fishers militating against higher catch, the correlation between the base of *atalla* gear and the canoe, and /or the preservation methods employed. Much of the information is very important, particularly for the purpose of contributing to the controversial issues of mesh size regulation in a mixed species fishery and whether or not atalla fishery has a detrimental effect on the fisheries of the bigger-sized fish.

This study presents a first comprehensive report on the *atalla* fishery of Anambra river and focuses on species composition and abundance, the fishers, gear and craft, and processing and preservation methods employed.

Materials and Methods

Monthly samples of *elem* were collected from the catch of randomly chosen commercial *atalla* fishers in the lower reaches of Anambra river from May, 1998 to March, 1999. Samples were preserved in 10% formalin and later sorted and identified up to species level wherever possible making use of Daget *et al.*(1984, 1986 a, b), Leveque *et al.*(1990, 1991, 1992), Teugels *et al.*(1992) and Olaosebikan and Raji (1998). Simpson's Index of diversity (D) was calculated as: $D = 1 - \Sigma(n_i/N)^2$, where n_i = the number of each fish species, and N = the total number of all fish species. The standard length (SL), fork length (FL) and total length (TL) to the nearest 0.01 cm and the weight to the nearest 0.01g of each fish were measured and the sex determined by examination of the gonads. The number of *atalla* fishing units was counted during each monthly sampling but care was taken not to enumerate a fishing unit twice. The dimensions of the bases (proximal ends) and distal ends of 15 *atalla* lift nets and the lengths of the associated canoes of cooperating fishing pairs were measured. The relationship between the base of *atalla* (B_a) and the length of canoe (L_c) was determined using the straight line curve ($B_a = a + bL_c$) because the b-value of the power curve ($B_a = aL_c^b$) was not significantly different from 1. Mesh sizes of the lift nets were determined.

Each month, at least a pair of commercial *atalla* fishers was closely monitored by moving with the pair to the fishing ground. Information relating to fishing grounds, fishing time, catch, income, preservation and marketing were obtained from each pair of *atalla* fishers.

Results

Species composition and abundance of catch: The species composition of *elem* (Table 1) showed that there were 40 species of fin fish belonging to 27 genera and 15 families, and three shell fish species - two decapod crustaceans (*Macrobrachium felicinum* and *M. rosenbergi*) and a mollusc (*Potadoma* sp). The family with the most numerous species was Mormyridae (7 species), followed by Mochokidae (5 species). Pantodontidae, Notopteridae, Hepsetidae, Malapteruridae and Nandidae had only one species each.

Simpson's index of diversity (D = 0.7824) showed that *Pellonula leonensis* (Boulenger, 1916) was the dominant species in the catch contributing 0.4487 (57.35 %) of the value of the index. It was also the most abundant species by number (8601, 35.3 %) and weight (8.52 kg, 23.14 %), followed by *Parailia pellucida* (Boulenger, 1901) (6538, 26.85 % and 7.93 kg, 21.54 % respectively) (Table 1). *P. leonensis* and *P. pellucida* exhibited inverse numerical relationship (Fig. 1).

The clupeids dominated by number (8691, 35.69 %) followed by schilbeids (7984, 32.78 %) and characids (3888, 15.96 %), whereas in terms of weight the schilbeids had the highest biomass (11.46 kg, 31.13 %) followed by the clupeids (8.98 kg, 24.39 %) and characids (8.75 kg, 23.77 %). Together the clupeids and schilbeids constituted over 68 % and 55 % by number and weight respectively of the total catch. Apart from the target clupeids and schilbeids, the rest of the families, the decapod crustaceans and the mollusc constituted the by-catch. Of these, the two most important families (Characidae and Bagridae) that grow to large size relative to the target families constitute 22 % by number and over 29 % by weight of the total catch (Table 1).

The temporal variation in abundance (Table 2) showed that *P. leonensis, Brycinus longipinnis* (Gunther, 1864), *Chrysichthys auratus* Geoffrey Saint-Hilaire, 1809 and *P. pellucida* occurred all the year round. Most of the mormyrids and decapod crustaceans were more abundant during the rains than the dry season, whereas the reverse was the case for the mochokids.

