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# COMPOSITION, DISTRIBUTION AND ABUNDANCE OF MACROINVERTEBRATES OF THE UPPER REACHES OF RIVER ETHIOPE, DELTA STATE NIGERIA

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## Abstract
Benthic macroinvertebrates from the source to a gradient of 45 kilometers of the River Ethiope were sampled monthly between July 2002 to January 2003 using the modified kick sampling technique. Benthic macroinvertebrate densities ranged from 94±7.04 organisms/m$^2$ to 183± 21.24 organisms/m$^2$ with higher densities occurring during the dry season months and lower densities during the wet season months. The distribution of organic matter, macrophyte cover, substratum texture and current velocity accounted for the variations in the species composition, taxonomic richness and total abundance at the five stations sampled. The density of taxonomic group differed significantly ($P < 0.05$) among the stations. Generally, the most dominant taxonomic order was decapoda (26.3%) closely followed by diptera (18.9%) and the least, plecoptera (0.3%). Shannon-Wiener diversity and evenness were significantly higher ($P < 0.05$) at station 5.

Keywords – Benthic macroinvertebrate, abundance, diversity, River Ethiope, taxa richness

## Introduction

The composition and structure of macroinvertebrate communities has been the subject of much research in river system. Potential benefits of research on macroinvertebrates include the quick assessment of biological resources for conservation purposes and the detection of pollution through differences between predicted and actual faunal assemblages (Miserendino, 2001).

Macrobenthic invertebrates are useful bio-indicators providing for more accurate understanding of changing aquatic conditions than chemical and microbiological data, which at least give short term fluctuations (Ravera,1998; 2000).

Studies on macroinvertebrates of African lotic waters are few in literature (Victor and Dickson, 1985) and until recently had not received much attention in Nigeria (Edokpayi *et al* 2000). A review of some works is presented by Anadu and Ejike (1981), Victor and Dickson (1985), Ogbeibu and Victor (1989), Edokpayi *et al* (2000), Edema *et al* (2002), Ogbeibu and Oribhabor (2002) and Adakole and Annune (2003).

Only a few published works are available on the macro invertebrate fauna of lotic waters in Delta State, Egborge *et al* (2003) reported the macroinvertebrate fauna of the Udu-Ughievwen wetland in Delta State. Olumokoro (1996) however studied the macrobenthic fauna of Warri River. The structure and macroinvertebrate composition of River Ethiope, a prominent freshwater body in Delta State is poorly known, therefore the objective(s) of this study is to describe the macroinvertebrate assemblages and composition and to identify abiotic factors that best predict species richness and abundance of macroinvertebrates in the upper reaches of the river.

**Description of Study Area**

River Ethiope is one of the two main tributaries of the Benin River, the other being the Jamieson River (Fig. 1). From its source at Umuaja, it flows a westerly direction for approximately 100km through the evergreen forest zone and enters the Benin River at Sapele. The river is tidal only in its lower reaches (Sapele to Aghalokpe Stretch).

Two climatic seasons, wet and dry, prevail in the study area. These seasons were defined using an Aridity Index (AI). The wet season (May-November, AI > 30) is characterized by high monthly rainfall (range 120 – 350 mm) while the dry season (December – April; AI < 30) is characterized by low precipitation (range 0-90mm).

For the purpose of this study, five sampling stations were demarcated in the river:

**Station 1:** This stations was located at Umuaja; the source of the river.The substratum here is covered by coarse sand and gravel, with an average depth and width of 0.2metres and 1.5m respectively. It is swift-flowing (average velocity: 0.3m/s) and a high transparency of 100%. The vegetation cover here includes *Dryopteris* species, *Bambusa vulgaris, Azolla africana, Commelina* species, *Pistia stratiotes, Oxystigma* species.

**Station 2:** The station is located in Umutu (about.5km downstream from the source). The substratum is covered with coarse sand. It has an average depth and width of 0.2m and 1.9m respectively. Mean current velocity rate was 0.2m/s. the vegetation cover here includes *Dryopteris* spp., *Bambusa vulgaris.* Human activities here include washing of cloth, melon processing and bathing.

**Station 3:** Located at Obiaruku, 16.5km from the source near a hardwood company. The substratum is made up of muddy sand. It has an average depth and width of 0.3m and 2.4m respectively, mean current velocity rate was 0.2m/s.

