Global Veterinaria 14 (4): 619-622, 2015
ISSN 1992-6197

DOI: 10.5829/idosi.gv.2015.14.04.93189

Growth Profile of an Indian Anchovy Species, *Stolephorus indicus* (van Hasselt, 1823) of Family Engraulidae from Keti Bunder, Sindh, Pakistan

[1]*Musarratulain,* [2]*Zubia Masood,* [2]*Rukhsana Bibi,* [2]*Mussrat Bibi,* [2]*Hina Gul,*
[1]*Rehana Yasmeen Farooq and* [3]*Nelofer Jamil*

[1]Department of Zoology, University of Karachi, Karachi-75270, Pakistan
[2]Department of Zoology, Sardar Bahadur Khan Women University, Quetta, Pakistan
[3]Department of Chemistry, Sardar Bahadur Khan Women University, Quetta, Pakistan

Abstract: A study was carried out to analyze the growth patternof an Indian anchovy species, *Stolephorus indicus* belong to family EngraulidaeattheKetiBunder of Karachi Coast, Pakistan. During the year 2014, a total of 101 specimens were collected from the landing sites at KetiBunder. Cubic law ($W= aTL^b$) was used to evaluate the growth profile of this species. The regression coefficient*b*value was greater than the ideal value that is b=3.0, hence shows the positive allometric growth pattern. While the mean value of condition factor (K) and relative condition factor (Kn) were 0.97 and 1.02, respectively. Further, the coefficient of correlation(r)value calculated for this specieswas also high (r>0.95).Thus, the results of the present study reveals that the growth conditions of *S.indicus*atKetiBunderof Karachi coast were favorable for this species.

Key words: Indiananchovy (*Stolephorus indicus*) · Growth profile · Length-Weight Relationship (LWRs) · Condition factor (K) · Relative Condition Factor (Kn)

INTRODUCTION

Stolephorus indicus iscommonly known as 'Indian anchovy' is belonging to the family Engraulidae. This species includessmall sized fishes, most common in 12.0 cm in total length (TL) and are mostly found in creeks and estuaries [1]. Anchovies are mainly used as a fish meal because they rich in omega-3 oils, calcium and iron, hence, considered as a good food fish. These fishes alsouse as boiled and fried forms or can be used to make fish-based culinary products i.e. fish sauce or in curries throughout the world [2,3].

The growth profile of a fish can be easily estimated by linear regression analysis of length-weight data. This method helps to compute weight of a fish, growth rate and biomass using length observations. Seasonal variation in fish growth rate can also be calculated by Length-weight relationship of fish. Therefore, the parameters of length-weight relationship (LWRs) of various fish specieshad commonly used byseveral in fisheries throughout the world as well as inPakistan[4-9].In order to find out the fitness or wellbeing of the fish, the condition factor (K) is commonly used in fisheries science [10], while the relative condition factor (Kn) is used to evaluate the condition of fish ofsame population inside their size classesorthe condition of fishes in different seasons or to compare the growth conditions among differentfish species that are found in the identical environment [11].

MATERIALS AND METHODS

Sample Collection: A total of 101 fish specimens of Indian anchovy (*Stolephorus indicus*) were collected from the landing sites at the KetiBunder of Karachi coast. Fish sample was immediately kept in ice cooler and bring to the laboratory for further analysis. Total length of fish was measured to the nearest 1mm with the help of measuring board, while the whole body weight of fish was weighed in grams by using digital balance.

Statistical Analysis of Data: Growth profileof Indian anchovy (*Stolephorus indicus*) was collected by linear regression equation followed by Le Cren [12] as follows;

Corresponding Author: ZubiaMasood, Department of Zoology, SardarBahadur Khan Women University, Quetta, Pakistan

$$W=aL^b \quad (1)$$

In the above equation, the values of regression coefficient '*b*' show the growth pattern in fish. If the value of b=3, this is called isometric growth. If b<3, the growth is called negative allometric growth and when b>3, growth is called positive allometric growth, as followed by Zubia *et al.* [7].

