



## SEASONAL NUMERICAL ABUNDANCE AND DETERMINATION OF SIZE DISTRIBUTION OF *Bagrus Docmac* FROM LAKE AKATA, BENUE STATE, NIGERIA

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### ABSTRACT

Seasonal numerical abundance and determination of size distribution of *Bagrus docmac* in Lake Akata was conducted between April 2018 and May 2019. The result revealed that *Bagrus docmac* was numerous in February (17.9%) and also well represented November (14.7%) and in December (14.4%) but had low percentage abundance in June (9.7%) and July (7.3%). The monthly mean sizes of *Bagrus docmac* showed that the highest monthly mean standard length (31.00cm) and mean weight (475.0g) were obtained in the month of October, while the least standard length  $21.45 \pm 2.91$ cm and weight  $297.2 \pm 66.8$ g were recorded in August. It could be concluded that *Bagrus docmac* had a seasonal trend in abundance, also their variation in the monthly mean standard lengths was not significant ( $p > 0.05$ ) in males and females.

**Keywords:** Abundance, size, distribution, *Bagrus docmac*, Lake Akata.

### INTRODUCTION

The family Bagridae is represented by thirty genera and two hundred and forty-five species (Nelson, 2006). Bagridae have four pairs of well-developed barbels covered by a layer of taste bud-enriched epithelium (Zhang *et al.*, 2006). Large Bagrids are important as food fish. Some species are kept as aquarium fishes (Nelson, 2006). This family is of considerable commercial importance. Bagridae are a family of catfish that originate from Africa and Asia from Japan to Borneo (Nelson, 2006). *Bagrus docmac* are found in Benin, Congo Democratic Republic, Egypt, Mali, Ghana, Guinea, Kenya, Sudan, Nigeria, Tanzania, and Uganda. Wide spread in African Rivers and lakes the Nile, Niger, Senegal, Congo, Volta Lake, Chad Basins, and East African Rift Lake (Froese and Pauly, 2009).

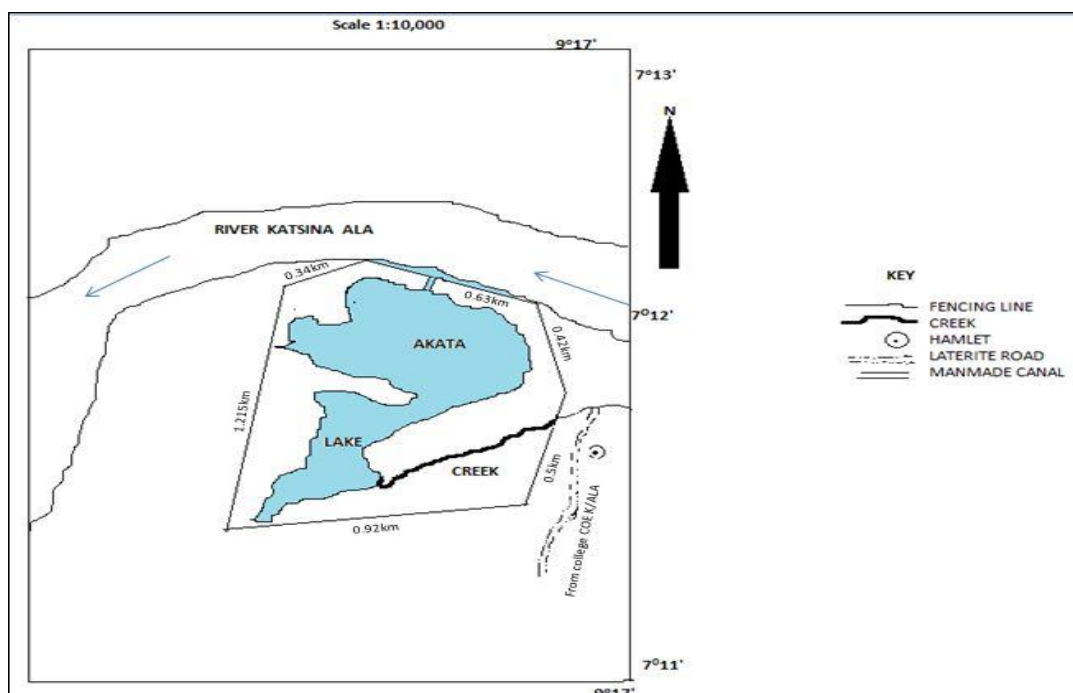
*Bagrus docmac* is fairly common throughout the year, inhabits lakes, swamps and rivers, (Olaosebikan and Raji, 1998), widespread in both shallow and deep water (Witte *et al.*, 1995) and is probably associated with rocky bottoms/coarse substrates (Lock, 1982). Some aspects of the biology of some members of this family have been studied by various scholars. They include Ogbe *et al.*, (2006): numerical abundance for some Bagrids in the Lower Benue River, Ikongbeh *et al.*, (2012): length-weight relationship and condition factor of *Bagrus docmac* from Lake Akata, Benue state, Nigeria, El-Drawany and Elnagar (2015): the growth, food and feeding habits of *Bagrus bayad* and *Bagrus docmac* in Muess Channel, Sharkia Province, Egypt. Furthermore, Jega *et al.*, (2020) reported the length-weight relationship and spawning season of *Bagrus bayad* (Forsskal, 1775) in Yamama Lake

