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Morphometric Analysis of Fish Population from two Different Ponds of Vadodara City, Gujarat, India

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Abstract

The present study was carried out with an aim to understand morphometric relationship of Tilapia (Oreochromis mossaimbicus) from natural waters. Samples were collected from two different ponds viz., Sama pond and Danteshwar pond of Vadodara city. These morphometric data represent specific structure of the inhabitant fish population of these ponds. The average of total length and total weight and standard length and total weight of fishes of both ponds indicates that the morphometric structure of Sama pond fishes were bigger than that of Danteshwar pond. Condition factor K values were 1.58 and 1.67 and the exponential equation were Wt = +0.609 (TL) $^{0.329}$ and Wt = -1.169 (TL) $^{2.430}$ of fishes of both ponds respectively indicating allometric growth. The condition factor of fishes of both ponds indicates that all fishes were in good condition. However, biomass of fishes of Danteshwar pond was more compared to Sama pond. Correlation between total length and total weight as well as standard length and total weight was 0.76, 0.77 and 0.83, 0.87 of fishes of both ponds respectively, which revealed positive correlation between length and weight of the fishes.

Keywords: Tilapia, length–weight relationship, condition factor.

Introduction

Morphometric analysis is based on a set of measurements which represent size and shape variation and are continuous data. In fish morphometric character represent one of the major keys for determining their systematic, growth variability[1] and various population parameters. The success of fishing industry depends mainly on fish catches in terms of weight which, in turn is a function of its length. These two measurements are closely related. As the growth of fish varies species to species and environment to environment, it is of great importance to have the knowledge of length-weight relationship of a species occurring in a particular area for its fishery[2]. The estimation of *a* and *b* parameters of length-weight relationship is important for stock assessment[3].

The length-weight relationship is an important tool in fish biology; physiology and ecology and fisheries assessment. This relationship serves three purposes viz. i. determine the type of the mathematical relationship between two variables so that if one variable is known the other could be computed, ii. the relative condition can be estimated to assess general well being of the fish and type of growth i.e. whether isometric or allometric and iii. helps to the potential yield per recruit in the study of fish population dynamics[4]. The length-weight relationship is very important for proper exploitation and management of the population of fish species. To obtain the relationship between total length and body weight is also very much essential for finalizing the taxonomic characters of the species. Among the freshwater fishes, length-weight relationship of different fishes has been studied by many researchers[5-7]. The changes in weight in relation to length are generally not on the basis of specific gravity but due to changes in the form of volume because the density in the organism and that of the surrounding water. Such changes are analyzed by the condition factor or "Pondered index"[8]. The present work has been carried out on the morphometric aspects such as length-weight relationship and condition factor of Tilapia (*Oreochromis mossaimbicus*) from natural water bodies i.e. Sama pond and Danteshwar pond of Vadodara city (figure 1).

Material and Methods

The Tilapia (*Oreochromis mossaimbicus*) were collected from the natural water bodies of two different ponds i.e. Sama and Danteshwar which are located in Vadodara district of Gujarat State. The geo-location of Sama pond is 22^0 20'35 N and 73^0 12'02 E and of Danteshwar pond is 22^0 16'34 N and 73^0 12'39 E. These are perennial urban ponds and utilized by surrounding inhabitants for various activities.

The following measurements and observations were recorded for each sample. i. Total length in centimeters. ii. Standard length in centimeters. Length was measured with the help of thread and scale (in cm). iii. Total weight in grams. Weight was measured with help of an electronic weighing balance to the nearest 0.01 gram (in gm).

The relationship between the length (L) and weight (W) of fish was expressed by equation

$$W=a\,L^b$$

Where W= weight of fish in gram, L=total length (TL) of fish in cm. a=Constant (intercept), b = The length exponent (slope)

When expressed in Logarithm:

Log W=Log a + b Log^{L} i.e. y = A+Bx**,** where
Y = Log W, B = n (regression coefficient) and X =Log L. The "a" and "b" values were obtained from a linear regression of the length and weight of fish.

