PJN
ISSN 1680-5194

PAKISTAN JOURNAL OF NUTRITION

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Pakistan Journal of Nutrition 10 (4): 328-331, 2011
ISSN 1680-5194

Reproduction and Breeding Cycle of Some Commercially Important Fish Species in Gbedikere Lake, Bassa, Kogi State, Nigeria

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Abstract: This study was carried out to examin the reproduction and breeding cycle of some commercially important fish species in Gbedikere Lake, between July and December, 2007. 553 fish samples comprising *Gymnarchus niloticus*, *Clarias gariepinus*, *Tilapia zilli* and *Oreochromis niloticus* were obtained for the study. Samples were sexed, measured and weighed for meristic and morphometric parameters. Egg diameter was determined using ocular lens diameter and stage micrometer. Fecundity in each ovary was determined by direct enumeration using digital counter and recorded. The result showed that the male *G. niloticus* had 102.0 cm length and 12.5 g weight and the females had 86.0 cm length and 13.6 g as size at first maturity with a corresponding mean standard length at entry with 2" mesh net of 18.50 cm while 12.0 cm length/17.0 g weight, 17.0 cm length/4.6 g weight with 19.0 cm as corresponding mean standard length at entry with 2" meshes was obtained for *Clarias gariepinus*. *Tilapia zilli* and *Oreochromis niloticus* had 34.3 cm (length)/17.0 g (weight), 17.0 cm length/4.6 g weight with 19.0 cm; 34.1 cm length/6.0 g weight, 20.5 cm length/4.3 g weight with 10.80 cm length respectively for males and females.

Key words: Fish species, Gbedikere Lake, reproduction and breeding cycle

INTRODUCTION

Rainfall flood triggers the reproductive cycle of most of the fish species generally in the tropics (Hails and Abdullahi, 1982). The study of how fish reproduce forms a basic part of the biology of fishes particularly those that support important fisheries.

In reproductive studies, fecundity and gonad indices are used to estimate the reproductive potential of a population (Adeyemi, 2010) which can aid the estimation of the minimum adult population needed to maintain a stock (Bankole *et al*., 1994). Knowledge of sex ratio and the state of maturity of individual fish specie in a population is useful and estimates of fecundity are considerably important in studies of population dynamics, productivity or population estimates (Scott, 1979; Wootton, 1979).

Reproduction is very vital to the sustenance, replenishment and progeny in maintenance of every living organism including fish. Fish stocks as renewable natural resources get replenished from incessant cropping by fishermen through reproduction (Bankole, 1989). Conservation and survival of any fish specie depend more importantly on its reproductive potential. Gbedikere Lake is exposed to a daily vigorous harvesting regime by fishermen (Adeyemi *et al*., 2009) yet the stock had been able to sustain itself even in the face of such onslaught through their resilience.

This study seeks to examine the resilience through reproduction potentials and breeding cycle of some commercially important fish species in the lake.

MATERIALS AND METHODS

Study area: The study area (Fig. 1) is Gbedikere Lake. The lake is a natural lake located between Latitudes $7^{o}25^{N}$ and Longitudes $7^{o}30^{E}$ and is about 10 km East of Oguma the headquarters of Bassa Local Government Area of Kogi State. Water enters the lake from tributaries that run from River Benue during rainy or flood season, when the season is over, the lake separates out. The lake is about 450 m north of Gbedikere village. The water body covers an area of about 400-450 m with a means depth of 10-14 m (AIFP, 2004) depending on the season.

Collection of fish samples: Fish samples were caught using graded fleets of multifilament experimental gillnets (comprising $1^{1}/_{2}$" - 7") stretched meshes between October 2006 and September 2008. Nets were set to cover various habitats of shore, surface and bottom. Each net measured 50 m long by 3 m deep with twine specifications of 210/3 for the first 7 meshes and 210/6 for the last one. Nets were set in the evening and recovered in the early morning of the next day. When inadequate samples were captured, specimens were obtained from artisanal fishermen's catches. Fish samples obtained were transported in iced plastic buckets to Biological Sciences Laboratory Kogi State University, Anyigba for analysis.

