Rec. zool. Surv. India : **101** (Part 3–4) : 233–239, 2003

LENGTH-WEIGHT RELATIONSHIP AND RELATIVE CONDITION INDEX OF *NOTOPTERUS NOTOPTERUS* (PALLAS) OF TILAIYA RESEARVOIR, BIHAR

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INTRODUCTION

Family Notopteridae is widely distributed in Southeast Asia and Africa. In India, genus *Notopterus* is represented by two species viz., *Notopterus chitala* (Hamilton) and *N. notopterus* (Pallas). The former is very large fish (>1500 mm) and latter is a medium sized fish (>600 mm). *Notpterus notopterus* forms lucrative fisheries in rivers reservoirs beels and ponds in Indian sub-continent. The information on length-weight relationship and condition index of *Notopterus notopterus* (Pallas) is very scanty in the literature, barring the preliminary work of Sinha and Parameswaran (1966) from the ponds of Cuttack, Orissa. Therefore, the paucity of scientific data on these aspects has necessitated to undertake such studies.

MATERIALS AND METHODS

Fishes were collected randomly bi-weekly through out the year from Barhi Fish landing centre, district Hazaribagh, Jharkhand. A total of 300 species ranging from 81 mm to 360 mm in total length and grouped at 10 mm were utilized for the computation of length-weight relationship and condition index. The measurements were taken on a convential fish measuring board upto the nearest millimeters and corresponding weights on a monopan balance to the nearest gram.

The length-weight relationship was derived separately for males and females by well-known equation ($W = a\ l^n$) where W = Weight of the fish, L = length of the fish, a is a constant and n an exponent, usually ranging between 2.5 and 4.5 (Hiles, 1936). Relative Condition Index (K_n) was also derived separately for the two sexes as per Le Cren (1951) by using, the equation : $K_n = W/W^{\wedge}$ where W is observed weight of the fish and $W^{\wedge}$ is mean weight calculated for each group of fish.

RESULTS

Length-weight relationship

The equations describing the length-weight relationship for males & female are given below :

Males : $\text{Log } W = 0.00001464\ L^{2.8951}$ or expressed logarithmically as :

$\text{Log } W = -4.7835 + 2.8951\ \text{Log } L$ ($r = 0.9450$).

Females : Low $W = 0.00001546\ L^{2.9052}$ or expressed logarithmically :

$\text{Log}\ W = -4.8152 + 2.9052\ \text{Log}\ L$ ($r = 0.93901$).

Since, the difference between the above equations for the two sexes appeared to be non-significant the data for males and females were pooled together into a single equation. The general length-weight equation for *N. notopterus* was calculated to be :

$W = -4.7988\ L\ 2.9015$ or expressed logarithmically as :

$\text{Log}\ W = 0.000015892\ L^{2.9015}$ (both sexes combined).

The length-weight relationship of *N. notopterus* is depicted in Fig. 1. The curve represents the calculated weight derived by the general length-weight relationship and the dots the empirical weights. The agreement between the calculated values and observed values of weights is generally quite close, except for the fishes between the size range 300 to 340 mm. In this group, the observed values are slightly higher than the calculated ones. Similar trends are reflected in the relative condition of the fish that is also highest in this group. This further indicates that group gains more in weight than in length or in other words fishes are heavier for their lengths.

Seasonal fluctuation in relative condition

The monthly average of K_n values for males and females are plotted in Fig. 2. A perusal of the graph indicates that peak values of K_n of either sex were attained in the winter month of Novermber. Thereafter, a gradual fall in the values of either sex was observed. Females attained minimum value in February and males in March. Subsequently, a general improvement in the condition of both sexes was observed in summer months (April–June). With the advent of monsoon in July, K_n values for males showed an abrupt fall. The same for females was observed in August. Thereafter, the K_n values for both the sexes shot up in October.

Fluctuation in Kn in relation to length and age of fish

The fishes were divided into 7 age groups for determining the condition index. First age group below 101 mm in length was scarce, in the catch, hence not taken into consideration for determining the relative condition index. Average value of K_n thus, obtained in relation to length and age of the fish of either sex is plotted in Fig. 3. It may be seen that the pooled k_n of the two sexes is lower in the case of smaller (II and III) and larger fishes (VI and VII) than medium group (IV and V).