Kebbi State, Nigeria. There are no reliable data on the abundance of *Bagrus docmac* from Lake Akata. Accurate fisheries statistics in the lake; and its adjoining flood plains is vital for the formulation of a sound fisheries management programme in the Akata Lake and similar water bodies. It is therefore necessary to carry out a comprehensive study on the abundance and size distribution of *Bagrus docmac* from Lake Akata to create a sound base for fisheries management.

## MATERIALS AND METHODS

The study area, Lake Akata is an ox-bow lake of the River Katsina-Ala and lies between

longitude  $9^{\circ}16'$  and  $9^{\circ}17'$  East and latitude  $7^{\circ}11'$  and  $7^{\circ}13'$  North (Figure 1). The host town Katsina-Ala is a riverside resort with a unique feature and the scenic beauty of savannah landscape, supplemented by the famous River Katsina-ala with extensive Fadama flood plain covered by numerous lakes scattered over the flood plain one of such lake is the Lake Agbo (MANR Makurdi, 1984). Katsina-ala has a tropical savannah climate with two clearly marked season of wet between (April and October), and dry between (November and March).



**Figure 1: Map of Lake Akata.**

**Source:** Ministry of Agriculture and Natural Resources, Makurdi, Benue State (MANR, 1984).

## Experimental Design

Fish species were randomly sampled monthly for one year and usually in the mornings between 7.00am – 9.00am and in the evenings between 4.30 pm – 6. 30pm. The fish specimens used for the study were obtained from fishermen operating along Lake Akata, between April 2018 and May 2019. These fish were caught with the aid of

various fishing gears including hand nets, cast nets and gill nets of various standard mesh sizes (20.2, 25.4, and 30.5mm) while du-out canoes were the fishing craft. The fish specimens were transported to the Fish Laboratory of the University of Agriculture, Makurdi in an ice chest with ice cubes to reduce rigor mortis to the barest minimum. Length and weight measurements were taken

directly from the landing sites. The total and standard lengths were measured with a meter rule on measuring board according to (Olatunde, 1977). Since *Bagrus docmac* has a forked tail, the two lobes were pressed together to give the maximum length measurement. The total body weight was determined using the mettler table-top loading electronic weighing balance (model 59174). The sex of each fish sample was determined by visual observation using genital evidence.

### Data Collection

Mean monthly length and weight were computed and length frequency histograms were plotted using 1 cm length class for both sexes. Fish samples were collected and

identified in the field according to (Olaosebikan and Raji, 1998) and (FAO, 1992).

