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Condition Factor of Four Cichlid Species of a Man-made Lake in Imo State, Southeastern Nigeria

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Abstract

The condition factors of four cichlid species, namely *Chromidotilapia guntheri*, *Tilapia cabrae*, *T. mariae* and *T. zilli* from a man-made lake were studied over a period of 12 months (April 1997 to March 1998). Mean condition factor for *C. guntheri* was 4.58±1.53, while it was 5.27±0.56, 5.38±0.56 and 4.3±0.19 for *T. cabrae, T. mariae* and *T. zilli*,, respectively. There was a significant difference (t=1.85, p=0.05) in the mean condition factor of male and female *C. guntheri*, while in *T. cabrae*, *T. mariae* and *T. zilli*, there was not a significant difference in the condition factors of males and females. It was observed that the dry season condition factors of *C. guntheri* and *T. mariae* were higher than the wet season values, while in *T. zilli*, the reverse was the case with higher condition values recorded in the wet season. And there was not a significant difference between the condition factors of dry and wet seasons in *T. cabrae*.

The general trend in the condition factors for length classes of *C. guntheri, T. cabrae* and *T. mariae*, is that relatively lower condition factors were recorded for relatively higher lengths of fish while relatively higher condition factors were recorded for relatively lower lengths of fish.

Key Words: Cichlid species , condition factor, Umuoseriche, man-made lake, dry and wet seasons

Introduction

In fisheries science, the condition factor is used in order to compare the "condition", "fatness" or wellbeing of fish. And it is based on the hypothesis that heavier fish of a particular length are in a better physiological condition (Bagenal, 1978). Condition factor is also a useful index for the monitoring of feeding intensity, age, and growth rates in fish (Oni *et al*., 1983). It is strongly influenced by both biotic and abiotic environmental conditions and can be used as an index to assess the status of the aquatic ecosystem in which fish live.

Condition factors of different tropical fish species were investigated and reported by Bakare (1970), Saliu (2001), Lizama *et al*. (2002) and similar studies particular to cichlid fish including, Siddiqui (1977), Welcomme (1979), Fagade (1978, 1983), Dadzie and Wangila (1980), Arawomo (1982) and Oni *et al*. (1983). These reports focused on the determination of changes in condition factor with season, fish length, sex and/or reproductive status of fish in localities other than the freshwater reaches of Niger Delta floodplains.

This investigation is part of a series, which intends to supply information (Anene, 1998; 1999; 2000; 2004; in Press) on various aspects of the biology of some Cichlidae family members in man-made Lake of Umuoseriche. This study particularly focused on the condition factors of *Chromidotilapia guntheri*, *Tilapia cabrae*, *Tilapia mariae* and *Tilapia zilli*.

Material and Methods

The man-made Lake of Umuoseriche is located in Oguta, Imo State, Nigeria, within the freshwater reaches of Niger Delta floodplains (Figure 1). It is situated between the latitudes of 5° 30' N and 5° 38' N and was described in Anene (1999). Monthly samplings were carried out from April 1997 to March 1998 by using gillnets of various mesh sizes (20.2, 25.3, 30.4, and 40.1 mm) and a cast net of 15 mm mesh size. The methodology of sampling was described in Anene (1998).

Fish samples were immediately immersed in 10% formalin and transported to the laboratory where the species identifications were performed by using keys provided by Boulenger, (1909, 1916); Pellegrin, (1912); Daget, (1954); Gras, (1961); Blache, (1964); Daget and Iltis, (1965); Stauch, (1966); Thys van den Audenaerde (1966); Reed *et al*. (1967) and Leveque *et al*. (1990). Representative samples of different specimens were also sent to the Laboratorium voor Ichthyologie in Tervuren, Belgium for the confirmation of species identification.

In the laboratory, samples were given a registration number, differentiated into separate sexes, and weighed to the nearest 0.1 mg on a Metler balance. Their standard lengths were also measured to the nearest 1 mm on a measuring board. Fulton's condition factor was calculated from the expression (Bagenal, 1978):

$$K = 100\ W/L^3$$

Where W is the whole body weight in grams and L the standard length in millimetres.

