ISSN 2321–340X

Journal of Aquatic Biology & Fisheries | Vol. 7 | 2019 | pp. 102 - 105

LENGTH-WEIGHT RELATIONSHIP AND CONDITION FACTOR OF HALF-SMOOTH GOLDEN PUFFER FISH *LAGOCEPHALUS SPADICEUS* (RICHARDSON, 1845) (TETRAODONTIFORMES: TETRAODONTIDAE) FROM KOLLAM, KERALA

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Abstract: The length-weight relationship of half-smooth golden puffer fish *Lagocephalus spadiceus* (Richardson, 1845) from south-west coast of India revealed asymmetric growth as the 'b' value of fishes was 2.813 $\pm$ 0.03, which was significantly different ($P<0.05$) from isometric value 3.0. Head-length relationship with standard length plotted resulted in a linear regression line with 'b' value 0.859 ± 0.02 also showed significant ($P<0.05$) difference, which denotes stout head in relation to its body length. The mean condition factors worked out were 2.55± 0.47 for males, 2.49±0.74 for females and 2.51± 0.66 for the total population, which showed good condition of the fish.

Key words: *Lagocephalus spadiceus,* Length-weight relationship, Asymmetric growth, Condition factors

INTRODUCTION

Tetraodontids are circumglobal in tropical and temperate waters, mostly marine; several enter estuaries and some exclusively in freshwater but absent from cold waters (Matsuura, 1997). Tetraodontiformes form an ecologically important order because of their species abundance, regional diversity, and carnivorous nature and are also used in aquariums. Puffer fishes belonging to this order are fatal due to the presence of neurotoxin called tetrodotoxin (TTX) in its body organelles like liver, gonad, skin, muscle and testis.

As the growth of fish varies between the species and among the 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. Studies on length weight relationship of species of the order Tetraodontiformes are very meagre, some of which include Garcia *et al*. (1998) on *Arothron monoceros* from Colombia; Abdallah (2002)for *Stephanolepis hispidus* from Egyptian Mediterranian waters; Vianna *et al*. (2004) on four species of Tertraodontiforms from South eastern Brazil; Kulbicki *et al*. (2005) on seven species of the Order from New Caledonia; Sangun *et al*. (2007) on *Balistes capriscus*, and *Lagocephalus lagocephalus* from North eastern Mediterranean coast of Turkey; Simon and Mazlan (2008) on archer fish and puffer fish from estuaries of peninsular Malaysia; Salahi *et al*. (2015) on *Uranoscopus guttatus* Cuvier, 1829 and *Lagocephalus inermis* from Gulf of Oman; Anju *et al*. (2019) on *Lagocephalus inermis* from Arabian Sea, Kerala and Abdullah *et al*.(2017) on ten fishes including *Lagocephalus sceleratus* from Eastern Libya Mediterranean Sea Coast.

Length weight analysis describes the relation between length and weight mathematically and one can be converted to the other (Le Cren, 1951) and were established according to the equation $W = aL^{b;}$ where 'b' provides the information on growth of the fish. When the value of 'b' equals 3, then the increase in weight is isometric and if the value is greater than or less than 3, then the weight is allometric. The parameters 'a' and 'b' are considered important in stock assessment studies (Froese, 1998; Can *et al.*, 2002; Moutopoulos and Stergiou, 2002).

The present study was conducted in the demersal species *Lagocephalus spadiceus* (Richardson, 1845) which is obtained as bycatch during trawling. The species has a widespread distribution throughout the tropical Indian and Pacific Oceans (Froese and Pauly, 2016). No serious attempts have been made by any fishery biologist towards a comprehensive study on the biology of puffer fishes from Kerala as they are not considered as significant food fish. This may not justified as each organism has its own significance in the ecosystem. But now *Lagocephalus spadiceus* is considered non-toxic and the fishermen in Neendakara and Sakthikulangara harbour of Kerala proclaim that this species has huge export value in Tamilnadu and after proper cleaning, it is considered as a delicacy. In India earlier these species were either discarded in the sea as it cause large destruction to nets or used to make manure. The study is focused on the length weight relationship and condition factor of *Lagocephalus spadiceus* from Kollam harbours of Kerala coast.

