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THE STRUCTURE AND FUNCTION OF THE ARTISANAL GILL- NET FISHERY OF THE LOWER CROSS RIVER SYSTEM, NIGERIA.

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ABSTRACT

The organisational structure and functional operations of artisanal gillnet fishery of the lower Cross River were studied through weekly analysis of fish landing in two fishing villages. From May 1986 to May 1987, data were collected on number of canoes, total weight and species composition of catch, and the frequency of fishing outings among the fishers. A total of 175 and 50 fishing units (canoes) were sampled in the two stations. The highest monthly catch per unit effort (cpue) of 7.2 kg/canoe/night was obtained in April for the lower estuary while 6.8 kg/canoes/night was obtained in November for the upper part of the estuary. The overall mean cpue were 4.9 and 4.1 kg/canoe/night for the two stations. Twenty eight fish taxa were identified, but the catch consisted mostly of *Pseudotolithus elongatus*, *Chrysichthys nigrodigatatus*, *Ethmalsosa fimbriata*, *Psettias sebae* and *a Mugil falcipinis* which together constituted at least 81% of the total catch in any particular month

KEY WORDS: Arisanal Fishery, catch, Cross River, Nigeria.

INTRODUCTION:

The Cross River system encompasses the Cross River and its estuary and many tributaries like the Calabar River, Great Kwa River, etc. (fig.1). The fisheries of this river system is artisanal. The hydrology (Akpan 1994), fisheries (Moses 1981, Etim 1991, Enin et at 1991) and ecology (Nawa 1982) of this river system have been reported. Gill nets are the most predominant fishing gear in use.

The aim of this work was to elucidate the nature of the artisanal gillnet fishery in this river system with emphasis on the catch composition and catch per unit effort.

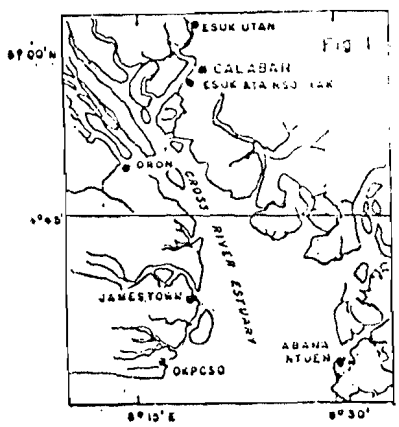

Fig. 1 - Map of the Cross River estuary showing the sampling points at Esuk Ata Nso Iyak and Esuk Utan

MATERIALS AND METHODS

From May 1986 to May 1987, weekly

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sampling visits were paid to the sampling stations at Esuk Ata Nso Iyak (located on the lower part of the Calabar River about 7.5 km upstream from the confluence of Calabar/Cross Rivers) and Esuk Utan (located about 21.5 km upstream from the aforementioned confluence). Data were collected on total weight and species composition of catch, ponderal and numerical strength of each species in catch, catch per effort. Gillnets of various mesh sizes were used, Roll call of fishermen were kept from were the rate of fishing outings were computed. The annual income per canoe was estimated from various interviews with the fishers, their apprentices and from the estimated cpue.

RESULTS

Catch per unit effort Cpue. The monthly variation in cpue for the two landing beaches are given in Fig. 2. Fig. 3 and 4 show the breakdown of the results into species. In Esuk Ata Nso Iyak, the highest monthly mean cpue of 7.22 kg/canoe/night was in April 1987. The species contributions to catch in order of importance were *Pseudotolithus elongatus, Chrysichthys nigrodigitatus, Ethmalosa fimbriata, Cynoglosus Senegalensis and Mugil falcipinis, and together they constitute 81 of the* monthly mean cpue. For *P. elongatus* peaks of mean cpue were observed in April (2.74kg/canoe/night) and November (3.61kg/canoe/night). The minimum cpue (0.9 kg/canoe/night) was in August. For *C. nigrodigitatus* the highest mean cpue of 3.52 kg/canoe/night was in July, after

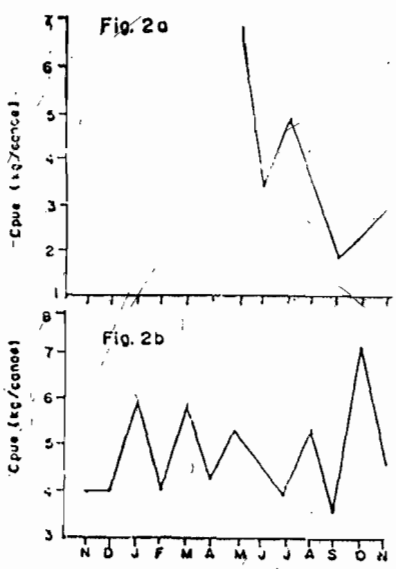

Fig 2 – Monthly average Cpue of all fishes sampled at Esuk Utan (2a) and Esuk Ata Nso Iyak (2b)