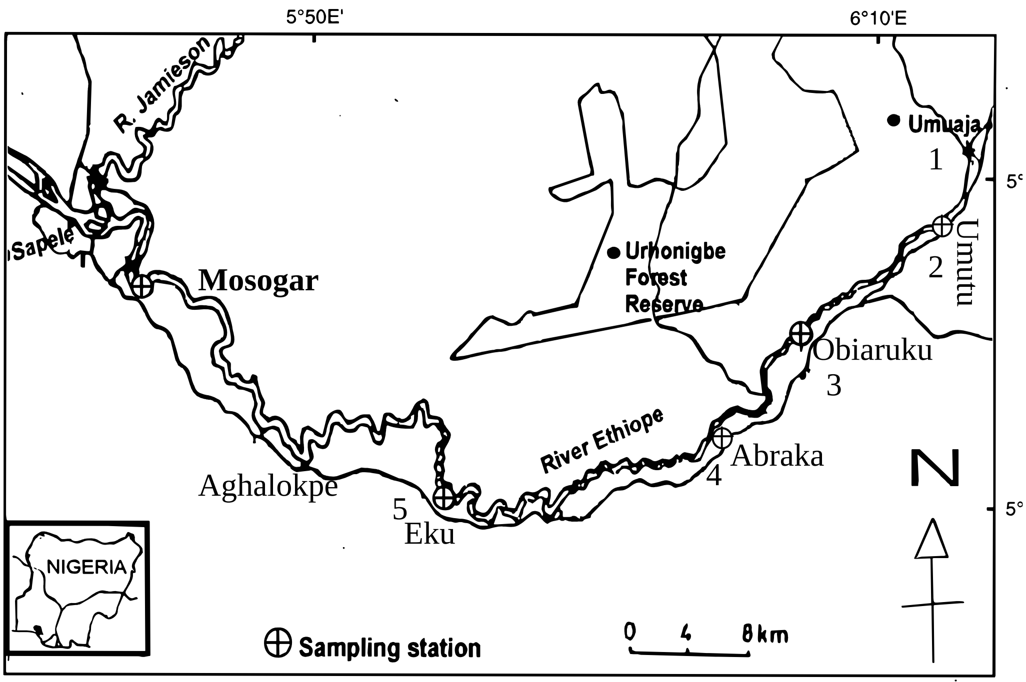


**Fig. 1**. Map of Ethiope River showing the sampling stations (1–3).

The vegetation cover here are *Dryopteris* species, *Commelina* species, *Salvina* species. Human activities here include washing of clothes, bathing and sand dredging, fishing and transportation using canoe.

**Station 4:** This station is located at Abraka. It is about 30km from the source of the water. The bottom river is covered with coarse sand, at the sample point, the depth was 0.3m, and flow velocity is 0.2m/s. the vegetation cover here include *Azolla africana, Pistia statiotes, Salvia nymphellula.* Human activities at this station include bathing and washing of clothes.

**Station 5:** This station is located in Eku, about 45km from the source of the river. The bottom has fine sand mixed with clay soil. The shoreline is inundated with flood from the municipal area. The excess water is attributed to the topography of the region, which is due to the lowland area, poorly drained soil and influence of erosion from the municipal area. The water is dirty at the banks. Mean current velocity is 0.17m/s, depth at the bank is 0.28m. The dominant vegetation at the bank are *Azolla africana, Nymphia* species, and *Commelina* species. The major human activities here are the use of canoe for commercial services, land dredging, domestic washing and cassava washing.

The marginal vegetation along all stretches is of the freshwater swamp type. The fringing trees are principally *Raphia vinifera* P. Beauv., *Symphonia* sp., Elaeis guinneesis *Jacq.,* Havea brasiliensis *Muell. Arg., Bambusa* sp., *Grewia* sp. and *Cocos nucifera* L.

## Materials and Methods

Sampling for water quality parameters and macroinvertebrates were carried out at monthly intervals for a period of six months between July 2002 and January 2003. During this period, sampling was done between 0700 and 1200 hours on each sampling day. Rainfall data during the study period were obtained from the ministry of Aviation, Department of Meteorological Services, Warri (No: 0600538).

Air and surface water temperature were measured with a 0 – 100 $^{o}$C mercury in glass thermometer. Water depth was determined using a calibrated straight wooden pole fixed at a particular portion. Dissolved oxygen (DO), Alkalinity, acidity were determined titrimetrically as described by APHA (19985). Flow velocity was measured by employing the float ‘ping pong’ ball technique over a known distance (Petr, 1970).

The “kick sampling technique” described by Lenat *et al* and modified by Kellogg (1994) was used in collecting macroinvertebrates from the bankroot biotope of each station. In this methodthe substratum and the emergent vegetation were vigorously disturbed by kicking towards upstream. The disturbed animals from the streambed were washed by the current and wooden net of mesh size (154cm) held downstream was used to collect them. Collected samples were preserved with 10% Formalin. In the laboratory, samples were washed in a 600micro meter mesh sieve to remove formalin, invertebrates were picked from the substrate with the aid of an illuminated 10x magnifier, and then the entire sample was enumerated and identified to the lowest practical taxon under a binocular dissecting microscope. Identification was doneusing keys and references: Pennak (1978), Macan, (1959), Mellanby (1963), Hawking (2000) and Theischinger (2001). Margalef’s taxa richness (d), Shannon index of general diversity (H) and Evenness index (E) were used to analyze the community structure of the macroinvertebrates(Zar, 1984).