Results

The mean condition factors for the four major cichlid species in the man-made Lake of Umuoseriche are shown in Table 1. The results indicated that there was a significant difference between the condition factors of male and female *C. guntheri* ($p<0.05$). There were not significant differences between the condition factors of male and female fish in other three species.

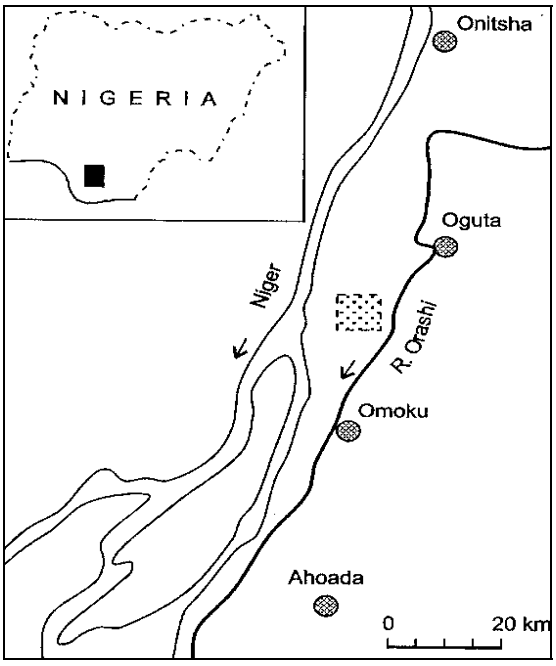

Figure 1. Location of the Lake Umuoseriche (dotted area).

The condition factors were also checked during dry and wet seasons (Table 2). The condition factor for *C. guntheri* in dry season (4.58±0.38) was significantly higher than that (4.29±0.64) in wet season ($p<0.05$). The same trend was observed in *T. mariae* while the dry season condition factor (5.37±0.16) was significantly higher than the mean value of wet season (5.28±0.36) ($p<0.05$). In contrast, the wet season condition factor (4.37±0.27) of *T. zilli* was higher than that (4.21±0.11) in dry season ($p<0.05$), while in *T. cabrae*, there was no difference between dry season (5.26±0.51) and wet season (5.23±0.88) values ($p<0.05$) (Table 2).

Figure 2 shows the variations in condition factors with standard lengths. In *C. guntheri* (Fig. 2A), three phases are easily distinguished. In phase I, the condition factor significantly decreased from 4.10±0.10 at a length of 90 mm to 3.91±0.1 at a size of 110 mm. In phase II, there was a significant increase from 3.91±0.10 (110 mm) to 4.6±0.60 at a length of 120 mm ($p<0.05$). In the third phase, there was a decline to 3.70±0.40 at a standard length of 150 mm.

In *C. cabrae* (Figure 2B), the size spectrum of condition factor showed that there were two phases of significant slump separated by a plateau. The plateau size ranged between 100 and 120 mm in smaller fish. The condition factor significantly decreased from 7.2±0.6 at a length of 70 mm to 5.10±0.5 at 100 mm ($p<0.01$). The second phase of the significant decrease was observed between 120 mm (4.91±0.71) and 140 mm (1.82±0.2) ($p<0.05$).

Condition factor values of *T. mariae* (Figure 2C) registered a significant and progressive decrease ($p<0.05$) between the size range of 120 mm and 150 mm from 5.58±0.34 to 5.16±0.51, respectively. It significantly increased between 150 and 170 mm from 5.16±0.51 to 5.53±0.1, respectively ($p<0.05$). Thereafter, it significantly decreased ($p<0.05$) to a

Table 1. Condition Factor of four major cichlid fish of a man-made lake

Species	Male + Female	Male	Number	Female	Number	T-test
C. guntheri	4.58 ± 1.53	4.50 ±0.68	554	4.68±2.17	544	1.85
T. cabrae	5.27 ± 0.56	5.27±0.50	409	5.27±0.60	236	-
T. mariae	5.38 ± 0.56	5.32±0.46	101	5.42±0.60	137	1.46
T. zilli	4.3 ± 0.19	4.29±0.19	267	4.31±0.28	311	1.23

