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LENGTH FREQUENCY DISTRIBUTION AND SEX RATIO OF M*ACROBRACHIUM MACROBRACHION* IN THE LAGOS – LEKKI LAGOON SYSTEM, NIGERIA

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Abstract
Length frequency distribution and sex ratio of *Macrobrachium macrobrachion* sampled by cane traps in the Lagos –Lekki lagoon system were estimated from May 2002 to April 2004. The total number of size classes for the first and second year for both male and female ranged from 10 – 12. The length range was 3 to 14cm for the two sexes. Young adult category constituted the highest percentage of all the catches for both male and female for the two years. Female class size with the highest percentage was 7cm and 8cm for years 1 and 2 respectively, while for the male it was 8cm and 7cm for these two years respectively. The over all sex ratio for the entire sampling period was 1: 2, male to female. Length frequency distribution has shown that from the management view point for resource sustainability, there is need for caution since the majority of the catch is made up of young adults that may not have had the opportunity to reproduce.

Key words: Length frequency distribution, Sex ratio, *Macrobrachium macrobrachion* Lagos-Lekki Lagoon System.

Introduction
Length measurements are fundamental to many aspects of fisheries science. The required precision of length sample depends on the purpose of sampling. In order to identify modes of individual year classes for a length-based assessment, the precision of the sample needs to be quite high. Sample sizes of more than 1,000 are necessary to identify more than half the modes in a typical length distribution (Erzini, 1990). A sample size of at least 100 fish was recommended for age-based stock assessment purposes (Anderson and Neumann, 1996).

Regardless of the type of assessment that is used, the shape of the length-frequency distribution (LFD) is of interest, rather than simple summary statistics such as mean or variance (Gerritsen, 2007). The information contained in a length-frequency distribution is largely a function of sample size.

Length frequency distribution of any fish is important to know the status of the size structure of that fish population in nature. Sex ratio is of great importance in fishery biology (Nurul-Amin, *et. al*, 2005).
The objective of this study is to examine the length frequency distribution and sex ratio of *Macrobrachium macrobrachion* in the Lagos-Lekki lagoon system with the view of obtaining information required for scientific management of this resource.

Materials and Methods
The study was conducted on the Lagos-Lekki lagoon system, longitude $3^{o}22.5'$ to 4^{o} 13'E and latitude $6^{o}24'$ to 6^{o} 38'N (Fig. 1). The lagoon system is part of the Lagoons of Guinea Coast, West Africa stretching from Cotonuou, Republic of Benin up to Sapele, Delta State Nigeria (Webb, 1958). The lagoons open into the Atlantic Ocean via the harbour in Lagos.

Samples of *M. macrobrachion* were collected on a monthly basis for two years

(May 2002 – April 2004) from eighteen (18) stations using cane traps.

The biometric measurements of the specimen were made with Vernier callipers. The measurements taken were total length (TL), from the orbital notch to the tip of the telson, carapace length (CL), from the orbital notch to the posterior edge of the carapace. These measurements were made to the nearest centimetre (cm), as described by FAO species identification sheets for fishery purposes (FAO, 1981). The data from the different stations were pooled for each sampling year and grouped into length classes of 1cm interval for subsequent analysis. The sex determination was done using morphometric features, presence of an appendix masculina on the second pleopods and an appendix interna in the male while for the female it was only appendix interna.