Logarithmic transformed model of equation 1 is used to linearize the data as follows:

$$\log W = \log a + b \log L \quad (2)$$

Condition factor (K) was calculated with the following equationofLawson and Olagundoye [13] as follows:

$$K = W \times 100 / L^3 \quad (3)$$

Relative condition factor (Kn) was calculated after Ranzani-Paiva *et al*. [14] as follows:

$$Kn = Wt / We \quad (4)$$

All statistical analysis was done with the help of computer software MS Excel 2013.

RESULTS

The results of the total length (Minimum to maximum), body weight (Minimum to maximum), value of constant *a* and regression coefficient *b*, coefficient of correlation 'r', coefficient of determination 'r^2' and growth type of *Stolephorus indicus*were noted in Table 1. The regression coefficient (*b*-value) was calculated by using cube law ($W=aL^b$) and observed that the *b* value was

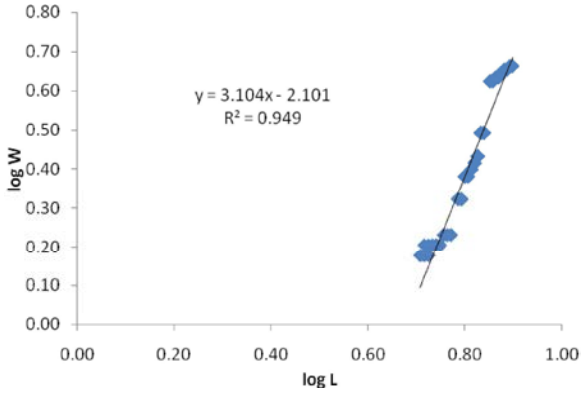

Fig. 1: Length-weight relationship of *Stolephorus indicus*

greater than the ideal value that is 3.0, hence, this species showed the positive allometric growth pattern (Table 1& Figure 1). From the mean values ofcondition factor (K) and relative condition factor (Kn) of *Stolephorus indicus* revealed that this species was found in good conditionat KetiBunder of Karachi coast as shown in Table 2, respectively.

DISCUSSION

Length-Weight Relationship (LWRs): The study of length-weight relationship (LWRs) have an great prominence in fishery science, as it isa powerful tool in understanding the general well- being and growth patterns in a fish population. Furthermore, it also throws light on the environmental conditions of the aquaticecosystem in which thefish is residing [15]. If b-value is equal to 3.0, than growth is isometric, but if is less than 3.0, than fish becomes more slender as it increase in length, therefore, its growth will be negative allometric that might be because habitat conditions are not suitable for its growth. On the other hand, if b-value

Table 1: Parameters of Length-weight relation (LWRs) of IndianAnchovy (*Stolephorus indicus*) from the KetiBunder of Karachi coast, Pakistan.

Total Length (TL) in cm.		Weight (Wt) in grams		Number of samples	Regression Coefficient			Growth type
Min.	Max.	Min.	Max.	N	a	b	r	GT
5.1	7.5	1.5	4.6	101	-2.1	3.1	0.97	A^+

Note: A^+ Shows positive allometric growth pattern.

Table 2: Condition and relative condition factors of IndianAnchovy (*Stolephorus indicus*) from the KetiBunder of Karachi coast, Pakistan.

Total Length (TL) cm.		Weight (Wt) grams		Number of samples	Condition factor K		Relative condition factor Kn			
Min.	Max.	Min.	Max.	N	Min.	Max.	Mean K-value	Min.	Max.	Mean Kn-value
5.1	7.5	1.5	4.6	101	0.83	1.17	0.97	0.88	1.75	1.02

is greater than 3.0, than fish becomes heavier and showed positive allometric patternof growth for their specific lengths, which may be due to optimum condition as described by Zubia *et al.* [7] on Karachi coast of Pakistan.