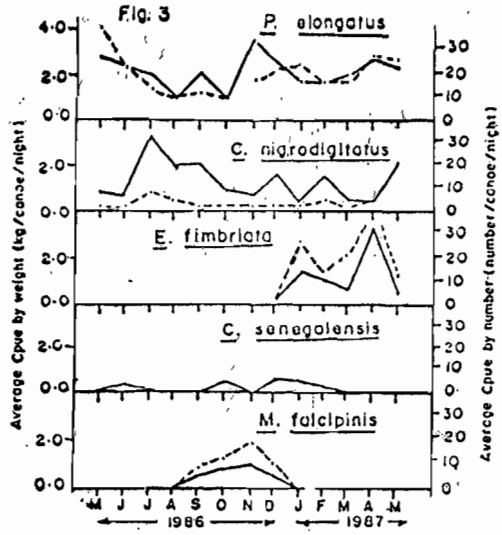

Fig. 3 – Monthly Cpue of some fishes landed at Esuk Ata Nso Iyak (—— weight, ------- number)

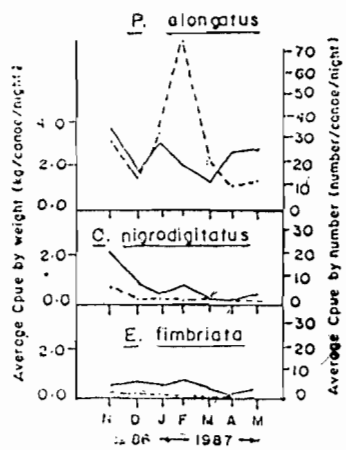

Fig. 4 – Monthly Cpue of some fishes landed at Esuk Utan (—— weight, ------- number)

there was a fall till the lowest values of 0.2 kg/canoe/night (March) and 0.28 kg/canoe/night (April). *E. fimbriate* started appearing in catch in December and reached a peak in April. At Esuk Utan, the highest cpue (6.83kg/canoe/night) was in November and the lowest (1.8 kg/canoe/night) in March. Here, the landings were dominated by *P. elongatus, C. nigrodigitatus* and *C. senegalensis*. The overall mean cpue values were 4.93 and 4.09 kg/canoe/night for Esuk Ata Nso Iyak and Esuk Utan , respectively.

Species Composition. Twenty eight taxonomic groups were encountered, 12 were identified to the species level, 8 to the genus level and 8 to the family level. Only 6 species were considered of interest either because of their high ponderal or numerical contribution to the catch or because of their continuos temporal patterns in their occurrence during the study period. In Esuk Ata Nso Iyak, 5 of the species *(P. elongatus, C. nigrodigitatus, E. fimbriata, Mugil falcipinis* and *Psettias sebae*) contributed monthly averages ranging between 81.43 to 94.205 of the whole catch by weight. *P. elongatus* contributed an annual average of 43.38%, the leasst value being 23.3% in August and the highest 60.05 in November (Fig 5a). The species was the most consistent, ponderally, in the catches with high contributions year-round. *C. nigrodigititatus* was the second most regular species contributing 23.4% overall in the sampling period. The minimum value was in January (3.4%) while the highest value was in July (58.4%). *E. fimbriata* made a sudden and conspicuous appearance in December and by May it was virtually absent from the catch. It peaked in April (46.5%). The highest contribution of *Mugil falcipinis* was in October (23.85%). Another

