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RESEARCH ARTICLE

SEASONAL VARIATIONS IN CONDITION FACTOR AND FEEDING INTENSITY OF FRESHWATER TELEOST: *OMPOK BIMACULATUS, XENENTODON CANCILA, PUNTIUS SARANA* AND *LABEO BOGGUT* FROM TIGHRA RESERVOIR, GWALIOR (M.P.)

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ABSTRACT

Condition factor and feeding intensity of *Ompok bimaculatus, Xenentodon cancila, Puntius sarana*, *Labeo boggut* were studied from May, 2012 to April 2013. The condition factor of *Ompok bimaculatus* was varied from 0.49±0.03 to 0.81±0.13. The maximum mean monthly condition factor of *Xenentodon cancila* was observed in the month of April (0.59±0.05) and minimum in the month of November (0.21±0.04). Condition factor of *Puntius sarana* showed variation from 1.07±0.04 to 1.9±0.05 and it was increased in the month of March while decreased in the month of November. The condition factor of *Labeo boggut* was varied from 1.01±0.13 to 1.87±0.09 and it was highest in the month of April and lowest in the month of December. It was observed that condition factor (K) was higher when fish entered into the maturity period during the month of March and April while in the other months K showed slightly lower values. The gastrosomatic index and hepatosomatic index, both indices were minimum in the months of June and July and maximum in the months of December and January due to availability of good food items.

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INTRODUCTION

Fish have great significance in the life of mankind, being an important natural source of protein and provider of certain other useful products as well as economic sustenance to many people and the nations. The condition factor 'K' is to basically quantify the condition of fish which influenced by several factors including age of fish, stage of maturation, fullness of gut, type of food consumed, amount of fat reserve and degree of muscular development. Condition factor (K) of fish presents valuable information regarding maturity spawning, availability of food and environmental conditions (Brown, 1957). The variations in condition of fishes are related to different factors including reproductive cycles and availability of food (Thompson, 1943; Hickling, 1945). Several authors have observed that physico-chemical factors of the environment, season, and availability of food, sex, life stage and physiological state of fish directly influence the growth of fish (LeCren 1951, Brown, 1957, Nikolsky 1993).

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The gastrosomatic index and hepato-somatic index was related to feeding intensity of fish. The feeding intensity means the fullness of stomach. The condition factor of fish has been studied by a number of fishery biologist's viz., Rao and Krishnan (2009), Olurin and Savage (2011), Abedi *et al.* (2011), Mir *et al.* (2012), Hossain *et al.* (2012), and Dar *et al.* (2012), Chaturvedi and Saksena (2013). In view of above information, main aim of this study was to collect information about the growth, well being of these fish species which are mainly consumed by common people in this area.

MATERIALS AND METHODS

The samples of fishes were collected after every month, at a point located near the dam, from Tighra reservoir, Gwalior, during May 2012 to April 2013. This Tighra reservoir lies on 26-12'0" latitude and 78-30-0" E Longitude. The reservoir was made by constructing a dam on the Saank River near Tighra village in 1909. The catchments area of the reservoir is 414 sq. Km. The field collections were done by using cast nets with the help of local fishermen. The total length and total weight were recorded after removing the moisture by soaking them

with dried cloth. The total length of the fish was measured to its nearest 0.1 cm. and total body weight was measured to its nearest 0.1g. For the estimation of feeding intensity or gastro somatic index and hepatosomatic index of the fish species, the fishes were dissected by giving a vertical incision on the ventral side and eviscerated to avoid regurgitation of the last meal. The stomach and liver were weighed by using spatula balance. The growth of fish was estimated by determining the condition factor, which was calculated by the formula as suggested by Hile (1936). The condition factor is used to determine the wellness of a fish by using total length and total weight of the fish.

$$K = \frac{W}{L^3} \times 100$$

Where,

K = Condition factor
W = weight of fish (gm)
L = Length of fish (mm)

The gastrosomatic index and hepatosomatic index were also calculated by using following formulae:

$$\text{Gastrosomatic index} = \frac{\text{Weight of the stomach}}{\text{Weight of the fish}} \times 100$$

$$\text{Hepatosomatic index} = \frac{\text{Weight of the liver}}{\text{Weight of the fish}} \times 100$$

RESULTS AND DISCUSSION

The seasonal variations in condition factor of four fish species, *Ompok bimaculatus, Xenentodon cancila, Puntius sarana* and *Labeo boggut* were calculated for a year *i.e.,* from May, 2012 to April, 2013 on monthly basis by taking ratio of weight to length of the fish. The highest mean monthly condition factor for *Ompok bimaculatus* was recorded in the month of April and the lowest mean monthly condition factor were recorded during August.