## Results

### Physical and chemical factors

The variations in the physical and chemical conditions of the study stations are shown in Table 1. Air temperature, water temperature, water depth, Alkalinity and Acidity were not significantly different ($p > 0.05$) in all stations.

The highest value of water temperature ($28^0$c) was recorded in the month of July and lowest in the month of December ($24^0$c). The flow rate fluctuated greatly between stations. It was swiftest in station I with a value of 0.25 m/s. It reduced as it flows down to station V, were the least value (0.17m/s) was obtained. Positive correlation coefficient ($P < 0.05$) thus exists between current velocity and the various sampling stations. The same also applied to dissolved oxygen. It was highest in station V (5.73 mg/L). There exist significant differences ($P < 0.05$) between the various sampling stations.

Table 1: Summary of the physicochemical properties of the study stations, upper reaches of River Ethiope, July 2002 – January 2003. (n = 6, number of samples) values are mean ± S.E. (minimum and maximum values in parentheses)

| Properties | Station I | Station II | Station III | Station IV | Station V | F-value | ANOVA Probability (p) |
|---|---|---|---|---|---|---|---|
| ***Physical*** | | | | | | | |
| *Air temperature ($^0$c)* | 26.7±0.76 (23.0-31.0) | 26.7±1.36 (22.0-31.0) | 25.7±0.95 (23.0-29.0) | 36.0±1.26 (22.0-30.0) | 26.2±0.40 (25.0-27.0) | 0.17 | P > 0.05 |
| Water Temperature (*$^0$c*) | 25.0±1.03 (21.0-28.0) | 25.2±0.75 (23.0-28.0) | 25.2±0.31 (24.0-26.0) | 26.3±1.04 (24.0-30.0) | 26.7±1.12 (23.0-30.0) | 0.74 | P > 0.05 |
| Water depth (m) | 0.21±0.02 (0.16-0.26) | 0.22±0.01 (0.19-0.24) | 0.30±0.01 (0.25-0.33) | 0.29±0.01 (0.28-0.31) | 0.32±0.01 (0.28-0.31) | 0.20 | p>0.05 |
| Flow Velocity (m/s) | 0.25±0.03 (0.12-0.31) | 0.24±0.02 (0.14-0.31) | 0.19±0.02 (0.15-0.25) | 0.19±0.01 (0.14-0.21) | 0.17±0.03 (0.11-0.19) | 4.19 | P<0.05* |
| ***Chemical*** | | | | | | | |
| DO (mg/L) | 5.00±0.34 (4.20-5.60) | 4.83±0.17 (4.20-5.20) | 5.53±0.28 (4.00-6.40) | 5.63±0.31 (4.60-6.60) | 5.73±0.30 (4.80-6.80) | 3.36 | P <0.05* |
| Alkalinity (mg/L) | 3.20±0.26 (2.20-4.00) | 3.10±0.17 (2.60-3.80) | 3.67±0.25 (2.40-4.60) | 3.57±0.34 (2.40-4.20) | 3.77±0.17 (3.00-4.20) | 1.49 | p>0.05 |
| Acidity (mg/L) | 0.39±0.02 (0.30-0.44) | 0.39±0.04 (0.28-0.54) | 0.37±0.04 (0.28-0.54) | 0.31±0.02 (0.26-0.36) | 0.28±0.06 (0.14-0.42) | 0.78 | p>0.05 |

The results of analysis of variance (ANOVA) computed for each factor and the statistical significance is indicated. * indicate significant difference

**Macroinvertebrate composition, density and distribution**

Macroinvertebrate assemblages collected from the upper reaches of River Ethiope were diverse, with 59 taxa identified and 831 individuals /m$^2$ recorded during the study (Table 2). The total number of taxa and individuals present at stations 1, 2, 3, 4 and 5 were 37 (172), 14 (83), 28 (189), 23 (127), and 39 (260) respectively. Crustaceans (decapods) made up the largest or most dominant taxonomic order accounting for 26.3%, closely followed by Diptera (19.9), Annelida 10.95% and the least, Plecoptera accounting for only 0.3% of the total macroinvertebrate density (Fig 2). The most abundant species was the decapod, *Potamalpheops* sp and it was present in all the stations. The Diptera, *Chironomus transvaalensis* was the second most dominant species. It was mostly common in station I, II, V and virtually absent in stations III and IV.