Table 2. Seasonal variation and t-test analysis of the condition factor of both sexes of four species of cichlids in the man-made Lake of Umuoseriche

Species	Dry Season	Number	Wet Season	Number	T-test	P
C. guntheri	4.58 ± 0.38	657	4.29± 0.64	441	5.19	0.05
T. cabrae	5.26 ± 0.51	400	5.23 ± 0.88	245	0.45	0.05
T. mariae	5.37 ± 0.16	140	5.28 ± 0.36	98	2.3	0.05
T. zilli	4.21 ± 0.11	328	4.37 ± 0.27	250	8.82	0.05

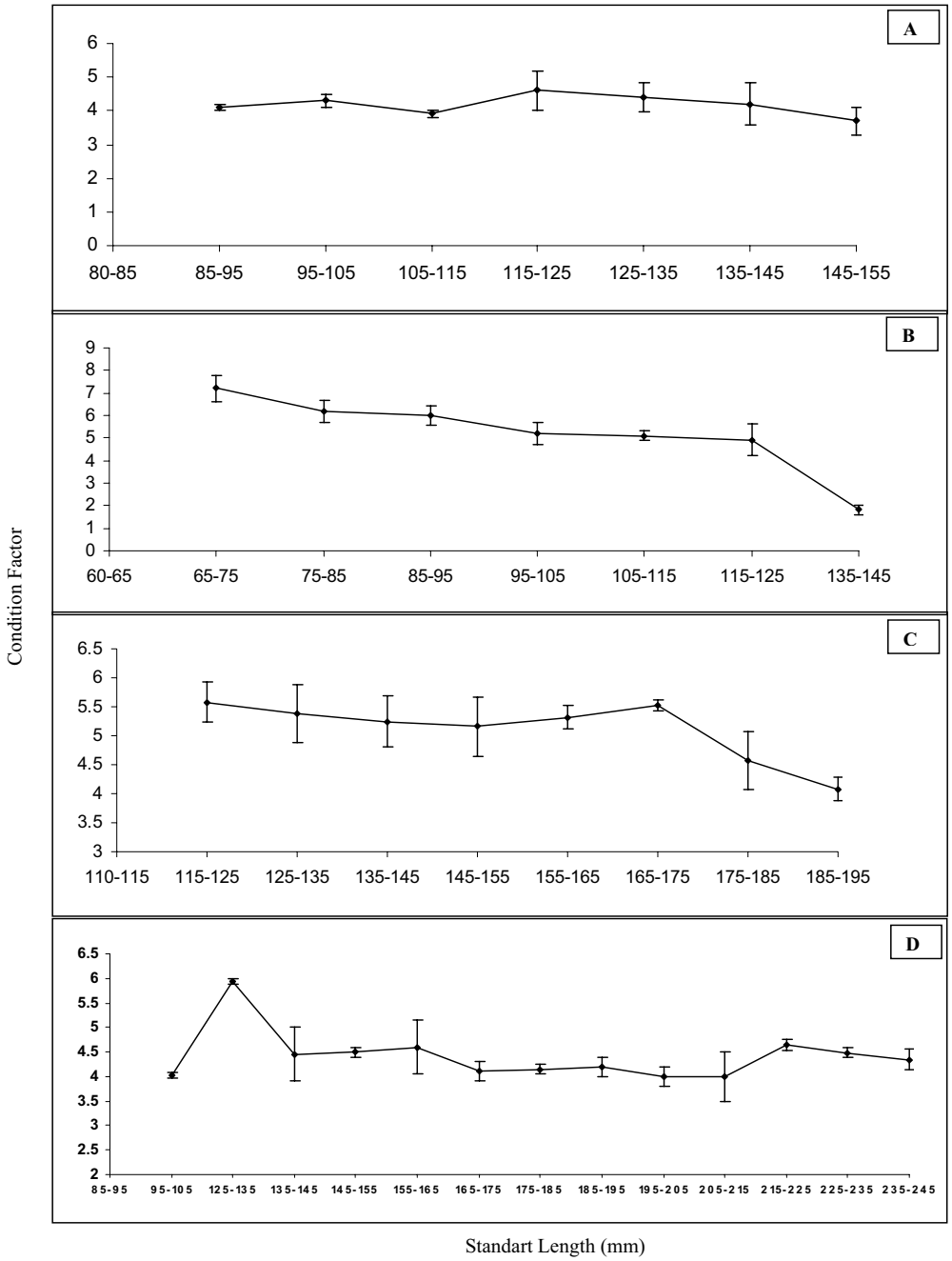

Figure 2. Variation of condition factor with fish size.

mean value of 4.08±0.32.

In *T. zilli* (Figure 2D), the inflexions occurred in the condition factor at the length of 130, 140, 210 and 240 mm over the size spectrum of 95 and 245 mm. The size increase ranged from 4.02+0.05 (90 mm) to 5.93±0.05 (130 mm) ($p<0.01$). Then, it decreased to 3.79±0.51 at a length of 210 mm but significantly increased again between 210 and 240 mm, from 3.79±0.51 to 4.65±0.11 ($p<0.01$). In the final phase, the condition factor of *T. zilli* significantly slumped from the previous level (4.65±0.11) to 4.34 ± 0.21 at a length of 240 mm ($p<0.05$).

Discussion

The condition factor of *C. guntheri* in this study is favourably comparable with that of the same species in a small man-made lake in Ibadan (Fagade, 1983). However, the condition factor values of *T. cabrae*, and *T. mariae* from the current study are relatively higher than those reported for the other cichlid fish (Siddiqui, 1977; Arawomo, 1982). Similarly, the condition factor for *T. zilli* in our study is higher than that found for the same species by Oni *et al.* (1983). Environmental factors have been taken into consideration in order to account for spatial and

temporal differences in condition factor of fish (Bagenal, 1978; Braga, 1986; Ekanem, 2004). In the case of the man-made Lake of Umuoseriche, we observed that cichlid fish had a euryphagic feeding habit, a strategy that allows for a switch from one diet to another and also disallows intra- and inter- species competition for food (Anene, In Press). This single biotic environmental factor might largely be responsible for the differences in the condition factor hitherto mentioned. Relatively high condition factors of cichlid species estimated in the present study indicate that the Lake Umuoseriche is a quite productive and stable ecosystem.