MATERIAL AND METHODS

Fishes for the present study were collected from the commercial trawlers of Neendakara(8°56'19'N; 76°32'25E), and Sakthikulangara(8°55'30'N; 76°33'22'E), landing centres of Kollam district. The specimens were procured from fishermen, where *Lagocephalus spadiceus* were obtained as trawl bycatch and a total of seventy fishes were collected and analysed. Immediately after collection samples were kept in ice box and were taken to the laboratory for further studies. Standard length and head length were measured in cm and weight of the fish in grams was calculated using a Metler analytical balance.

The length-weight relationship of the fish was calculated by the equation $W = aL^b$(Pauly, 1984). The values of constants 'a' (intercept) and 'b' (length exponent) were estimated from the log transformed values of length and weight i.e. log W = log a + b log L, via least square linear regression, where 'b' is an exponent (i.e. slope) with a value nearly always between 2 and 4, and often close to 3. The sex ratio of the population collected was also analyzed. To assess length and weight for a particular sample or individual, condition factors are used, $Kn = W/aL^b$ (Le Cren, 1951).

RESULTS

Length-Weight Relationship

The length weight relationship according to cube law for *L. spadiceus* was established using logistic regression analysis and the best linear fit (r = 0.983) was obtained for the species (fig.1.). The logarithmic transformed length and weight plotted for the total population resulted in a straight line, which indicates linear relationship between the two variables. The length weight relationship was expressed as log Wt = 2.813 log Lt – 3.244 and the 'b' value of fishes for length weight relationship was 2.813 $\pm$ 0.03, which show slight asymmetric growth with less weight increment than length andsignificantly differ from isometric value 3.0 (t = 2.619; P<0.05).

Length-length Relationship

Head length relationship with standard length (fig.2.) was also plotted for the total population to elucidate the head length proportion of the species. Logarithmic transformed standard length plotted with head length resulted in a linear regression line indicate the best fit (r = 0.946). The head length standard relationship was established as log Hd Lt = 0.859 log Lt-0.734, with coefficient, 'b' value as 0.859 ± 0.02 which showed significant (P<0.05) difference from expected value of 1.0, which means head grows with smaller increments with respect to standard length of the fish.

Condition Factor

The mean condition factors for male, female and for the total population were 2.55± 0.47, 2.49±0.74, and 2.51± 0.66 respectively.

DISCUSSION

Length and weight are regarded as important growth criteria in the ecology of fish. The maximum observed length of our specimen was 28.7 cm which is similar to the values reported by Sirisha and Rao (2007) which was 28.7cm in *L. spadiceus* from Vishakapatanam and the values obtained for Basusta *et al.* (2013) was 37.4 cm from Turkish Bay which was well above the values from the present study. Similarly the maximum weight of the fish recorded was 298.4gms which was well below than that of 695.97gm reported by Basusta *et al.* (2013) from Turkish Bay.

The 'b' value obtained for our present study was 2.81 which is almost similar to that of values given by

