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Length-weight relationship and condition factor of four fishes of the Family Trichiuridae south west and east coast of India

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ABSTRACT: Cutlass fishes *Trichiurus gangeticus*, Gupta, 1966, *Eupleurogrammus glossodon*, (Bleeker, 1860) *Tentoriceps cristatus* (Kluzinger, 1884) and *Benthodesmus oligoradiatus*, Parin and Becker, 1970 were collected from the landing centers, off southwest, south east and northeast coast of India during 2020-2021. The present study estimated the length-weight relationship parameter b with the coefficient of determination r^2 scores using ordinary least squares regression method. The b values in the relationship $W=aL^b$ varied between 2.6306 to 3.3396 and the r^2 value ranged from 0.8 to 0.93. Also determined the condition factor of all the four fishes and it indicates wellbeing ranging from 1.02 to 1.1. Present study provides valuable inputs to the species management and stock assessment.

Key words: Cutlassfishes, Indian waters, length-weight relationship, Trichiuridae

The length-weight relationship (LWR) is used for estimating the weight of the fish in relation to length and to know the condition of the fish (Froese, 2006; Le Cren, 1951). It is an important parameter used for fisheries management and stock assessment (Froese, 2006; Froese *et al.*, 2011). Condition factor is used for monitoring the feeding intensity, age and growth rate in fishes and determining whether fishes are in good or poor condition (Uddin and Gish, 2021). From the Family Trichiuridae 15 species were reported from the Indian coast. However, information on LWR data and condition factor is limited to a few species viz., *Trichiurus lepturus*, *Lepturacanthus savala*, *Trichiurus auriga* and *Eupleurogrammus muticus* (James, 1967; Narasimham, 1970; Swain, 1993; Rizvi, 2001; Azadi and Ullah, 2008; Chakravarty *et al.*, 2012; Rizvi *et al.*, 2012; Pakhmode *et al.*, 2013; Kudale *et al.*, 2014; Bineesh *et al.*, 2018). Present study aimed to establish LWR details and condition factor of *Trichiurus gangeticus*, Gupta, 1966, *Eupleurogrammus glossodon*, (Bleeker, 1860) *Tentoriceps cristatus* (Kluzinger, 1884) and *Benthodesmus oligoradiatus*, Parin and Becker, 1970, belonging to the Family Trichiuridae. These estimates can be useful for the species management and fisheries stock assessment in the region.

MATERIALS AND METHODS

Present study collected specimens from different landing centres of the southwest and east coast of India,

Sakhthikulangara (Kerala), Tuticorin (Tamil Nadu) and Shankarpur (West Bengal) during 2020-2021. The specimens were identified using standard references (Day 1876; Goode and Bean 1895; Alcock 1899; FAO 1984; Smith and Heemstra 1986; Nakamura and Parin, 1993). The length was measured to the nearest 0.1 cm (Total Length, TL) using Digital Vernier caliper and weighed to the nearest 0.1 g (weight, W) using an electronic balance. The length weight was estimated using the regression formula $W=aL^b$, (Le cren, 1951; Froese, 2006) where W is body weight (g), L is the total length (cm), a and b are regression parameters. After converting the measurements into logarithmic values, least square regression of weight and length was derived by excluding the outliers ($\log W = \log a + b \log L$) (Petrakis and Stergiou, 1995). Coefficient of determination (r^2) and 95% of confidence interval of a and b estimated (Zar, 1984). Students't-test (Zar, 1984) was used to test the statistical significance of the isometric value ($b=3$). Analysis of Covariance (Zar, 1984) was also performed for comparing regression parameters of male and female. R software (R Core Team, 2021) was used for all statistical analysis.