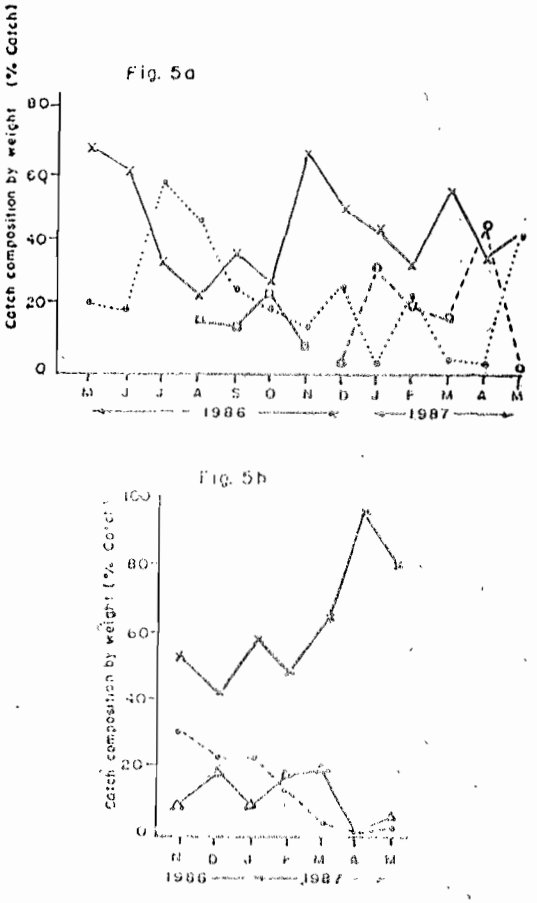

Fig. 5 - Monthly percentages composition of some species landed at Esuk Ata Nso Iyak (5a) and Esuk Utan (5b)

pelagic fish *P. sebae* made a co-appearance with *E. fimbriata* between December and April. Its impact in the catch was not much (highest contribution was 13.2%), but its clear seasonality is worth noting.

In Esuk Utan, three species (*P. elongatus, C. nigrodigitatus and C. senegalensis)* dominated the catch (fig 5b). *P. elongatus* was again the most abundant in the catch and its contribution was consistently high throughout the period. In April, virtually all the catch (98.6%) was due to this species. Its overall mean contribution during the study period was 57.3%. The contribution of *C.*

nigrodigitatus ranged between 1.4% (April) and 31.6% (November) with an overall average of 21.6%. For *Cynoglosus senegalensis* the highest contribution was in March (above 20%). The overall average was 12.6%.

Size distribution of species in catches. In Esuk Ata Nso Iyak, length frequency analysis showed that *P. elongtus*_consist of a group with modal length between 16 and 21 cm. A second group had its modal length between 27 – 29 cm; this group was absent between January and May. The highest mean weight was in November (0.22 kg) and the lowest occurred in May (0.06 kg). For *E. fimbriata*, there were two size groups – the smaller ones with total length between 8 and 17 cm with modal length at 9.0 cm locally called "ekpai", and the larger group 18 to 27 cm with modal length at 22 cm locally named "ibat".

December samples consisted of only the lager size group, whereas March and April samples were made almost entirely of the small size group. The catches for January and February were mixed. This pattern is reflected in the average individual weight which was greatest in December (0.12 kg) and lowest in March (0.03 kg).

DISCUSSION

The fairly high cpue obtained in July at Esuk Ata Nso Iyak was due to the influx of C. nigrodigitatus during this period. Until then, the catch was mainly dominated by P. elongatus in the rainy season. The highest peak of cpue was obtained in April. In the artisanal fishery in Lagos the highest cpue is between November and May (Abass et al 1982).

The monthly catch rates which ranged between 1.83 and 6.83 kg/canoe/night are lower than those reported for marine artisanal fishery of cross River State (Moses 1981), for bonga fishery of Akwa Ibom State coastal waters (Moses 1986) and for gillnet catches in Logos Lagoon (Udolisa and Solarin 1979). The values given by these authors are about 3 times that obtanied in this study. The differences may be due largely to types and sizes of gears and applications rather than fishing area. For instance, bonga fishery on coastal areas employs a special kind of gillent – the encircling net (Marcus 1984) while bait are sometimes used in conjunction with nets in Lagos lagoon (Udolisa and solarin 1979).

From the role call, an average of 145 fishing days per year was estimated for the fishery. The total average annual income per canoe is estimated at 4000 to 5000 naira (one us dollar = circa N10 in 1987 and about N85 naira in 1998). The reliability of the fishers responses to our interviews is hard to ascertain, consequently the reliability of this estimate is difficult to assess. Whatever, the share of the second fisherman is far less than half of this total income. Often, the second fisherman is far is just an apprentice and works for a more pittance.

Catch composition analysis showed that *P. elongatus* was dominant over all other species in most part of the year. This is different from Nawa's (1982) report on the artisanal fishery of the Cross River estuary. Although his result shows a high relative abundance of the species, the magnitude (13.8%) is by far less than that obtained in this study. The year-round occurrence of bonga in this study shows that the data might have been more of coastal artisanal than estuarine, since bonga fishery is only seasonal in estuaries and lagoons, and all year round in coastal waters (Fagade and Olaniyan 1972).
The other species of P*seudotolithus*, namely *P. typus* and *P. senegalensis* reported in the coastal fisheries (Longhurst 1964) were completely

absent. This finding supports the report of Fischer et al (1981) that the species are more marine than *P. elongatus*.

