



## Observation on the anatomy and the conditional factors of fresh-water air-breathing fish, *Anabas testudineus* Bloch

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### Abstract

The present study was carried out to determine the morphological and anatomical characters of fresh-water air-breathing fish, *Anabas testudineus*. The specimens comprising male and female under body weight 28.35 – 61.07 gm of the species have been assessed during winter season, 2015 to characterize the length, weight of alimentary tract and reproductive features like Gastrosomatic index (GSI), Gonadosomatic index (GnSI), Hepatosomatic index (HSI) and Condition factor (k). The result showed adverse effects on the gonads as well as on liver weight. The mean Gastrosomatic index (GSI), Gonadosomatic index (GnSI), Hepatosomatic index (HSI) and Conditional factor (K) in young male, female and adult male, female specimens were 0.52, 0.57 and 1.17, 0.72 (GSI); 0.49, 0.54 and 0.13, 0.37 (GnSI); 1.48, 1.80 and 1.35, 1.30 (HSI); 2.59, 2.53 and 3.09, 2.37 (K) respectively.

**Keywords:** *Anabas testudineus*, Gastrosomatic index (GSI), Gonadosomatic index (GnSI), Hepatosomatic index (HSI), Condition factor (K).

### Introduction

Fish Biology is a subject of relevance to the wider researchers for its considerable applied as well as commercial importance to mankind and to Biologists too for interesting research<sup>1</sup>. Commercial fishes and aquaculture technologies support food substences throughout the World<sup>2</sup>. Needless to say, man has made considerable use of bony fishes, which indeed provide a considerable part of essential protein of major part of total human food. Further teleosts are representatives of all aquatic ecosystems and an enormous variety is exhibited in their mode of living, their utility as food as well as materials for scientific study. It has been rightly stated that aquatic living resources is a vital tool for transforming India into a nutritionally secured Nation<sup>3</sup>.

Fishes have some unique anatomical and physiological characteristics that are different from higher vertebrates. However, fishes still possess the same organ systems that are present in other higher animals. Scientist concerned mainly with the fisheries, should understand well about feeding activity, which is considered to be the dominant activity in any animal's entire life. Investigation in to the problems regarding biological and anatomical features in fishes call for appropriate methodologies. An understanding of the biological parameters of fish food 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 to the season, maturity and availability of materials on the environment. Through observation in the field and examination of the contents of the digestive tract in the

laboratory, researchers have learnt much about biological behaviour, food material and anatomical mechanisms that are developed for digestion<sup>4</sup>.

**Aims and objectives:** Displaying and noting the differences seen in the structure of alimentary tract of *Anabas testudineus*. Determination of the size and wt. of internal organs such as liver, stomach, gonad of this fin fish having different weight groups. Estimation of the gastrosomatic, gonadosomatic, hepatosomatic as well as condition factor indices of the same fish during winter season.

### Materials and methods

For the present study a total of twelve number of freshly caught young and adult male and female specimens of *Anabas testudineus*, body weight ranging from 28.35 gms to 29.38 gms were collected from culture fish pond located at Hotar, Magrahat, South 24 Pargans (West Bengal), India. They were classified as suggested by Bhattacharya et al<sup>5</sup>, into two stages i. e. young and adults. After morphometric measurements of all young and adult specimens, dissection was carried out under 100 watt illuminations. The internal organs such as stomach, liver, ovaries and testis were exposed and carefully dissect out from the body. Then their weight were measured by Afcosel Electronic Balance<sup>4</sup>. The morphometric features like total length (TL), standard length (SL), total weight and abiotic parameters were measured and determined following the standardized protocols<sup>6</sup>. Thus, from the anterior projecting part of the head to the posterior most tip of the caudal fin was included in total length<sup>7</sup>. Standard length was the distance from the anterior most

part of the head to the end of the vertebral column (i. e. caudal peduncle)<sup>8</sup>. Whereas, condition factor was determined by making the relationship between standard length of the fish and its weight<sup>9,10</sup>. 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<sup>11</sup>.

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

where, 'K' is the coefficient of condition. 'W' is the weight of fish (gm). 'L' is the standard length of the fish (cm).

Anatomical parameters: Gastro-Somatic index (GSI): It is revealed as the weight of gut (stomach + intestine) divided by total body weight of fish as percentage<sup>12</sup>.

**It is calculated using the following formula:** Weight of gut (gm) × 100 / total weight of fish (gm.)

Gonado-Somatic Index (GnSI): The development of gonads is estimated by determining its weight related to the body weight of the fish<sup>13</sup>. The body mass (gm) and gonad mass (gm) were recorded and these data were used to calculate the (GnSI) according to the formula of Roff<sup>14</sup> and Bhattacharya et al<sup>5,15</sup>.

