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RESEARCH ARTICLE

STUDIES ON SEASONAL VARIATIONS IN BIOLOGICAL AND ANATOMICAL ASPECTS OF FRESH-WATER AIR-BREATHING FISH *Clariasbatrachus* Linn

***Ajanta Sarkar, Dr. A. K. Patra and Dr. Utpal Kumar Sar**

Department of Aquaculture Management and Technology, Vidyasagar University, Midnapore, West Bengal, India

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ABSTRACT

The present study was carried out to determine the morphological and anatomical character of fresh-water air-breathing fish Clariasbatrachus to characterized the length, weight of alimentary tract and reproductive aspects like condition factor (K), Gastrosomatic index (GSI), Gonadosomatic index (GnSI), Hepatosomatic index (HSI). The result obtained indicated adverse effects on the gonads as well as on liver weight. The average Gastrosomatic index (GSI), Gonadosomatic index (GnSI), Hepatosomatic index (HSI) and condition factor (K) in young and adult male and female sexes of *Clariasbatrachus* were 1.73 and 1.01, 1.70 and 1.70 (GSI) 0.37 and 0.32, 0.05 and 0.32 (GnSI) 0.62 and 0.43, 0.56 and 0.64, (HSI)2.42 and 2.80, 2.54 and 2.18 (K) respectively.
The physico-chemical parameters of pond water during winter season showed.
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P^H	8.1
Alkalinity	66.0 mg/l
Free CO_2	9.5 mg/l
Dissolved O_2	6.5 mg/l
Total Solid	114 mg/l
Total hardness	60 mg/l
Total suspended solid	4.0 mg/l
Chlorides	10.6 mg/l

The weight-length relationship, Gastrosomatic index, Gonadosomatic index, Hepatosomatic index and condition factor differed from four specimens.

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INTRODUCTION

Fish Biology is a subject of relevance to the wider audience for its considerable applied importance to mankind and to biologist for interesting research (Chondar, 1999), Teleosts fishes commercial fishes and aquaculture systems support subsistence's throughout the world (Wootton, 2002). Needless to say, man has made considerable use of bony fishes, which indeed provide in considerable part of total human food. Further teleosts fishes are representatives in virtually of all aquatic ecosystems and an enormous variety is exhibited in their way of living, their utility as food and as materials for scientific study.

****Corresponding author: Ajanta Sarkar,***
Department of Aquaculture Management and Technology, Vidyasagar University, Midnapore, West Bengal, India.

It has been rightly stated that aquatic living resources is a vital tool for transforming India into a nutritionally secured Nation (Gupta, 2008). Fishes have some unique anatomical and physiological characteristics that are different from mammals. However fishes still possess the same organ systems that are present in other higher animals. Scientist concerned with any activity of fisheries should understand well about fish feeding activity, which is the dominant activity in any animal's entire life. Investigation in to the problems in respect of biological and anatomical in fishes call for appropriate methodologies. An understanding of the biological parameters of food fishes is of immense importance, which will provide an effective opportunity to determine the developing requirements of fishes in culture system. The feeding intensity or the degree of feeding is related with season, maturity and availability of materials. Through observation in the field and examination of the contents of the digestive tracts, researchers have learnt

much concerning biological behavior and the kinds of organisms that are eaten as well as anatomical mechanisms that are developed for digestion.

- To display and note the difference of in the structure of alimentary tract of certain fresh water fishes.
- To determine the size of internal organs such as liver, stomach, intestine, gonad of the fin fishes of different size.
- To estimate the gastrosomatic, gonadosomatic, hepatosomatic as well as condition factor indices of the fin fishes during fact winter season.

MATERIAL AND METHODS

For the present study a total of twelve number of freshly caught young and adult male and female specimens from each stage within the weight ranging from 100.58 to 117.19 gms in adults and 46.85 gms to77.60 gms in young only were studied after being collected from culture fish pond located at Hatar, Magrahat, South 24 Pargans (West Bengal) India. They were classified into two stages i. e. young, adults. After morphometric measurements of all adult and young specimens, dissection was carried out under 100 watt illuminations. The internal organs (stomach, liver, ovary and testis) were exposed and carefully detached from the main body. Then their specific wet weights were determined by Afcosel Electronic balance (Reheman *et al*., 2002). The morphometric features like total length (TL), standard length (SL), total weight and abiotic parameters were measured and determined fallowing the standardized protocols (Chandra and Jhan, 2010). Thus, from the anterior projecting part of the head to the posterior most tip of the caudal fin was included in total length (Biswas, 1985). Standard length is the distance from the anterior most part of the head to the end of the vertebral column i. e. caudal peduncle (Dasgupta, 2004). Condition factor is represented by relating the standard length of the fish to its weight (Backman, 1948, Evans, 2000). It was calculated basing on the Cube law in order to compare the condition of fishes under various culture regimes in numeral terms by using the following formulae of Hile (1936).

$K = 100 (w/L^3)$ where,
'K' is the coefficient of condition,
'W' is the weight of fish (in gm).
'L' is the standard length of the fish (in cm).

Anatomical peculiarities like Gastrosomatic index (GSI), Gonadosomatic index (GnSI) and Hepatosomatic index were calculated after measuring the total body wt. of stomach, wt. of the gonads and wt. of the livers to the nearest 0.1g. GSI is defined as the weight of gut as percentage of the total body weight of fish (Desai, 1970).

It is expressed as :

Wt. of gut in gram X 100/ wt. of fish in gms.