The results of the current study also presented that there were no significant variations in condition factors with respect to sex, on the contrary to *Brycinus nurse* (Saliu, 2001), but the study was in agreement with the values reported for different cichlid fish in Nigeria (Fagade, 1978, 1983; Dadzie and Wangila, 1980; King, 1994; Junquera, *et al.* 1999).

It was found that dry season condition factor of *C. guntheri,* and *T. mariae* was higher than wet season values, while for *T. zilli*, the contrary was the case with higher condition values recorded in the wet season. In *T. cabrae*, there was not a significant difference in the condition factor between both seasons. Seasonal variation in the condition factor of fish has been reported for *Leuciscus lepidus* and *Brycinus nurse* (Karabatak, 1997; Saliu, 2001). However, the results of this study do not conform to those published for *T. guineensis*, *C. guntheri* and *T. mariae* (Fagade, 1978, 1983; King, 1994) in which no seasonal changes were observed in condition factor. Despite this difference in observation, Oni *et al*., (1983) noted that condition factor is not constant for a species or population over a time interval and might be influenced by both biotic and abiotic factors such as feeding regime and state of gonadal development (Saliu, 2001).

This study affirmed that there is a variation in condition factor by size (length) classes in four species of cichlids studied. The general trend is that in *C. guntheri, T. cabrae* and *T. mariae*, relatively lower condition factors were recorded for relatively large sizes, while relatively higher condition factors were recorded for rather smaller fish. This observation is not in harmony with that made for *Brycinus nurse* (Saliu, 2001). However, Lizama *et al*. (2002) made similar observations in characid fish and attributed it to the resource transferred to the gonads in the latter stages of the life history of a fish.

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