In the present study, the value of *b*=3.1 was indicating thepositive allomatric growth pattern in *Stolephorus indicus,* which means that increase in weight is more rapid than increase in length. Bagenal and Tesch [16] give values of *b* between 2.9 to 4.8. According to Pauly and Gyanilo [17] the values of *b* may range between 2.5 to 3.5, Abdullah [18]also recorded these values between 2.5 to 3.4 for fishes caught by trawl of Alexandria in Egypt, Ecoutin *et al.* [19] record value of *b* between 2.8 to 3.4 for the fish populations of a relatively undisturbed tropical estuary at Gambia. The value of *b* can be affected by many factors such as number of specimens, length range or size of specimens [20], season or extreme environment [21]. The similar positive allometric observed in *Lizapersia* byRenjini and Nandan [22] and Zubia *et al.* [7] for *Mugilcephalus* and *Liza macrolepis*. There are various factors such as, habitat of fish, gonad's maturity, diet, stomach fullness, seasonal conditions and preservation techniques that can affect the Length-weight relationship of fishes as reported by Tesch [23].

Condition Factor (K) and Relative Condition Factor (Kn): As the values of condition (K) and relative condition (Kn) factors shows the condition of fish, therefore, the results of the present study revealed that the mean Kn value reported for this species was greater than one (1.0) that indicated that the environmental conditions at KetiBunder were suitable for their normal growth of this species. The similar result was also reported by Zubia *et al*. [7] and Masooma *et al.* [9] for the mugilid species on Pakistan coast. According to the Renjini and Nandan [22], the values of condition factor (K) changes with the changing in maturity stages and seasonal differences in fishes.

REFERENCES

1. Bianchi, G., 1985. FAO species identification sheets for fishery purposes. Field guide to the commercial marine and brackish-water species of Pakistan. PAK/77/033 and FAO (FIRM) Rome, FAO.
2. Shiriskar, D.A., G.D. Khedkar and N.S. Sudhakara, 2010a. Preparation of boiled and dried products from anchovies (*Stolephorus*sp.) and studies on quality changes during storage. Journal of Food Processing and Preservation, 34: 73-86.
3. Shiriskar, D.A., G.D. Khedkar and N.S. Sudhakara, 2010b. Preparation of pickled product from anchovies (*Stolephorus* sp.) and studies on quality changes during storage. Journal of Food Processing and Preservation, 34: 176-190.
4. Kolher, N., J. Casey and P. Turner, 1995. Length-weight relationships for 13 species of sharks from the western North Atlantic. Fishery Bulletin, 93: 412-418.
5. Koutrakis, E.T. and A.C. Tsikliras, 2003. Length–weight relationships of fishes from three northern Aegean estuarine systems (Greece). Journal of Applied Ichthyology, 19: 258-260.
6. Zubia, M. and Y.F. Rehana, 2010. Length-weight relationship and condition and relative condition parameters of Lutjanus species of the family Lutjanidae collected from Karachi fish harbor, Karachi, Pakistan. International Journal of Biology and Biotechnology, 7: 505-509.
7. Zubia, M., Y. Rehana, S.H. Muhammad, M.T. Omer and Lakht-e-Zehra, 2014. Length-weight relationship, condition and relative condition factor of four mugilid species (Familymugildae) from the Karachi Coast of Pakistan. Journal of Coastal Development, 17(385): 1-6.
8. Afsarullah, A. Zaheen, S. Saira, M. Zubia, Musarrat-ul-Ain, Y. Rehana, Hameed-Ur-Rehman, U. Asim, K. Alyas and S. Shagufta, 2015. Length-Weight Relationship of the SingaraFish (*Sperataseenghala*) inBaran Dam of District Bannu, Khyber Pakhtunkhwa (KPK), Pakistan. World Journal of Fish & Marine Sciences, 7(1): 52-45.
9. Masooma, K., K. Rizwana, M. Zubia, H. Zaigham, I. Farhat, R. Wajeeha and Hameed-Ur-Rehman, 2015. Length-weight relationship, condition and relative condition parameters of Mugilincilus (Mugilidae: Mugiliformes) collected from the River Indus of district Sukkur, Pakistan. Biological Forum – An International Journal, 7(1): 793-799.
10. Anene, A., 2005. Condition factors of four cichlid species of a man-made lake in Imo state, Southeast, Nigeria. Turkish Journal of Fisheries and Aquatic Sciences, 5: 43-47.
11. Samat, A., M.N. Shukor, A.G. Mazlan, A. Arshad and M.Y. Fatimah, 2008. Length-weight Relationship and Condition Factor of *Pterygoplichthyspardalis* (Pisces: Loricariidae) in Malaysia Peninsula. Research Journal of Fisheries and Hydrobiology, 3(2): 48-53.
12. Le Cren, E.D., 1951. The length-weight relationship and seasonal cycle in gonad weight and condition in the perch (*Percafluviatilis*). J. Anim. Ecol., 20: 201-219.