The fishers, gear and craft: An *atalla* fishing unit consists of two fishers, the gear and craft (canoe). A total of 23 *atalla* fishing units operated in the lower Anambra river during the study period; six units were part-time and cropped only during the high catch period (July-December), 17 were full-time engaged in *atalla* fishery throughout the year. Out of the 23 *atalla* fishers' pairs, 21 (91.30%) were Ijaw and 2 (8.70%) were indigenous Anam people. All the units used the drifting method of operating *atalla*. The major problems of *atalla* fishers militating against higher catch include mosquito and sandfly bites, general body weakness resulting from daily fishing, cold, lack of powerful light source to attract the fish and lack of outboard engines to fish in distant *elem*-rich waters.

The net of *atalla*, made up of two-ply and of 10 mm mesh size, or rarely of plastic mosquito gauze, is framed by four poles, two horizontal (distal and proximal) and two vertical. A device at the base of each vertical pole anchors the gear to the canoe, and ropes at each end of the distal horizontal pole enable the *atalla* to be raised out of water and to shake off the catch into the canoe. The distal horizontal pole is always longer than the base (proximal horizontal pole) of

Table 1: The species composition and abundance of *elem* in the lower Anambra river.

Species	Number (%)	Weight, kg (%)
Clupeidae		
Odaxothrissa mento (Regan, 1917)	90 (0.37)	0.46 (1.25)
Pellonula leonensis (Boulenger, 1916)	8601(35.32)	8.52 (23.14)
Pantodontidae		
Pantodon buchholzi (Peters,1876)	4 (0.02)	0.01 (0.03)
Notopteridae		
Xenomystus nigri Gunther, 1868	1 (+)	0.02 (0.05)
Mormyridae		
Mormyrus rume Valenciennes, 1846	2 (0.01)	0.08 (0.22)
Marcusenius abadii (Boulenger, 1901)	1 (+)	0.01 (0.03)
Marcusenius cyprinoides (Linnaeus, 1758)	1 (+)	+ (+)
Petrocephalus ansorgi Boulenger, 1902	16 (0.07)	0.04 (0.11)
Pollimyrus isidori (Valenciennes, 1846)	19 (0.08)	0.07 (0.19)
Gnathonemus petersii Gunther, 1862	1 (+)	+ (+)
Brienomyrus brachystius (Gil, 1863)	50 (0.21)	0.17 (0.46)
Hepsetidae		
Hepsetus odoe Bloch, 1794	11 (0.05)	0.25 (0.69)
Characidae		
Alestes baremoze de Joannis, 1835	119 (0.49)	0.58 (1.58)
Brycinus leuciscus (Gunther, 1867)	692 (2.84)	2.93 (7.96)
Brycinus nurse (Ruppell, 1832)	454 (1.86)	2.62 (7.11)
Brycinus longipinnis Gunther, 1864	2623 (10.77)	2.62 (7.11)
Distichodontidae		
Phago loricatus Gunther, 1865	4 (0.02)	0.01 (0.03)
Distichodus rostratus Gunther, 1864	25 (0.10)	0.05 (0.14)
Citharinidae		
Citharinops distichodoides Pellegrin, 1919	3(0.01)	0.06(0.16)
Citharinus latus Muller and Troschel, 1845	6(0.02)	0.05(0.14)
Citharinus citharus Geoffrey Saint-Hilaire, 1809	16(0.07)	0.50(1.36)
Cyprinidae		
Barbus callipterus Boulenger, 1907	1311(5.38)	1.19(5.19)
Barbus sp.	132(0.54)	0.17(0.46)
Bagridae		
Chrysichthys auratus Geoffrey Saint-Hilaire, 1808	265(1.09)	0.81(2.20)
Chrysichthys nigrodigitatus Lacepede, 1803	1205(4.95)	1.15(3.12)
Schilbeidae		
Parailia pellucida Boulenger, 1901	6538(26.85)	7.93(21.54)
Siluranodon auritus Geoffrey Saint-Hilaire, 1827	1127(4.63)	3.09(8.39)
Schilbe intermedius Ruppell, 1832	44(0.18)	0.19(0.52)
Schilbe mystus Linnaeus, 1758	275(1.13)	0.25(0.68)
Malapteruridae		
Malapterurus electricus Gmelin,1789	9(0.04)	0.02(0.05)
Mochokidae		
Synodontis clarias Linnaeus, 1758	50(0.21)	0.41(1.11)
Synodontis gobroni Daget, 1954	54(0.22)	0.34(0.92)
Synodontis filamentosus Boulenger, 1901	14(0.06)	0.07(0.19)
Synodontis eupterus Boulenger, 1901	173(0.71)	0.28(0.76)
Synodontis ocellifer Boulenger, 1900	83(0.34)	0.51(1.39)
Nandidae		
Polycentropsis abbreviata Bouenger, 1901	1(+)	+(+)
Cichlidae		
Pelvicachromis pulcher Boulenger, 1901	29(0.12)	0.21(0.57)
Hemichromis fasciatus Peters, 1852	1(+)	+(+)
Hemichromis bimaculatus Gill, 1862	1(+)	0.01(0.03)
Oreochromis niloticus (Linnaeus, 1758)	9(0.04)	0.21(0.57)
Decapod crustaceans		
Macrobrachium felicinum	273(1.12)	0.15(0.41)
Macrobrachium rosenbergii	12(0.05)	0.01(0.03)
Gastropod mollusc		
Potadoma sp.	1(+)	+(+)
Total	24354	36.81