DISCUSSION

A perusal of the length-weight equation derived for *N. notopterus* of Tilaiya Reservoir indicates that the values of n, the equilibrium constant were found to be less than 3 (2.8951 for males and 2.9052 for females) and so was the case with the general length-weight equation derived for either sex ($n = 2.9015$). Since the value of n is below 3, it may be inferred that the weight of *N. notopterus*

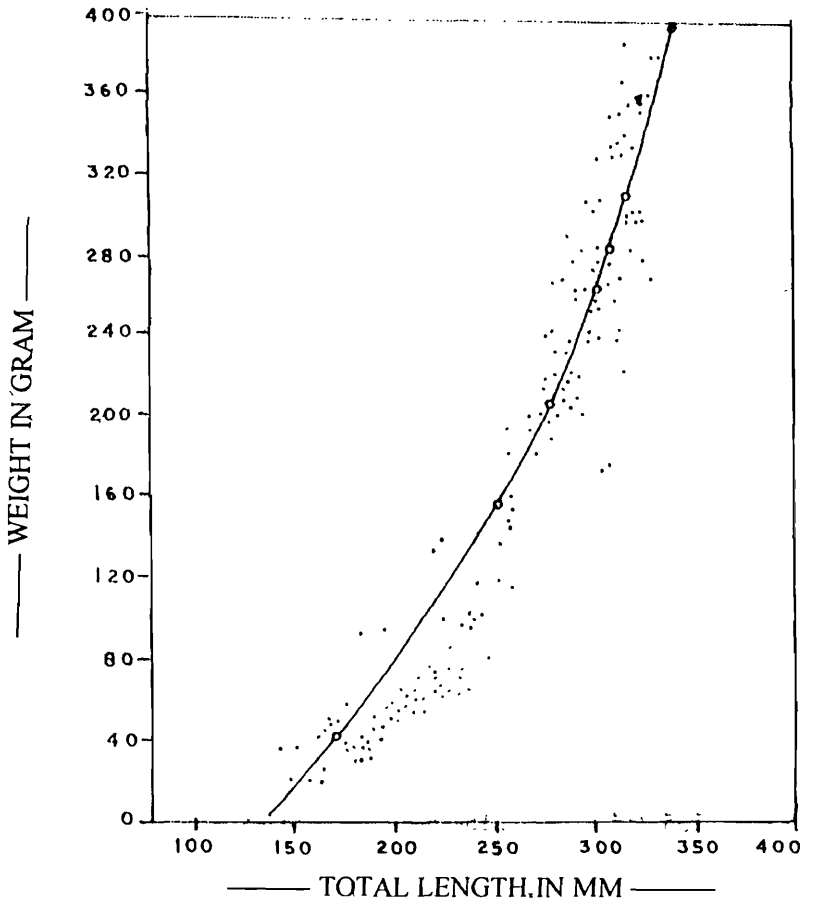

Fig. 1. Length-weight Relationship of *N. notopterus* (pallas).