**This is calculated using the following formula:** Weight of gonad (Testis or Ovary) gram × 100 / weight of fish (gm.)

Hepato-Somatic Index: This index is determined as a ratio of liver weight divided by body weight as percentage i.e.

$$\text{Weight of liver (gm.)} \times 100 / \text{weight of fish (gm.)}$$

## Results and discussion

During winter season (2015-2016) the values of the abiotic parameters were in relation to their natural habitat (Table-1).

**Table-1:** The mean physico chemical parameters of pond water during winter season, 2015.

pH	8.1
Alkalinity (mg l <sup>-1</sup> )	66.0
Free CO <sub>2</sub> (mg l <sup>-1</sup> )	9.5
Dissolved Oxygen (mg l <sup>-1</sup> )	6.5
Total Solids (mg l <sup>-1</sup> )	114
Total hardness (mg l <sup>-1</sup> )	60
Total suspended solids (mg l <sup>-1</sup> )	4.0
Chlorides (mg l <sup>-1</sup> )	10.6

**Table-2:** Index values and condition factor of *Anabas testudineus*.

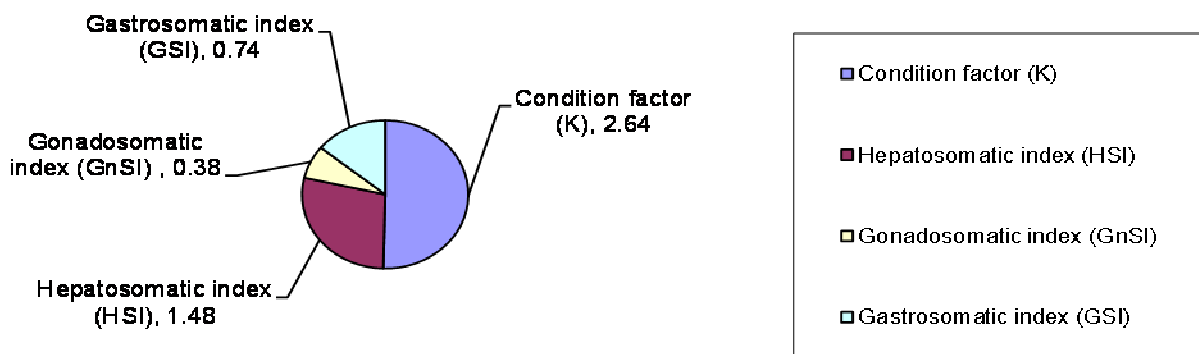
Name of fish: <i>Anabas testudineus</i> .					
Sl. No.	Descriptive	Young Male Specimen 1	Young Female Specimen 2	Adult Male Specimen 3	Adult Female Specimen 4
1	Body weight (gm)	28.35	29.38	57.68	61.07
2	Total length (cm)	12.3	13	14.7	16.2
3	Standard length (cm)	10.16	10.5	12.3	13.7
4	Weight of stomach (gm)	0.15	0.17	0.68	0.44
5	Weight of liver (gm)	0.42	0.53	0.78	0.80
6	Weight of ovary (gm)	X	0.16	X	0.23
7	Weight of testis (gm)	0.14	X	0.08	X
8	Gastrosomatic index (GSI) (%)	0.52	0.57	1.17	0.72
9	Gonadosomatic index (GnSI) (%)	0.49	0.54	0.13	0.37
10	Hepatosomatic index (HSI) (%)	1.48	1.80	1.35	1.30
11	Condition f actor (K) (%)	2.59	2.53	3.09	2.37

The weight-length relationship, Gastroscopic index, Gonadosomatic index, Hepatosomatic index and Condition factor have been analyzed and showed difference among four specimens. GSI values of male and female specimen of both young and adult had been recorded i.e. 0.52% and 0.57%, 1.17% and 0.72% whereas GnSI values were 0.49% and 0.54%, 0.13% and 0.37%, HSI values were 1.48% and 1.80% , 1.35% and 1.30% and 'K' factors were 2.59% and 2.53%, 3.09% and 2.37% respectively (Table-2).

