Research Article

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STUDY OF LENGTH-WEIGHT RELATIONSHIP AND RELATIVE CONDITION FACTOR OF A HILL STREAM TELEOST NEMACHEILUS MOREH

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Abstract: *Nemacheilus moreh,* is a small fish which plays vital role in torrential ecosystem and contributes immensely in fish biodiversity. Though it is not productive and economically important, it is pretty common in river Mutha and tribal people, and the "Katkari" catch them from commercial point of view. The logarithmic regression equation obtained for *N. moreh* male is Log W = -5.444 + 3.263 Log 1. and Log W = -4.713 + 2.957 log 1 for female. The coefficient of correlation for male was r = 0.988 and for female r = 0.989 respectively, which show a good relationship between the measurements of length and weight. The result indicate the cubic law (n = 2.957) in female for isometric growth. In male there is slight departure from cubic relation (n = 3.263). This may be due to intense feeding or due to early sexual maturity in male. The flactuation of Kn values of males and females for different size groups showed similar trends. The average Kn value of *Nemacheilus moreh* is 0.834 ± 0.173, show well-being in its natural habitat.

Keywords: *Nemacheilus moreh,* Length-weight relationship, Kn values, logarithmic values, length frequency.

INTRODUCTION

Present study has been designed to study the edible fish *Nemacheilus moreh* from Mula-Mutha river system in northern Western Ghats, Pune in Maharashtra state, situated between 17°54" and 19°21" N latitude and 73°24" to 75°14" E longitude in western India. The river system is contributed by several streams originating along the crest of Sahyadris (Western Ghats) and finally drains to Krishna river system about 200Km to South east of Pune. *Nemacheilus moreh,* is a small fish which plays vital role in torrential ecosystem and contribute immensely in fish biodiversity. Though it is not productive and economically important, it is pretty common in river Mutha and tribal people, and the "Katkari" catch them on commercial point of view. *N. moreh* is known to have the potential to withstand extreme ecological conditions. It is therefore, worth, to consider such study. It may also provide a basic knowledge on biology and reproductive behavior of hill stream fishes, and hence encouraging working on the group of fishes and other wild variety of hill stream teleost.

Length-weight relationship study in fishes is being carried out with a view to establish the relationship between length and weight of a species which enable to major the growth rate[1]. Several authors[2,3] have mentioned the importance of Length-weight relationship for getting the information on habitat and stressed the importance in modeling aquatic ecosystem[4]. It also helps to measure the variations of the expected weight due to changes in surrounding environment related to life cycle of all fishes[5].

Relationship between length and weight of the fish has numerous practical applications in fishery biology especially for proper exploitation and management of the population of fish species[6]. Weight of a fish is a unit function of growth and vary with the cube of length[7,8,9]. Length-weight parameters of the same species may be different in the population because of feeding, reproduction, activities and fishing[10] whereas different length and weight relationship due to factors such as differences in food availability in lotic and lentic environmental conditions[11].

The study of relative condition factor (Kn) can be used to compare the promptness of a fish to the relative environmental factors. It is also helpful to fish culturist to compare the weight of fish against calculated weight, to determine whether fishes are in better or poor condition. The relative condition factors can also be used to compare the general well-being, fitness or the state of development. Some studies [5, 12, 13] have recommended a study on relative condition factor (Kn) in preference with the Ponderal index (K), will be highly influenced by many environmental factors. Condition factor (Kn) is useful index for monitoring of feeding intensity, age and growth rates in fish[14].

N. moreh is not only important as food fish but also

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draws attention on its diversified occurrence. Length-weight relationship and relative condition factor of *N. moreh* have been studied and discussed in detail in the present study.