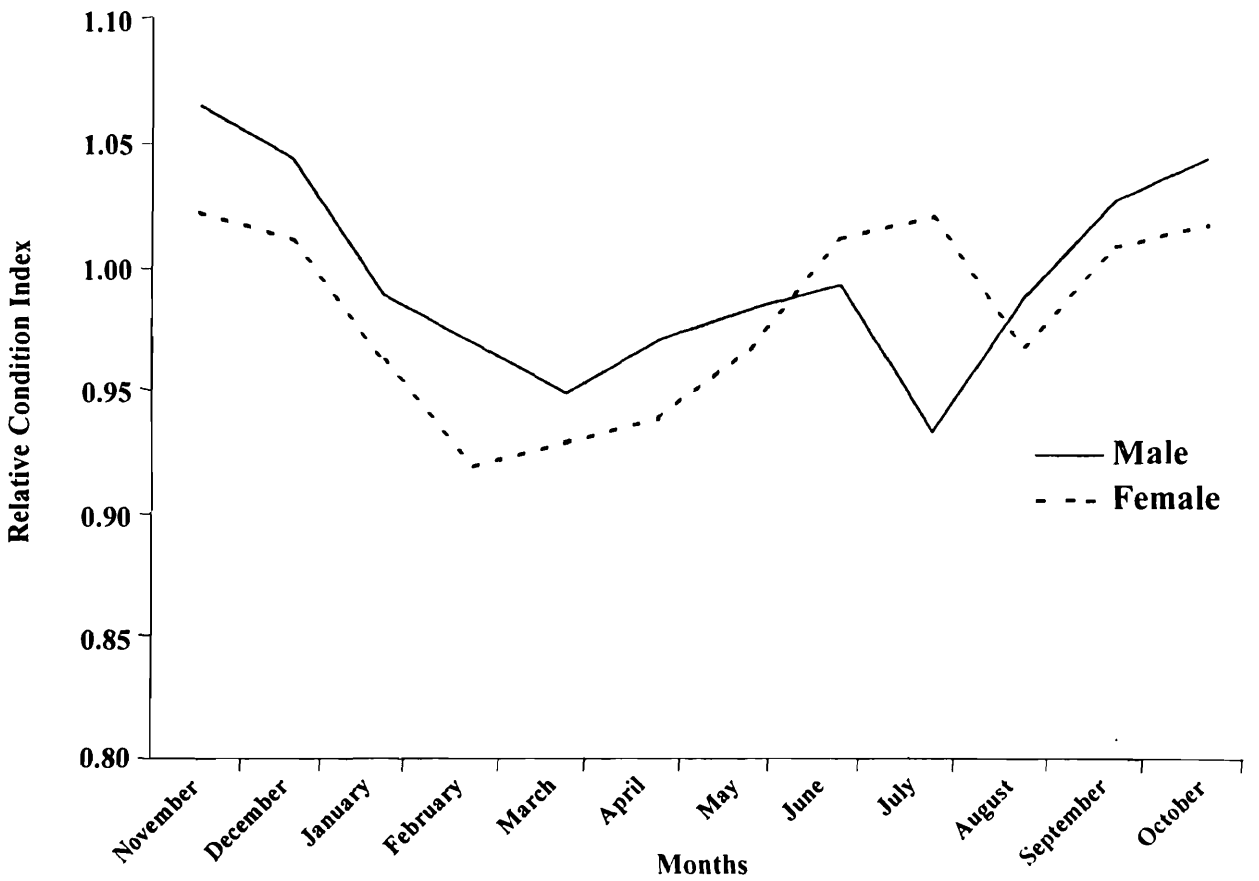

Fig. 2. Monthly fluctuation in the average Kn of *N. notopterous* of either sex.