HSI is defined as the ratio of liver wt. to the body weight. It is expressed as:

Wt. of liver in gram X 100/ wt. of fish in gms.

The development of gonads is estimated by determining its weight relative to the body weight of the fish (Hopkins, 1979). The body mass (gm) and gonad mass (gm) where recorded and these data were used to calculate the (GnSI) according to the formula of Roff (1983) and Bhattacharya *et al*. (2005).

This is expressed as

Wt. of the gonad (Testis or ovary) in grams X 100/ wt. of fish in gms.

In this study, GSI values of the adult and young male and female had been recorded as 1.73% and 1.01%, 1.70% and 1.70% whereas, GnSI values were 0.37% and 0.32%, 0.05% and 0.32%, HIS values were 0.62% and 0.43% , 0.56% and 0.64% and 'K' factors were 2.42% and 2.80%, 2.54% and 2.18% (Table 1).

During winter season 2015-2016, the values of the abiotic parameters were in relation to their natural habitat.

RESULTS AND DISCUSSION

In both male and female fin fishes it has been observed that there exists certain variation in the value of anatomical parameters in relation to morphometry. In this study, GSI values of the male and female have been recorded as 1.73 and 1.01, 1.70 and 1.70. GnSI values 0.37 and 0.32, 0.05 and 0.32. HIS values 0.62 and 0.43, 0.56 and 0.64 and 'K' value 2.42 and 2.80, 2.54 and 2.18 respectively (Table 1. Fig 1 and 2).

Table 1. Index value and condition factor of *Clariasbatrachus*

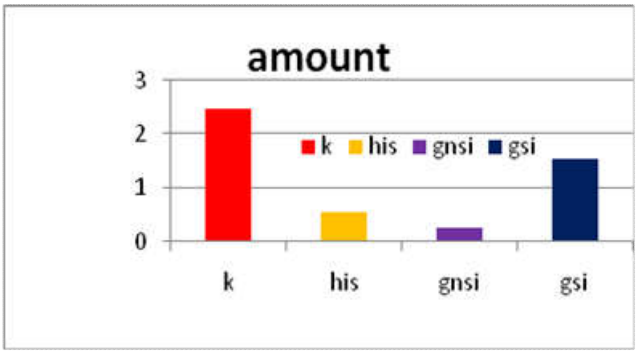
Name of fishes : Clariasbatrachus					
S. No.	Descriptive	Adult Male Specimen 1	Adult Female Specimen 2	Young Male Specimen 3	Young Female Specimen 4
1	Body weight (gm)	117.19	110.58	77.60	46.85
2	Total length (cm)	24.7	22.6	14.5	18.4
3	Standard length (cm)	16.9	15.8	14.5	12.9
4	Weight of stomach (gm)	2.03	1.02	1.32	1.43
5	Weight of liver (gm)	0.73	0.44	0.44	0.30
6	Weight of ovary (gm)	X	0.33	X	0.15
7	Weight of testis (gm)	0.44	X	0.04	X
8	Gastrosomatic index (GSI) (%)	1.73	1.01	1.70	1.70
9	Gonadosomatic index (GnSI) (%)	0.37	0.32	0.05	0.32
10	Hepatosomatic index (HSI) (%)	0.62	0.43	0.56	0.64
11	Condition f actor (K) (%)	2.42	2.80	2.54	2.18

GSI of *Channa Punctatus* normally varies from 1.1 – 3.5, (Parameswaran, 1975) indicated that feeding activity of fish which matured becomes high during February – April. In present study the higher GSI values in than the female indicates that the Male growth is faster than Female.

Table 2. Average index value and condition factor of *Clarias batrachus Linn*

The average value of *Clariasbatrachus*Linn.		
S. No.	Characters	*C.batrachus*.
1	Condition factor (K)	2.48
2	Hepatosomatic index (HSI)	0.56
3	Gonadosomatic index (GnSI)	0.26
4	Gastrosomatic index (GSI)	1.53

Table 2. Details average value of condition factor, Hepatosomatic index, Gonadosomatic index and Gastrosomatic index of *Clarias batrachus Linn*



Considering the GnSI values, the male attains early maturity than the female. Similarly HSI values of male establishes higher than female that again signifies the growth and maturity in male is faster and earlier than female. However the mean GSI value (1.73 and 1.01, 1.70 and 1.70) of both the sexes is higher than GnSI value (0.37 and 0.32, 0.05 and 0.32). Such results indicate that the post monsoon season winter of the fish commences little later. Pillary (1954) expressed that the post monsoon season of Liza tade may start in May – June and continue till September with regards to 'K' value the male again shows little higher fecundity than the female. The same opinion has been made by Dasgupta (2004) Rehman *et al*. (2002) have mentioned that in Liza parsia (3.5 gms) the gastrosomatic index value (1.48) was much higher than the gonadosomatic index value (0.45). The present study agrees with the above observation. Generally gastrosomatic index is low during the spawning season of fish species in Colisafascialus Rehman (2002). Sarkar and Deepak (2009) observed a gradual increase in gonadosomatic index value during pre-spawning period and its peak was reached during spawning period, and again gradual increase of gonads start with post monsoon season. The similar observations have been found in this present study. An idea could also be developed about the carnivorous, omnivorous or herbivorous nature of the fin fines by analyzing the values of relative weight, length of gut and the shape and size of the gill rockers (Soranganba and Saxena, 2007). Endeavour's and achievements of this short piece of scientific study is only a fundamental beginning however, much more in depth of study is under progress to have complete understanding about the morphometry, anatomy, spawning behavior and biological endices.

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