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CONTENT

Nutritional Quality of Freshwater Fishes and its Importance on Regulation of Nutritional Status of Local Fishermen Community of Murshidabad District, West Bengal, India: A Field Study SOUMIMA CHATTORAJ AND KAUSIK MONDAL	1-10
Length-weight Relation, Relative condition and GSI of <i>Channa Punctata</i> (Bloch, 1793) in Wetlands of Nadia District, West Bengal RUPALI CHAKRABORTY, SUDHIR KUMAR DAS AND DIBAKAR BHAKTA	11-18
Cage Culture of Tilapia with respect to Nutrition and Feeding E. PRABU, N. FELIX, B. AHILAN, CHERYL ANTONY, A. UMA AND P. RUBY	19-33
Periphyton Based Aquaculture : A Review P. RUBY, B. AHILAN AND E. PRABU	35-48
Role of Astaxanthin in Aquaculture – A Review C. JUDITH BETSY AND J. STEPHEN SAMPATH KUMAR	49-57
Review on Enzymes as Fish Feed Additives M. MUTHU ABISHAG AND C. JUDITH BETSY	59-77
Immune Response of Fish to Parasitic Infection – A Review PETCHIMUTHU, M., ROSALIND GEORGE, M., RIJI JOHN. K. AND DINESH, R	79-89
Ribosomal RNA and their Applications in Species Identification RANJITH KUMAR, K., SUDHAN, C., UTSA ROY AND MADHUSUDHANA RAO, B.	91-99
Advanced Developments in Fish Vaccination A. KAMALII., E. PRABU, P. RUBY AND B. AHILAN	101-109

LENGTH-WEIGHT RELATION, RELATIVE CONDITION AND GSI OF *CHANNA PUNCTATA* (BLOCH, 1793) IN WETLANDS OF NADIA DISTRICT, WEST BENGAL

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ABSTRACT

The biological parameters like length-weight relationships, relative condition factor, gonado-somatic index were examined of 348 specimens of *Channa punctata* (Bloch, 1793) from wetlands of Nadia district, West Bengal. The total length of the species varied from 80-220 mm with minimum size of first maturity was recorded at 110 mm. The species was categorized into two group's viz., group I (<110 mm) and group II (\geq 110 mm) for the convenience of interpretation. The 'b' value was encountered as 3.1634 and 2.9978 from the group I and group II specimen respectively. The fish exhibited isometric growth. Relative condition (Kn) factor was varied from 1.029 to 1.217. There were significance differences ($P < 0.05$) in Kn value of *Channa punctata* during the period of study. Gonado-somatic index values (GSI) varied from 0.50 to 2.30 for males and 0.52 to 5.26 for females.

Keywords: *Channa punctata*, Length-weight relation, Relative condition, GSI, Wetlands, West Bengal.

INTRODUCTION

Channa punctata (spotted snakehead, common pond murrel) locally known as 'Lata' or 'Taki' of the family Channidae under order Channiformes is very popular candidate species for the versatile distribution. In India it is distributed in Assam, West Bengal, Bihar, UP, Punjab, Haryana, Gujarat, Maharashtra, MP, Andhra Pradesh, Tamil Nadu, Karnataka and Kerala (Day, 1878 and Misra, 1959). It is an important fish in wetlands and it has a great demand in markets due to its high nutritive value. The culture of snakehead murrel is not common due to the scarcity of quality

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seed supply and lack of adequate knowledge on their feeding and breeding techniques. Biological studies are required for proper management of fisheries and aquaculture. Biology and growth of fish are influenced by the environment where it lives. According to Reddy (1981), the analysis of length and weight data constitutes an essential part of investigations on any stocks. A perusal of literature on the length-weight relationship of fishes indicates that not only do the different stocks of a species but even the sexes in each stock may show differences in the relationship of fishes. According to Kulbicki *et al.* (2005), little information is available on length-weight relationship of tropical and sub-tropical fish species of India. Very few works have been done on the length-weight relationships of *Channa punctata* and was carried out by Kashyap *et al.* (2013, 2014 and 2015), Rao *et al.* (2013), Serajuddin *et al.* (2013), Jhan and Chandra (2010), Samad and Jafri (1996), Sarkar (1996), Basheer *et al.* (1993), Bashgeer (1993) and Haniffa *et al.* (2006). Parameswaran (1975) reported that K_n value in males and females of *Channa punctatus* fluctuates in various size of the fish, but no correlation between these function and maturity cycle was evident.

Studies on the reproductive biology of any species are essential in evaluating the commercial potential of the stocks. Gonado-somatic index value gives clear cut idea regarding spawning season of any species which enable us to set seasonal closures during the reproductive season. Bagenal (1978) reported that in most of the fishes, the number of eggs does not change significantly as the season progress but the gonad weight increases due to an increase in water content or organic matter derived from food, or organic matter transferred from somatic tissues.