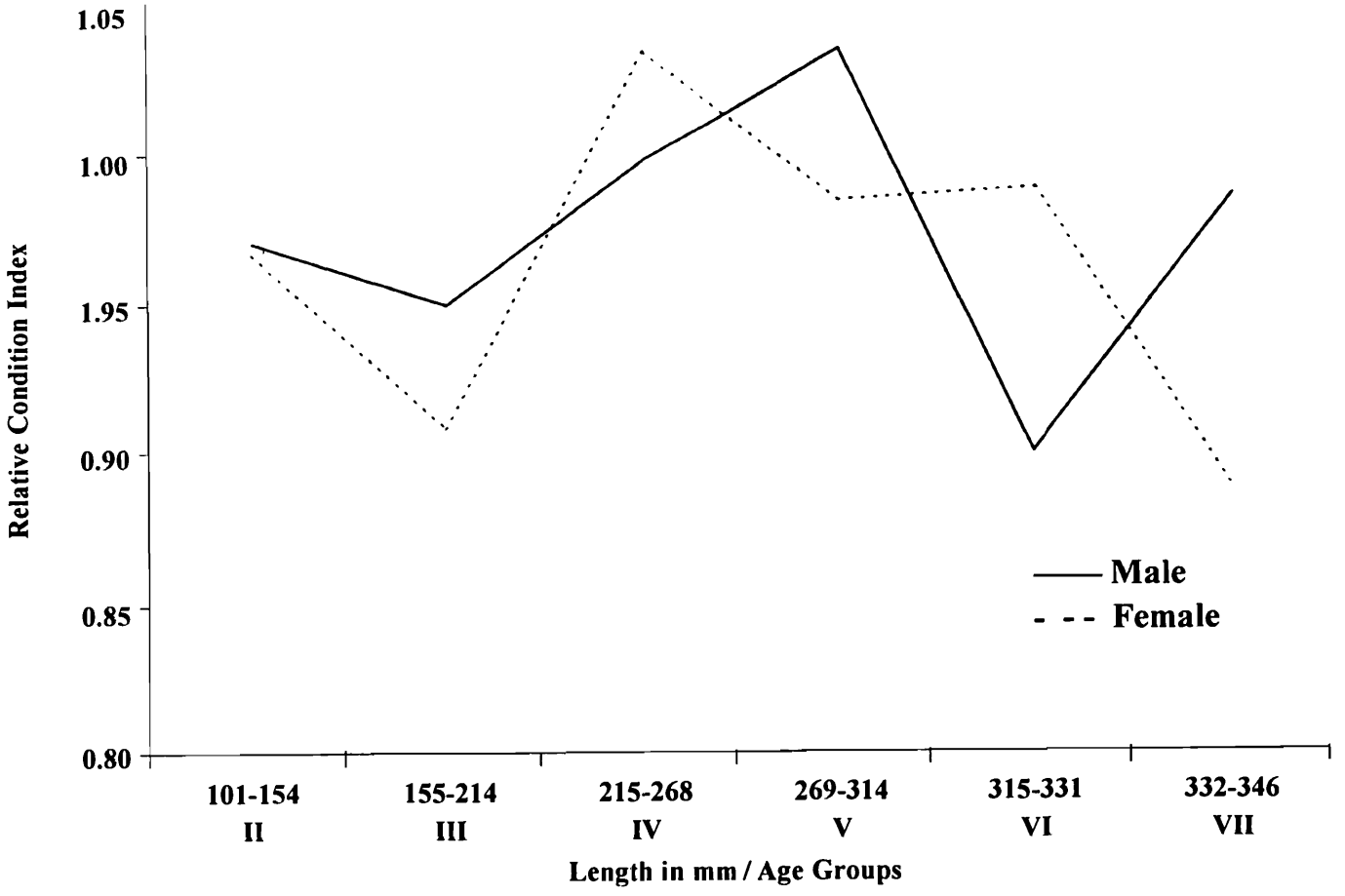

Fig. 3. Average Kn in relation to length and age of *N. notopterus* of either sex.

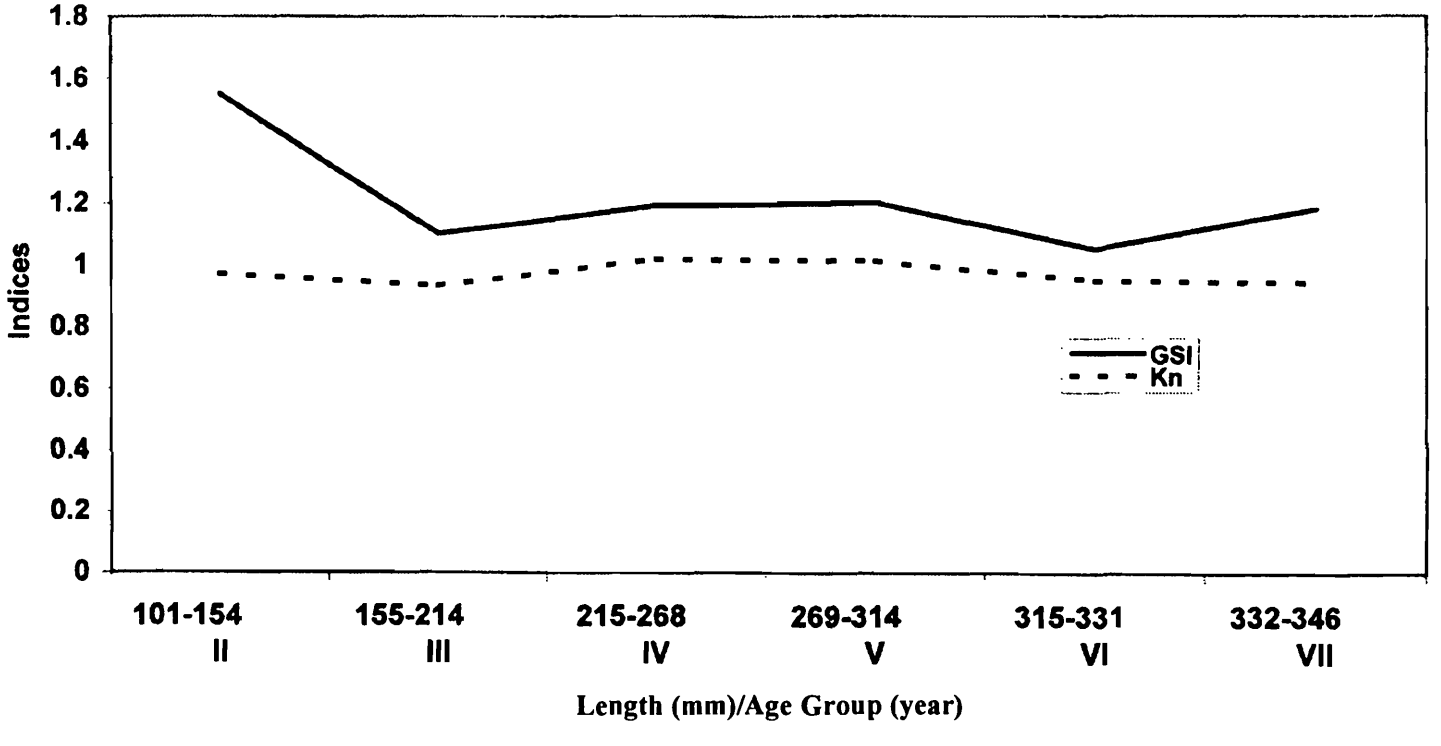

Fig. 4. Gastrosomatic Index (GSI) and Relative condition index (Kn) of various age size groups of *N. notopterous.*

of Tilayia Reservoir increases slightly lesser than the cube of its length, indicating that the individuals of either sex do not obey the cube law. Similar observations have been reported by a host of workers (Fulton, 1904; Hile, 1936; Le Cren, 1951). Parameswaran and Sinha (1966) derived the length-weight equation for *N. notopterus* of Cuttack ponds as $\text{Log } W = -4.9556 + 2.9677 \log L$. They too observed the value of n to be less than 3, though slightly more than that derived for *N. notopterus* of Tilaiya Reservoir.