+ = Less than 0.01

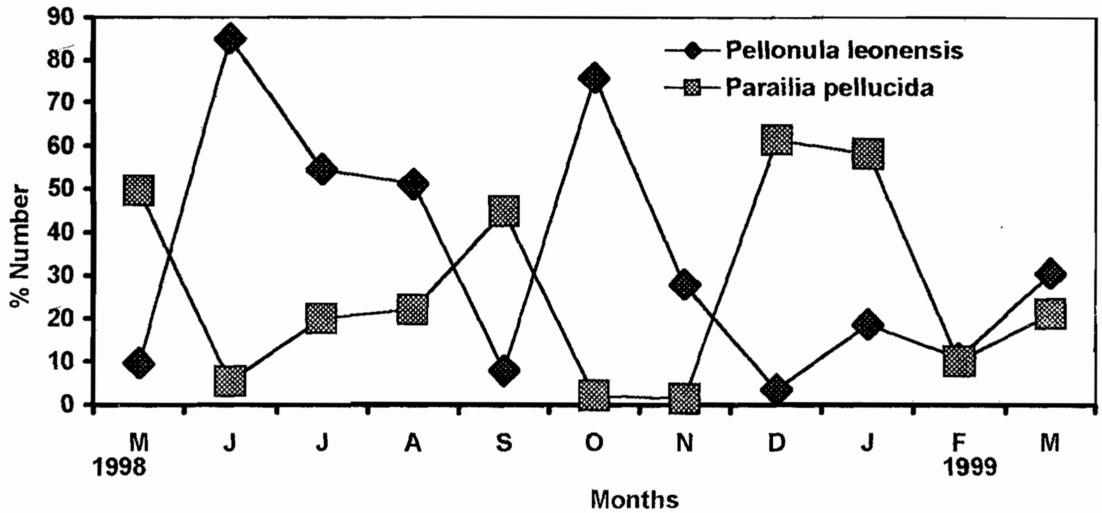

Fig. 1: Inverse numerical relationship between the clupeid, Pellonula leonensis, and the schilbeid, Parailia pellucida, in the lower Anambra river

Table 3: Catch and income estimates of *elem* during periods of low and high catches in the lower Anambra River

