Short Communication

Length-Weight Relationship of Two Creek Associated Mangrove Fishes, Gorai Creek, Mumbai, India

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ABSTRACT

The length-weight relationships were estimated for two creek associated mangrove fishes caught in Gorai creek, Mumbai, North-Western part of Maharashtra, India using dol nets. The dol net fishing took place from August, 2019 to July, 2020 in monthly intervals, using dol nets of equipped with mesh size of 280 mm at mouth part and 20 mm at cod end part of the dol net. The dol nets fabricated with nylon multifilament were operated from 6 to 25 m depth for 3–6 h each time deployed in 15 fishing trials. The total length and total weight of the combined sex group was recorded by using the logarithmic transformed data, linear regression analysis was performed to calculate a and b values for two fish species to establish length-weight relationships with respective coefficient of correlation and the 95% confidence intervals. A new maximum total length was recorded for two creek associated mangrove fishes, viz., *Escualosa thoracata* (10.1 cm) and *Bregmaceros mcclellandi* (10.5 cm).

Length-weight relationship (LWR) and relative condition factor (Kn) are two of the most important biological aspects to assess the growth and health condition of fish and general well-being and fitness of the ecosystem. In addition, LWR parameters will serves as a valid input data for estimation of biomass (Kimmerer *et al*., 2018), fish populations (Panda *et al*., 2016; Roul *et al*., 2017), population dynamics and stock assessment (Mendes *et al*., 2004), ecosystem models (Christensen and Walters, 2004). The variations from the estimated LWR of a species in any specific ecosystem indicates changes in ecology of the habitat or fish physiology or vice-versa (Jaiswar and Kulkarni, 2002). The information on LWR and Kn are important to plan a better conservation strategy of the fishery resources and valuable for establishing a monitoring, management system and allow future comparisons of these fish species.

Materials and methods

The Gorai creek, commercially used for the transportation, lies between the Borivali and Gorai village, Sub-urban Mumbai, Maharashtra (19.2253°N, 72.8215°E and 19.2282°N, 72.8059°E). For the present study, five different sampling sites were fixed such as, interior of the creek towards freshwater inlet (site-1: 19.2311, 72.8186), mid-way near to mangrove areas (site-2: 19.2214, 72.8071), ear to Essel World- Global Vipassana Pagoda (site-3: 19.2124, 72.8048), in near to off mangrove areas (site-4: 19.2063, 72.7992) and near to Gorai beach (site-5: 9.1997, 72.7952) towards the mouth of creek. The fishing trials were conducted along the creek area in monthly intervals from August, 2019 to July, 2020. The dol nets, measuring about 15 m in total length equipped with float line and hauling line made up of nylon Multifilament and lead line made of nylon, thermocole bundle or plastic drums (35l capacity) as floats; Stones / Steel iron (Irregular shape) used as sinkers were set in creek at the depth of 6–25 m around 2 am and hauled back around 7 am with

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a soaking duration of 3–4 h at each sampling date. In 15 fishing trails. Total length (TL) in cm was measured from the tip of the snout of the fish to the posterior tip of the caudal fin, to the nearest 0.1 cm by using a regular ruler validated against a vernier caliper. The corresponding total weight (TW) in g was measured using a digital balance with an accuracy of 0.1 g (Froese *et al.*, 2014, 2017). The parameters (a= intercept and b= Slope) were estimated by the length☐weight relationship formula, $W = a*L^b$ *i.e.*, log $W = \log a + b \log L$, where, L is the total length, W is the total body weight, a and b are the intercept and slope of the power equation, respectively (Froese, 2006; Froese and Pauly, 2021).

Results and discussion

A total of 3072 specimens belonging to 35 species, distributed under 7 orders, 21 families, and 29 genera, were recorded. The new maximum records (TL) of *E. thoracata* and *B. mcclellandi* is reported during the study. The results on the LWR estimates for the two studied species are presented in Tables I and II, providing for each species the sample size, size range covered as well as the means and 95% confidence intervals for both equation parameters a and b.

