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EFFECTS OF SEDIMENT INPUT ON AQUATIC ANIMAL COMMUNITIES IN NEW CALABAR RIVER RIVERS STATE NIGERIA

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ABSTRACT

The effects of sediment input on aquatic animal communities in New Calabar River in Rivers State Nigeria were studied. Samples of the sediments were collected using Ekman's grab. Sediments were seived through various mesh sizes until fme silt was obtained. Macroinvertebrates were collected using scoop nets. The water temperature, pH, dissolved oxygen content and transparency were measured from September to December, 2006. The results indicated that temperature and dissolved oxygen content were within tolerable range for the animals. Silt was gradually being deposited in the River and some parts are silted up resulting in loss of water and decrease in the population of macroinvertebrates such as *Biomphalaria* sp, *Lymnae sp and Asphatharia sp.* In addition the texture of the silt determiners the abundance of macroinvertebrates hence the increase in the population in the month of Nov, while Sept(43%), Oct(6.6%) and Dec(1.5%), had a gradual decrease that is inversely proportional to the siltation of the river.

KEYWORDS: Silt, freshwater, benthic, Molluscs and sediments.

INTRODUCTION

General studies on organisms colonizing benthic substrate of streams and rivers in Nigeria are very rare. The literature is either confined to macrobenthic invertebrates (Victor and Dickson, 1985, Victor and Ogbeibu, 1985, 1986; Ogbeibu and Victor, 1989) or to macroinvertebrates in general (Bidwell and Clarke 1977, Nwadiaro, 1984, Victor and Ogbeibu, 1991).

Catchment disturbance that results in fine sediment input into streams has been identified as a major contributor to the degradation of freshwater habitats (Kreutzweiser et ,al, 2005).

Factors such as agricultural tillage, urbanization, mining, road and house construction and logging activity result in sediments inputs and deposition in water bodies (Cuker, 1987).

Wetzel (1983), Gliwcz (1999) demonstrated that siltation occurs when clay from catchment watershed are washed into the reservoir. Clay sedimentation destabilizes the benthos which can result in loss of habitat which increases drift of the benthic animals or reduction in food quality. Some biological Consequences of sedimentation include decline in benthic invertebrate abundance and or changes in community structure (Bidwell and Clarke 1977, Kreutweiser *et al* 2005).

Sedimentation is widely recognized as a problem of fish but not harmful to all fishes while there is decline with sedimentation in some taxa Hart, 1987.

This study was therefore undertaken to provide some baseline information on the fine sediment content of the New Calabar River and some Physio-chemical Parameters of the river. To assess the effects of siltation on the macroinvertebrates and fishes in New Calabar River at Choba, Rivers State.

STUDY AREA

The New Calabar River is located in the tropical rainforest of the lower Niger Delta and has a gradual transition from fresh to salt water along the reach. The river is about a 98km long, 40km of which is fresh while the rest is brackish/salt water. It empties into the Atlantic Ocean. For about 87km of its length the river is tidal black water. The study area (Choba) is tidal fresh water.

MATERIALS AND METHODS

Sediment collection: sediments were collected from the river with Ekman's grab. Five loads of sediment bed were collected from each point. Samples from each station were wash using 0.5mm mesh screen. The residue in the sieve was then emptied into a wide mouth labelled plastic container and preserved in 10% formaline.

A qualitative sampling of invertebrates that were exposed to dry section of the river were collected using scoop nets. The content of the scoop net were preserved also in 10% formaline. In the laboratory the organisms were sorted out and identified to genus or species.

The dissolved oxygen content of the water was measured using titrimetric method. The transparency of the water was measured using the sachi disc, the

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diameter was 20.20cm. The surface water temperature and pH were determined.

RESULTS

The surface water temperature in New Calabar River varied from 25.5^{0C} to 28.5^{0C}. The water transparency fluctuated between 100cm in September, 133cm in October, 112.5cm in November and 119cm in December. The pH of the water varied from 7.91 in September, in October 8.12, in November 8.5 and 8.57 in December. There was little fluctuation in these physical parameters (Table 1).

The dissolved oxygen content of the River was 4.75mg/l in September, 3.9mg/l in October, 3.95mg/l in November and 4.35mg/l in December. The dissolved oxygen content fluctuated minimally.

Table 1: Temperature, pH content, transparency and dissolved oxygen in New Calabar River.