Laboratory analysis: A total of 553 fish samples comprising *Gymnarchus niloticus* (n = 150), *Clarias*

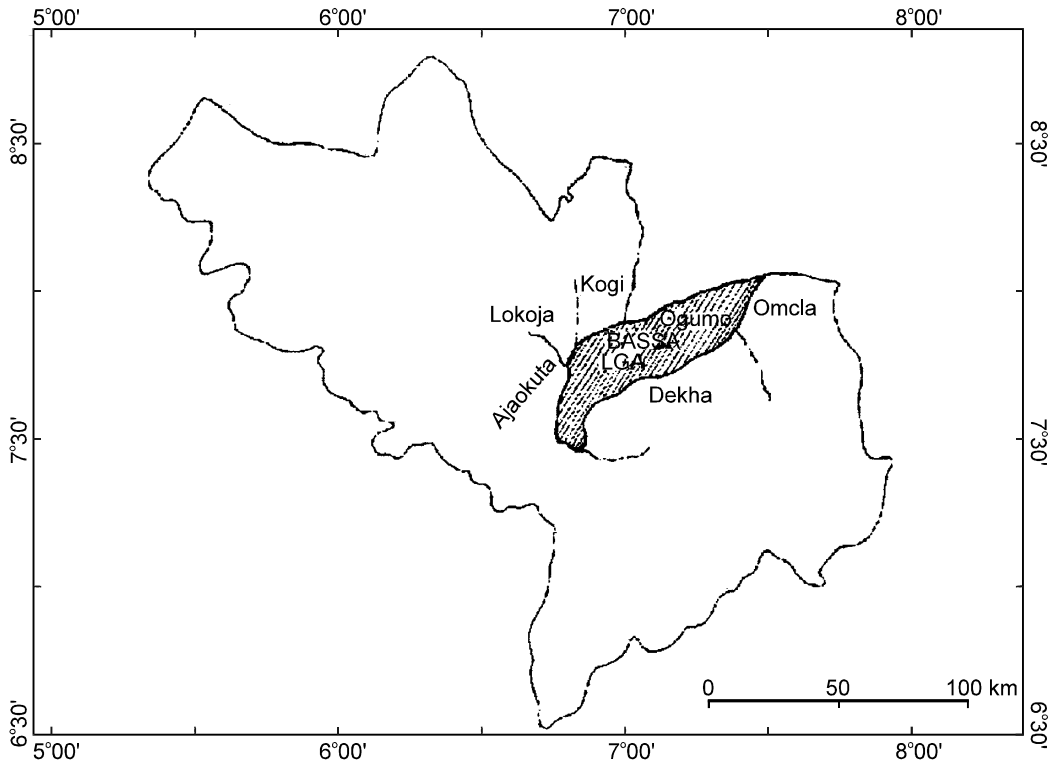

Fig. 1: Map of Kogi State showing Bassa Local Government Area. Sourve: SOVOD mapping and computer service, Lokoja

gariepinus (n = 137), *Tilapia zilli* (n = 127) and *Oreochromis niloticus* (139) were obtained between July and December, 2007, each were measured and weighed for both meristic and morphometric parameters of Standard Length (cm), Total Length (cm) and Weight (g). Sex was determined and gonad maturity stages were classified as described by Scott (1979). Female ovaries were identified, removed and preserved in Gilson fluid. Egg diameter was determined using ocular lens diameter and stage micrometer. Fecundity in each ovary was determined by direct enumeration using digital counter and recorded. In some cases enumeration was done by volumetric sub-sampling method using wet eggs. 250 cm^3 of eggs and water were put in 500 cm^3 flat bottom flask; the mixture was stirred so that the eggs were well distributed. A sub-sample was quickly taken with 1 cm^3 glass pipette five times and counted separately. The mean of the five sub-samples were recorded and this was used to estimate the fecundity relative to the total volume of the mixture.

Data analysis: Data analysis was done using computer analysis package (Microsoft Excel) for Analysis of Variance (ANOVA). Estimation of growth parameters was done from Length frequency and Length at age using the Bhattacharya's von Bertallanffy's method all of which are available in the length frequency based fish stock assessment computer programme (FiSAT, 1996).