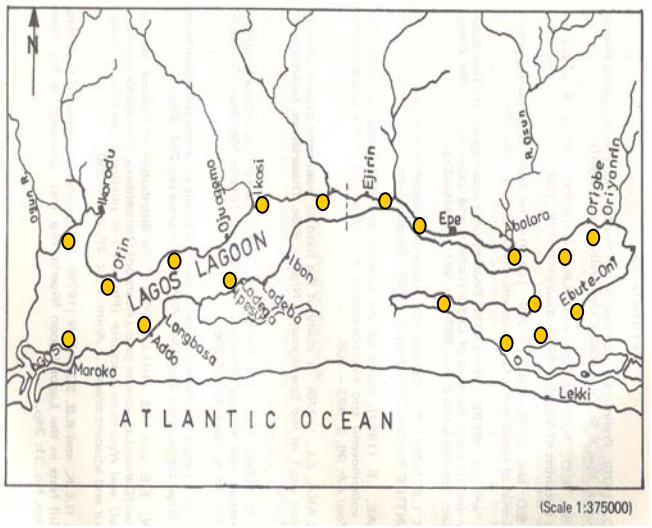
Prawn classification as regard total length according to previous works of Rutherford, 1971; Powell, 1982; and Marioghae, 1982; prawn in the size range of 10 – 30mm (1 – 3cm) in size are juveniles, and those of 30 – 120mm (3 – 12cm) are adults. For ease of interpretation Edokpayi, 1989 categorized the adults into young and old adults. Prawns in the size range of 30 – 80mm (3 – 8cm) were classified as young adults, while those of 80 – 120mm (8 – 12cm) are old adults.

The chi square analysis was performed for the sex ratio of the species.

$$X^2 = \frac{(fi - Fi)^2}{Fi} \quad \ldots\ldots\ldots (1)$$

Where:

fi = observed frequency



Key: ◯ Sampling Site

Fig 1: Study Area (Lagos – Lekki Lagoon System) with Sampling Sites

Fi = Expected frequency

Results

Length frequency distribution of *M. macrobrachion* for the whole study period was expressed as percentage frequency of each of the length classes for the two sexes separately. Figures 2a to 3b present the frequency distribution of each of the sampling year.

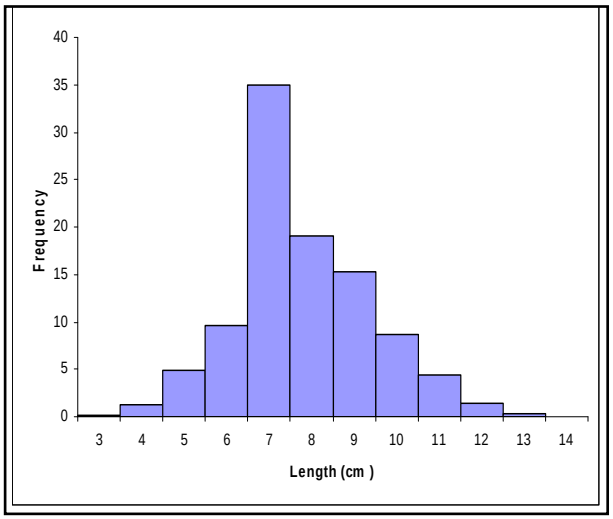


Fig. 2a: Percentage Length Frequency Distribution of Female *M. macrobrachion* for Year 1

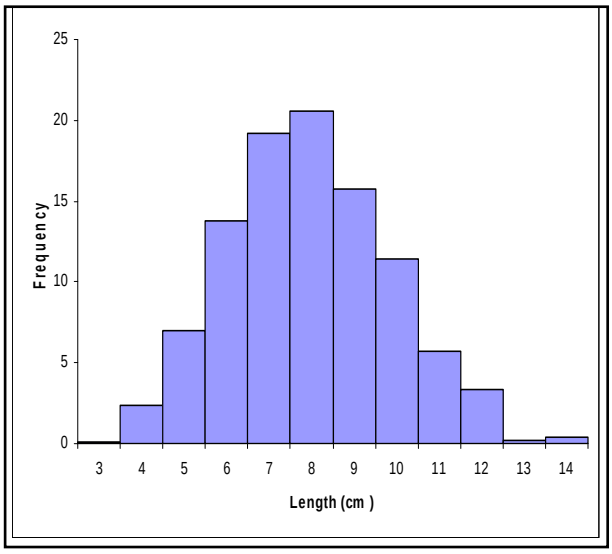


Fig. 2b: Percentage Length Frequency Distribution of Female *M. macrobrachion* for Year 2

