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Length -weight relationship of selected commercially important marine fishes from east coast of India

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Abstract
The paper deals with length-weight relationship (LWR) of selected commercially important marine fishes from the east-coast of India. Samples were collected fortnightly from experimental fishing using trawl operated at depth up to 70 M off Vishakhapatnam coast on the east-coast of India during 2015-17. Measurements of total length (TL) (nearest to 0.1 cm) and body weight (nearest to 0.1 g) of individual fish were taken. The LWR showed good fit with *r*2 values ranging from 0.975 for *Lepturacanthus savala* Cuvier, 1829 to 0.999 for *Upeneus vittatus* Forsskål, 1775. The 'b' values ranged from 2.618 for *Photopectoralis bindus* Valenciennes, 1835 to 3.186 for *L. savala* Cuvier, 1829.

Keywords: Length-weight relationship (LWR), marine fish, east-coast of India

Introduction
Growth in an organism is expressed as a function of age [1]. Growth in fish is influenced by availability of food and environmental parameters. Biomass of fishes is calculated based on the length frequency of collected samples. Length can be converted in to weight, where the catch is expressed in weight. Length-weight relationship (LWR) and length-length relationship (LLR) parameters find use in fish stock assessment and fisheries management [7]. The present study reports Length-weight relationship of selected commercially and ecologically important marine finfish species inhabiting Vishakhapatnam on the east coast of India (western Bay of Bengal). The east coast of India contributes significantly to the marine fish landings of India.
Fish species belonging to families such as Engraulidae, Dussumieriidae, Mullidae, Sciaenidae, Leiognathidae, Haemulidae, Trichiuridae and Synodontidae form an important component of marine fisheries of east coast of India. These species are harvested by the commercial bottom trawls. So, it is important to collect biological information like LWRs to assess the stock and biomass. Information on LWRs of these species in the east coast of India is scanty and hence present study was carried out.

Materials and Methods
Experimental trawling using trawl of 20 mm mesh size was carried out fortnightly in different depths up to 70 M off Vishakhapatnam coast (16.98°N-20°43.2N, Long 82.19°- 86.53°44 E) during 2015-17. Catch from trawl was brought to the laboratory for species identification and to record length-weight information. Length-Weight data was collected from 2056 specimens belonging to eight families viz., Engraulidae, Dussumieriidae, Mullidae, Sciaenidae, Leiognathidae, Haemulidae, Trichiuridae and Synodontidae. Total length (from tip of snout to the tip of longest ray in the caudal fin) in mm and weight in grams (nearest to 0.1g) of selected important fish species were recorded.
Le Cren (1951) W = a Lb equation [10] by the method of least square was adopted to estimate the length–weight relationship,
Where: W= Body weight (g), L= Total length (mm); 'a' is a coefficient related to body and 'b' is an exponent indicating isometric growth when equal to 3 [2-4]. The same in the logarithmic form can be written as: Log W= log *a* +*b* log L.

Results and Discussion
For the selected fish species, calculated b values of regression were within the estimated range of 2.5 to 3.5 [7]. All the estimated LWR values were significant with 'b' values ranging from

2.618 for *Photopectoralis bindus* Valenciennes, 1835 to 3.186 for *Lepturacanthus savala* Cuvier, 1829 and *r*2 values ranging from 0.975 for *L. savala* Cuvier, 1829 to 0.999 for *Upeneus vittatus* Forsskål, 1775. Generally, growth in an ideal fish is considered isometric if the weight of the fish is an exponential function of its length and their relationship could be expressed by the cube-law, *i.e*., weight = a x length3. The "b" values also change due to changes in physiological growth conditions such as development of gonads or food availability for the respective population [2-4].

The detailed information on sample size, total length range (cm), LWR parameters a and b, and coefficient of determination (*r*2) for each species is given in Table 1. Length of *Thryssa mystax* ranged from 6.7-18.5 cm and growth parameters b and r were estimated at 2.904 and 0.998 respectively. For *T. mystax b* value of LWR was reported as 3.081 and r value at 0.983 from Chilka lagoon [9]. Growth parameters for *Dussumieri acuta* were estimated at 3.059 (b) and 0.998 (r), and length varied from 10.7-20.4 cm. For *D. acuta* off Kenyan coast, b and r values were reported as 3.228 and 0.903 respectively [10].