	Low catch period (December-June) [$\bar{X}$ (range)]	High catch period (July- November) [$\bar{X}$ (range)]
a. Average daily weight of catch (kg)	3.3 (1.2-5.9)	44.7 (19.5-97.5)
b. Average weight of a basket full of *elem* (kg)	1.3(1.3-1.4)	1.3(1.3-1.4)
c. Average cost of a basketful of *elem* (₦)	110* (80-120)	40(30-50)
d. Average daily income for a fishing pair (a/b x c) (₦)	280(100-500)	1375(600-3000)
e. Average monthly (28 days) income for a fishing pair (d x 28) (₦)	7840	38500
f. Average monthly (28 days) catch for a fishing pair (a x 28) (kg)	92.4	1251.6
g. Average monthly catch for all fishing pairs (f x17) and (f x23) respectively (kg)	1570.8	28786.8
h. Average catch for period of low catch (g x7) and period of high catch (g x 5) respectively (kg)	10995.6	143934.

USD 1 = N 85.00 (during the study period)

atalla lift net by 30-55 cm (7.69 – 12.36%) (mean 10.29±1.64%) but the vertical poles are equal in length. The longer distal end enabled the sampling of a large area. The base of the *atalla* (B_a) showed a close relationship with the length of the associated canoe (L_c) (Fig.2). The following regression equation gave the best fit between them: $B_a = 1.1212 + 0.4441\ L_c$, $r^2 = 0.91$,

Table 2: Monthly variation in the species abundance of *elem* in the lower Anambra river