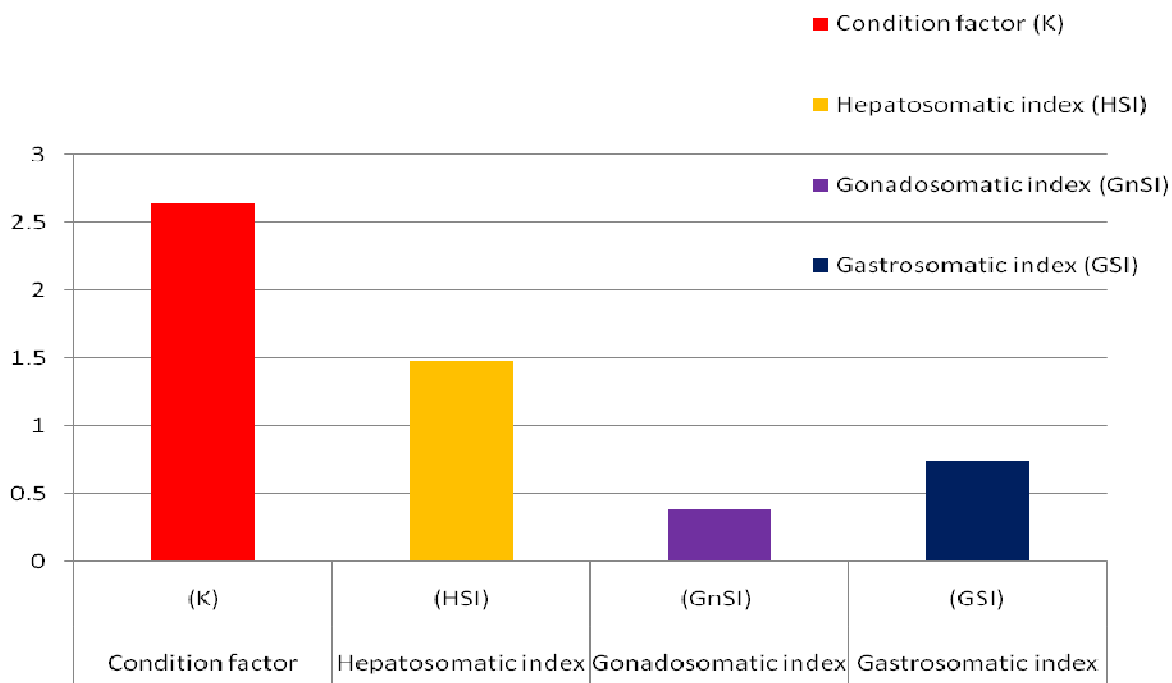
Parameswaran<sup>15</sup> reported that GSI of *Channa Punctatus* generally ranges in between 1.1 – 3.5 and high rate of feeding activity of adult fish was observed during the month from February to April in a year. Through the clarification of higher GSI values, it is pointed out that male growth is faster than female.

**Table-3:** Mean index values and condition factor of *Anabas testudineus*.

The average value of <i>Anabas testudineus</i> .		
Sl. No.	Characters	<i>Anabas testudineus</i>
4	Condition factor (K) (%)	2.64
3	Hepatosomatic index (HSI) (%)	1.48
2	Gonadosomatic index (GnSI) (%)	0.38
1	Gastroscopic index (GSI) (%)	0.74



**Figure-1:** The mean index and condition factor values of *Anabas testudineus* Bloch.



**Figure-2:** Mean values of condition factor, hepatosomatic index, gonadosomatic index and gastroscopic index of *Anabas testudineus* Bloch.

In respect to GnSI values, it is inferred that the male attains early maturity than the female. Similarly, HSI values of male also signify that the growth and maturity in male is faster and earlier than female. However, in case of both the sexes mean GSI value i.e. 0.74 (Table-3) is higher than GnSI value i.e. 0.38 (Table-3) whereas HSI value is also quite high i.e. 1.48 (Table-3). Such results indicate that introduction of post monsoon season (winter) of the fish, *Anabas testudineus* become started few days later. Pillay<sup>16</sup> expressed that the post monsoon season of *Liza tade* may start in May – June and continue till September. 'K' values are 2.59, 3.09 in young and adult male while 2.53, 2.37 in young and adult female respectively (Table-2). In comparison to 'K' value, the male again shows little higher fecundity than the female. The similar opinion has been made by Biswas<sup>7</sup>, Rahaman<sup>18</sup> and Dasgupta<sup>8</sup>. They reported that the gastrosomatic index value was much higher than the gonadosomatic index in *Liza parsia*. The present study strengthens the above observation. Generally gastrosomatic index is low during the spawning season of fish species namely *Colisa fasciatus*<sup>18</sup>. Sarkar and Deepak<sup>17</sup> deliberately described that gonadosomatic index value is increasing gradually during pre-spawning period whereas it reaches maximum during spawning period. Then it starts to show gradual lower value at the onset of post monsoon season. The present study during winter season (post monsoon) may be cited in this context. Furthermore, the carnivorous, omnivorous or herbivorous nature of food habit of fin fishes may be determined by analyzing the values of relative weight, length, shape and size of the gut. This part of the research work has been undertaken for future study.

## Conclusion

This study reveals that the growth and maturity of male *Anabas testudineus* are faster than the female ones. However, scientific study in detail is required to understand the morphometry, anatomy, spawning behaviour and biological indices of Indian air-breathing fish, *Anabas testudineus* completely.

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