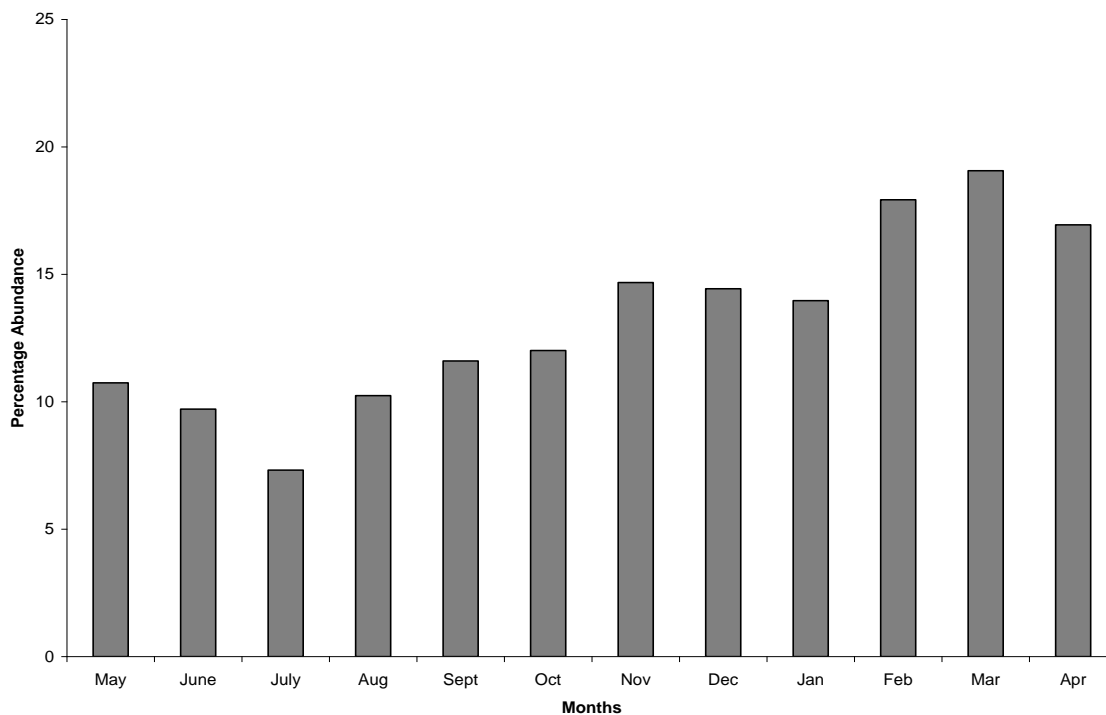
### Data Analysis

The data obtained when pooled together were used to determine numerical abundance and size distribution of *Bagrus docmac* from Lake Akata.

## RESULTS:

### Abundance

*Bagrus docmac* are abundant throughout the year (Figure 2). *Bagrus docmac* was most numerous in March (19.5%) and also well represented in November (14.7%) but had low percentage abundance in June (9.7%) and July (7.3%).