The co-efficient of condition or the condition factor is an indicator to fish welfare in their habitat (Omogoriola *et al.*, 2011) The Relative condition factor (Le Cren, 1951) was estimated using the formula $K_n = W_o/W_c$ Where, W_o – weight observed and W_c – is weight calculated (aL^b)

RESULTS AND DISCUSSION

The length weight relationship of four fishes of the Family Trichiuridae has been carried out. Scientific name, sample size, length range and weight range and the estimated, regression parameters a and b, Coefficient of determination (r^2), 95% of confidence interval of a and b, are given in the Table 1. Results of Student's t-test (Pooled data) showed that b value *B. oligoradiatus*, *E. glossodon* and *T. cristatus* was statistically significant ($p < 0.05$) and b value of *T. gangeticus* was not significant. Results of ANCOVA showed that the curvilinear relationship for all the four species (ANCOVA, $p < 0.05$).

The mean condition factor with standard deviation of Fulton's condition factor and Relative condition factor is furnished in the Table 2 and the relative condition factor for the species *T. gangeticus*, *E. glossodon*, *T. cristatus*, and *B. oligoradiatus* found to be $Kn > 1$. While the Fulton's condition factor for all the species is $K < 1$.

LWR was established for four ribbonfish species namely, *T. gangeticus*, *E. glossodon*, *T. cristatus*, and *B. oligoradiatus*. The b value of *T. cristatus* ranged from 2.5463- 2.7149 and was statistically significant. From a study of LWR of *Tentoriceps cristatus* in South China Sea, the reported b value was 2.875 (Senta, 1975), which is nearer to the b value estimated by the present study. Hence, it can be inferred that *T. cristatus* follow negative allometric growth. Present study estimated the b value of *Trichiurus gangeticus* as 3.34 (Range 2.7409- 3.9383). Sastry (1980) reported a b value of 2.86 from Kakinada waters. Length range of specimens used by Sastry (1980) was 6.4 cm to 15.7 cm. Length range of specimens used by the present study was 36.9-49.7. This difference in the length class of specimens can be attributed as a reason for the differences in b value. However, statistical tests proved that this value is not significant, hence it can be inferred

Table 2: Condition factor of four fishes of the Family Trichiuridae from the south west, and east coast of India during 2020-2021

Species	Relative Condition Factor (Kn)
<i>Trichiurus gangeticus</i> Gupta, 1966	1.02±0.16
<i>Benthodesmus oligoradiatus</i> Parin & Becker, 1970	1.102±0.172
<i>Tentoriceps cristatus</i> (Klunzinger, 1884)	1.039±0.256
<i>Eupleurogrammus glossodon</i> (Bleeker, 1860)	1.07±0.069

that *Trichiurus gangeticus* follows isometric growth pattern.

Present study estimated b value of *E. glossodon* and *B. oligoradiatus* at 3.05 and 3.22 respectively and found significant. Hence, it can be inferred that these species follows allometric growth pattern. Coefficient of determination (r^2) was ranged from 0.8 to 0.9. This showed the strong relationship between the total length and the total weight of all these four ribbonfish species. Additionally, the regression parameters were compared with the Bayesian approach (Froese and Pauly, 2021), but the parameters were not within range. This may due to narrow size range of some species. Sample size, habitat, season, sex, diet, and gonadal maturity of specimens play a major role in LWR (Le cren, 1951, Bagenal and Tesch, 1978, Aneesh *et al.*, 2016). According to Froese (2006), b value of finfishes should be within the range of 2.5 to 3.5. Results of present study (a and b value) of four species were within this limit. Hence, it can be concluded the LWR of four species of ribbonfishes estimated by the present study can be used as input for understanding the stock status and hence for sustainable management of these species.