MATERIAL AND METHODS

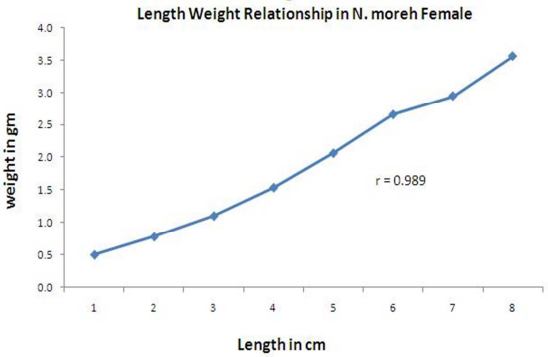
During the study, total of 374 *Nemacheilus moreh* (178 males and 196 females) were sampled, Length was measured from the tip of caudal fin. Standard length was measured from the tip of premaxila to the base of caudal fin to the nearest mm. The collected fishes were grouped in various class intervals. Weights of the fish were determined to the nearest 0.1gm. Measurements of length and weight were taken in fresh condition after wiping the fish with blotting paper. The data is computed logarithmically. The length-weight relationship was determined by using the equation W= CLn and its log transformations.

$$W = \log C + n \log L$$

Where W- weight, L- length, C- constant n – exponent

The relative condition (Kn) of each size group was estimated by the equation Kn=W\w used by Weatherley [15] and others, where W= observed weight, w= mean weight of each size group calculated from length- weight relationship.

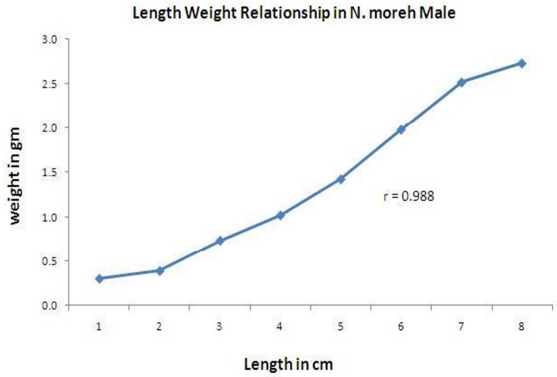
Fig. No. 1



RESULT AND DISCUSSION

During the study, total of 374 *Nemacheilus moreh* (178 males and 196 females) were sampled, ranging size of the male from 32 mm (0.260gm weight) to that of 69 mm (2.600gm wt) and the female fish varied from 36 mm (0.500gm wt.) to that of 70 mm (3.800gm wt.). Statistical details of length-weight relationship of *N. moreh* male and female on the regressions of the log of weight on log of length values in each of the size groups has been summarized. The coefficient of correlation between length and weight measured separately for males and females. The co-efficient of correlation (r) obtained from the statistical analysis of the data. The coefficient of correlation for male was r = 0.988 and for female r = 0.989 respectively. Figure.1 which shows a good relationship between the measurements of length and weight exists. The logarithmic regression equation obtained for *N. moreh* male is Log W = -5.444 + 3.263 Log l and for female Log W = -4.713 + 2.957 log l.

The result indicate the cubic law (n = 2.957) in female for isometric growth. In male there is slight departure from cubic relation (n = 3.263). This may be due to intense feeding or due to early sexual maturity in male.