The maximum mean monthly condition factor of *Xenentodon cancila* was observed in the month of April (0.59±0.05) and minimum in the month of November (0.21±0.04) (Table 1). Range of variation of mean monthly condition factor of *Puntius sarana* was 1.07±0.04 to 1.9±0.05 (Table 1) and it reaches its highest point in the month of March while it decreased in the month of November. The condition factor of *Labeo boggut* fish was varied from 1.01±0.13 to 1.87±0.09.8 (Table 1). It was highest in the month of April and lowest in the month of December. The highest condition factor in different fish species has been occurring in January, February and March (Rahman and Hafzath, 2012 and Kamaruddin *et al.,* 2012). The present findings also showed similarity with the above study. The condition factor of *Cynoglossus arel* was remained low from March to September, it increases slightly from October to February and the maximum value of condition factor was obtained during February (Gaffari *et al.* 2011). The good condition of fish in some manner is directly correlated with the feeding intensity of the fish. The condition factor of *Catla catla* has been found higher in Tighra reservoir in comparison to Ramaua reservoir due to better nutrient level of Tighra reservoir, good production of fish food organisms (Saksena and Kulkarni, 1983).

The feeding intensity refers to the degree of feeding as indicated by the relative fullness of stomach. It varies along with the seasons, availability of preferred food items, maturity stage of the fish and spawning season of the species. In the present study on the gastrosomatic index or feeding intensity of the *O. bimaculatus, X. cancila, L. boggut* and *P. sarana* showed variations in feeding intensity in different months of the study. The findings of present study revealed that the gastrosomatic index of *O. bimaculatus* was observed minimum in the month of June (1.31 ± 0.09) and maximum in the month of December (3.52 ± 0.26) (Table 2). *X. cancila* showed minimum feeding intensity in rainy season, especially in July and August due to depletion in occurrence of food items while the maximum during winter season (December and January) due to availability of good food items. Range of variation in gastro-somatic index was from 1.19 ± 0.17 to 3.97 ± 0.23 (Table 2). *P. sarana* showed minimum feeding intensity in July (0.38 ± 0.09) and maximum in January (1.23 ± 0.09) (Table 2). Minimum feeding intensity of *L. boggut* was observed in June (0.29 ± 0.07) and maximum in December (0.85 ± 0.15) (Table 2) due to availability of good food items.

Table 1. Seasonal variations in the mean of condition factor of *Ompok bimaculatus, Xenentodon cancila, Puntius sarana* and *Labeo boggut* during May, 2012 to April, 2013

S.N.	Months	*O.bimaculatus*	*X. Cancila*	*P.sarana*	*L.boggut*
1.	May	0.49±0.02	0.52±0.12	1.15±0.03	1.5±0.3
2.	June	0.61±0.07	0.36±0.09	1.37±0.14	1.12±0.23
3.	July	0.73±0.09	0.31±0.01	1.37±0.11	1.23±0.13
4.	August	0.81±0.03	0.33±0.03	1.15±0.08	1.12±0.08
5.	September	0.71±0.06	0.27±0.03	1.19±0.07	1.04±0.13
6.	October	0.68±0.06	0.26±0.05	1.18±0.1	1.28±0.14
7.	November	0.69±0.04	0.21±0.04	1.07±0.04	1.25±0.12
8.	December	0.67±0.06	0.23±0.01	1.27±0.03	1.01±0.13
9.	January	0.65±0.05	0.28±0.08	1.18±0.05	1.21±0.1
10.	February	0.64±0.04	0.25±0.01	1.24±0.07	1.03±0.7
11.	March	0.63±0.05	0.47±0.03	1.9±0.05	1.02±0.06
12.	April	0.57±0.13	0.59±0.05	1.08±0.03	1.87±0.09

The gastrosomatic index has shown an inverse relationship with the reproductive cycle of the fish (Pandian, 1966; Desai, 1970; Bhatnagar and Karamchandani, 1979; Serajuddin *et al.*, 1988; Fatima and Khan, 1993 and Jhingaran, 1997) and this was true for *O. bimaculatus, X. cancila, P. sarana* and *L.*

Table 2. Average value of Gastro-Somatic Index (GSI) along with Standard Error (S. E.) of *Ompok bimaculatus, Xenentodon cancila, Puntius sarana* and *Labeo boggut* during May, 2012 to April, 2013

S.N.	Months	*O.bimaculatus*	*X. Cancila*	*P.sarana*	*L.boggut*
1.	May	1.79 ± 0.18	1.53 ± 0.21	0.79 ± 0.07	0.33 ± 0.04
2.	June	1.31 ± 0.09	1.39 ± 0.19	0.61 ± 0.05	0.29 ± 0.07
3.	July	1.39 ± 0.21	1.19 ± 0.17	0.38 ± 0.09	0.31 ± 0.03
4.	August	1.51 ± 0.23	1.21 ± 0.24	0.47 ± 0.11	0.37 ± 0.08
5.	September	1.63 ± 0.19	1.47 ± 0.21	0.59 ± 0.08	0.41 ± 0.10
6.	October	1.89 ± 0.25	1.61 ± 0.20	0.68 ± 0.13	0.47 ± 0.09
7.	November	2.19 ± 0.35	2.01 ± 0.31	0.83 ± 0.17	0.53 ± 0.13
8.	December	3.52 ± 0.26	3.15 ± 0.35	1.11 ± 0.19	0.85 ± 0.15
9.	January	2.91 ± 0.22	3.97 ± 0.23	1.23 ± 0.09	0.71 ± 0.11
10.	February	2.17 ± 0.20	2.29 ± 0.18	1.03 ± 0.10	0.63 ± 0.07
11.	March	2.08 ± 0.18	2.11 ± 0.22	0.97 ± 0.08	0.58 ± 0.03
12.	April	2.01 ± 0.19	1.73 ± 0.19	0.81 ± 0.06	0.43 ± 0.05