Species	% Number (% weight)										
	M	J	J	A	S	O	N	D	J	F*	M
Clupeidae											
Odaxathrisa mento	-----	-----	0.78(5.74)	0.28(1.78)	0.95(1.93)	-----	-----	-----	-----	1.72(3.81)	-----
Pellonula leonensis	9.62(10.22)	84.86(71.36)	54.48(40.12)	51.17(35.21)	7.96(7.30)	75.74(74 44)	28.04(4.73)	3.52(0.88)	18.63(4.75)	10.66(7023)	30.44(27.28)
Pantodontidae											
Pantonula leonensis	-----	-----	-----	-----	-----	-----	0.29(0.23)	0.03(0.04)	-----	-----	-----
Notopteridae											
Xenomystus nigri	-----	0.05(0.80)	-----	-----	-----	-----	0.19(1.54)	-----	-----	-----	-----
Mormyridae											
Mormyrus rume	-----	-----	-----	-----	-----	-----	0.19(1.54)	-----	-----	-----	-----
Marcusenius abadii	-----	-----	-----	0.06(0.06)	-----	-----	-----	-----	-----	-----	-----
Marcusenius cyprinodes	0.06(0.30)	-----	0.16(0.30)	0.11(0.11)	-----	-----	-----	-----	-----	---	-----
Petrocephalus ansorgii	0.34(0.87)	0.05(0.20)	0.15(0.26)	-----	0.15(0.42)	-----	-----	-----	-----	----	-----
Pollimyrus isidori	0.23(2.20)	-----	0.15(0.21)	-----	0.45(0.43)	-----	-----	-----	-----	---	-----
Gnathonemus petersii	-----	-----	-----	0.06(0.06)	-----	-----	-----	-----	-----	-----	-----
Brienomyrus brachystius	0.23(0.74)	0.05(0.23)	0.03(0.07)	0.83(1.42)	0.55(1.39)	0.14(0.14)	0.48(0.32)	0.25(0.80)	-----	0.10(0.31)	-----
Hepsetidae											
Hepsetus odoe	---	----	----	-----	-----	-----	0.10(0.67)	0.28(4.09)	0.13(0.78)	-----	-----
Characidae											
Alestes baremoze	---	0.05(0.18)	0.66(1.99)	1.72(2.94)	1.44(1.66)	0.24(1.04)	0.77(1 88)	-----	1.65(78.41)	0.05(0.25)	0.14(0.36)
Brycinus leuciscus	3.21(2.11)	0.97(3.42)	1.04(1 53)	0.28(1.10)	0.40(0.54)	0.19(0.34)	33.78(35.07)	5.60(10.58)	2.53(12.22)	0.10(0.65)	-----
Brycinus nurse	-----	0.19(1.17)	0.28(1.26)	0.33(0.82)	8.16(14.92)	-----	17.42(33.91)	0 18(1.23)	1 14(4.78)	0.49(2.65)	1.76(1.76)
Brycinus longipinnis	18.56(16.23)	0.29(1.38)	1.16(1.97)	0.95(1.68)	2.79(1.57)	3.78(2.16)	0.96(1.15)	0.31(0.80)	2.79(6.21)	53.17(29.08)	27.46(18.93)
Distichodontidae											
Phago loricatus	0.11(0.27)	-----	0.03(0.09)	-----	0.05(0.03)	-----	-----	-----	-----	-----	-----
Distichodus rostratus	-----	-----	0.23(0.17)	----	-----	-----	-----	-----	-----	-----	-----
Citharinidae											
Citharinops distichodoides	-----	-----	-----	-----	-----	-----	0.29(1.19)	-----	-----	-----	-----
Citharinus latus	-----	-----	0.05(0.24)	0.11(0.13)	0.05(0.18)	-----	0.10(0.67)	-----	-----	-----	-----
Citharinus citharus	----	-----	-----	-----	-----	-----	1.53(9.49)	-----	-----	-----	-----
Cyprinidae											
Barbus callipterus	12.49(17.57)	0.83(1.81)	0.76(1.42)	2.22(1.30)	5.07(4.36)	2.08(1.22)	0.96(0.17)	0.80(0.84)	-----	10.66(11.09)	17.19(20.98)
Barbus sp.	-----	2.48(1.95)	0.78(0.61)	0.89(1.07)	1.24(0.37)	0.14(0.29)	0.57(1.16)	-----	-----	-----	-----
Bagridae											
Chrysichthys auratus	0.06(0.12)	0.83(4.92)	2.27(1.54)	1.61(4.51)	0.40(0.85)	1.51(3.84)	0.10(0.19)	1.29(3.19)	1.14(2.18)	1.18(2.91)	0.34(1.65)
Chrysichthys nigrodigitatus	-----	2.29(2.11)	14.09(8.40)	9.45(5.23)	4.18(3.38)	10.34(9.70)	0.10(0.02)	1.78(2.44)	-----	1.03(1.67)	1.33(1.32)
Schilbeidae											
Parailia pellucida	49.6(45.72)	5.36(8.20)	20.02(31.49)	22.08(34.11)	44.88(41.15)	2.12(1.60)	1.44(0.12)	61.44(35.19)	58.17(18.45)	10.07(7.06)	20.95(26.02)
Siluronodon auritus	-----	0.10(0.60)	0.38(1.03)	3.62(5.03)	5.92(9.46)	3.07(3.72)	6.99(3.88)	17.75(30.77)	-----	6.83(23.33)	0.11(0.80)
Schilbe intermedius	0.60(0.25)	----	-----	----	0.85(1.35)	0 42(0.53)	0.77(1.43)	0.06(0.43)	0.13(0.14)	0.29(1.04)	-----
Schilbe mystus	-----	-----	-----	0.39(0.32)	13.33(8.00)	-----	0.19(0.01)	-----	-----	-----	0.11(0.73)
Malapteruridae											
Malapteruridae electricus	----	----	----	0.39(0.32)	0.10(0 30)	---	-----	-----	-----	-----	-----
Mochokidae											
Synodontis clarias	-----	-----	-----	-----	----	-----	-----	-----	4.56(12.10)	0.69(2.51)	-----
Synodontis gobroni	-----	-----	-----	-----	-----	-----	0.38(0.29)	0.37(0.91)	3.93(9.41)	0.34(0.94)	-----
Synodontis filamentosus	-----	-----	-----	-----	-----	-----	0.19(0.36)	0.37(1.08)	----	-----	-----
Synodontis eupterus	----	-----	-----	0.06(0.05)	0.05(0.03)	-----	3.92(0.97)	2.88(3.34)	0.13(0.02)	1.62(1.75)	0.06(0.15)
Synodontis ocellifer	-----	-----	----	-----	-----	-----	0.19(0.23)	1.07(3.26)	3.30(8.04)	0.98(3.72)	-----
Nandidae											
Polycetropsis abreviata	-----	0.05(0.14)	-----	-----	-----	-----	-----	----	-----	-----	-----
Cichlidae											
Pelvicachromis pulcher	0.46(1.06)	0.05(0.31)	0.23(0.29)	-----	0.05(0.08)	0.05(0.47)	-----	-----	1.14(5.54)	-----	-----
Hemichromis fasciatus	-----	-----	-----	-----	-----	-----	0.10(0.05)	-----	-----	-----	-----
Hemichromis bimaculatus	----	-----	-----	-----	-----	-----	0.10(0.15)	-----	-----	-----	-----
Oreochromis niloticus	-----	0.05(0 34)	-----	-----	-----	0.09(0.47)	-----	0.03(0.14)	0.63(6.97)	-----	-----
Decapod crustaceans											
Machrobrachium felicinum	4.98(2.34)	1.41(0.79)	2.30(1.27)	2.22(0.93)	1.0(0.31)	0.09(0.03)	----	----	-----	-----	0.11(0.02)
Machrobrachium rosenbergii	----	----	-----	0.67(0.24)	-----	----	----	----	----	----	---