The Annelids were represented by two families; Naididae; comprising of five taxonomic species namely *Chaetogaster diastrophus, Nais* sp., *Aulophorus furcatus, Dero* sp and *Branchiodrilus hortensis* and Tubificidae comprising of one species, *Tubifex*. The annelids accounted for 10.95% of the total composition of different taxa in the river. Station I had the least abundance of only five individuals.

The Nematods were represented by two families; family Plectidae comprising one taxonomic species *Rhabdolaimus,* restricted to stations III and IV. The second family Dorylaimidae was represented by one species *Dorylaimus* and was present in stations III, IV and V.

The insecta group comprising of Ephemeroptera, Plecoptera, Trichoptera Coleoptera, Hemiptera, Diptera and Odonata was dominated by Diptera (18.94%) and closely follwed Hemiptera accounting for 15.01% of the total composition (Fig. 2).

**Table 2:** The Composition, density (No. of individuals/m$^2$) and distribution of macrobenthic invertebrates in the sampling stations from July 2002-January 2003.

| Taxa | Sampling Station | | | | | |
|---|---|---|---|---|---|---|
| | I | II | III | IV | V | TOTAL |
| NEMATODA | | | | | | |
| Family Plectidae | | | | | | |
| *Rhabdolaimus* sp | - | - | 1 | 4 | - | 5 |
| Family Dorylaimidae | | | | | | |
| *Dorylaimus* sp | - | - | 6 | 2 | 4 | 12 |
| ANNELIDA | | | | | | |
| Family Naididae | | | | | | |
| *Chaetogaster diastrophus* | - | 12 | 3 | - | 1 | 16 |
| *Nais* sp | 4 | - | 4 | - | - | 8 |
| *Aulophorus furcatus* | - | - | - | 10 | 9 | 19 |
| *Dero* sp | 1 | - | 5 | 2 | 14 | 22 |
| *Branchiodrilis hortensis* | - | - | - | 4 | 11 | 15 |
| Family Tubificidae | | | | | | |
| *Tubifex* sp. | - | - | 7 | 2 | - | 9 |
| DECAPODA | | | | | | |
| Family Desmocaridae | | | | | | |
| *Desmocaris trispinosa* | 9 | 4 | 13 | - | 8 | 34 |
| Family Euryrynchidae | | | | | | |
| *Euryrhynchina edingtonae* | 3 | 6 | - | 13 | 4 | 26 |
| Family Atyidae | | | | | | |
| *Caridina gabonensis* | - | 7 | 16 | - | - | 23 |
| *Caridina Africana* | 2 | - | 8 | 12 | 21 | 43 |
| Family Apheidae | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| *Potamalpheops* sp. | 24 | 12 | 17 | 16 | 19 | 88 |
| ARACHNIDA | | | | | | |
| Family Limnocharidae | | | | | | |
| *Hydrachna* sp. | 2 | - | 5 | - | 2 | 9 |
| *Hydrobates* sp. | 1 | - | 3 | - | 1 | 5 |
| Family ... | | | | | | |
| *Argyronecta aquatica* | - | - | - | 3 | 4 | 7 |
| INSECTA | | | | | | |
| EPHEMEROPTERA | | | | | | |
| Family Baetidae | | | | | | |
| *Baetis bicaudatus* | 8 | 2 | - | - | - | 10 |
| *Baetis* sp | 2 | 1 | - | - | - | 3 |
| *Centroptilum* sp | 4 | - | 2 | 2 | 8 | 16 |
| *Cloeon* sp | - | - | 3 | - | 2 | 5 |
| Family Ecdyonuridae | | | | | | |
| *Ecdyonorus* sp | 4 | - | - | 1 | - | 5 |
| Family Coenodes | | | | | | |
