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SOME ASPECTS OF THE BIOLOGY OF *Parachanna obscura* IN ITAPAJI DAM, EKITI STATE, NIGERIA.

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ABSTRACT

Some aspects of the biology of *Parachanna obscura* were studied in Itapaji dam in Ekiti State Nigeria. Fish specimens were collected monthly from the dam's landing site from March to August 2021. The Standard Length (SL), Total Length (TL), and Body Weight (BW) were measured respectively. The sex ratio was determined and did not depart from the 1:1 population of the stock. The condition factor (K) calculated was less than 1 which indicated *P. obscura* is not in a good physiological state. The length-weight relationship (b-values) for combined sexes was 2.96 and indicated a negative allometric growth pattern in Itapaji reservoir. The frequency of occurrence of food items consumed showed that 13% had detritus and fish, 18.8% had earthworms and fish, 6.5% had prawns and fish, 5% had prawns, fish and snail shells, and 4% had earthworms and fish. Food items of primary importance were fishes, prawns, nematodes, and detritus. The minimum and maximum Gonado-somatic indexes were 0.18% and 0.79% respectively while the minimum and maximum hepato-somatic indexes were 0.22% and 0.62% respectively.

Keywords: *Parachanna obscura*, Itapaji dam, Gonado-somatic index, Hepato-somatic index.

INTRODUCTION

Parachanna obscura is one of the common Nigeria fish species found in Nigerian waters. It is a carnivorous fish species which belongs to the family *Channidae.* The fish species assist in periodic fisheries management policy formulation and implementation, thus assisting in efficient management of fisheries resources. Itapaji dam is an inland water body located in the southwestern part of Nigeria and was constructed for water supply to communities neighboring it. With the huge volume of water in the Dam, it housed diverse fish species thereby providing livelihood to the surrounding communities (Adebayo and Ayoade, 2019, Siddiquee *et al.*, 2015). Itapaji dam is blessed with a diverse species of aquatic faunas which include members of *Hepsetidae, Channidae, Bagridae, Cichlidae* and *Clariidae* families (Omotayo *et al.*, 2018). The studies on the ecology and biology of fishes are an important component in the rational management of fisheries resources (Greiner and Gregg, 2010; Rutter *et al.*, 2010; Olurin and Savage, 2011), as it provide baseline information for the production and management of fishes (Haylor, 1992; Yakoob and Ali, 1992; Marimuthu *et al.*, 2001; Mylones *et al.*, 2010). Also, studies on the length-weight relationships (LWRs), gonado-somatic index, hepato-somatic index, food gut analysis and sex ratio in fishes has great significance in fish biology and fisheries. Apart from the valuable information provided by the investigation of food habits and LWRs of fishes, they also provide important information about the changes that may occur in the environment because of human practices. There have been reported studies of the LWR, condition factor, sex ratio and food habits of *P. obscura* by Oginni *et al.*, (2022), Bakare (2021), Osho and Usman (2019) and Hassan and Ja'afaru (2019) in Egbe Reservoir, Epe Lagoon, Anambra River, and Kiri River respectively to mention a few. However, there is paucity of these information on the fish species in Itapaji Dam, hence the need for this study. The information from this study will enhance effective aquaculture and fisheries management practices, knowledge of the growth patterns, food habits, condition factor and gonado-somatic index which are necessary for management practices that is effective, exploitation that is sustainable and as a prelude to make it an aquaculture candidate.

MATERIALS AND METHODS

Study Area

Itapaji dam is in Itapaji village, Ikole Local Government Area of Ekiti State, Nigeria and lies between latitude 07° 56' and 07° 57'N, and longitude 05° 27' and 05° 28'E at an elevation of 445 m above the sea level. This dam is the second the largest dams in Ekiti State with a total catchment area of about 647,250.6m^2 (Fagbohun, 2016). The dam was created on River Ele in 1972 and was designed with the ability to discharge 5,175m^3 /day to village sand towns in Oye, Ikole and Ekiti East Local Governments. It also serves for irrigation, fishing, and domestic uses. The Ele River on which it was dammed flows 20km northwards from the source into the Dam and then northwestwards after the Dam to Rivers Osse and Kampa in Kwara State (Fagbohun 2016). The area where the Dam is located experiences heavy rainfall throughout

the year with the rainy season between April – October and the dry season between November – March. The range of annual rainfall is between 1350 - 1400mm while temperature is between 28ºC – 30ºC and 22ºC – 25ºC in the dry and wet seasons respectively (Adebayo and Ayoade 2018).