Month	Mean value	Temp. (Oc)	pH	Transparency (cm)	DO, (mg/l)
September		25-26	7.52-8.3	90-110	4.20-5.30
	Mean	25.5	7.91	100	4.75
Octo ber		26-27	8.13-8.10	126-140	3.80-4.00
	Mean	26.5	8.12	133	3.9
November		27 -28	8.40-8.60	105-120	3.70-4.20
	Mean	27.5	8.5	112.5	3.95
December		28- 29	8.64-8.50	103-135	4.0-4.70
	Mean	28.5	8.57	119	4.35

The silt content was 11.91 to 33.12% in September, 12.85 to 17.09% in October, 12.3 to 18.1% in November and 21.7 to 23.19% in December.

Table 2: Monthly variation in silt content of New Calabar River

Month	Daily silt weight (g)	Daily silt weight after drying (g)	Average silt %
September	Week 1 500-700	27.-39.24	33.12
	Week 2300-350	20.04-20.16	20.1
	Week 3220 - 290	11.81-12.90	12.36
	Week 4200 - 240	11.41-12.40	11.91
October	Week 1 200-210	16.6-17.30	17.00
	Week 2 160 – 180	15.18-19.00	17.09
	Week 3200-230	16.00 - 17.30	16.65
	Week 4 150-160	12.50 - 13.20	12.85
November	Week 1 170 – 180	17.24-18.00	17.6
	Week 2 160-170	16.29-16.40	16.35
	Week 3 180 – 185	17.80 - 18.40	18.1
	Week 4 130 – 135	11.90 - 12.70	12.3
December	Week 1 350 – 380	23.57 -22.80	23.19
	Week 2400 – 450	21.00-23.90	22.45
	Wee 3400-500	20.60-22.80	21.7

The invertebrates collected were mollusks. The two classes represented were Gastropoda and Bivalvia. The gastropods were *Biomphalaria* and *Lymnae* species with *Lymnae* constituting about 6% and *biomphalaria* constituting about 3%. Bivalves mostly *Asphatteria* species formed about 1.5% of the invertebrates collected.

The fishery composition of the River showed that the family Cicidae represented by *Hemichromis fasciatus, Tilapia zilli, Sarotherodon galilaeus* and

Oreochromis niloticus were the most abundant species constituting about 90% of the catch. Other families represented were Bagridae, *Chrysithyes nigrodigitatus* and *Auchenoglanis occidentalis* which formed 100% of the catch while family Anabantidae represented by *Ctenopoma kinsleye* formed about 5% of the catch.

DISCUSSION

The water temperature and pH values of silt content obtained in the New Calabar River were within tolerable limits for aquatic organisms. The temperature range of 25- 28.5oc obtained from September to December was within the range obtained by Hart (1987) for Imo River between August to December 1993.

Transparency obtained in the present work was between (90.85-145cm). These values obtained attributed to the presence of suspended matter in the river. Scattering of solar radiation in water increased as a result of influx of suspended matter. Hart (1987) obtained high transparency ranging from 88.60 to 390.0cm in Elele-Alimini Stream and a low Sechi disc transparency value of 12.5 and 120.30cm was obtained in lmo-River, all in Rivers state. The Silt Content of the River was observed to be high in the month of September. Silt has gradually accumulated over the years in New Calabar River with a Portion of the River drying up during the dry season. The result is loss of aquatic environment with the animals during the months of September and October. Many molluscs especially *Biomphnlaria, Limnea* and *Asphateria* were exposed to dry condition because of loss of water in the section of the river and the animals were desiccated. However when heavy rain comes, the dry region regains water.

There are ecological consequences if this condition continues in the water body. Firstly, the accumulation of silt in the New Calabar River has effect on the aquatic animal biomass. In New Calabar River, there is gradual reduction of the abundance of *Biomphnlaria* and *Lymnae* (Gastropod) and Bivalves, *Aspathnria* species.

This is due to the death of these organisms in the River. Similar observations of decline in invertebrate fauna was made by Krutzweiser et *a1* 2005.

The factors identified as being responsible for the deposition of silt in New Calabar River are: Construction of houses along the river, increases the effluent into the river. Agricultural practices along the river leads to the removal of weeds that protect the top soil and during the rainy season the soil is washed into the river. Consequently every rainy season, more silt would be deposited in the river and with time the river would become silted up. This research has shown that there is gradual degradation of this fish habit due to human activities around the catachment zone and if this development is not checked immediately, New Calabar River will gradually run dry leading to the devastation of the environment.

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