The condition factor (K) of the experimental fish was estimated by using Fulton's condition factor: K= W/L^3*100.[9].

Where K= condition factor, W= weight of fish (g), L= length of fish (cm)

The correlation (r^2) that is the degree of association between the length and weight was computed from the linear regression analysis: R = r^2

Results and Discussion

The analysis of the data revealed the growth pattern and condition of fishes of Sama and Danteshwar ponds. The regression line derived from the graph represents a linear relationship between the two morphometric variables viz., length (total and standard) and total weight (figure 2, 3, 4, 2A, 2B, 3A, 3B, 4A, 4B) of fish population of both ponds. It can be seen from the graphs that the points are more or less very close to the line and hence it can be assumed that there is a close relationship between the length (total and standard) and Total weight. From the graphs (figure 2 and 3, 2A, 2B, 3A, 3B) the average of total length (TL) and total weight (TW) and standard length (SL) and total weight of fishes of two ponds indicates that range of TL and SL of fishes of Sama pond was bigger than the Danteshwar pond because the growth and condition of fishes are affected by the water quality of the resources[10]. Correlation between TL and TW as well as SL and TW was 0.76, 0.77 and 0.83, 0.87 of fishes of both ponds respectively. This indicates that there were positive correlations between two variables where if the length will increase the weight will also increase. The exponential equation of fishes of Sama and Danteshwar were Wt = +0.609 $(TL)^{0.329}$ and Wt = -1.169$(TL)^{2.430}$ respectively. The theoretical value of 'b' (regression coefficient) in length-weight relationship is reported as 3 when the body form of fish remains constant at different length i.e. the growth is isometric[11]. The value is less than or more than 3 indicates that is growth is allometric[12]. When the value is less than 3 indicate that the fish becomes more slender as they increase in length[13]. During the present investigation the 'b' value was less than 3. This Indicates that fish become more slender as they increase in length and the growth pattern of fish population was allometric. The similar types of values were recorded from various marine species[14-16]. Condition factor (K) of fish population of Sama and Danteshwar ponds were 1.58 and 1.67 respectively, these values were varied slightly with the results from other studies[17,18] and showed that all fishes were in good condition.

Danteswar Pond

Sama Pond

Figure-1
Representation of study area

Conclusion

The present investigation indicates that the fishes of Sama and Danteshwar ponds were in good condition. The range of total length and standard length of Sama pond was bigger than the Danteshwar pond. There was positive correlation between length and weight of fishes of both ponds. The regression coefficient 'b' revealed that the growth pattern of fish population of both ponds was allometric.

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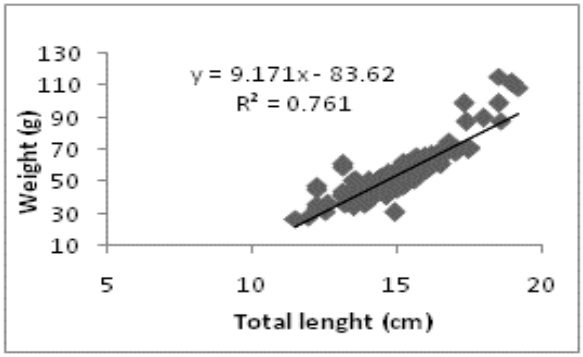

Figure-2(A)

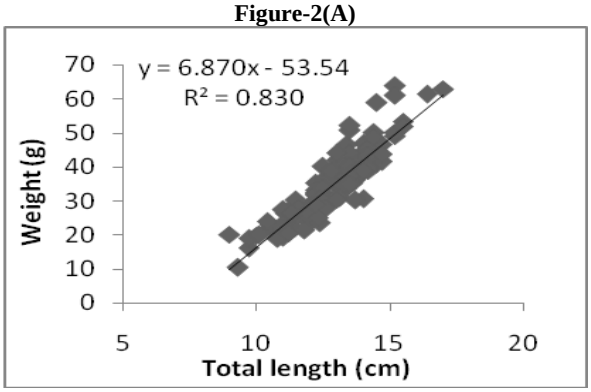

Figure-2(B)