**Figure 2: Monthly Percentage Abundance of *Bagrus docmac* from Lake Akata**

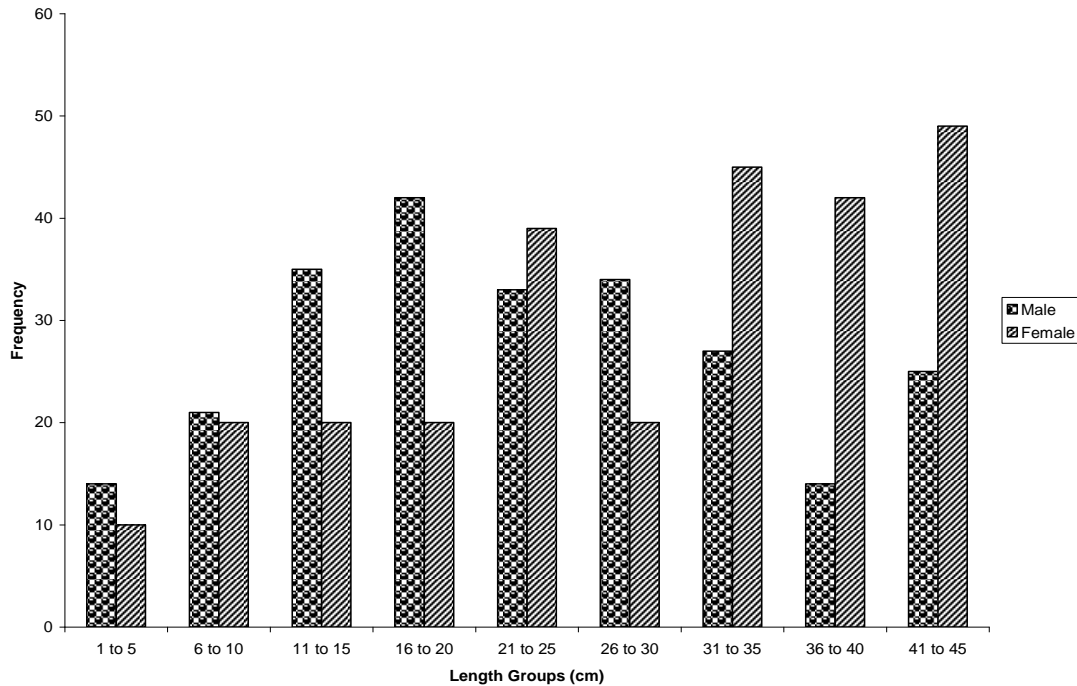
### Size and Weight Distribution

The standard Length-frequency histograms for male and female *Bagrus docmac* (Figure 3) indicates that males ranged from 16 to 20cm with frequency of 42 which is 16.4% of the total. The females, whose standard lengths ranged from 41 to 45cm occur at frequency of 49 which represent 18.5%. The

standard length and weight of *Bagrus docmac* (Figures 4 and 5) show that male specimens had a mean standard length and weight of  $23.47 \pm 0.74$ cm and  $320.4 \pm 18.3$ g respectively. The highest monthly mean standard length  $31.00 \pm 3.00$ cm and mean weight  $475.0 \pm 8.6$ g were obtained in the month of October respectively while the least

standard length  $21.45 \pm 2.91$ cm and weight  $297.2 \pm 66.8$ g were recorded in August. Months that also had high mean sizes were July, December, and March. Standard length  $27.61 \pm 2.84$ cm and weight  $422.9 \pm 72.7$ g, standard length  $26.90 \pm 2.50$ cm and weight  $451.6 \pm 66.2$ g, and standard length  $27.75 \pm 2.24$ cm and weight  $420.0 \pm 56.5$ g. The mean monthly standard lengths and weights for the females ranged from  $34.24 \pm 2.85$ cm

and  $555.8 \pm 73.3$ g in August, to  $25.50 \pm 2.37$ cm and  $401.7 \pm 50.0$ g in March. The variation in the monthly mean standard lengths was not significant ( $p > 0.05$ ) in males and females. Male specimens had slightly bigger mean sizes than females in the months of June, September, October, December, and March. While the females were slightly bigger in May, July, August, November, December, January, February, March and April.