Length of *U. vittatus* varied from 7.0-21.6 cm and b value was determined at 3.015 and r value at 0.999. LWR was derived at 2.99 and r value at 0.98 for *U. vittatus* [15]. The growth parameter 'b' of LWR varied between 2.646 and 3.043 for the three species, *N. japonicus*, *U. vittatus* and *P. maculatus* off Chennai coast [5]. Length range for the both species *J.carutta* and *P. anea* was recorded as 5.6-20.8 and growth parameters estimated at 2.892-3.124 (b) and 0.997-0.998 (r). Growth parameters b of LWR was estimated at 2.838 to 3.30 for *P. anea* and *J.carutta* [17]. Growth parameters b and r were estimated at 2.618-2.896 and 0.995-0.998 respectively for the three species, *G. minuta, E.splendens and P. bindus*. Length-weight relationship of *G. minuta* from the Tuticorin coast was studied and the 'b' value estimated at 3.0624 [13]. From Chennai coast, length-weight relationship was reported at 3.051 and 2.922 for *P. bindus* and *G. minuta* respectively [10].

LWR values b and r were determined at 3.114-3.186 and 0.975-0.997 for the both species of family Trichiuridae; *L. savala* and *T. lepturus* while their length exhibited a wide range 9.0-89.4 cm. For T. *lepturus*, b value reported was 3.6163 and r value 0.96 from Saurashtra coast [6]. Growth parameters for *L. savala* were reported as 3.22 and r value as 0.92 off Ratnagiri coast [14]. From Mumbai coast, b value was reported as 3.16 and 3.44 for males and females of *L. savala* respectively [18]. For *S. undosquamis* b and r values were estimated at 2.947 and 0.998 respectively. Length-weight relationship for both sexes was found to be 3.03 for *S. undosquamis* [16].

Table 1: Length -weight relationship of selected commercially important marine fishes from east-coast of India

Species	n	Length (cm)		Parameters		
		Min	Max	*a*	*b*	*r2*
Engraulidae, Clupeiformes						
Thryssa mystax Bloch & Schneider, 1801	125	6.7	18.5	0.00562	2.904	0.998
Dussumieriidae, Clupeiformes						
Dussumieria acuta Valenciennes, 1847	136	10.7	20.4	0.00654	3.059	0.998
Haemulidae, Perciformes						
Pomadasys maculatus Bloch, 1793	168	13.0	46.5	0.0199	2.901	0.997
Sciaenidae, Perciformes						
Johnius carutta Bloch, 1793	170	5.7	19.8	0.0118	2.892	0.998
Pennahia anea Bloch, 1793	254	5.6	20.8	0.0164	3.124	0.997
Leiognathidae, Perciformes						
Gazza minuta Bloch, 1795	157	3.5	18.4	0.0268	2.896	0.998
Eubleekeria splendens Cuvier, 1829	164	3.4	16.9	0.0458	2.749	0.997
Photopectoralis bindus Valenciennes, 1835	180	3.1	14.8	0.03666	2.618	0.995
Mullidae, Perciformes						
Upeneus vittatus Forsskål, 1775	165	7.0	21.6	0.0125	3.015	0.999
Trichiuridae, Perciformes						
Lepturacanthus savala Cuvier, 1829	210	9.0	63.2	0.00048	3.186	0.975
Trichiurus lepturus Linnaeus, 1758	153	16.0	89.4	0.0004	3.114	0.997
Synodontidae, Aulopiformes						
Saurida undosquamis Richardson, 1848	174	6.5	34.9	0.0186	2.947	0.998

n, sample size; length in cm; *a* and *b*, parameters of length-weight relationship; *r*2, coefficient determination

Conclusion

This study reports LWRs and maximum length values for fish species belonging to eight families viz., Engraulidae, Dussumieriidae, Mullidae, Sciaenidae, Leiognathidae, Haemulidae, Trichiuridae and Synodontidae. Findings of the study will contribute to the understanding of fish population and stock status of above listed species of east-coast of India and would be useful for fisheries management.