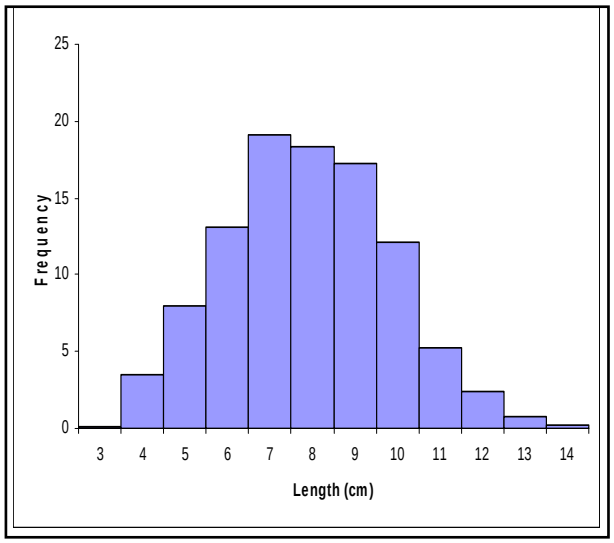


Fig. 3b: Percentage Length Frequency Distribution of Male *M. macrobrachion* for Year 2

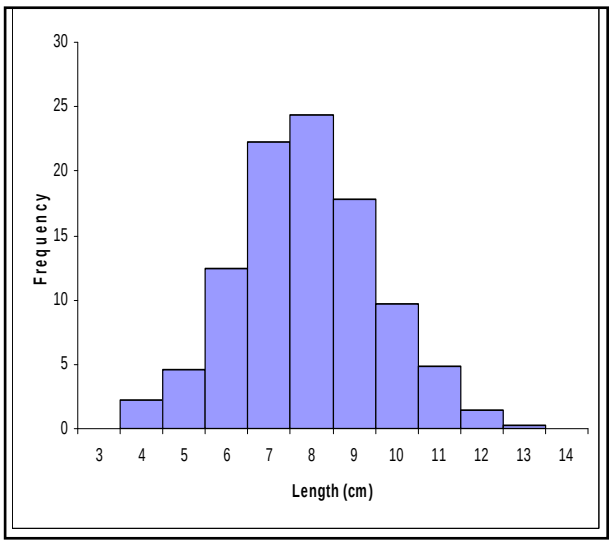


Fig. 3a: Percentage Length Frequency Distribution of Male *M. macrobrachion* for Year 1

M. macrobrachion female total size classes in the first year was 11 while in the second year it was 12. Male of *M. macrobrachion* in year 1 had a total of 10 size classes which increased to 12 in the second year. Female total length range for the first year was from 3 to 13cm and in year 2 it was 3 to 14cm. Male first year total length range was from 4 to 13cm while in the second year it was from 3 to 14cm.

Only 0.14% of the first year *M. macrobrachion* females were juveniles, 69.63% were young adults and 30.24% were old adults. In the second year 0.10% were juvenile, 62.97% were young adults and 36.96% were old adults. In the first year there was no juvenile male *M. macrobrachion*, 66% were young adults while the remaining 34% were old adults. Juvenile male constituted 0.08% of the second year size structure, 61.99% were young adults while 37.94% were old adults.

In year 1, class size with the highest percentage was 7cm for female *M. macrobrachion*, constituting 34.9%. For the second year 8cm class size was the

highest at 20.60%. Highest class size for male *M. macrobrachion* in the first year was 8cm with a percentage of 24.37. In the second year however, 7cm was the highest class size with 19.08%. In both sexes of *M. macrobrachion* for the two years, the class size with the highest percentage number fell within the young adults.

The sex ratio for male to female was 1: 2.2 in the first year sampling period based on a total number of 1,496 males caught to 3,339 female. The X^2 gave a value of 2,676.81 which was significant at both $P < 0.01$ and $P< 0.05$. The total male caught in the second year was 2,575 and the corresponding number for the female was 4,758. The sex ratio of male to female was 1: 1.8, and X^2 result was 4,208.43. Also as in the first year the difference was not due to chance as it was significant at both $P < 0.01$ and $P< 0.05$. The overall sex ratio was 1: 2, male to female.