**Figure 3: Length Frequency Distribution of *Bagrus docmac* from Lake Akata**

**DISCUSSION**

*Bagrus docmac* caught from Lake Akata showed changes in the monthly abundance mostly exhibiting peaks in the months of the dry season. *Bagrus docmac* had peak abundance in March. This trend in abundance agrees with the findings of (Ogbe and Fagade, 2002). Ogbe *et al.*, 2006 reported the trend in numerical abundance for some Bagrids caught in Lower Benue River throughout the year. In a similar study (Solomon *et al.*, 2017) reported the

abundance and composition of fish in Lake Kalgwai Jigawa State, Nigeria. The result of

this study is comparable to that of (Ikongbeh *et al.* 2017) who reported fish species diversity and seasonal abundance in Lake Akata, Benue State, Nigeria. Greater abundance in the dry season could be due to low water level that makes the fish more vulnerable to capture. The month of May marks the beginning of the rainy season. During the peak of rainy season, the River flood, and merges with the lake. The month of November marks the beginning of the dry season. During the dry season period the lake is cut-off from the river due to reduction in the water level. Fish moves with the receding water to the main river channel. However,

some remain trapped in cut-off flood pools and become vulnerable to fishing by baskets, nets, and hooks. This is because fish migrate from the lake and swamps into the river. The movement could be associated with environmental changes brought about by rainfall and spate conditions. It shows that the abundance of *Bagrus docmac*, in Lake Akata was influenced by the rise in water level of the river, this helps in the biological productivity of the lake with optimal light penetration. The slight differences in the period of peak abundance for *Bagrus docmac* in Lake Akata could be due to the difference in the geo-hydrological factors of the water body especially global warming (increase in temperature), shifting of global climate zones, changes in the intensity, quality, duration and general pattern of rainfall leading to drought, desertification, and flooding; melting of glaciers/polar ice and increased incidences and severity of extreme weather events, among other effects (Afangideh *et al.*, 2013).

FAO estimated that most of the world's major inland fisheries are now at their maximum level of exploitation (FAO, 2014). The rapid decline of catch from fish landing is a possible indication that the fish yields of most Nigerian inland waters are generally on the decline (Solomon *et al.*, 2012). The decline of these fisheries has been attributed to irresponsible fishing practices (FAO, 2009), climate change (Ipinmoroti, 2012), habitat loss and degradation (Enim, 2012), water abstraction (Roberto *et al.*, 2017) dam construction (Santos *et al.*, 2018) and pollution (Imaobong and Mandu, 2013). Variation in the total estimate values in Lake Akata could be attributed to differences in fishing activities in the lake and around the lake. The reason for the low estimates in Lake Akata could be as a result of high mortality of both juveniles and brood stock as a result of predation and agro-chemical toxicity.

Factors affecting fish distribution and abundance have already been reported by different workers. Availability of food, spawning rates, breeding grounds coupled with shelter, presence of current, vegetation, depth of water, breeding habits, migration and low predation have been suggested as major limiting factors affecting the distribution and abundance of various fish families in Kainji Lake (Ita, 1978).

In this study, it was observed that the mean standard lengths, and mean total weights of the females of *Bagrus docmac* were higher than the males. In the analysis of size ranges in some catfishes the females exhibit faster growth rate than males (Olatunde, 1979).

The mean lengths with respect to the months of the year of *Bagrus docmac* were not significant. While the mean weights of *Bagrus docmac* was significant. The comparatively large sizes of *Bagrus docmac* observed in this study is similar to the findings of (Froese and Pauly, 2009) who reported that *Bagrus docmac* attains a maximum size of 50.00cm (male/unsexed). It could be suggested that these fish stocks have remained stable over the years due to rational exploitation. The reason could be attributed to a fishing strategy that gives the highest steady yield year after year. Robins *et al.*, (1991) reported that *Bagrus docmac* attained maximum weight of 35.0kg. This could be attributed to sufficient space area and abundant food supply throughout the year were probably some of the main factors contributing to the steady increase in their weight and also might be influenced by both biotic and abiotic factors such as feeding regime and state of gonadal development. The variations in fish sizes indicate that the fish population ranged from immature specimens to fully matured ones. This also suggests differences in their growth (Frota *et al.*, 2004).

## CONCLUSION

It could be concluded that *Bagrus docmac* had a seasonal trend in abundance, also their variation in the monthly mean standard lengths was not significant ( $p>0.05$ ) in males and females.