Collection of fish samples

Ninety-three samples of *P. obscura* were collected from the catches by the fishermen at the fish landing site around the dam. These activities were carried out between March and August 2021. The fish were transported in a white plastic transparent 20-litre bucket to the Fish Biology Laboratory of the Department of Fisheries and Aquaculture, Federal University Oye-Ekiti, Ekiti, Nigeria.

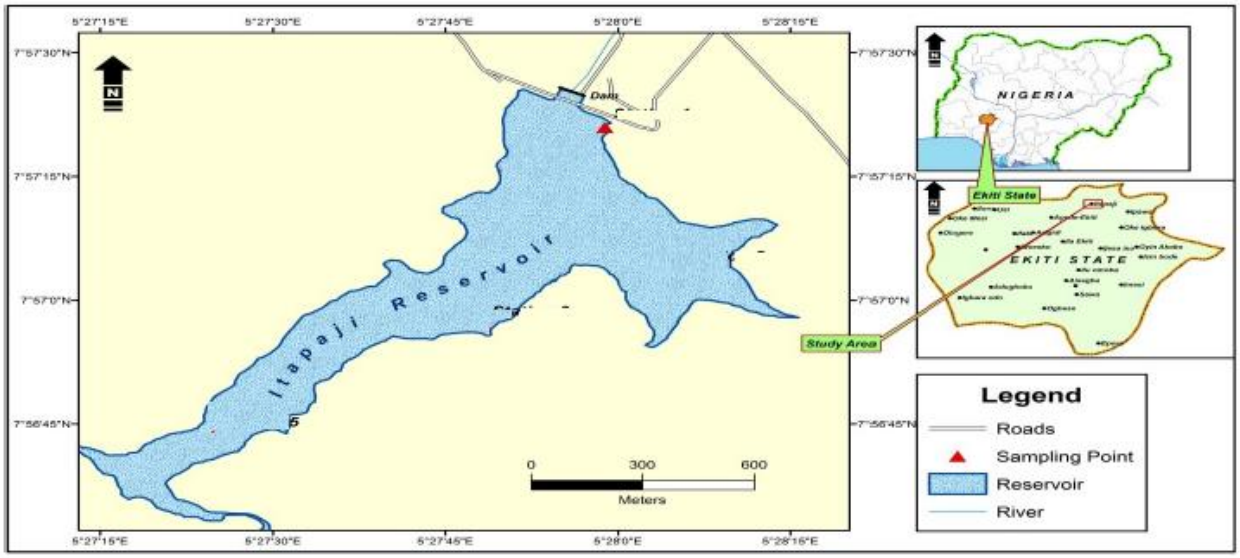

Figure 1: Map of Itapaji dam
Source: Adebayo and Ayoade (2019)

Morphometric analysis

The body weight and standard length of fish samples collected were measured to the nearest 0.1g and 0.1 cm respectively.

Length-weight relationships

Length-weight relationships of sampled fish species were calculated using the equation I:

$W = aL^b$ ---------Equation I

Where:

W = the total weight (g) of *P. obscura* samples,
L = the standard length (SL, cm), *P. obscura* samples
'a' and 'b' are the parameters of the linear regression equation.

Sex ratio

The sex ratio was estimated using equation II:

$Sex\ ratio$: $\frac{Number\ of\ males}{Number\ of\ females}$ --------Equation II

Condition factor (K)

The condition factor was estimated as cited by Olasunkanmi and Ipinmoroti (2014) with Equation III:

$K = \frac{100W}{L^3}$----------Equation III

Where:
K = condition factor of *P. obscura*
W = weight of individual of *P. obscura* fish,
L = length of each of *P. obscura* fish.

Gonadosomatic index (GSI)

The gonado-somatic index was determined as described by Jega *et al.*, (2017), which was measured according to the modified methods of Dada and Adeparusi, (2012) in Equation IV:

$$GSI = \frac{\text{weight of gonad}}{\text{weight of fish}} \times 100$$----------Equation IV

Hepatosomatic index (HSI)

Hepato-somatic index (HSI) was determined as reported by Namin *et al.* (2014) in Equation V:

$$HSI = \frac{100\,(LW)}{BD}$$----------Equation V

Where:

LW= Liver weight of *P. obscura*

BW= Body weight of *P. obscura*.