Discussion

The number of class sizes observed in the *M. macrobrachion* resource from the Lagos – Lekki lagoon system ranged between 10 and 12 for both sexes. These numbers of class sizes conforms to the statistically acceptable numbers for population structure analysis involving length frequency distribution. According to Zar (1974), the minimum number of class sizes should be 10 and maximum 20. Class size percentage contribution revealed that class sizes 7 - 8cm were the highest for both sexes in the two sampling years. On this basis the Lagos – Lekki lagoon *Macrobrachium* fishery exploits mainly the young adults of *M. macrobrachion*, as 69.63% were young adults in the first year for female and 36.96% were old adults and only 0.14% were juvenile. For the male, in the first year, there were no juvenile, 66% were young adults while the remaining 34% were old adults. Similar trend was observed for the second year in which the young adult constituted the highest exploited percentage.

This finding has management implication for resource sustainability, in order to ensure resource sustainability, there is need for caution as the greater proportion been exploited is the young adults that may not have had the opportunity to reproduce before been subjected to fishing mortality.

Overall female were more than male for *M. macrobrachion.* The overall sex ratio for *M. macrobrachion,* 1:2 male to female was significant at $P<0.01$ and 0.05. Edokpayi (1989) reported similar result for *M. macrobrachion* in the Benin River with value of 1:1.2 male to female and significant at $P<0.001$.

Conclusion

Length frequency distribution has proven to be a very useful tool in the management of the Lagos – Lekki lagoon system *M. macrobrachion* resources as it ex-rayed the population structure and also the class most susceptible to fishing mortality. It showed that for resource sustainability there is need for caution since the majority of the catch is made up of young adults that may not have had the opportunity to reproduce.

References

Anderson, R.O., and R.M. Neumann (1996): Length, weight, and associated structural indices. In Fisheries techniques, 2nd ed. (B.R. Murphy and D.W. Willis, eds.), p. 447 – 482. *Am. Fish. Soc.,* Bethesda, MD.

Edokpayi, C.A (1989): Ecology of prawns (Crustacea: Decapoda: Natantia) in the Benin River at Koko, Bendel State. Ph.D Thesis. University of Benin. Nigeria.

Erzini, K. (1990): Sample size and grouping of data for length-frequency analysis. *Fish. Res*. 9: 355 – 366

FAO (1981): FAO Species identification sheets for fishery purposes. Eastern Central Atlantic fishing area. W. Fisher, G. Bianchi and W. B. Scott. Ed.

Gerritsen, H.D. and D. McGrath (2007): Precision estimates and suggested sample sizes for length-frequency data. Fishery Bulletin, http:// findarticles.com/ p/articules/ mi m0 FDG/is_1_105/ai_n19094575/pg_1? tag=artBody;c...

Marioghae, I.E (1982): Notes on the biology and distribution of *Macrobrachium vollenhovenii* and *Macrobrachion macrobrachion* in Lagos lagoon (Crustacea, Decapoda, Palaemonidae). *Rev. Zool. Afr.,* 96: 493 – 508.

Nurul-Amin, S. M, A. Arshad, G. C. Haldar, S. Shohaimi and R. Ara (2005): Estimation of size frequency distribution, sex ratio and length-weight relationship of Hilsa (*Tenualosa ilisha*) in the Bangladesh water. *Research Journal of Agriculture and Biological Sciences*, 1(1): 61 – 66, INSInet Publication.

Powell, C.B (1982): Fresh and brackishwater shrimps of economic importance in the Niger Delta. In Proc. 2nd Annual Conf. *Fish. Soc*. Nigeria, Calabar, 25 – 27 January 1982, pp. 254 – 285, FISON, Lagos.

Rutherford, T.C. (1971): Freshwater shrimps in the area of Cape Coast, Ghana. *Ghana Journal of Science*. 11 (2): 87 – 91

Webb, J. E (1958): The ecology of Lagos Lagoon V. Some physical properties of lagoon deposits. *Phil. Trans. Roy. Soc.* London B. (683): 393 – 417

Zar, J.H. (1974): Biostatistical Analysis. Prentice – Hall, Inc, Englewood Cliffs, New Jersey.