The Kn values of the present study ranged from 1.02 to 1.1, which shows wellbeing of the species. According to

Table 1: Length-weight relationship parameters of four fishes of the Family Trichiuridae from the south west, and east coast of India during 2020-2021

Species	N	Length range (cm)	Weight range (g)	(a)	(b)	95% CL of a	95% CL of b	r^2
<i>Trichiurus gangeticus</i> Gupta, 1966	34	36.9 - 49.7	11.8 - 34.4	0.000085	3.3396	0.00000901-0.000813	2.7409-3.9383	0.8013
<i>Benthodesmus oligoradiatus</i> Parin & Becker, 1970	66	30.6 - 63.6	8 - 86.5	0.00013	3.2205	0.00006093-0.000314	3.0071-3.4338	0.9342
<i>Tentoriceps cristatus</i> (Klunzinger, 1884)	268	21.9 - 79.8	5.5 - 227.5	0.00176	2.6306	0.001254-0.002486	2.5463-2.7149	0.9341
<i>Eupleurogrammus glossodon</i> (Bleeker, 1860)	54	31.2 - 41.8	13.5 - 31.8	0.000405	3.0509	0.000177-0.000931	2.819-3.2829	0.9305

Abbreviations: a, intercept; b, slope; CL, confidence limits; N, total number of samples; r^2 , coefficient of determination.

Bennet (1970), Sajeevan and Kurup (2015) and Jisr *et al.* (2018) relative condition factor value above 1 is considered as wellbeing bench mark value of a fish, hence fish with relative condition factor above wellbeing bench mark were considered to be in good condition. Results of the present study indicated that Cutlass fishes *Trichiurus gangeticus*, Gupta, 1966, *Eupleurogrammus glossodon*, (Bleeker, 1860) *Tentoriceps cristatus* (Kluzinger, 1884) and *Benthodesmus oligoradiatus*, Parin and Becker, 1970, occurring along south west, and east coast of India are in good condition throughout the study period.

CONCLUSION

Present study established LWR of four cutlass fishes. Results indicated that *Trichiurus gangeticus*, Gupta, 1966 follows isometric growth pattern. But, *Eupleurogrammus glossodon* (Bleeker, 1860) and *Benthodesmus oligoradiatus*, Parin and Becker, 1970, showed positive allometric growth pattern. *Tentoriceps cristatus* (Kluzinger, 1884) recorded a negative allometric growth pattern. Relative condition factor estimates revealed that all four cutlass fishes under the study are in good condition.

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REFERENCES

- Alcock, A. W. (1899). A descriptive catalogue on the Indian deep-sea fishes in the Indian Museum: Being a revised account of the deep-sea fishes collected by the Royal Indian marine survey ship Investigator II, India, Trustees of Indian Museum, Calcutta, 211 p. <https://doi.org/10.5962/bhl.title.4684>
- Aneesh Kumar, K. V., Thomy, R., Deepa, K. P., Hashim, M. and Sudhakar, M. (2016). Length–weight relationship of six deep-sea fish species from the shelf regions of western Bay of Bengal and Andaman waters, *Journal of Applied Ichthyology*, 32: 1334–1336. <https://doi.org/10.1111/jai.13164>
