Length-weight relationship of catfish *Clarias batrachus* (Linn.) in Bhadravathi Area, Karnataka

Dr. I.Ramesh1, Dr. B. R. Kiran2, Dr. S.G. Dhananjaya3

1. Assistant Professor, Department of Zoology, Government Science College, Chitradurga, Karnataka
2. Research & Teaching Assistant in Environmental Science, DDE, Kuvempu University, Karnataka
3. Assistant Professor, Department of Zoology, Government Science College, Chitradurga, Karnataka

Abstract: The present study deals with length-weight relationship (LWR) of air-breathing catfish Clarias batrachus (Linn.) in Bhadravathi area, Karnataka and it shows an allometric pattern of growth. The average allometric coefficient 'b' of the LWR was found close to the isometric value (b = 3.3705). The results further indicated that the LWRs were highly correlated (r2 = 0.948, p<0.01). The length-weight relationship in the logarithmic mode for this fish can be written as: Log W =-2.5661 + 3.3705 Log L. The correlation coefficient (r) was found to be 0.948 which showed a good relationship between the two parameters.

Key Words: Length-weight relationship, Clarias batrachus, Bhadravathi area.

Introduction:

The catfish *Clarias batrachus* is a species of freshwater air breathing catfish native to Southeast Asia, but also introduced outside its native range where it is considered an invasive species. It is named for its ability to "walk" across dry land, to find food or suitable environments. While it does not truly walk as most bipeds or quadrupeds do, it has the ability to use its pectoral fins to keep it upright as it makes a sort of wiggling motion with snakelike movements ("Catfish 'walk' down street". Metro.co.uk. 2008-07-18). This fish normally lives in slow-moving and often stagnant waters in ponds, swamps, streams and rivers, flooded rice paddies or temporary pools which may dry up. When this happens, its "walking" skill allows the fish to move to other sources of water. Considerable taxonomic confusion surrounds this species and it has frequently been confused with other close relatives (Froese, Rainer and Pauly, Daniel, eds,2011; Ng, Heok Hee, and Kottelat, Maurice ,2008; https://en.wikipedia.org).

The mathematical relationship between length and weight of fish can be formulated in an equation through which one measure can be converted into another. The equation has biological significance because it represents isometric growth i.e. the weight increases as the cube of the length. Empirical observations, however, strictly do not always conform to the cube law and the equilibrium constant shows certain variability around 3 (Umesh Goswami and Nripendra Nath Sarma,1996). Since the weight of a fish is usually closely proportionate to the cube of length, the length-weight relationship is expressed by the formula: $W = aL^n$ or, when expressed in logarithm:

$$\text{Log } W = \text{Log } a + n \text{ Log } L, \text{ where}$$

W = Weight of fish, L = Length of fish, a = Constant, n = Equilibrium constant (Le Cren, 1951; Umesh Goswami and Nripendra Nath Sarma,1996). In this study we report the parameters of length-weight relationships for *Clarias batrachus* fishes collected from Bhadravathi area of Karnataka, India.

Materials and Methods:

A total of 30 specimens were collected from local market of Bhadravathi town (Latitude 13° 52' N and Longitude 75° 40' E), Shimoga district, Karnataka for Six months beginning from January to June 2009 and analyzed for the length-weight relationship. Total body length and weight were taken for estimation of length-weight relationship. The total lengths of the fish were recorded to the

nearest millimeter from the tip of the snout to the tip of the caudal fin. Weights of fish were recorded to the nearest gram with the help of electronic weighing balance. The equations used for the present estimations were followed according to Le Cren, (1951), Boraey and Soliman, (1984) and Shendge (2009).The length-weight relationship of *Clarias batrachus* was determined by using the equation $W = aL^b$ and its log-log transformation log W =log a+ b log L in the usual notations.

Results and Discussion:

The length-weight relationship for *Clarias batrachus* is presented in Figure 1 and Figure 2 depicts logarithmic relationship between length and weight. The regression equation obtained is as follows :

Log W = -2.5661 + 3.3705 log L. r^2=0.948

Allen (1938} suggested that the value of 'b' in an ideal fish could be 3. However, Hile (1936) and Martin, (1949) opined that it might vary between 2.5 to 4.0. In the present study, the regression value 3.3705 was significantly different from the theoretical value of 3, indicating slightly deviation from the 'cube law' for allometric growth of *C. batrachus* in Bhadravathi area of Karnataka. A slight deviation in the value from 3 may be related to factors such as ecological conditions of the habitat, physical and chemical conditions of the environment, seasonal variability in food availability, competition with indigenous species, immature individuals in the samples, reproductive stages etc. (Hmoud et al., 2003; Shendge, 2009).