13. Lawson, E.O. and A.U. Olagundoye, 2011. Growth patterns, diet composition and sex ratios in giant African Threadfin, PolydactylusquadrifilisfromOloge lagoon, Lagos, Nigeria. International Journal of Agriculture & Biology, 13(4): 559-564.
14. Ranzani-Paiva, M.J.T., A.T. Silva-Souza, G.C. Pavanelli and R.M. Takemoto, 2000. Hemitological characteristics and relative condition factor (Kn) associated with parasitism in *Schizodonborelli* (Osteichthyes, Anostomidae) and *Prochiloduslineatus* (Osteichthyes, Prochilodontidae) from Parana River, Parana, Brazil. ActaScientiarum, 22: 515-521.
15. Shaheena, S., A.R. Yousuf and P. Muni, 2013. Length-weight relationship and breeding biology of *Puntiusconchonius* (Hamilton, 1822) From Dal Lake, Kashmir. International Journal of Innovative Research and Development, 2(2): 229-312.
16. Bagenal, T.B. and F.W. Tesch, 1978. Age and growth. In: Methods for assessment of fish production in freshwater, 3rd edition, (ed. T.B. Bagenal), IBP Handbook, Blackwell Scientific Publication, Oxford, UK, pp: 101-136.
17. Pauly, D. and F.C. Gayanilo Jr., 1997. A Bee: An alternative approach to estimating the parameters of a length-weight relationship from length frequency samples and their bulk weights. NAGA ICLARM, Manila, Philippines.
18. Abdallah, M., 2002. Length-weight relationship of fishes caught by trawl of Alexandria, Egypt. Naga, The ICLARM Quarterly, 25(1): 19-20.
19. Ecoutin, J.M., J.J. Albaret and S. Trape, 2005. Length–weight relationships for fish populations of a relatively undisturbed tropical estuary: The Gambia. Fisheries Research, 72: 347-351.
20. Morey, G., J. Moranta, E. Massuti, A. Grau, M. Linde, F. Riera and B. Morales-Nin, 2003. Weight-length relationships of littoral to lower slope fishes from the Western Mediterranean. Fisheries Research, 62: 89-96.
21. da-Costa, M.R., H.H. Pereira, L.M. Neves and F.G. Araújo, 2014. Length–weight relationships of 23 fish species from Southeastern Brazil. Journal of Applied Ichthyology, 30: 230-232.
22. Renjini, P.K. and S.B. Nandan, 2011. Length-weight relationship, condition factor and morphometry of gold spot mullet, *Liza persia* (Hamilton 1822) from Cochin estuary. Indian Journal of Geo-Marine Sciences, 4: 567-571.
23. Tesch, F.W., 1971. Age and growth. In: Methods for assessment of fish production in fresh waters, (Eds. W. E. Ricker), Blackwell Scientific Publications, Oxford, pp: 98-130.