The factors which influence n values are : dietary, topographic, taxonomic and selectivity of the gear (Lc Cren, 1951). When the influence of above factors on n of this fish is critically examined, it is brought out that relatively colder climate, lower basic productivity level of Tilaiya Reservoir and selectivity of gill-nets might have contributed to lowering of n as compared to the well manured stocking ponds of Cuttack. The effect of taxonomic factor could not be assessed in the present study on account of non-availability of morphometric data of this fish from Cuttack ponds.

Fig. 2 indicates 3 Peaks in K_n, which are coinciding, with the 3 seasons *viz.*, winter (November, December, January and February) summer (March, April, May and June) and monsoon (July, August, September and October). The highest peak in K_n was observed in June for male and July for females. These months represent peak breeding and low intensity in feeding (Khan, 1983). This suggests that high value of k_n be due to ripening of gonads alone and not to pertaining to feeding intensity. Comparison of pooled k_n and GSI values of this fish is given in Fig. 4 (after Khan, *op, cit.*). It is further corroborated by the fact that the period of breeding continues upto August as revealed by maturity. The same is reflected in low K_n of fishes of either sex in July and August thereafter values of K_n shows upward trend till December on account of high feeding intensity as after spawning fishes are in recovery stage and require more nourishment hence, resort to intensive feeding. Moderate water temperature also helped in increasing the epitite of the fishes. But, the severe winter condition in January and February had an adverse effect on its condition index due to subdued feeding, and it is reflected by gradual fall in condition index. The onset of summer months created better feeding conditions on account of improvement of food supply in the ecosystem caused by higher water temperature of summer months. This in turn induced emergence of insects and activated the weed fishes and prawns thus making them available aplenty as food for this fish. Thus, availability of preferred food in the ecosystem results in shooting up of the K_n values in summer months, reaching a peak in June.

Males registered relatively a higher K_n than females because the latter diverted most of the energy for development of the gonads (Le Cren, 1951; Sinha, 1972). Parameswaran and Sinha (1966) observed more or less similar trend in *N. notpterus* of Cuttack fishponds. Fig. 4 indicates a lower value of K_n in immature group 156–215 mm (shown in the Fig. 4 as 1st) of both sex and a higher value in older groups (5+ to 7+). The low value of K_n for the former may be accounted for by the faster linear growth in the early two years of fish life because at this stage the metabolic changes in fish tend more towards increase in linear dimension than towards building of weight.

The low value of K_n in 156–214 mm group is due to onset of sexual maturity. The fluctuations in K_n values related to increase in length of fish have been used by several workers (Hart, 1931; Verghese, 1973) as a sign of attainment of sexual maturity.

The point of inflexion on a curve shows the diminution of the length at which sexual maturity is attained, it was observed in this fish, on K_n curve between 155–214 mm for either sex *i.e.*, when fishes attain first sexual maturity. The intermediate groups (216–348 mm) of either sex showed generally, an upward trend in K_n values, thereby indicating that the subsequent spawning has not much adversely affected the K_n. However, low value of K_n observed in males at 315–331 mm and in females of the same group may be of cyclic nature. Pantulu (1961) and Verghese (1973) observed a similar trend in fluctuation of K_n values in *Mystus gulio* and *Coilia ramacarati* Gunthur respectively.

SUMMARY

A total of 300 fishes, ranging from 81 mm to 360 mm in total length were procured from Tilaiya Reservoir, Jharkhand for the study of length-weight relationship and relative condition index (K_n). The pooled length-weight relationship for the two sexes was found to be $W = -4.7988 + 2.9015 \text{ Log } L$. The Relative Condition Index was estimated on monthly basis and well-marked seasonal fluctuations in its values were observed. In general, peak values of Kn were higher in male's (1.068) than female's (1.023) and were observed in November. Females attained minimum values in K_n in February and males in March. Subsequently, a general improvement in condition of fishes of the two sexes was observed in summer, while in peak monsoon months an abrupt fall in K_n was perceptible for the two sexes.

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