The appearance of *E. fimbriata* in the dry season is due to increase in salinity in the estuary during the period. Several fish species are known to migrate into the estuary mainly for feeding and breeding (Ssentongo et al 1983).

Increase in estuarine salinity in the dry season may be the proximate factor that triggers off inward migration of bonga into the estuary to take advantage of the increased phytoplankton biomass during the period (Akpan 1994). This explanation also applies to *P. sebae*, which is marine but migrated into the estuary only in the dry season. Moses (1980) suggested that *C. nigrodigitatus* migrates from estuary into the freshwaters of the Cros River for breeding purpose. Although this explanation is now widely accepted, it has not yet been proved empirically. Although great Kwa river and Calabar river are tributaries of the Cross river, *Chrysichthys* species undergo annual migration only in Cross and Calabar rivers. The reason for this is yet to be established empirically. The appearance of *Mugil falcipinis* in the catch between August and January suggests that the species also undergoes annual migration. De Silva and Silva (1979) attributed the influx of *Mugil cephalus* into Sri Lanka lagoon to low salinity. Contrary to the results of this work, adults in Sierra Leone waters were found to be positively salinity-dependent (Silva and De Silva 1981).

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REFERENCE

Abass, M., Ajayi, T., Amadi, A., Marcus, M., and Wilson, A. (1982). Stock assessment of the artisanal marine and brackish water coastal fisheries: A preliminary report. Ann. Rep. Nigerian Inst. Oceanogr. Mar. Res. 11-14

Akpan, E.R. (1994) Seasonal variation in phytoplankton biomass and pigments in relation to physico-chemical factors in the Cross River System. Ph.D Thesis, University of Calabar. 269p.

De Silva, S.S. and Silva, E.I.L. 1979. Biology of young greymullet *Mulgil cephalus L.* populations in a coastal laggon in Sri Lanka. J. fish Biol. 15(1): 20.

Enin, U.I., Lowenberg, U. and Kunzel, T. (1991). The *Nematopalaemon hastatus* (estuarine prawn) fishery in the outer estuarine region of the Cross River, Nigeria. *Archiv Fisco Fisch. Wiss.* 41(1): 61-88.

Etim, L. 1991. Growth, biochemical composition and reporoductive cycle in Egeria radiata (Lamarck 1804) Lamellibranchia: Tellinacea: Donacidae) from the Cross River, Nigeria. Ph.D thesis. University of Calaber. 193p.

Fagade, S.O. and Olaniyan, C.I.O (1972). The biology of the West African shad *Ethmalosa fimbriata*

(Bowdich) In the Lagos Lagoon. J. Fish Biol.4: 519 – 533.

Fischer, W., Bianchi, G. and scott, W.B. (1981). FAO species identification sheets for fishery purposes. East central Atlantic: Fishing Area 34, 47.

Longhurst, A. R. (1964). A study of the Nigerian trawl fishery. *Bull.I.F.A.N.* 21: 686- 700.

Marcus, O. (1984). A summary of the fishery statistical data and biology of *Ethmalosa fimbriata* (Bowdich, 1925) in Nigeria. COPACE/TECH/84/60:16 – 29.

Moses, B. S. (1980) Fisheries of the Cross River State of Nigeria: A preliminary report. Fishery Division., Calabar, Nigeria. 51 p.

Moses, B. S. (1981). Estimates of fish biomass and potential yield of Cross River State marine fisheries. Proc. 1st Cross River State Fish. Conf. 33 – 44.

Moses, B. S. (1986). Contribution to the study of bonga Ethmalosa fimbriata (Bowdich 1825) of Nigerian inshore waters: Its fisheries, size distribution, growth pattern, mortality and potential yield. 1st Nat. Workshop on Dceanogr. University of Calabar. 50 p

Nawa, I. G. (1982). An ecological study of the Cross River estuary Ph.D Thesis. University of Kiel. 163 p.

Silva, E.I.L. and De Silva, S.S (1981). Aspects of biology of grey mullet *Mugil cephalus L.* adult populations of a coastal lagoon in Sri Lanka. J. Fish Biol. 19(1): 1-10.

Ssentongo, G.W., Ajayi,T.O. and Ukpe, E.T. (1983). Report on a resource appraisal of the artisanal and inshore fisheries of Nigeria. *FOA Field Document.* 2:43p.

Udolisa, R.E.K. and Solarin, B.B. (1979). Design characteristics of castnets and gillnets in Lagos Lagoon. Nigerian Inst. Oceanograph. Mar. Res. Occ. Pap. 31. 24p.