Data Analysis

The mean values of monthly fish abundance were presented using simple descriptive statistics, while Analysis of Variance (ANOVA) was used for mean separation of morphometric parameters across the months.

RESULTS AND DISCUSSION

Morphometric data of *P. obscura* samples

The morphometric Data of the fish species are presented in Table 1. A total of 93 *P. obscura* samples were collected and examined in this study, with highest individuals in March (23) and least in August (11), with an overall mean of 16 individuals. April recorded the highest values for total length (31.77 ± 1.98cm), standard length (26.93 ± 1.82cm), total weight (263.28 ± 42.78g), gutted weight (252.73 ± 41.18g), and stomach weight (4.1 ± 0.79g) while the least were recorded in August for total length (26.35 ± 1.95cm), standard length (22.34 ± 1.81cm), total weight (154.26 ± 34.21g), and gutted weight (147.96 ± 33.92g). Stomach weight was least in July (2.18 ± 0.46g), gonad weight (1.22 ± 0.29g) and liver weight (0.96 ± 0.22g) was highest in August and least in March for gonad weight (0.39 ± 0.04g) and June for liver weight (0.47 ± 0.05g). The overall mean value for total length, standard length, total weight, gutted weight, gonad weight, liver weight and stomach weight were 28.79 ± 0.59cm, 24.32 ± 0.55cm, 206.16 ± 12.09g, 197.77 ± 11.71g, 0.74 ± 0.08g, 0.66 ± 0.04g and 2.83 ± 0.19g respectively. The gutted weights of *P. obscura* were similar ($p > 0.05$) in March, May, June, and July (Table 1).

Table 1: Morphometric Data of *P. obscura* in Itapaji Dam, Ekiti state

Parameter/ Month	March	April	May	June	July	August	Mean
N	23	12	16	18	13	11	16
Total Length (cm)	28.38 ± 0.86^{ab}	31.77 ± 1.98^{ba}	29.38 ± 1.42^{ab}	28.88 ± 1.47^{ab}	28.00 ± 1.65^{ab}	26.35 ± 1.95^{ab}	28.79 ± 0.59
Standard Length (cm)	23.83 ± 0.74^{ab}	26.93 ± 1.82^{ba}	24.77 ± 1.38^{ab}	24.42 ± 1.35^{ab}	23.77 ± 1.42^{ab}	22.34 ± 1.81^{ab}	24.32 ± 0.55
Total Weight (g)	212.18 ± 16.46^{ab}	263.28 ± 42.78^{ba}	213.33 ± 30.65^{ab}	202.95 ± 28.03^{ab}	182.34 ± 35.71^{ab}	154.26 ± 34.21^{ab}	206.16 ± 12.09
Gutted Weight (g)	203.94 ± 16.02^{ab}	252.73 ± 41.18^{ba}	203.46 ± 29.60^{ab}	195.95 ± 27.09^{ab}	173.76 ± 34.54^{ab}	147.96 ± 33.92^{ab}	197.77 ± 11.71
Gonad Weight (g)	0.39 ± 0.04^{ab}	1.03 ± 0.33^{ba}	0.91 ± 0.18^{ab}	0.76 ± 0.17^{ab}	$0.46 \pm 0.0.5^{ab}$	1.22 ± 0.29^{ba}	0.74 ± 0.08
Liver Weight (g)	0.73 ± 0.05^{ab}	0.58 ± 0.06^{ab}	0.73 ± 0.07^{ab}	0.47 ± 0.05^{a}	0.51 ± 0.09^{a}	0.96 ± 0.22^{ba}	0.66 ± 0.04
Stomach Weight (g)	2.74 ± 0.24^{ab}	4.1 ± 0.79^{ba}	3.10 ± 0.47^{ab}	2.65 ± 0.51^{ab}	2.18 ± 0.46^{ab}	2.29 ± 0.47^{ab}	2.83 ± 0.19

Mean values with different superscripts are significant ($P<0.05$)