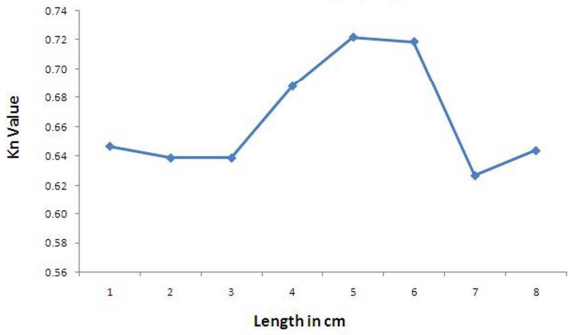


Length weight relationship of fishes serves two purposes namely, it determines the mathematical relationship between two variables; length and weight and to measures the variations expected for weight and length of individuals or group of fishes[5]. The value of 'n' in ideal fish is 3, hence, it should agree with cube law[16]. According to some studies[17,18], value of 'n' generally ranges between 2.5 and 4.5. Other researcher[19] observed that, the value of 'n' from below 2.5 to above 4.5. Some[20] have observed 'n' ranges from 1.3932 to 4.8356, collected from 27 different species of juvenile fishes. The value of 'n' obtained in this study for female is 2.957 and for male is 3.263. Hence, it is in agreement with reports of previous findings[1], several theories have been advanced by a number of workers to confirm, what governs or influences the value of 'n'. However, no relationship was found between the feeding behavior of fish and value of 'n'[20]. The changes in body weight with increasing age often causes the coefficient of regression logarithm weight on logarithm of length to deviate substantially from the value of 3.0[21]. In the present study, however, fishes of different sex i.e. male and female of a different size groups, have almost the same 'n' value. There is slight deviation noticed, which may be due to error in data collection. The spawning activity does not affect on the feeding intensity, on other hand, in case of female fish, during spawning season, the ovary occupies maximum cavity of abdomen and hence there is low intensity of feeding, consequently affect 'n' value in male. The value of correlation coefficient in both the sexes however, shows that growth of fish is in proportion. Hence, equation $W = aL^b$ expresses the relationship better than the cube of law $W = CL^3$.

Relative Condition Factor:

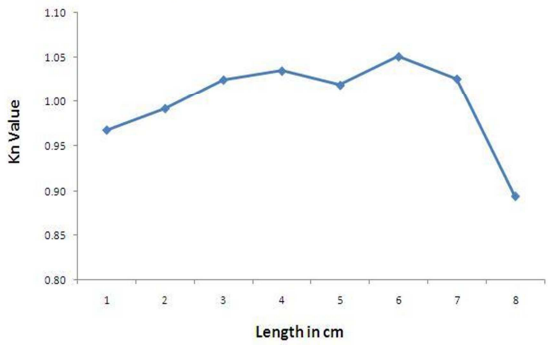
The fluctuation of Kn values of males and females for different size groups showed similar trends (Fig. 2 and 3). The average Kn value of *Nemacheilus moreh* is 0.834 ± 0.173, show well-being in its natural habitat. In male, the Kn values were observed ranging from 0.894 to 1.051 (average 1.001), which is a little higher; while in female, Kn values are comparatively less ranging from 0.627 to 0.722 (average 0.66). It can be seen from Figure 2. that, Kn values of male steadily increased up to length group 45 - 49, and in female it is almost static up to this length group and thereafter both sexes showed fluctuations in Kn values. The Kn values showed a gradual increase from length group 45 - 49mm to 55 - 59mm, and attains a peak in both sexes. A steep decline is also seen from length group 55 - 59 onwards in both sexes.

Fig. No. 2
Kn value in Relation to Length group - Female



Variations in condition of fishes have been attributed to various reasons. The condition is invariably related to two major factors viz., spawning and feeding intensity. Changes in the condition of ribbon fish *Eupleurogammus intermedius* were related to factors other than reproductive cycle and the feeding habits[22]. A difference in relative condition factor suggests that environmental factors promoting growth may also be contributory[23]. In *Nemacheilus moreh* such types of indication was observed during the size at first maturity. The high Kn values are recorded in length group (55-59) may be due to intense gonad activity and high productivity of fish. The steep decline in Kn values found at 65-69mm length group, may be due to less feeding activity.

Kn value in Relation to Length group - Male



The Kn values is dependent on physiological factors like maturity, spawning and environmental factors like availability of food[9]. It has also been attributed to a variety of other reasons[24, 25]. One of the reasons for fluctuations of Kn values may be a onset of maturity and feeding intensity observed in *Saurida humbil*[26] and intense gonadal activity as reported in Carangid[27]. Hence it may be presumed that, Kn values in *N. morech* are not only under influence of gonad activity and feeding intensity, but also due to some other factors.