- Azadi, M. A. and Ullah, M. (2008). Length-weight relationship and relative condition factor of the ribbon fish, *Lepturacanthus savala* (Cuvier, 1829) from the Bay of Bengal, Bangladesh. *Chittagong University Journal of Biological Sciences*, 3(1): 119-126. 10.3329/cujbs.v3i1.13412
- Bagenal, T. B. and Tesch, F. W. (1978). Age and Growth. In: T.B. Bagenal, (ed). Methods for assessment of fish production in fresh water. Blackwell Science Publications, Oxford, UK, Pp: 101-136.
- Bennet, G.W. 1970. Management of lakes and ponds. Van Nostrand Reinhold, New York, 385p.
- Bineesh, K., Nashad, M., Aneesh Kumar, K. V., Akhilesh, K. V. and Hashim, M. (2018). Length–weight relationships of eight deep-sea fish species collected from the southwest coast of India. *Journal of Applied Ichthyology*, 34(5): 1220-1222. <https://doi.org/10.1111/jai.13745>
- Bleeker, P. 1860. Dertiende bijdrage tot de kennis der vischfauna van Borneo. *Acta Societatis Regiae Scientiarum Indo-Neerlandicae* v., 8 (4): 1-64.
- Chakravarty, M. S., Pavani, B. and Ganesh, P. R. C. (2012). Length-weight relationship of ribbonfishes: *Trichiurus lepturus* (Linnaeus, 1758) and *Lepturacanthus savala* (Cuvier, 1829) from Visakhapatnam coast. *Journal of the Marine Biological Association of India*, 54:99-101. <https://doi.org/10.6024/jmbai.2012.54.2.01711-18>
- DAY, F. (1876). Fishes of India, Vol. I, 778 pp. London. William Dawson & Sons Ltd. 1958. Trichiuridae from the Hooghly estuarine system. *Proceedings of the Zoological Society*, 19: 169-171. <https://doi.org/10.5962/bhl.title.62705>
- FAO. (1984). FAO species identification sheets for fishery purposes, In W. Ficher & G. Bianchi (Eds.), (Western Indian Ocean), Rome, Italy: Food and Agricultural Organization of the United Nations, Fishing area 51: Vol. 1- 4. <https://www.fao.org/3/ag419e/ag419e00.htm>
- Froese, R. (2006). Cube law, condition factor and weight length relationships: History, meta analysis and recommendations. *Journal of Applied Ichthyology*, 22(4): 241–253. <https://doi.org/10.1111/j.1439-0426.2006.00805.x>
- Froese, R., Tsiklirans, A. C. and Stergiou, K. I. (2011). Editorial note on weight-length relations of fishes, *Acta Ichthyologica et Piscatoria*, 41(4): 261–263. <https://doi.org/10.3750/AIP2011.41.4.01>
- Froese, R. and Pauly, D. (2021). (eds.) Fish base, World Wide Web electronic publication. Retrieved from <http://www.fishbase.org> version (08/2021)
- Goode, A. B. and T. H. Bean (1895). Oceanic ichthyology. *Memoirs of the Museum of Comparative*