Table 3. Average value of Hepato-Somatic Index (HSI) along with Standard Error (S. E.) of *Ompok bimaculatus, Xenentodon cancila, Puntius sarana* and *Labeo boggut* during May, 2012 to April, 2013

S.N.	Months	*O.bimaculatus*	*X. Cancila*	*P.sarana*	*L.boggut*
1.	May	1.89 ± 0.12	2.31± 0.21	1.01 ±0.04	0.98±0.02
2.	June	1.31 ±0.01	1.57 ±0.19	0.81 ±0.07	0.49 ±0.07
3.	July	1.19 ±0.05	1.55 ±0.1	0.79 ±0.02	0.63 ±0.05
4.	August	1.01 ±0.09	1.9 ± 0.01	0.97 ±0.08	0.91 ±0.09
5.	September	2.16 ±0.05	3.12± 0.04	1.07 ±0.1	1.09 ±0.03
6.	October	2.54 ±0.02	4.94 ±0.13	1.15 ±0.12	1.01 ±0.08
7.	November	3.09 ±0.14	5.98 ±0.09	1.21 ±0.08	1.19 ±0.12
8.	December	5.09 ±0.18	7.18 ±0.06	1.58 ±0.14	1.49 ±0.15
9.	January	5.26 ±0.05	6.2 ±0.09	1.97 ±0.12	1.31 ±0.07
10.	February	4.19 ±0.07	6.87± 0.17	1.51 ±0.07	1.19 ±0.01
11.	March	4.01 ±0.09	5.11 ±0.18	1.37 ±0.05	1.13 ±0.05
12.	April	3.67 ±0.11	5.01 ±0.07	1.19 ±0.1	1.02 ±0.01

boggut. *Ompok bimaculatus* and *O. malabaricus* showed low feeding intensity during August and June and it may be due to shortage of food items or due to the spawning season of the fish (Arthi *et al.*, 2011). *O. bimaculatus, X. cancila, L.boggut* and *P. sarana* showed high feeding intensity during winter when spawning period did not take place but it has shown low intensity during spawning period and empty stomachs were also observed in the month of June. The similar results were made by Rajkumar *et al.* (2007) who revealed feeding habit of *Catla catla* in which the high feeding intensity was observed during the non spawning while low feeding intensity was observed during spawning period. The feeding intensity of *Eutropiichthys vacha* which continued its feeding even during the spawning season (Abbas, 2010). Mathialagan and Sivakumar (2012) reported the feeding intensity of *Cirrhinus reba* and found that the gastrosomatic index for both the sexes observed high during November and December and it again decreased in June and July. Dutta *et al.* (2013) observed most of empty stomachs of *Tenualosa ilisha* during June and September and the maximum feeding was observed during February and March.

The highest value of hepato-somatic index in *Ompok bimaculatus* was recorded in the month of January as 5.26±0.05 and least value was recorded in the month of August as 1.01±0.09 (Table 3).The highest value of hepato-somatic index of *X. cancila* was recorded in the month of December as 7.18±0.06 and least value was recorded in the month of July as 1.55±0.1 (Table 3). In *Puntius sarana* the highest value of hepato-somatic index was recorded in the month of January as 1.97±0.12 and least value was recorded in the month of July as 0.79±0.02 (Table 3).

The highest value of hepato-somatic index in *Labeo boggut* was recorded in the month of December as 1.49±0.15 and least value was recorded in the month of June as 0.49±0.07 (Table 3). The hepatosomatic index of *Atherina boyeri* was increasing from winter to spring and decreased during spawning, while it obtained constant from midsummer to winter (Andreu-soler *et al.,* 2006). The hepatosomatic activity of *Etrumeus teres* recorded higher during a period from December to April (Osman *et al.,* 2011) and in *Cynoglossus arel,* it was increasing from September (0.48 ± 0.01) to March (0.83 ± 0.02) and it declined slightly from April to September (Ghaffari *et al.,* 2011). It is concluded that feeding intensity was maximum during winter season and minimum during summer season. Feeding intensity was related with gastrosomatic index and hepatosomatic index so that both indices increased in winter season and decreased in summer season.

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