| *Coenis horaria* | 1- | - | - | - | 1 | 2 |
| *Heptagenia* sp | 3 | - | - | - | 2 | 5 |
| PLECOPTERA | | | | | | |
| Family Leutridae | | | | | | |
| *Leuctra* sp | - | - | 3 | - | - | 3 |
| TROCOPTERA | | | | | | |
| Family Hydropsychidae | | | | | | |
| *Hydropsych* sp. | -. | - | 4 | - | 3 | 7 |
| COLEOPTERA | | | | | | |
| Family Dytiscidae | | | | | | |
| *Dytiscus marginalis* | 6 | - | 8 | 4 | - | 18 |
| *Hyphydrus ovatus* | 2 | - | - | - | - | 2 |
| *Platambus* sp. | - | 4 | 13 | 3 | 4 | 24 |
| Family hydrophilidae | | | | | | |
| *Hydrophilis* sp. | - | - | 4 | 6 | 7 | 17 |
| Family Gyrinidae | | | | | | |
| *Gyrinus* sp. | 12 | - | - | - | - | 12 |
| HEMIPTERA | | | | | | |
| Family Belostomatidae | | | | | | |
| *Belostoma* sp | - | - | 6 | 12 | 9 | 27 |
| *Lithocerus* sp. | - | - | - | 5 | - | 5 |
| Family Gerridae | | | | | | |
| *Gerris lacustris* | 4 | - | 3 | - | 5 | 12 |
| *Rheumatobates* sp | 1 | - | - | 1 | 0 | 2 |
| *Hebrus* sp. | 6 | - | - | - | 1 | 7 |
| Family Naucoridae | | | | | | |
| *Ilyocoris crimicoides* | 6 | - | 14 | - | 3 | 23 |
| Family Notonectidae | | | | | | |
| *Notonecta* sp | 4 | - | - | - | 6 | 10 |
| Family Corixidae | | | | | | |
| *Corixa* sp | 2 | 8 | - | 9 | 2 | 21 |
| Family Veliidae | | | | | | |
| *Velia caprai* | 4 | - | - | - | 11 | 15 |
| DIPTERA | | | | | | |
| Family Chironomidae | | | | | | |
| *Chironomus transvaalensis* | 26 | 14 | - | - | 21 | 61 |
| *Chironomus fractibolus* | 8 | - | - | - | 4 | 12 |
| *Tanytarsus balteatus* | 2 | -- | - | - | - | 2 |
| *Corynoneura* sp. | 2 | - | - | - | - | 2 |
| *Cricotopus* sp. | - | 1 | - | - | 8 | 9 |
| *Anopheles* sp. | - | 5 | 6 | - | 12 | 23 |
| *Culex* sp. | 1 | - | 8 | 2 | - | 11 |
| *Theobaldia* sp. | - | - | 12 | - | 3 | 15 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Family Ceratopogonidae | | | | | | |
| *Ceratopogonid* | 1 | - | - | - | 2 | 3 |
| Family Tabanidae | | | | | | |
| *Tabanus* sp. | 3 | - | - | 4 | 9 | 16 |
| ODONATA | | | | | | |
| Family Libellulidae | | | | | | |
| *Libellula* sp. | 2 | - | - | - | 14 | 16 |
| *Sympectrum* sp. | - | - | - | 6 | 7 | 13 |
| Family Macromiidae | | | | | | |
| *Macromia* sp. | 4 | 1 | 7 | - | - | 12 |
| Family Aeshnidae | | | | | | |
| *Aeshna* sp | 4 | - | - | - | 2 | 6 |
| Family Calopterygidae | | | | | | |
| *Calopteryx* sp | 1 | - | - | - | - | 1 |
| Family Coenagriidae | | | | | | |
| *Coenagrion* sp. | 1 | - | - | 4 | 6 | 11 |
| *Enallagma* sp. | 2 | 6 | - | - | - | 8 |
| MOLLUSCA | | | | | | |
| *Limnaea* sp. | - | - | - | - | 9 | 9 |
| Family Planorbidae | | | | | | |
| *Planorbis* sp. | - | - | 6 | - | 1 | 7 |
| Family Viviparidae | | | | | | |
| *Viviparus* sp. | - | - | 2 | - | - | 2 |
| No. of Individuals (N) | 172 | 82 | 189 | 127 | 260 | 831 |
| No. of species (S) | 37 | 14 | 28 | 23 | 39 | |