Similar, 'allometric' growth was observed by Sunil (2000) on *Rasbora daniconius*. Bharat Raj Subba and Tapan Kumar Ghosh (2000) obtained similar 'allometric' growth pattern in relation to standard length in *Glyptothorax telchitta* (Hill stream fish) and they opined that *Glyptothorax telchitta* did not strictly follow the 'isometric' growth pattern though its value in relation to total length which was very close to the 'isometric' value of 3. Whereas, Godsil (1948) and Marr (1955) have reported non-linear relationship of various body measurements with the total length in other fish species. While discussing the merits of 'allometric' equations in contrast to the cube formula in expressing the length-weight relationship, Beverton and Holt (1957) stated that the value of "a" and 'b' may vary within wide limits for very similar data and instances of important deviations from isometric growth in adults fishes are rare.

The length-weight relationship were obtained in case of *Clarias batrachus* by Shipra Chowdhary and Srivastava (2013), under poor availability in natural conditions from Unnao, Uttar Pradesh, India. They recorded average allometric coefficient 'b' of the LWR was found close to the isometric value (b = 3.4890). Shendge (2009) studied the length-weight relationship of *Clarias batrachus* (Linn.) from Bhima river, Maharashtrae. They reported isometric growth of the fish in its natural habitat. The correlation coefficient (r) was found to be 0.9824.

Length and weight relationship of *C. batrachus* has been studied by several workers on fish of different regions of India (Hora and Pillay, 1962; Thakur,1975; Umesh Goswami and Nripendra Nath Sarma,1996; Shendge, 2009; Shipra Chowdhary and Srivastava, 2013) . This is the first report on the same of *Clarias batrachus* collected from the Bhadravathi area of Karnataka, India.

Conclusion

The exponential value of "b" in the present study significantly differ from the value observed by several researchers in India. It has been shown that the environmental conditions and water quality of the study area, which has a influence on the growth as well as reproduction of cat fish *Clarias batrachus*. The study of LWR will be useful to fish biologists in imposing adequate regulations for sustainable fishery management in the natural lentic and lotic water bodies.

References

1. Allen, K.R., 1938. Some observations on the biology of the trout *Salmo trutta* in Wingermere. J. Anim. Ecol. 7: 333-349.
2. BharatRajSubba and Tapan Kumar Ghosh. 2000. Length-weight relationship of a Hill-Stream fish, *Glyptothorax telchitta* (Ham.) from Saptakoshi river of Nepal. *J. Indian Fish. Assn.,* 27 : 79-82.
3. Beverton, R.J.H. and Holt, S.J. 1957. On the dynamics of exploited fish populations. *Fish. Invest.,* London Ser. II, 19 : 533.
4. Boraey, F.A. and Soliman, F.M., 1984. Length-weight relationship, relative condition and food and feeding habits of the goat fish *Upeneus sulphureus* in Safaga bay of the red sea. J. Mar. Bioi. Ass. India. 26: 83-88.
5. *Catfish 'walk' down street. Metro.co.uk. 2008-07-18. Retrieved 2008-07-18.*
6. Froese, Rainer and Pauly, Daniel, eds. (2011). "*Clarias batrachus*" in FishBase. December 2011 versio
7. Godsil, H.C. 1948. A preliminary population study of the yellow fin tuna and the albacore, *Calif. Fish and Game* 70 : 90-91.
8. Hile, R., 1936. Bull U.S. bur. Fish.48, Pp.311.
9. Hora, S.L. and T.V.R. Pillay 1962. Hand book of fish culture in Indo-Pacific region. FAO Fishery Biology Technical Paper, No. 14. 203.
10. Hmoud Fares Alkahem, Zubir Ahmad and Amir Ahmad Abdur-Rahman AI-Dhahi., 2003. Length-weight studies of Epinephelus chlorostgma and E. areolatus from Arabian Gulf. J. Ind. Fish Ass. 30: 65-71.
11. Le Cren, E.D. 1951. The length-weight relationship and seasonal cycle in gonad weight and condition in Perch (*Perca fluviatilis*).Ecology,20:201-219.
12. Martin, W.R. 1949. Univ. Toronto Stud. Bioi. 58. Pub/. Ont. Fish Res. Lab. 70. Pp.l.
13. Marr, A.C. 1955. The use of morphometric data in systematic and relative growth studies in fishes. *Copeia.* 13 : 23-41.
14. Ng, Heok Hee, and Kottelat, Maurice (2008). *The identity of Clarias batrachus (Linnaeus, 1758), with the designation of a neotype (Teleostei: Clariidae).* Zoological Journal of the Linnean Society 153: 725–732.
15. Sunil, M.S. 2000. Length-weight relationship in *Rasbora daniconius* (Ham.) from Achancoil river, Pathanam thitta, Kerala, India. *Indian J. Fish.* 47(3) : 271-274.
16. Shendge, A.N.2009. Length-weight relationship in freshwater cat fish *Clarias batrachus* (Linn.) . J. Indian Fish Assoc., 36: 21-24: 21-24.
17. Shipra Chowdhary and P. P. Srivastava.2013. Length–weight relationships (LWR) of threatened Asian catfish, *Clarias batrachus* under poor availability in natural conditions from Unnao, Uttar Pradesh, India . Advances in Applied Science Research 4(6): 138-141.
18. Thakur, N.K. 1975. On the length-weight relationship and relative condition in *Clarias batrachus* (Linn). Proc. Nat. Acad. Sci. India, 45(B) Part III. 197 - 202.
19. Umesh C. Goswami and Nripendra Nath Sarma.1996. Length-weight relationship in *Clarias batrachus* (Linn.) from the Brahmaputra river system . Indian J. Fish., 43(2) 195-197.
20. https://en.wikipedia.org/wiki/Walking_catfish