Figure-2 (a and b)

Graphical representations of the relationship of the Total length and Total weight of fish population two ponds

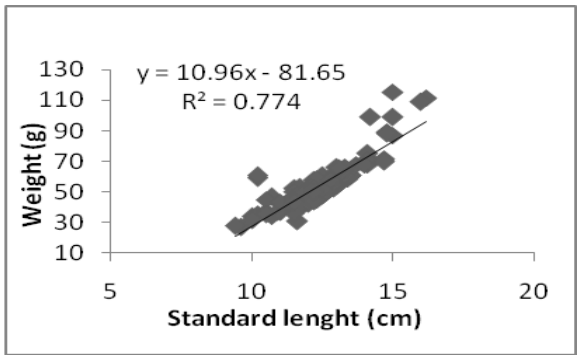

Figure-3(A)

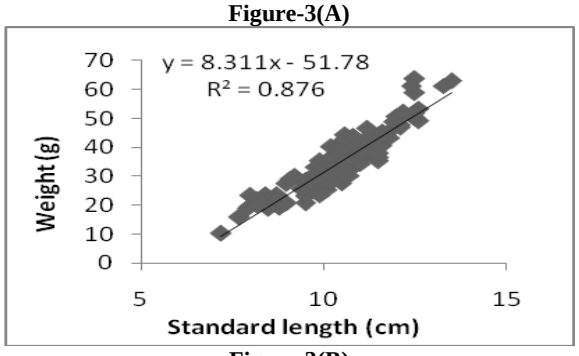

Figure-3(B)

Figure-3(a and b)

Graphical representations of the relationship of the Standard length and Total weight of fish population of two ponds

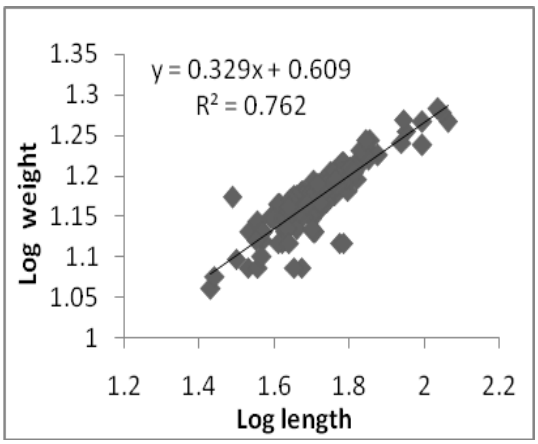

Figure-4(A)

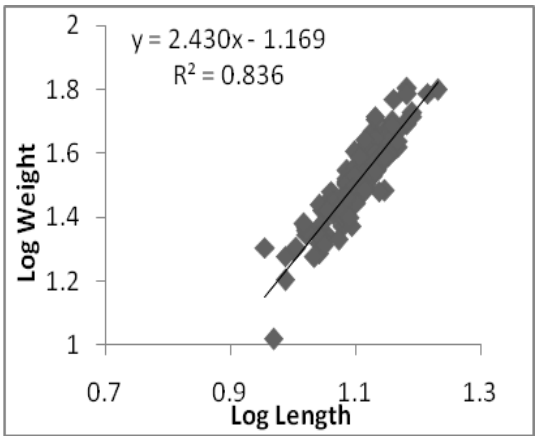

Figure-4(B)

Figure-4 (a and b)

Graphical representations of the values of Log length and Log weight of fish population of two ponds.