The information on LWR in fish is crucial for study on growth pattern-cum-behaviour, ecosystem health, trophic niche with habitat conditions, life history traits, and morphological characters of the fish (Froese, 2006). Our estimate for LWR equation ranges between 2.5 and 3.5 (Froese, 2006). The co-efficient of determination (R^2) for the corresponding b value was estimated as 0.9263, *Escualosa thoracata* (Valenciennes, 1847) and 0.9612 *Bregmaceros mcclellandi* Thompson, 1840 indicating better predictive power and smaller dispersion of the data. Though, Gorai creek ecosystem is an important ecosystem that provides different ecosystem services for coastal people, literature review revealed only limited studies on the aspects of its biodiversity (Datta *et al.*, 2010), checklist of flora and fauna, water quality assessment (Varshney *et al.*, 2006), health status (Balasaheb *et al.*, 2017; Kesavan *et al.*, 2021) and other ecological studies (Jaiswar *et al.*, 2007). The findings of the study are helpful in the management of the depleted fish stock with special reference to Unicorn cod. The LWR obtained for *Bregmaceros mcclellandi* Thompson, 1840 in the present study should be considered as tentative and needs further substantiation because despite the fact that our study offers a new maximum total length (TL_{max}), the number of specimens is to be increased for future validation and confirmation.

Table I. Species Checklist, Bayesian length-weight relationship and model estimates of two fishes.

Taxa	Lm/ Lmax	Bayesian length-weight		Model estimates/ global standards							
Scientific name (Common name)	(in cm)	a	b	PD_{50}	TS	R	V	PC	GCS	FS	TS
Order: Clupeiformes Family: Clupeidae											
Escualosa thoracata (Valenciennes, 1847)	(White sardine) --/10.0	0.00776 (0.00514 - 0.01173)	3.05 (2.93-3.17)	0.7500	3.2±0.11	H	L	L	LC/ NE/ NE	C	H
Order: Gadiformes Family: Bregmacerotidae											
Bregmaceros mcclellandi Thompson, 1840	(Unicorn cod) --/9.6	0.00372 (0.00152 - 0.00908)	3.19 (2.97-3.41)	0.5001	3.3±0.42	H	L	H	NE/ NE/ NE	C	H

Lm, length at first maturity; Lmax, maximum length reported; Bayesian length-weight, length-weight relationship study, (a: intercept, b: slope). Model estimates/ global standards, (PD_{50}, TS, R, V, PC, GCS, FS, TS); PD_{50}, phylogenetic diversity index; TS, trophic status; R, resilience (H, High; Me, Medium; l, Low); V, vulnerability (H, High; Mo, Moderate; L, Low); PC, price category (VH, Very High; H, High; Me, Medium; L, Low; Un, Unknown); GCS, global conservation status; IUCN/CITES/CMS, NT-near threatened; LC, least concern; DD, data deficient; NE, not evaluated; FS, fisheries status (HC, Highly Commercial; C, Commercial; MC, Minor Commercial (A: Aquaculture potential, Aq: Aquarium Potential, B: Bait, F: Food, G: Gamefish)). HTS, human threat status; (H, Harmless; P, Poisonous; T, Traumatogenic; V, Venomous).

Table II. Estimated LWRs paramters of two fish species from Gorai creek, Mumbai, India.

Species	n	TL (cm)		TW (g)		Regression parameters				
		Min	Max	Min	Max	a	95% CI a	b	95% CI b	R^2
Escualosa thoracata (Valenciennes, 1847)	70	4.8	10.1	3.1	13.7	0.0689	0.0021-0.1358	3.4722	2.9464-3.9981	0.9263
*Bregmaceros mcclellandi** (Thompson, 1840)	13	4.1	10.5	2.9	8.5	0.2103	0.0091-0.8395	2.7724	2.4611-3.0836	0.9612

n, sample size; TL, total length; TW, total weight; a, intercept; b, slope; CI, Confidence intervals; R^2, Co-efficient of determination; *Estimate is tentative.

IRB approval

The Institutional Review Board have given approval for the article through PME cell.

Ethical statement

No live specimens were used in the present investigation.

Consent for publication

All the authors have gone through the manuscript and agreed to submit the manuscript for publication.

Statement of conflict of interest

The authors have declared no conflict of interest.

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