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REFERENCES

1. Beverton RJR, Holt SJ, On the dynamics of exploited fish Population. Fish Invest Lond Sev, 1957, 2, 533.
2. Burbidge GR, Carrasco MC, Brown PA, Age, growth, length weight relationship sex ratio and food habits of the Argentine Pejerrey, Basilichthys bonariensis (Cuv. and Val.) form lake penuelas, vlalparai so, chile. J. Fish. Biol, 1974, 6, 299-305.
3. Siddiqui AQ, Reproductive Biology length-weight relationship and relative condition of *Tilapia leucosticta* (Trewavas) in Lake N aivasha, Kenya. J Fish Biol, 1977, 10, 257-260.
4. Kulbiki M, Guillemot N, Amand M, Univ J Zool Rajshahi Univ, 2008, 27, 97-98.
5. Le Cren ED, The length-weight relationship and seasonal cycle in gonad weight and condition in the Perch (*Perca flaviatilis*), Ibid, 1951, 20, 201-219.
6. Anene A, Turk J, Fish Aquat. Sci, 2005, 5, 43-47.
7. Brody S, Bioenergetics and growth, Reinhold Publishing Corporation, New York, 1945.
8. Lagler KF, Freshwater Fishery Biology, W C. Brown Company, Dubuque, Lowa. 1952, xii + 421.
9. Brown ME, Experimental Studies on growth, Academic Press, New York, 1957, 361-362.
10. Pervin MR, Mortuza MG, Notes on length weight relationship and conditionfactor of freshwater fish, *Labeo boga* (Hamilton) (Cypriniformes: Cyprinidae), Univ J Zool Rajshahi Univ, 2008, 27, 97–98.
11. Egbal OA, Ali ME, Aziz AA, Length- Weight relationships and Condition factors of six fish species in Atbara River and Khashm El. Girba Reservoir, Sudan, International Journal of Agricultural Sciences, 2011, 3, 65-70.
12. Thomas PA, The Goatfishes family (Mullidae) Of the Indian Seas, MBAI Memoir no. 3, 1969, 174.
13. Beverton POJ, Goile MAKN, Mohamed SM, Length-weight relationship in *Rastreliger kanagurta* (Cuvier) and *Siganus oramin* (Bloch. Schineider 1801), Uni Sci J (Dar Uni), 1981 7, 1&2, 71-76.

14. Ndimele PE, Kumolu-Johnson CA, Ayorinde OA, Agric Biol J N, 2010, 4, 584-590.

15. Weatherley AH, Growth and Ecology of fish population, London and New York Academic Press, 1972.

16. Allen KR, Some observations on the biology of the trout *Salmo trutta* in windermere, J Anim Ecol, 1938, 7, 333-339.

17. Hile R, Age and growth of ciso *Lenichthys artedi* (Le suen) in the lakes of North- Eastern High -lands, Wisconsin. Bull US Bur Fish, 1936, 48, 317.

18. Martin WR, The mechanics of body form in fishes, Univ Toronto Stud Biol, 1949, 58, 1-19.

19. Carlender K, Handbook of freshwater fishery biology. Lowa State University Press Ames, 1, 1969.

20. Bwathondi, POJ, Pratap HB, The length-weight relationship of fishes of kunduchi creek Dar Es Saloam, Tanzania J Mar Biol Ass India, 1981, 23, 161-163.

21. Pati S, Observations on the length-weight relationship of pomfrets from the Boy and Bengal, Mahasagar, 1981, 14, 83-85.

22. James PSBR, The ribbon fishes of the family Trichuridae of India, MBAI Memoir 1, 1967, 226.

23. Manzer JI, Length- Weight relationship for pomfret, J fish Res Bd Canada, 1972, 29, 1079-1081.

24. Hickling CF, The seasonal cycle in the cornfish pilchard *Sardinet pilchardus* Walbaum, J Mar Biol Ass UK, 1945, 26, 115-138.

25. Quasim, SZ, Proc Zoo Sci London, 1957, 126, 161.

26. Rao KVS, Indian J Fish, 1983, 30, 296.

27. Venkataramani VK, Biosystematic studies in carangid fishes of Port Novo Coast (Perciformes. Carangidae), Ph.D. Thesis, Annamalai University, 1979.

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