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References

1. Bertalanffy L. Von. A quantitative theory of organic growth. Human Biology. 1938; 10(2):181-213.
2. Beverton RJH, Holt SJ. On the Dynamics of Exploited Fish Population. Chapman and Hall, London. 1996, 533.
3. Draper NR, Smith H. Applied Regression Analysis. Wiley Series in Probability and Mathematical Statics, John Wiley and Sons, USA. 1981, 709.
4. Edwards AL. An Introduction to Linear Regression and Correlation. W. H. Freeman and Company, USA, 1976, 213.
5. Edwin Prabakaran Jeyasingh T, Thompson R, Deepak

Samuel V. A Study on length -weight relationships and morphometric characteristics of Fish Species Belonging to Three different families in Chennai Waters, India. Indian Journal of Applied Research. 2016; 6(8):261-264.
6. Fofandi MD. Population Dynamics and Fishery of Ribbonfish (*Trichiurus lepturus*) of Saurashtra Coast. doi:10.4172/scientific reports. 2012; 1:189.
7. Froese R. Cube law, condition factor and weight–length relationships: History, meta- analysis and recommendations. https://doi. org/10.1111/j.1439-0426.2006.00805.x.Journal of Applied Ichthyology. 2006; 22:241-253.
8. Froese R, Pauly D. (Eds). Fish Base. World Wide Web electronic publication. Retrieved from http://www.fishbase.orgVerson (16/2018).
9. Karna SK. Length–weight and length–length relationship of *Thryssa purava* (Hamilton, 1822), *Thryssa polybranchialis* (Wongratana, 1983) and *Thryssa mystax* (Bloch & Schneider, 1801) from Chilka lagoon, India. https://doi.org/10.1111/jai.13503. Journal of Applied Ichthyology. 2017; 33:1284-1286.
10. Kizhakudan Joe Shoba, Sitarami Reddy P. Length-weight relationship in three species of silverbellies from Chennai coast. Indian Journal of Fisheries. 2012; 59(3):65-68.
11. Le Cren ED. The length-weight relationships and seasonal cycle in gonad weight and condition in the perch (Perca fluviatalis).Journal of Animal Ecology. 1951; 20:201-219.
12. Mbaru EK, Mlewa CM, Kimani EN. Length-weight relationship of 39 selected reef fishes in the Kenyan coastal artisanal fishery. Fisheries Research. 2010, 106(3):567-569.
13. Nagarajan D. Fishery, biology and stock assessment of silverbellies (Pisces: Leiognathidae) exploited off Tuticorin Coast, Gulf of Mannar. Ph.D. Thesis, Manonmaniam Sundaranar University, Tamil Nadu. 2000; 143.
14. Pakhmode K Pallavi, Swapnaja A Mohite, Suresh D Naik, Ashish S Mohite. Length frequency analysis and length-weight relationship of ribbonfish, *Lepturacanthus savala* Cuvier, 1829 off Ratnagiri Coast, Maharashtra. International Journal of Fisheries and Aquatic Studies. 2013; 1(2):25-30.
15. Rajkumar U. Fishery and some aspects of population dynamics of goatfish *Upeneus vittatus* (Forskal) off Visakhapatnam. Journal of Marine Biological Association of India. 2004; 46(2):192-197.
16. Rao K, Venkatasubba. Length-weight relationship in *Saurida tumbil* and *S. undosquamis* and relative condition in *Saurida tumbil.* Indian Journal of Fisheries. 1983; 30(2):296-305
17. Rao T Appa. Length-weight relationship in *Pennahia macropthalmus* Bleeker and *Johnius carutta* Bloch. Indian Journal of Fisheries. 1982; 29(1, 2):263-266.
18. Rizvi F Anees, Deshmukh VD, Chakraborty SK. Comparison of condition factor of the ribbonfish *Lepturacanthus savala* Cuvier, 1829 and *Eupleurogrammus muticus* Gray, 1831 from Mumbai coast. Journal of Marine Biological Association of India. 2012; 54(1):26-29.