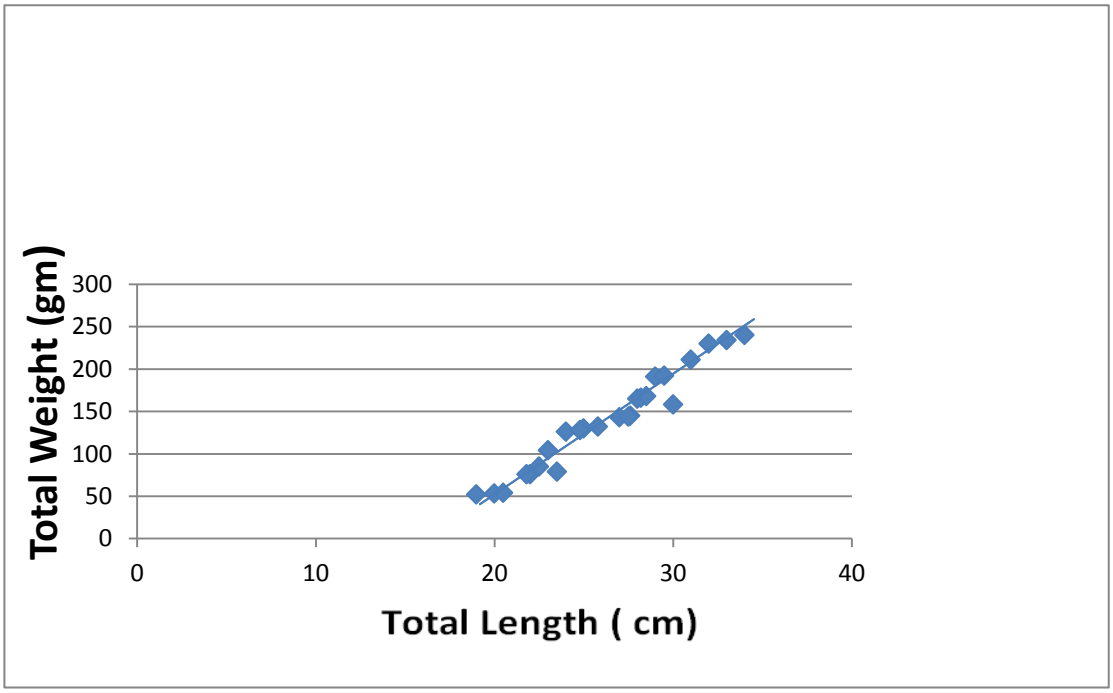

Figure 1: Length – Weight relationship in *Clarias batrachus*

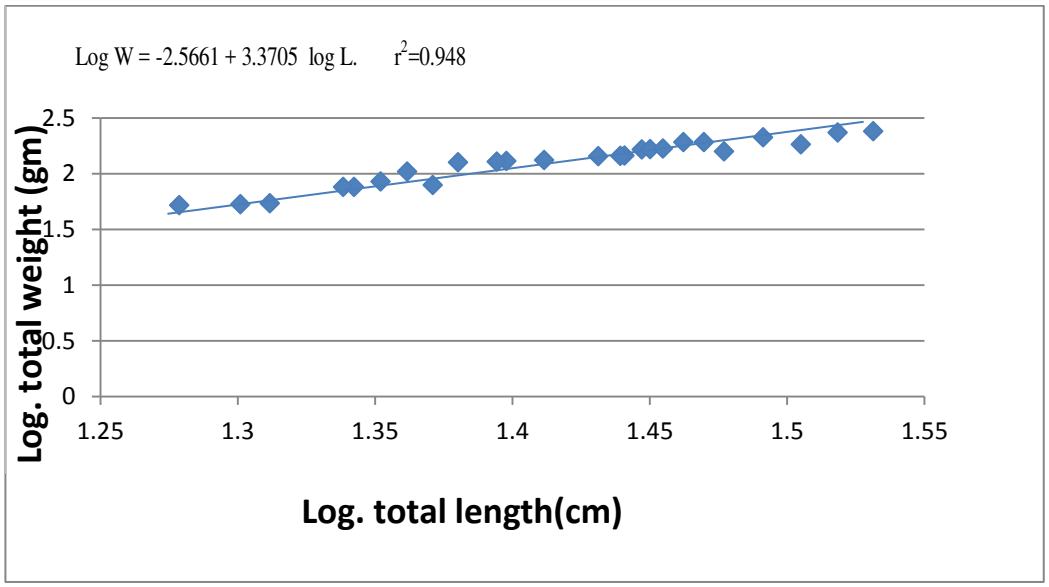

Figure 2 : Logarithmic relationship between length and weight of *Clarias batrachus*