- Zoology*, Harvard, 22: 1–553. <https://doi.org/10.5962/bhl.title.48521>
- Gupta, M. V. 1966. Two new species of ribbon-fishes of the genus *Trichiurus* Linnaeus (Pisces: Trichiuridae) from the Hooghly estuarine system. *Proceedings of Zoological Society Calcutta*, 19(2): 169-171.
- James, P. S. B. R. (1967). Comments on the four new species of ribbon-fishes (Family Trichiuridae) recently reported from India, *Journal of the Marine Biological Association of India*, 9(2): 327-338. <http://eprints.cmfri.org.in/id/eprint/981>
- Jisr, N., Younes, G., Sukhn, C. and El-Dakdouki, M.H. (2018). Length-weight relationships and relative condition factor of fish inhabiting the marine area of the Eastern Mediterranean city, Tripoli-Lebanon. *The Egyptian Journal of Aquatic Research*, 44(4): 299-305.
- Klunzinger, C. B. 1884. Die Fische des Rothen Meeres. E. Schweizerbart'sche Verlagshandlung (E. Koch), Stuttgart, ix+133 pp, taf. 1-3.
- Kudale, S. R. and Rathod, J. L. (2014). Length Frequency, Length-Weight and Relative Condition Factor of Ribbonfish, *Lepturacanthus savala* (Cuvier, 1829) from Karwar Waters, Karnataka State, *IOSR Journal of Environmental Science, Toxicology and Food Technology*, 8 (5): 25-31. [10.9790/2402-08512531](https://doi.org/10.9790/2402-08512531)
- Le Cren, E. D. (1951). The length-weight relationship and seasonal cycle in Gonad weight and condition in the perch (*Perca fluviatilis*). *Journal of Animal Ecology*, 20(2): 201–219. <https://doi.org/10.2307/1540>
- Nakamura, I., Parin, N.V. 1993. FAO species catalogue, vol. 15. Snake mackerels and cutlassfishes of the world (families Gempylidae and Trichiuridae). FAO Fish Synops 125, 1-7 + 1–136. <https://www.fao.org/3/t0539e/t0539e.pdf>
- Narasimham, K. A. (1970). On the length-weight relationship and relative condition in *Trichiurus lepturus* Linnaeus. *Indian Journal of Fisheries*, 17(1 & 2): 90-96. <http://eprints.cmfri.org.in/id/eprint/1373>
- Omogoriola, Hannah Omoloye, Akanbi Bamikole Williams, Oyeronke Mojisola Adegbile, Fisayo Christie Olakolu, Stella Ukamaka Ukaonu, Emmanuel Friday Myade. 2011. Length-weight relationships, condition factor (K) and relative condition factor (K_n) of Sparids, *Dentex congoensis* (Maul, 1954) and *Dentex angolensis* (Maul and Poll, 1953), in Nigerian coastal water. *International Journal of Biological and Chemical Sciences*, 5(2): 739-747.
- Pakhmode Pallavi, K., Swapnaja, A. Mohite., Suresh, D. Naik, Ashish and S. Mohite. (2013). Length-frequency analysis and length-weight relationship of ribbon fish *Lepturacanthus savala* (Cuvier 1829) off Ratnagiri coast Maharashtra. *International Journal of Fisheries and Aquatic Studies*, 1(2): 25-30.
- Parin, N. V. and V. E. Becker. 1970. Materials for a revision of the trichiurid fishes of the genus *Benthodesmus*, with the description of four new species and one new subspecies. *Proceedings of the Biological Society of Washington* v. 83 (33): 351-364
- Petrakis, G. and Stergiou, K. I. (1995). Weight-length relationships for 33 fish species in Greek waters. *Fisheries Research*, 21(3–4): 465–469. [https://doi.org/10.1016/0165-7836\(94\)00294-7](https://doi.org/10.1016/0165-7836(94)00294-7)
- R Core Team. (2021). R: A language and environment for statistical computing. R Foundation for Statistical Computing. Retrieved from <https://www.R-project.org/>
- Rizvi, A. F. (2001). Studies on two ribbonfish from Mumbai waters, Doctoral Thesis. University of Mumbai, Mumbai, 305p.
- Rizvi, F. A., Deshmukh, V. D. and Chakraborty, S. K. (2012). Comparison of condition factor of the ribbonfish *Lepturacanthus savala* (Cuvier, 1829) and *Eupleurogrammus muticus* (Gray, 1831) from Mumbai coast. *Journal of the Marine Biological Association of India*, 54(1), 26-29.
- Sajeevan, M.K and Kurup, B M. (2015). Length weight relationship and condition factor of Cobia *Rachycentron canadum* (Linnaeus, 1766) along northwest coast of India. *Fishery Technology*, 52 (2015): 184-186.
- Sastry, Y.A. (1980). The ribbonfish fishery of Kakinada during 1974-76, *Indian Journal of Fisheries*, 27 (182), 145-154.
- Senta, Tetsushi (1975). Re-description of trichiurid fish *Tentoriceps cristatus* and its occurrence in the South China Sea and the Straits of Malacca. *Journal of Ichthyology*, 21(2), 175-182. <https://doi.org/10.11369/jji1950.21.175>
- Smith, M. M. and Heemstra, P. C. (1986). Common names. In: M.M. Smith, P.C. Heemstra (eds). *Smiths' Sea Fishes*, Springer, Berlin, Heidelberg, Pp: 20-21.
- Swain, P. K. (1993). On the length-weight relationships and condition factor in the ribbonfish *Trichiurus lepturus* Linnaeus from Gopalpur (Orissa). *Mahasagar*, 26(2): 133-138. <https://doi.org/>

10.6024/jmbai.2012.54.2.01711-18
Uddin, N. and Ghosh, S., 2021. Length-weight relation and condition factor of *Coilia dussumieri* (Valenciennes, 1848) in the trawl fishery off Digha, West Bengal, India. *Journal of Entomology and Zoology Studies*, 9(2), pp 1-5.

Zar, J. H. (1984). Bio statistical Analysis. Prentice-Hall, London, 718 p.

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