References

1. Kovac V. and Copp G.H., Morphometry of the stone loach *Barbatula barbatula* (L.). Do metric characters reflect the species' life history thresholds, *Environ. Biol. Fish.*, **56**, 105-115 **(1999)**

2. Kulkarni A.S., Tendulkar M.V., Terdalkar S. S., Sharbidre A. A., Guhagarkar A.M. and Gaikwad S.A., Length-weight relationship of *Istiblennius dussumieri* (VAL.) from Ratnagiri sea coast (Peth-Killa Region), Ratnagiri, Maharashtra, *J. Aqua. Biol.*, **2(2)**, 112-114 **(2007)**

3. Vivekananda, E., Stock assessment of tropical marine fishes, *Indian Council of Agricultrual Research*, New Dheli, India, 115 **(2005)**

4. Prasad G. and Anvar Ali P.H., Length-weight relationship of a cyprinid fish P*untius filamentosus* from Chalakudy river, Kerala, *Zoos' print.*, **22(3)**, 2637-2638 **(2007)**

5. Alam M. R, Mortuza M.G., Islam M. S. and Hossain M.A., Notes on size frequency distribution and length-weight

relationship of freshwater fish *Alia coil* (Hamilton-Buchanan) (Siluriformes: Schilbeidae), *Univ. j. Zool. Rajshahi Univ*., **13**, 69-70 **(1994)**

6. Mortuza**,** M.G. and Mokarrama, T., Length-weight relationship and condition factor of mud loach Botia lohachata (Chaudhuri) (Cypriniformes: Cobitidae, *Univ. J. Zool. Rajshahi Univ*., **19**, 113-114 **(2000)**

7. Mortuza, M.G. and Tawfeequa, R., Length-weight relationship, condition factor and sex-ration of freshwater fish, *Rhinomugil corsula* (Hamilton) (Mugiliformes: Mugilidae) from Rajshahi, Bangladesh, *J. bio-sci*., **14**, 139-141 **(2006)**

8. Le Cren, E. D**.**, The length weight relationship and seasonal cycle in gonad weight and condition of Perch (*Perca fluviatilis*), *J. Anim. Eco*., **21**, 210-219 **(1951)**

9. Fulton, T. W., The rate of growth of fishes. 22nd Annual Report of the Fishery Board of Scotland **(3)**, 141-241 **(1904)**

10. Chaudhary preeti, Assessment of fish culture in some fresh water ponds of Dhar Town, MP, India, *J. Biological Sci*., **1(2)**, 73-76, **(2012)**

11. Allen, Some observations on the biology of Trout (*Salmo truttu*) in Windermere, *J. Anim. Ecol*., **7**, 333-349 **(1938)**

12. Bagenal, T.B**.** and Tesch, F.W., Age and growth in "Method for assessment of fish production in freshwater." IBP Hand book No. **3**,101-136. Ed: T.B. Bagenal. Third edition, Blackwell Scientific Publ. Oxford. **(1978)**

13. Grover, H. John and Juliano, R. O., Length-weight relationship of pond raised milk fish in Philippines. Aquaculture, **7**, 339-746 **(1976)**

14. Das N. G., Mujumder and Sarwar, S. M. M., Length-weight relationship and condition factor of catfish *Arius tenuispinis* Day, 1877, *Indian J. Fish*., **44 (1)**, 81- 85 **(1997)**

15. Letourneur, Y., Length-weight relationship of some marine fish species in Reunion Island, Indian Ocean, *Naga*, *ICLARM*, **21**, 37-39 **(1998)**

16. Rajasegar, M. and Rajkumar, M., Length-weight relationship of Scat Fish,Scatophagus argus (Bloch) from Parangiipettai coastal waters, Tamilnadu, *J. Aqua. Biol*., **19(2)**, 45-47 **(2004)**

17. Ajayi, T., The age and growth of the tongue sole, *Cynolossus Canariensis* In: Proceedings of the 2nd Annual conference of the fisheries society of Nigeria (FISON) New Bushsource, **2**, 19 **(1982)**

18. Nwadiaro, C.S. and Okorie, P.U. Biometric characteristics., Length weight relationships and condition factors in *Chrychthys filamentosus*, Pisces, Bagandae, from Oguta lake Nigeria, *Biol. Afr*., **2**, 48-56 **(1985)**