Length-weight relationship of *P. obscura*

The length-weight relationship and condition factor of *P.* obscura is presented in Table 2. The mean regression coefficient 'b' recorded for the length-weight relationship in this study was 2.96. Across the months, positive b-values were observed which implied that as length increased the weight also increased. A negative allometric growth pattern was observed for *P. obscura* because b-values were less than 3 as presented by Pauly (1993). The result conformed with the observation of Obasohan *et al.* (2012) who reported the same growth patterns in five different fish species including *P. obscura* from Ibiekuma stream, Ekpoma, Edo state, Nigeria. Similarly, Oginni *et al.* (2022), Bakare (2021), Ipinmoroti *et al.,* (2021), and Osho and Usman (2019) reported such growth patterns in Egbe Reservoir, Epe Lagoon, and Anambra River, Nigeria. The LWR gives information about the rate of growth and life stages development in fish (Ayoade, 2011). The mean condition factor recorded for *P. obscura* was 0.86. The statistical analysis indicated that there was no significant difference (P>0.05) in the LWR across the months. The condition factor of *P. obscura* in Itapaji Dam was 0. 86 (k<1) which meant that the fish is not living in a completely favourable environment in terms of food availability and good environmental conditions, which are factors that can influence fish growth. This result was corroborated by the findings of Odo *et al.* (2012) on *P. obscura* in Anambra River which was found to have a lower condition factor. Obasohan *et al.* (2012) and Bassey and Ajah (2010) similarly reported values less than 0.9 for at Ibiekuma stream, Ekpoma and between 0.63 and 0.79 for pond-cultured *P. obscura* that were fed different types of feed in South-west Nigeria.

Table 2: Length-weight relationship and condition factor of *P. obscura* in Itapaji Dam

Month	n	b	R^2	p-value	K
March	23	2.75	0.96	0.14	0.93
April	12	2.81	0.98	0.21	0.82
May	16	2.77	0.8	0.23	0.84
June	18	2.83	0.91	0.10	0.84
July	13	3.42	0.96	0.19	0.83
August	11	3.08	0.94	0.08	0.84
Mean		**2.94 ± 0.26**	**0.93 ± 0.07**		**0.85 ± 0.04**

n = number of *P. obscura* samples encountered, b = regression coefficient, R^2= regression value, k = condition factor, p-value are significant when p<0.05

Gonadosomatic index (GSI) and Hepatosomatic index (HSI)

The gonado-somatic index (GSI) and hepato-somatic index (HSI) of *P. obscura* in Itapaji dam, Ekiti state are presented in Table 3. The minimum (0.18%) and maximum (0.79%) GSI were recorded in March and August respectively with corresponding HSI of 0.22% and 0.62% in April and August. The mean gonado-somatic and hepato-somatic indexes recorded in this study were 0.36% and 0.32% respectively. The Hepatosomatic index in *P. obscura* showed that the highest HSI was observed in August, while a numerical decrease was observed in March, April, May, June, and July during the study. The minimum GSI was recorded in March and the maximum in August, while low GSI values were observed for male and female species from March to July. These high values in August for fish species indicates a high sperm potential, high reproductive abilities, maturity, egg size therefore indicating their period for spawning. These results were corroborated by reports of Roja (2011) who reported similar results and attributed this to time to the period of early gonad development and spent fish. It was revealed that less than 1.22±0.29% body mass of *P. obscura* was converted to development of the gonads as against 3.35±1.05% and 1.96±0.63% reported by Isangedighi and Umoumoh (2011) and Olurin and Savage (2011) respectively. It was also observed from the study that the mean length of maturation of male and female individuals was 26.35 cm and 22.34cm respectively which represented 50%, and it corresponds with the sizes of male and female *P. obscura* fish at first maturity. The GSI mean was significantly higher in August which was attributed to the high water level and food availability which is characteristic of this month (August) and stimulates *P. obscura* spawn. These observations were similarly reported by Al-Mahmud *et al.* (2016) in lentic and lotic environments.