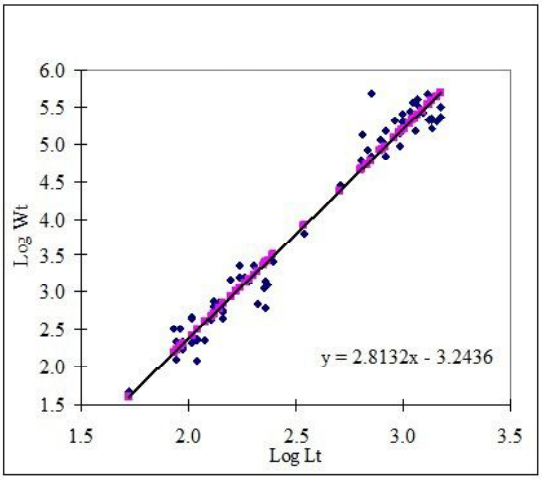

Fig. 1. Length (Std Lt.) weight relationship of total population

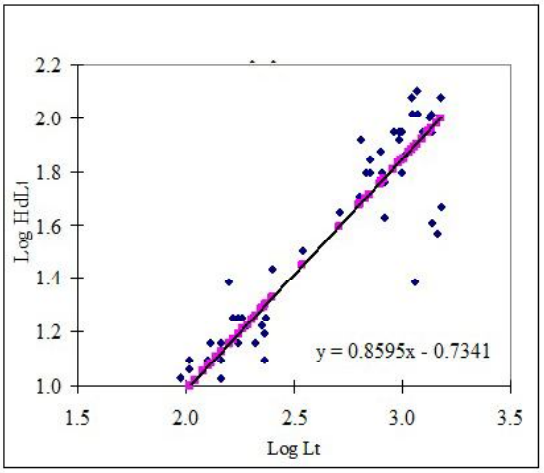

Fig. 2. Standard Length-head length relationship of total population

Basusta *et al* (2013) for *L. spadiceus* from Turkish Bay as 2.67 and 2.72 for males and females respectively showing negative allometric growth. Naik and Jalihal (1998) gave two separate expressions of length-weight relationships for males and females of *L. spadiceus*, from the west coast of India and stated significant difference between the slopes of the two sexes. Significant difference between the slopes for the two sexes showing negative allometric growth was noticed in *L. spadiceus* from east coast of India (Sirisha and Rao, 2007). Zare *et al.* (2012) also obtained similar 'b' value (2.70) for *L. guentheri* which again proved negative allometric growth. The 'a' and 'b' values of *L. scleratus* from eastern Mediterranean were 0.022 and 2.82 respectively, thus revealing negative allometric growth (Kalogirou, 2013). Sabrah *et al*. (2006) and Kulbicki *et al*. (2005) obtained lower 'b' values for *L. scleratus* (2.86-2.92). The values of 'b' were within the limits of 2.5– 3.5 reported for all fishes (Froese, 2006).

According to Aydin (2011), the 'b' value for *L. scleratus* was 2.979. The values of 'b' were less than 3 or nearly isometric (b = 3) in *L. wheeleri* and *L. scleratus*, indicating near isometric population growth conditions (Simon and Mazlan 2008). The value of 'b'depends on ecological conditions (Ricker, 1975; King, 1995; Avsar, 1997).

The condition factor for males was 2.55± 0.47 and for females it was 2.49±-0.74 which showed good condition of the fish.

Thus in the present study length weight relationship showed slight asymmetric growth with more length increment than weight for the species which proved negative allometric growth.

ACKNOWLEDGEMENTS

We thank the referees, specifically Dr. Neelesh Dahanukar for the critical comments received on the manuscript.

REFERENCES

Abdallah, M., 2002. Length-weight relationship of fishes caught by trawl off Alexandria, Egypt. *Naga ICLARM* Q. 25(1):19-20.

Abdullah, M.A.B, Ramadan, A.S. Ali, Sayed Mohamed Ali and Mohammad, E. El-Mor. 2017. Species Composition, Relative Abundance and Length-Weight Relationship of Ten Exotic Fishes from Eastern Libya Mediterranean Sea Coast. *Journal of Global Scientific Research* 2; 13-23.

Anju, C.V., Dahanukar, N., Sidharthan, A., Ranjeet, K. and Raghavan, R. 2019. Demographics of *Lagocephalus inermis* in the Arabian Sea unveils complex conservation challenges. *Journal of Fish Biology* 94: 187–190.

Avsar, D. 1997. Fisheries Biology and population dynamics, (Lecture Book No: 5) Baki Book and Press,. No: 21, *Adana*, 303 pp.

Aydýn, M. 2011. Growth, Reproduction and Diet of Pufferfish *Lagocephalus sceleratus* (Gmelin, 1789)

from Turkey's Mediterranean Sea Coast. *Turkish Journal of Fisheries and Aquatic Sciences* 11: 569-576 (2011).

Basusta., Asiye Basusta., Nuri Bausta and EbruIfakat Özer. 2013. Length-Weight Relationship of two Puffer Fishes, *Lagocephalus sceleratus* and *Lagocephalus spadiceus*, from Iskenderun Bay, Northeastern Mediterranean, Turkey. *Pakistan J. Zool.*, vol. 45(4), 1047-1051 pp.

Can, M.F., Basusta, N.and Cekaic, M.2002. Weight –length relationship of selected fish species of the small scale fisheries of south coast of the Iskenderon Bay.*Turk.J.Vet.Anima.Sci*., 26; 1181-1183.

Froese, R. 1998. Length-weight relationships for 18 lessstudied fish species. *J. Appl. Ichthyol*. 14: 117-118.

Froese, R. 2006. Cube law, condition factor and weight–length relationships: history, meta-analysis and recommendations. *J. Appl. Ichthyol.* 22, 241–53.