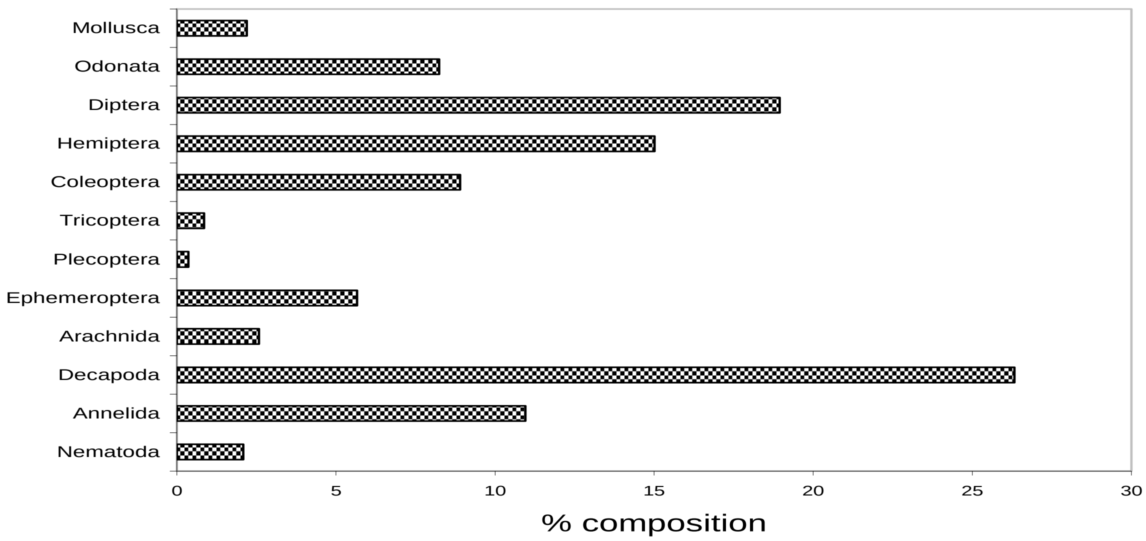


**FIG.2:** Percentage composition of the different groups in River Ethiope

The percentage species composition in the different sampling stations is shown in FIG. 3. Station 5 contributed the highest percentage of species (31.3%), followed by station 3 (22.7%) and station 3 recorded the least (9.98%). The distribution of major benthic macroinvertebrate taxa is shown in Fig. 4. Station V accounted for the highest number of individuals (831)/$m^2$ and 39 taxonomic group; station I followed closely with 172 ind./$m^2$ represented by 37 taxonomic group. Station II accounted for the least number of 83 individuals/$m^2$ been represented by only 4 taxonomic groups. Mollusca, Nematodes and Arachnids were completely absent at station II and Annelids were represented by *Chaetogaster diastrophus* only.

Monthly variations of the macrobenthic invertebrates in the different study stations is shown in (Fig. 5). The wet season months (July, August & October) recorded low abundance of 94±7.04 organisms/$m^2$ as compared to the dry season months (November, December and January), with a high abundance of 183±21.24 organisms/$m^2$. The month of December 2002 recorded the highest prevalence of 201 individuals/$m^2$ closely followed by November with 189 ind./$m^2$. The month of October recorded the least abundance of macroinvertebrates with only 94 individuals/$m^2$. Statistical analysis using single ANOVA classification indicated significant difference ($P<0.05$) between the months and stations.

Margalef's species richness index (d) was highest in station 1, followed by station 5. It was similar in station 3 and 4 and lowest in station II (Table 3). The species diversity measured by the Shannon diversity indices was highest in station 5, followed by station 1, 3 and 4 in that order. Station 2 had the lowest diversity. The Evenness index (E) was generally high, ranging from 0.873 in station I to 0.941in station 3.