## Recommendations

- i. It was recommended that fishing should target larger sizes but there is need to maintain catch limits to avoid depletion of the fish population.
- ii. Also, the decline of fish population could be eradicated or reduced through

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planning and management of the lake policy decisions. It is important in the exploitation and management of the fish species in Lake Akata.

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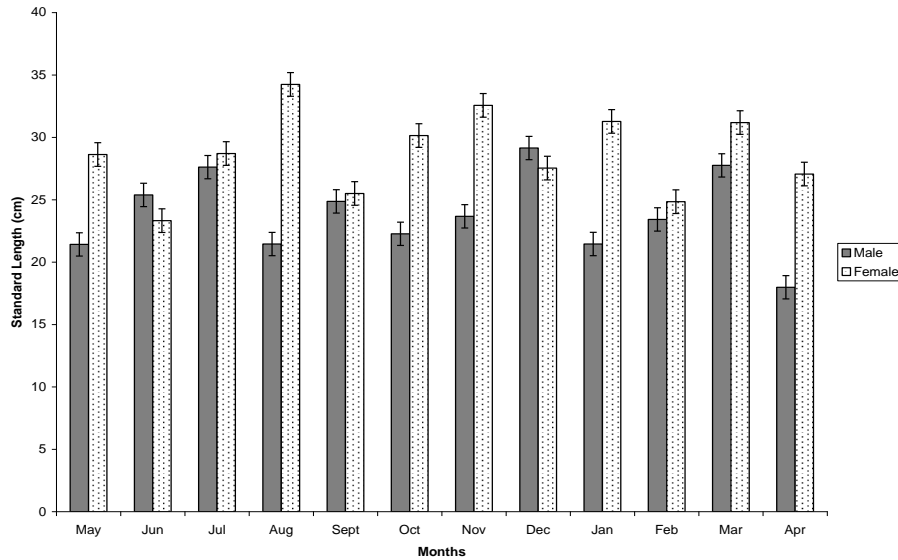
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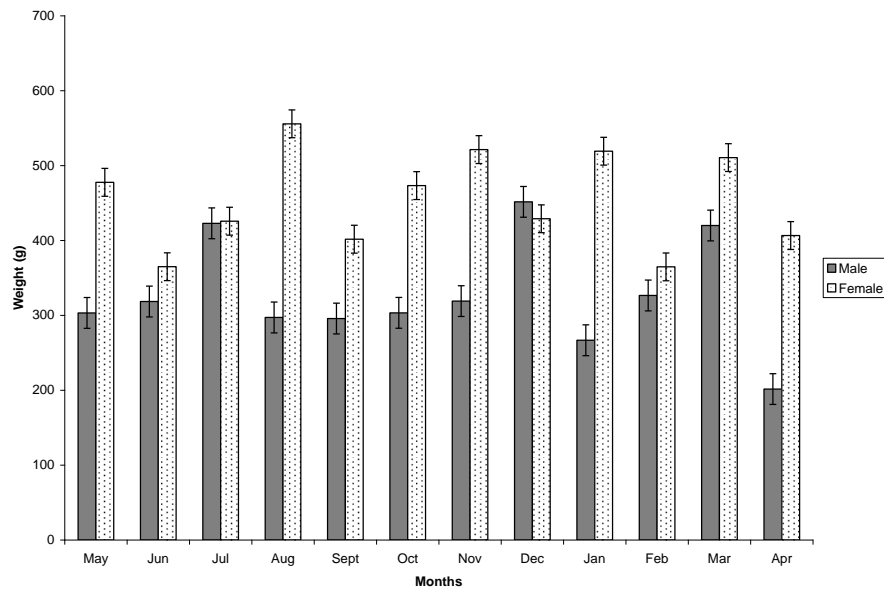
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**Figure 4: Monthly Mean Variation in Standard Length of *Bagrus docmac* from Lake Akata**



**Figure 5: Monthly Mean Variation in Weight of *Bagrus docmac* from Lake Akata**