Froese, R. and Pauly, D.2016. FishBase. *www.fishbase.org*. World Wide Web electronic publication Accessed on August 2016.

Garcia, C.B., Duarte, J.O., Sandoval, N., Von Schiller, D., Melo, G. and Navajas, P. 1998. Length weight relationship of demersal fishes from the Gulf of Salamanca, Colombia, *Naga ICLARM Q*.21 (3):30-32.

Kalogirou, S. 2013. Ecological characteristics of the invasive pufferfish *Lagocephalus sceleratus* (Gmelin, 1789) in Rhodes, Eastern Mediterranean Sea. A case study Medit. *Mar. Sci.*, 14/2, 2013, 251-260.

King, M. 1995. Fisheries Biology Assessment and Management. Fishing News Books, Oxford, 382 pp.

Kulbicki, M., Guillemot, N. and Amand, M. 2005. A general approach to length-weight relationships for New Caledonian lagoon Fishes. *Cybium*, 29(3): 235-252.

Le Cren, E.D. 1951. The length-weight relationships and seasonal cycle in gonad weight and condition in the perch (*Perca fluviatilis*). *J. Anim. Ecol*. 20: 201-219.

Matsuura, K. 1997. Tetraodontidae. In Okamura, O. and K. Amaoka (eds.): Sea fishes of Japan, pp. 706–716. Yama-kei Publishers Co., Ltd., Tokyo. (In Japanese.)

Moutopoulos, D.K. and Stergiou, K.I. 2002. Length-Weight and Length-Length Relationships of Fish Species from Aegean Sea (Greece). *Journal of Applied Ichthylogy*, 18,200-203. https://doi.org/10.1046/j.1439-0426.2002.00281.x

Naik, S.K. and Jalihal, D.R. 1998.Biological observations on the pufferfishes of South Konkan Coast with special reference to the net damaging species *L. spadiceus* (osteichthyes, Tetraodontidae). *Indian J. Mar. Sci*. 27: 426 - 432.

Pauly, D. 1984. Fish population dynamics in tropical waters: A manual for use with programmable calculators. *ICLARM* Studies and Reviews 8. 325 p. ISBN 971-1022-04-4

Ricker, W.E. 1975. Computation and Interpretation of Biological Statistics of Fish Populations, No: 191, *Fish. Res. Board Can. Bull.*, 382 pp.

Sabrah, M.M., El-GanainyA.A. and Zaky, M.A. 2006. Biology and Toxicity of the puffer fish *Lagocephalus sceleratus* (Gmelin, 1789) from The Gulf of Suez. *Egyptian Journal of Aquatic Research*, 32: 283-297.

Salahi gezaz, M., Paighambari, S.Y., Abbaspour Naderi, R., Vesaghi, M.J. 2015. Length–weight relationships for two marine fish species from the Gulf of Oman: *Uranoscopus guttatus* Cuvier, 1829 and *Lagocephalus inermis* (Temminck& Schlegel, 1850). *Journal of Applied Ichthyology*, 31, (6). https://doi.org/10.1111/jai.12821

Sangun, L., Erhan Akamca, and Mustafa Akar. 2007. Weight length relationship for 39 fish species from the North Eastern Mediterranean Coast of Turkey. *Turkish Journal of fisheries and Aquatic sciences* , 7:37-40.

Simon, K.D. and Mazlan, A.G. 2008. Length-Weight and Length-Length Relationships of Archer and Puffer Fish Species. *The Open Fish Science Journal, 1,* 19-22.

Sirisha, I. R. and P. Y. Rao 2007. Reproductive biology of half-rough-back puffer fish, *Lagocephalus spadiceus* (Richardson, 1844) off Visakhapatnam, east coast of India. J. Mar. biol. Assoc. India, 49: 70-75

Vianna, M., Sanos Costa, F.E. and Ferreira,V.N. 2004. Length weight relationship of fish caught as by- catch by shrimp fishery in the Southeastern Coast of Brazil. *V. Inst. Pesa*, Sao Paulo., 30 (1); 81-85.

Zare, P., Naderi, M.andAzvar, E. 2012. Length–weight relationships of 10 fish species collected from stake traps in the muddy shores of the inter-tidal zone of Bandar Abbas city, Persian Gulf, Iran. *J. Appl. Ichthyol.* (2012), 1–2.