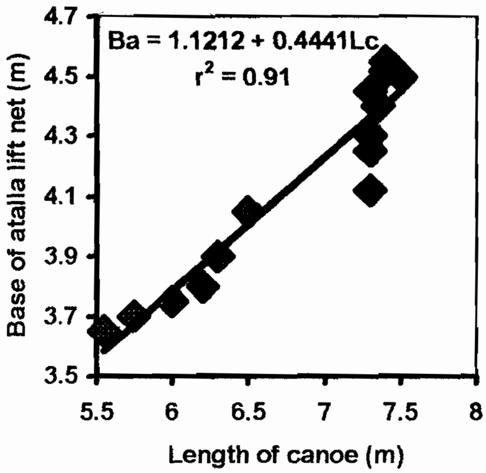

Fig. 2: The relationship between length of canoe, Lc and base of atalla lift net, Ba, in the lower Anambra river.

$P<0.001$, n=15. Thus, the length of canoe accounted for 95.4% of the variation in the base of *atalla* lift net. All the canoes employed by *atalla* fishers were planked and ranged in length from 5.55-7.50m (mean 6.83±0.70 m). Over 95% (22) of the canoes were hired.

Productivity of the fishery: *Atalla* fishery is an all year round fishery in the lower Anambra river. Low catches generally occurred from December to June and high catches from July to November, with peak catches in October and November. Each *atalla* fishing unit operating for 5±0.05 hrs (range 4-6 hrs) daily caught 3-45kg of *elem*. The fishers sell almost exclusively to middlemen, mainly women and girls, belonging to the local Fish Seller's Association, in a standard plastic basket. The fish content of the basket, when full, weighed 1.3±0.06 kg but this fetched different amounts in the periods of low and high catches (Table 3). The average monthly income for a fishing pair operating for 5 hrs daily was ₦7, 800.00 during the low catch period and N38, 500.00 during the high catch period. Thus, a fishing pair can recover the initial cost of operation of ₦12, 500.00 (planked canoe, ₦10, 000.00; *atalla* lift net, ₦2, 500.00) within two weeks during the high catch period. The total annual catch was about 155 t excluding the quantity consumed by the fishers' families estimated at about 16 t. *Atalla* fishery is, therefore, one of the most profitable fisheries in the Anambra river basin.