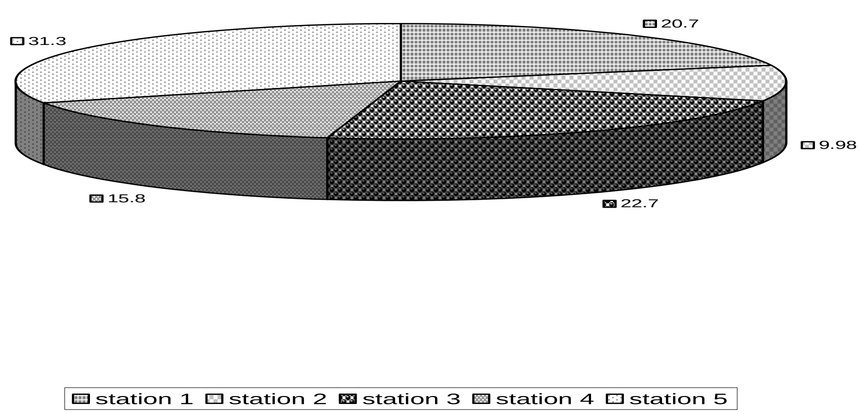


**Fig.3.**Percentage species composition in the different stations

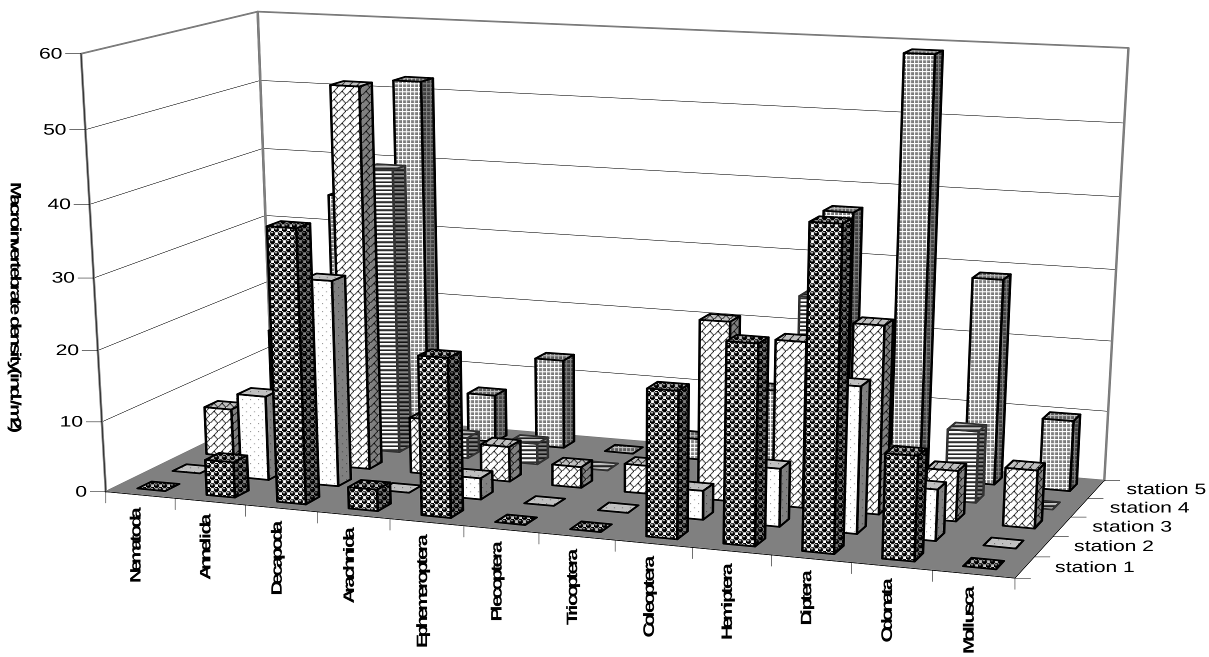


**Fig 4;** Distribution of major benthic macroinvertebrate taxa along the upper reaches of River Ethiope, Southern-Nigeria

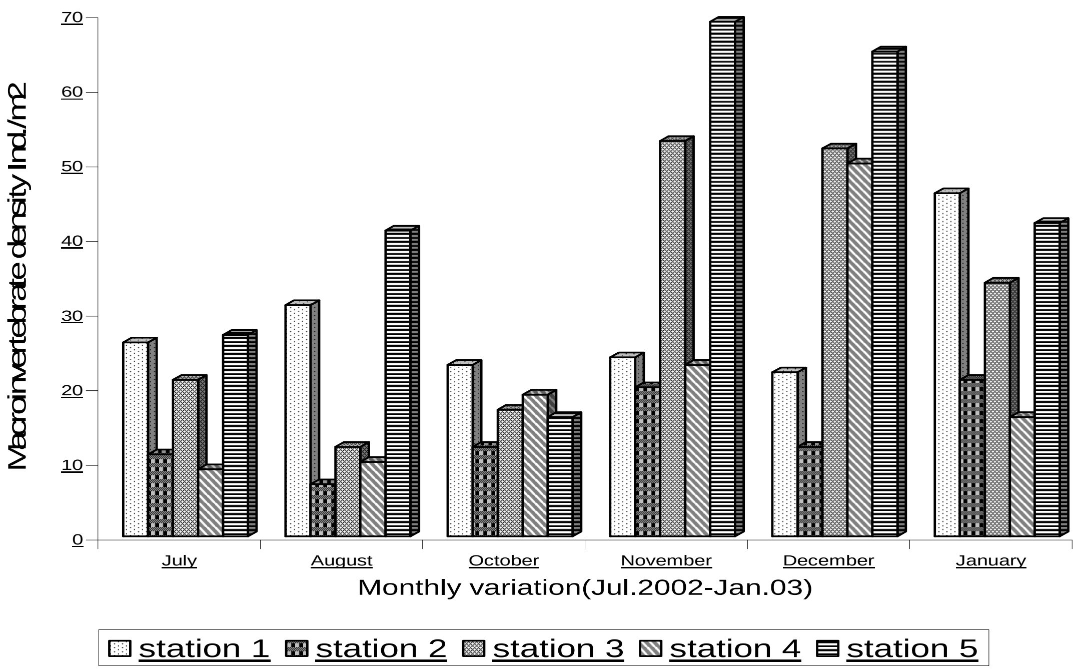


FIG.5; Monthly variation of the macrobenthic invertebrates in the different study stations of the upper reaches of River Ethiope

**Table III:** Diversity of benthic macroinvertebrates in the Sampling Stations of the upper reaches of River Ethiope

| | Station I | Station II | Station III | Station IV | Station V |
|---|---|---|---|---|---|
| No. of individuals (N) | 172 | 82 | 189 | 127 | 260 |
| No. of species (S) | 37 | 14 | 28 | 23 | 39 |
| Taxa Richness/ Diversity (d) | 6.99 | 2.94 | 5.15 | 4.54 | 6.83 |
| Shannon Diversity (H') | 1.369 | 1.036 | 0.362 | 1.245 | 1.446 |
| Evenness Index (E) | 0.873 | 0.904 | 0.941 | 0.914 | 0.979 |