In the present study, an attempt has been made to study the biological parameters of *Channa punctata* like length-weight relationships, condition factor and gonado-somatic index from samples collected from Nadia district, West Bengal. The study can be useful for promoting a suitable plan for sustainable management of the species for aquaculture and fisheries in the region.

MATERIALS AND METHODS

A total 348 specimen of *Channa punctata* were collected from different water bodies of Nadia district during October to next May month. The sample specimens were caught by cast net, drag net, hook and line, from various water bodies like beels, ponds, paddy fields, derelict water bodies, drainage canal with weed infestations etc. The specimens were brought to the laboratory to study length-weight relationship, gonado-somatic index and other biological features. Length and weight of fish were recorded in millimeter and gram respectively.

The total length of the specimen varied from 80-220 mm with minimum size of first maturity was recorded at 110 mm. The species was categorized into two groups viz., group I (<110 mm) and group II (\geq 110 mm) for convenience of interpretation.

The length-weight relationship was estimated following the standard equation of $W = aL^b$ of Le Cren (1951), where W is weight and L is length. It is converted to logarithmic form in order to obtain a linear equation where $\text{Log } W = \text{Log } a + b \text{ Log } L$.

The relative condition factors (K_n) was calculated by using the formula $K_n = W_0 / \hat{W}$, where W_0 is observed weight and \hat{W} is calculated weight.

Gonado-somatic index was found out with the equation, $\text{GSI} = \text{weight of gonad} / \text{weight of fish} \times 100$.

RESULTS AND DISCUSSION

In the present study from October to next May month, more than 40 specimens were examined in each month in the laboratory condition. The length of the species varied from 80 to 220 mm with weight 13 to 150 g respectively. The length-weight relationship was recorded as $W = 0.0098 L^{3.163}$ for fishes of the group I and $W = 0.0105 L^{2.998}$ for group II. The 'b' value was encountered as 3.163 and 2.998 from the group I and group II specimen respectively (Table 1). To find out whether the 'b' value is different from 3, 't' test was conducted. The growth of the fish was found to be isometric because 'b' value was not significantly different from the cube (3). Qasim and Bhatt (1966) observed in *Channa punctatus*, 'b' value for males was 3.117 and for females 3.559. Parameswaram (1975) reported from Karnataka water that the length-weight relationship for male was $\text{Log } W = -5.1610 + 3.0703 \text{ Log } L$, for female $\text{Log } W = -4.4901 + 2.7920 \text{ Log } L$ and for general it was $\text{Log } W = -4.8494 + 2.9348 \text{ Log } L$. Reddy (1981) obtained the 'b' value for males as 3.043 and for females 3.129. Serajuddin *et al.* (2013) and Kashyap *et al.* (2014) also reported the isometric growth of *Channa punctatus* from different environments. Kashyap (2015) was found the 'b' value ranged from 2.837 to 3.026 of *Channa punctatus* from Northern and eastern regions of India.

In the present study, the 'b' value resembles with the earlier studies. A relatively less value of 'b' in the size group of II might be due to less somatic growth caused by more gonadal development as the fishes increase in size as well as age.

Relative condition factor (K_n) is also studied widely in fish biology along with the length-weight relationship for use in fisheries management. It is a function of fatness, feeding and state of gonads. In general, K_n indicates the general well being of fish and the study of the changes in its values occur with the increase in length. It also indicates the size at first maturity. It gives an idea on the well-being of the fish in different stages of its life cycle (Mir *et al.*, 2012). In the present study K_n value varied from 1.029 to 1.217. There were significance differences ($P < 0.05$) in K_n value of *Channa punctata* during various months. The K_n value was calculated month wise in different size groups (Fig 1). The K_n value was high during October and November and it might be due to more feeding intensity. In winter season

during December to February the Kn value dropped due to less feeding activity and from March onwards the Kn value started increasing with a peak in May and it might be due to advanced maturity stages.

Table 1. Length-weight relationship of *Channa punctata*

Size group	Sample size 'n'	Length-weight relationship	
Group I (<110 mm)	93	$W = 0.0098L^{3.163}$	$\text{Log}W = -2.008 + 3.163 \text{ Log}L$
Group II (≥ 110 mm)	255	$W = 0.0105L^{2.998}$	$\text{Log}W = -1.979 + 2.998 \text{ Log}L$