RESULTS

The summary of the results obtained for different sizes of fish at first maturity and the reproductive parameters is as shown in Table 1 and 2. The result showed that the males *Gymnarchus niloticus* attained the size of 102.0 cm length and 12.5 g weight and the females had 86.0 cm length and 13.6 g as size at first maturity with a corresponding mean standard length at entry with 2" mesh net of 18.50 cm while 12.0 cm length/17.0 g weight, 17.0 cm length/4.6 g weight with 19.0 cm as corresponding mean standard length at entry with 2" meshes was obtained for *Clarias gariepinus*. *Tilapia zilli* and *Oreochromis niloticus* had 34.3 cm (length)/6.1 g (weight), 20.7 cm length/4.3 g weight with 11.60 cm; 34.1 cm length/6.0 g weight, 20.5 cm length/4.3 g weight with 10.80 cm length respectively for males and females (Table 1).

Details of the results obtained for the different stages of maturity and gonad development for the various species are as shown in Table 2. The result shows that *Gymnarchus niloticus* had the mean fecundity of 3250 the mean ovary weight of 0.8 g and the mean egg diameter of 0.50 mm. The mean fecundity of 4,600, mean egg diameter of 1.1 mm and the gonado somatic index of 4.16 were observed in *Clarias gariepinus*. The mean egg count of *Tilapia zilli* was observed to be 940. Gonado-somatic index was found to be 2.13, while the mean egg diameter was found to be 0.9. *Oreochromis*

Table 1: Observed sizes at first maturity for some commercially important fish species in Gbedikere Lake, Kogi State

Species	Size at first maturity in Gbedikere Lake				
	Male (c)	Wt (g)	Female (c)	Wt (g)	Mean standard length at entry with 2" mesh net
Gymnarchus niloticus	102.0	12.5	86.0	13.6	18.50 cm
Clarias gariepinus	12.0	17.0	17.0	4.6	19.00 cm
Tilapia zilli	34.3	6.1	20.7	4.3	11.60 cm
Oreochromis niloticus	34.1	6.0	20.5	4.3	10.80 cm

Table 2: Summary of reproductive parameters of some fish species in Gbedikere Lake, Kogi State

Species	NFE	NMF	MSL	MW	MOW	GI	MD	MF
Gymnarchus niloticus	105	45	11.0	60.07	0.8	1.31	0.50	3250
Clarias gariepinus	95	42	17.0	110.66	4.6	4.16	1.1	4600
Tilapia zilli	80	47	8.7	70.50	1.5	2.13	0.9	940
Oreochromis niloticus	88	51	8.5	71.34	1.90	2.66	0.43	790

NFE = No. of female examined; NMF = No. of mature female; MSL = Minimum standard length (cm); MW = Mean Wt. (gm); MOW = Mean Ovary Wt. (gm); GI = Gonadosomatic index = mean wt/body wt x 100; MD = Mean diameter of egg (mm); MF = Mean fecundity

niloticus was found to have mean egg count of 790. Egg size ranged from 0.83mm to 1.4mm the mean was 0.43 mm. Gonado-somatic index for the species was 2.66 respectively (Table 2).

DISCUSSION

Growth in Gbedikere Lake fish species could be related to the availability of food. The rate at which they grow could be related to the rate at which they are harvested. Rikhter and Efanov (1976) demonstrated that fish with a high natural mortality mature early in life, compensating for the high mortality by starting to reproduce early. This also is supported by the small sizes at which the species reach maturity. The implication for the fishery is that many of the fish would enter the fishery at an early age and this could lead to the present experience of the fish reproducing early (Rikhter and Efanov, 1976). However, Laudau (1979) found similar length at age in *Tilapia galilaea* of Lake Kinneret where the length at age distribution ranged from 1+ to 4+ in the fish caught over 4 seasons.

Fecundity can be influenced by environmental factors and food. Apart from genetic factors, environmental factors could also affect fecundity; such environmental factors could act through food. Bagenal and Tesch (1978) suggested that fecundity differences in Grand bank haddocks were associated with temperature. McFadden *et al*. (1965) also related fecundity to food. They found that fish from infertile streams had lower egg production. Legget and Power (1969) also correlated fecundity and food supply in salmon. Feeding experiment by Scott (1962) showed that food reduction led to lower fecundity in trout. Fish could change their reproductive strategies according to the intensity of mortality they are subjected to. They further claimed that the size at first maturity, numbers of eggs and ability to escape nets and body proportions could be affected by fishing intensity this is confirmed by Rikhter and Efanov (1976). The low fecundity observed in the Gbedikere species could be related to the fishing intensity and possibly the strong intra and interspecific food competition (Adeyemi and Akombo, 2010).

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