Table 3: Gonado-Somatic Index and Hepato-Somatic Index of *P. obscura* in Itapaji Dam

Month	N	GSI (%)	HSI (%)
March	23	0.18	0.35
April	12	0.39	0.22
May	16	0.43	0.34
June	18	0.37	0.23
July	13	0.25	0.28
August	11	0.79	0.62
Mean		0.40 ± 0.21	0.34 ± 0.15

GSI = gonadosomatic index; HSI = hepatosomatic index

Sex ratio of *P. obscura*

The mean sex ratio of *P. obscura* observed during the study is presented in Table 4. A total of 45 males were identified with highest values in June (28.9%) and April, May and August having the least values with 11.1% respectively. For the females, a total of 48 individuals with highest values in March (25.0%) and least in June (10.4%). When comparting the sexes, highest values were observed for males only in June (28.9%) while the remaining five months recorded the highest number for females. For the combined sexes, March recorded the highest number of species (24.7%) and the least in August (11.8%). The highest species was expected in March as it coincides with the dry season which is characterized by reduced water levels and increased susceptibility of fish to gears (Iyiola and Jenyo-Oni, 2023; Iyiola *et al.* 2022, Negi and Mamgain 2013). The highest mean sex ratio was observed in June (2.60:1) and the least in March (01:01.1) with an overall mean value of 1:1.06 (χ^2 = 0.004, P = 0.95). There was no significant difference (p > 0.05) in the sex ratio across the six months of data collection. The mean sex ratio (1:1.06) favoured both sexes, and the monthly sex ratio was not significant (P>0.05) from the expected 1:1. This implied that there was no predominance of one *P. obscura* sex over the other in the population during the study period. Similar findings were reported by Oboh *et al.* (2014) as the sexes of *P. obscura* were equally distributed (1:1.15) in Ovia River, and there was no significant difference from the expected 1:1 distribution. Also, Bakare (2021)

With the result and reports, it can be said as observed from this study that there is a balanced population of *P. obscura* sexes in the dam (Idowu *et al.*, 2020).

Table 4: Sex ratio of *P. obscura* during the study period

Month	Males	Males (%)	Females	Females (%)	Total	Total (%)	Ratio	χ^2 Calc.	χ^2 Critical	p-value
March	11	24.4	12	25.0	23	24.7	01:01.1	0.008	0.02	0.9
April	5	11.1	7	14.6	12	12.9	01:01.4	0.16	0.46	0.5
May	5	11.1	11	22.9	16	17.2	01:02.2	1.44	1.64	0.2
June	13	28.9	5	10.4	18	19.4	2.60:1	2.56	2.71	0.1
July	6	13.3	7	14.6	13	14.0	01:01.2	0.026	0.06	0.8
August	5	11.1	6	12.5	11	11.8	01:01.2	0.04	0.06	0.8
Mean	**45**	100	**48**	100	93	100	**1:1.06**	**0.0036**	**0.004**	**0.95**

P = probability value

Gut Frequency Occurrence.

Gut Frequency occurrence of food of *P. obscura* during the sampling period showed that 13% had detritus and fish. Other organisms found in the stomach were snails and prawns. 6.5% had prawns and fish, 5% had prawns, fish and snail shells, 4% fish had earthworms and fish while other organisms found in the stomach were detritus and crabs. On average, 54 (36.4%) out of the 93 samples collected had an empty stomach. This result was corroborated by reports of Hassan and Ja'afaru. (2019) and Narejo *et al.*, (2015), stated a high percentage of empty stomach occurrences which is a feature that distinguishes fish with predatory attributes and results from the rapid rate of food digestion. The high number of empty

stomachs recorded could be due to early feeding which takes place during the day. Most of the fish caught may have digested their food before dawn when they were captured (Osho and Usman 2019).

CONCLUSION

It was observed that a total of 93 *P. obscura* individuals were encountered which comprised of more females (51.61%) than males (48.39%). The highest values for total length, standard length and weight, gutted weight and stomach weight were observed in April. A positive and non-significant length-weight relationships were observed across the months with mean values of 2.96, and the growth pattern was negatively allometric. The mean condition factor value (0.86) was less than 1 which indicated the environmental condition is not almost favorable for the fish species in terms of food availability as it plays important roles in the growth of the fish. The gonado-somatic index (GSI) and hepato-somatic index (HSI) values which expressed the spawning periods of the fish species and was highest in August respectively, and indicated a high sperm potential, high reproductive abilities, maturity, and high egg size at that time. The mean sex ratio (1:1.06) favoured both male and female and no predominance in sexes and in significance. A large percentage of *P obscura* individuals had empty stomachs (36.4%) with detritus and fish (13%) were observed to be the highest occurring in the guts of *P. obscura* that had food materials.

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