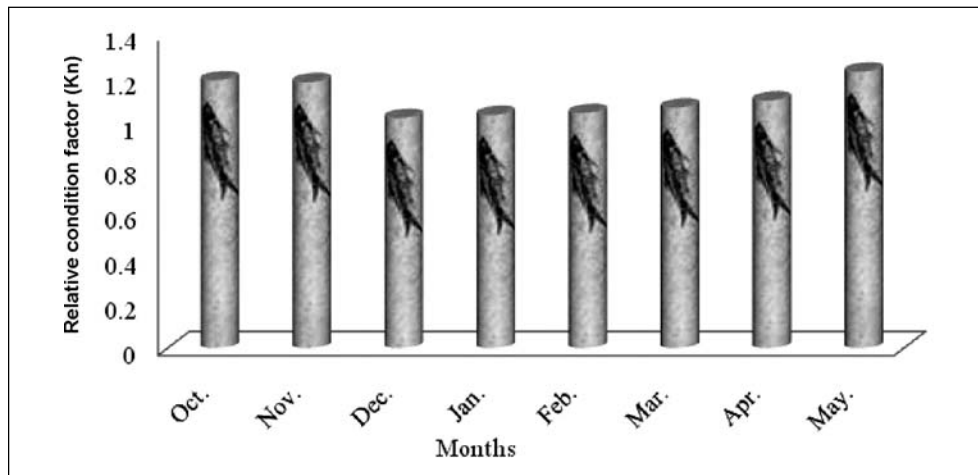


Figure 1. Month-wise variations in relative condition factor (Kn) of *Channa punctata*

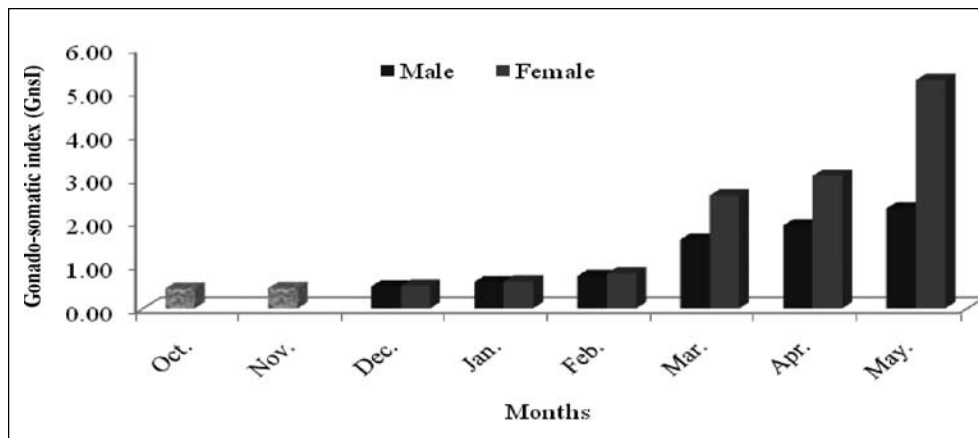


Figure 2. Month-wise variations in gonado-somatic index (GSI) of *Channa punctata*

Kashyap *et al.* (2015) found the Kn value of *Channa punctatus* from 0.99 to 1.13 from northern and eastern regions of India. Mishra *et al.* (2013) found condition factor (K) of *Ompok bimaculatus* ranged from 0.52 to 0.57 in different seasons from river Ghaghara, India. The highest value of 'K' during the pre-monsoon season indicates that the fishes are in good condition. Roy Choudhury *et al.* (2013) observed highest Kn value during the month of May and lowest during December of *Notopterus notopterus* (Pallas) from east Kolkata wetlands, West Bengal. Narejo *et al.* (2002) found highest Kn value of *Monopterusuchia* in smaller fishes. The highest Kn value was observed during April to June (spawning months) and it was mainly due to maturity of gonads while lowest value observed during July-August was due to the spent condition. In the present study, the Kn value bears similarities with the earlier works. Devaraj (1973) studied Kn value of large snake-head *Ophicephalus marulws*; (Ham.) in Bhavanisagar waters in different size groups. Kn value was recorded 0.85 to 1.47 for the 40 mm size group and mean Kn value was 1.015 at 440 mm size group. He observed higher values of Kn during November and from February to April, and it may be attributed to the predominance of young ones in the samples. The Kn value declined after September which could have been caused by the dominance of larger specimens and also by the spent gonads.

Gonado somatic index (GSI) of the species was studied by examining the gonads in different months. In the present study, the GSI values varied from 0.50 to 2.30 for males and 0.52 to 5.26 for females from December to May. The mean value of GSI during the month of October and November was 0.45 and 0.46 respectively when sexes could not get identified easily due to smaller sizes. The relationship between gonad weight and body weight may change from year to year depending upon environmental conditions like temperature and food availability (Delahunty and Vlaming, 1980). The GSI of several female fish exhibits relatively more value compared to its male counterparts of the same size due to the heavier weight of ovary. Mishra *et al.* (2013) found GSI value varied from 0.1 to 2.6 in males and 0.4 to 9.1 in females of *O. bimaculatus* from river Ghaghara, India. It is well comparable to the present study. In males, the GSI value is lower than the females (Fig 2). For both the sexes the lowest GSI value was recorded during the month of October and maximum during May, which indicates the beginning of spawning season. It was observed that there were significance differences ($P < 0.05$) in the GSI value for both the sexes in all months, which might be due to the seasonal changes in gonads. This study will provide the baseline information regarding further management of the species in the region.

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