Processing and preservation: The *elem* was not gutted or processed in any form before preservation. Two preservation methods were employed: (hot) smoking and sun-drying. The dominant method was smoking. In fact, over 99% of all the exploited *elem* in excess of immediate demand was preserved by smoking and it took 2±0.04 days (range 1-3 days) to dry. When smoking facilities are over – stretched, some of the *elem were* spread out on mats for sun – drying but these were later smoked. The smoked products were then packaged in small baskets lined with cement paper before marketing. Smoked *elem* fetched higher income than fresh *elem* from about July to November, whereas the reverse was the case from December to June.

Discussion

A large proportion of fish caught in *atalla* lift net constitutes the target clupeids and schilbeids which have attained their adult size and would of course die and be lost, if not cropped, because they are short – lived. As a result of their rapid turn over (Otobo and Imevbore, 1977; Marshall, 1993), these fish thrive and are abundant at the period (July – November) of recruitment of juveniles of the by-catch all of which are assumed to grow to large size. In reality, however, many fish species in the by-catch, such as

Phago loricatus Gunther, 1865, *Hemichromis* spp. and *Polycentropsis abbreviata* Boulenger, 1901 (Table 1), are already near to (or at) their maximum size; some, such as *Mormyrus rume* Val., 1846 and *Chrysichthys nigrodigitatus* Lacepede, 1803, are very fecund and exploiting their juveniles on the observed scale has no effect on the population (Reed *et al.*, 1977), and a few are forage species for predators and many would of course be lost through natural mortality if left unexploited. It does appear, therefore, that there is no apparent detrimental effect on the populations of the by–catch. Thus, the current Anambra State of Nigeria Fisheries Edict, banning the use of less than 76mm mesh size for the exploitation of all fish species in the State's freshwater systems, except *elem,* is realistic given the enormous production of clupeids, schilbeids and their by-catches in the mixed species fishery of the Anambra river and other water bodies in the State. The obedience of this Edict with respect to the exploitation of *elem* should be continued to accommodate *atalla* fishery as the small mesh sizes are targeted at particular species which are difficult to crop by the other conventional gears in use. Mesh regulation seems not to be relevant in the management of *atalla* fishery,

The inverse numerical relationship between *P.leonensis* (f. Clupeidae) and *P. pellucida* (f. Schilbeidae), the most abundant species in the catch, is attributed to predation by some members of the other family and to cannibalism. *Schilbe mystus* L., 1758 (= *Eutropius niloticus*) ingested *P. leonensis* and other clupeids as well as schilbeids, such as *P. pellucida* (= *Physailia pellucida*) and other *S. mystus* (Olatunde, 1978). *P. pellucida* preyed on *P. leonensis*, which cannibalized other *P. leonensis*; conversely, *P. leonensis* preyed on *P. pellucida* (Ezenwaji and Offiah unpubl.). A special predator–prey relationship seems, therefore, to manifest itself: the prey is the predator, and vice versa. This is, however, complicated by predation by other clupeids and/or schilbeids. The nature of this relationship and its relevance to reproductive success in the two species need further investigation.

The high productivity of *atalla* fishery is causally related to reproductive success, short life span and high annual turn–over of the target species (Otobo and Imevbore, 1977; Olatunde, 1978; Pers. obs). Otobo (1977) and Awachie and Walson (1977) estimated that the average monthly earning of a fishing pair from the production was between ₦100 - ₦210.00 at the peak period of *atalla* fishery. Taking only the upper figure, each of the *atalla* fishing pair earned ₦105.00 or USD 175 (USD 1 = ₦0.6 in 1977) per month. This is much less than the average monthly earning of each fishing pair at the period of high catch in this study (₦19, 250.00 or USD 226.5: USD1 = ₦ 85.00 in 1998 – 1999). Thus, *atalla* fishery is highly productive and profitable in the Anambra river. If current production, >155 t, is maintained, there will probably be no major threat to the fishery. However, factors influencing reproductive success as well as the biology of *P. leonensis* and *P. pellucida* in the Anambra River need to be urgently determined.

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