## Discussion

A gradual decrease of current velocity was evident from the head water (source) to the middle reaches during the period of study in River Ethiope. This was probably due to little or no discharges from either domestic or industrial effluents along the upper reaches of the river. According to Nelson and Lieberman (2002), flow velocity is important both directly and indirectly as it influences the type of river bed, amount of silt deposition, which in turn affects macroinvertebrate abundance. In our study a higher density of macroinvertebrates were recorded in station 5 corresponding to the station with relatively low flow velocity. In the head region were the velocity was rather high, the macroinvertebrate communites were dominated by Ephemeroptera (*Baetis* sp). Similar studies elsewhere also agree with our findings (Rader and Ward, 1988, Nelson and Liebermann 2002). According to Charpentier and Morin (1994) communities under conditions of increased flows may become dominated by high velocity adapted genera such as *Hydropsyche, Simulium* and *Baetis*. More Chironomids were reported in station 1 with high flow velocity. This is however at variance with the findings of Growns and Davis (1994) and Doisy and Rabeni (2001). They separately reported that Chironomid abundance is related to the amount of detritus, which is negatively correlated with flow because the detritus material that they feed on is unlikely to accumulate in areas of high velocity. Victor and Ogbeibu (1985) in consonance with our findings also reported high dominance of chironomids, Naididae and baetid ephemeroptera at the upstream section. Probably the chironomid presence at station 1 is due to the accumulation of detritus from leaf fall as a result of the dense canopy of trees. Also the current velocity of this station (0.25m/s) is relatively low when compared with results from other studies.

The significant role of dissolved oxygen in the abundance and diversity of benthic macroinvertebrates is well collaborated in this study, where high abundance and species diversity was recorded in station 5 with the highest dissolved oxygen levels. The reason for this could be due to large surface area of the station which exposed the site to air and sunlight as well as abundance of organic debris which favoured the photosynthetic activities of aquatic plants. Similar observations were also reported by King and Nkanta (1991). Station 2 had significantly lower dissolved oxygen than the other stations and accounted for low taxa diversity and species abundance. This station also coincided with the presence of heavy human activities, appeared cloudy with suspended clay particles.

The macroinvertebrate assemblages of the upper reaches of River Ethiope is striking in the fact that the decapod, *Potamalpheops* sp. dominated and was present in all stations in high numbers. Powell (1980) had earlier indicated the heavy presence of decapod crustaceans in Mangrove ecosystem of Niger Delta area, Nigeria. Egborge *et al* (2003) also reported the presence of this organism in a wetland area of Delta State. The reason for the high abundance of this organism could be that the river presented unique characteristics that favoured its survival and high abundance. Ogbeibu and Oribhabor (2002) had earlier implicated the presence of decapods to relatively unpolluted segments of a water body, since they are not tolerant of pollution induced environmental changes.

The 59 taxa of macro invertebrates identified spread over 36 families, with 813 individuals/$m^2$ recorded compares favourably with 55 taxa reported by Ogbeibu and Oribhabor,(2002), 46 taxa reported by Edema *et at.,* (2002) and 62 taxa reported by Egborge *et al* (2003). Majority of the animals recorded in this study are widely distributed else where in Nigeria (Victor and Ogbeibu 1985, Ogbeibu and Victor, 1989, Edokpayi *et al.,* 2000, Edema *et al* 2002, Adakole and Anunne, 2003 and Egborge *et al.,* 2003) and Africa, (Petr, 1970, Berhe *et al.,* 1989, Tumwesigye *et al.,* 2000).

A significant high density of macrobenthic invertebrates was recorded in the dry season months than the rainy season months. This could be as a result of the unstable nature of the substrate during the raining season months arising from inputs of stormwater thus accounting for the low density of organisms. Victor and Ogbeibu (1991), Edokpayi *et al* 2000 and Tumwesigye *et al* (2000) also subscribed to this. The general diversity index, taxa richness and evenness index clearly showed that station 5 had high taxa richness, diversity and evenness. This is an indication that the substratum was more stable than the other stations studied and that the organisms were tolerant to perturbation arising from human activities. The low evenness and diversity recorded in station 2 is indicative of an un-stable environment substratum due to the relatively high current velocity. Renkonen Similarity test showed that the fauna of station I was significantly different from station 2 and 3. Although it showed affinity between stations 3 and 5 (>50%). These stations shared pollution tolerant taxa in their bank root. The dissimilarity between station 3 and 4 and station 1 and 2 was not significant. This might be associated with similarity in the substratum and flow velocity of the river.

River Ethiope is relatively unperturbed in the upper reaches. Our baseline survey therefore points the need for more intensive study on the entire length of the river to fully comprehend the general fauna assemblages of the river.

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