TECHNICAL CONTRIBUTION

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Length–weight relationships of some fish from the Ganga River, India

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Abstract

Length–weight relationships (LWRs) were determined for seven riverine fish species from the river Ganga, India. Specimens were collected on a bi-monthly basis from April 2017 to December 2018 using gill nets (mesh size 22–34 mm), cast nets (mesh size 16 mm) and bag nets (mesh size 14–22 mm). Total length was measured to the nearest 0.1 cm using a digital caliper and weight was recorded to the nearest 0.01 g on an electronic balance. From estimated length–weight relationships, the values for parameter "*a*" ranged from 0.004 (*Bregmaceros mcclellandi* and *Setipinna tenuifilis*) to 0.014 (*Brachirus pan*). Likewise, the values for the parameter "*b*" of the equation ranged from 2.958 (*Bagarius bagarius*) to 3.124 (*Bregmaceros mcclellandi*) and r^2 from 0.978 (*Gonialosa manmina*) to 0.996 (*Brachirus pan*).

1 | INTRODUCTION

Length–weight relationship (LWR) is a common study in fisheries, used to estimate fish biomass at a given length and also to convert length measures into weight and vice-versa (Froese, 2006; Froese, Tsikliras, & Stergiou, 2011; Karna, 2017). LWRs can be useful when collected together with a number of other critical population parameters to develop predictive populations models, provided these data are obtained by a standardized sampling methods, where all investigators use—over the years—the same fishing methodology, including type of gear and sampling frequency.

In view of the importance of LWR information in fisheries management studies, many reports on this line from River Ganga have been published recently (Baitha, Karna et al., 2018; Baitha, Ray et al., 2018; Karna et al., 2018; Khan, Khan, & Miyan, 2012; Sarkar, Deepak, & Negi, 2009). But, LWR information for many important fish species from the river Ganga is not reported so far. Thus, the present study reports LWRs for additional species from the Ganga River system.

2 | MATERIALS AND METHODS

Sampling was conducted in the Ganga River from April 2017 to December 2018. Fishes were collected from Buxar (25°33'43.90"N

& 83°56'3.10"E), Patna (25°36'51.66"N & 85°12'7.02"E), Bhagalpur (25°15'28.338"N & 86°58'53.890"E), Farakka (24°47'38.478" N & 87°55'26.413"E) and Freserganj (21°35'40.58"N & 88°15'28.92" E) using mono-filament gill nets (mesh size 22–34 mm), cast nets (mesh size 16 mm) and bag nets (mesh size 14–22 mm). Species identity was confirmed using standard literatures for taxonomy (Jayaram, 1999; Talwar & Jhingran, 1991). Scientific names were checked in FishBase (Froese & Pauly, 2018). Total length (TL) was measured to the nearest 0.1 cm using a digital caliper and wet weight (W) was recorded to the nearest 0.01 g on an electronic balance.

The relationship between total length and body weight was determined by the linear regression analysis, Log W = Log a + b Log L, where W is the wet weight (g), L is the total length (cm), a is the intercept and b is the slope of the linear regression on the log-transformed weight and length data. Extreme outliers from the estimation were removed before analysis (Froese, 2006).

3 | RESULTS

Estimated parameters of length–weight relationship for the seven fish species are described in Table 1. All regression values were

TABLE 1 Descriptive statistics and length–weight relationship (LWR) parameters of fishes collected on bi-monthly basis from river Ganga in 2017–18

Family	Species	N	TL range (cm)	W range (g)	a	95% CI of a	b	95% CI of b	r^2
Sisoridae	*Bagarius bagarius* (Hamilton, 1822)	18	6.2–**81.5**	1.35–2,364.0	0.005	0.004–0.007	2.958	2.858–3.058	0.995
Bregmacerotidae	*Bregmaceros mcclellandi* Thompson, 1840	13	5.5–9.0	1.07–3.78	0.004	0.003–0.007	3.124	2.919–3.327	0.989
Soleidae	*Brachirus pan* (Hamilton, 1822)	14	2.8–11.1	0.37–21.56	0.014	0.011–0.017	3.049	2.934–3.165	0.996
Engraulidae	*Setipinna tenuifilis* (Valenciennes, 1848)	22	9.9–18.0	4.04–24.61	0.004	0.002–0.006	3.03	2.836–3.224	0.981
Clupeidae	*Gonialosa manmina* (Hamilton, 1822)	85	5.9–14.1	2.04–29.39	0.011	0.009–0.013	2.979	2.881–3.076	0.978
Sciaenidae	*Johnius coitor* (Hamilton, 1822)	10	7.3–16.5	4.16–45.68	0.009	0.006–0.014	3.052	2.851–3.252	0.993
Ariidae	*Arius arius* (Hamilton, 1822)	71	5.6–31.7	1.61–325.50	0.006	0.005–0.008	3.112	3.004–3.220	0.979

(N: sample size; TL: total length; W: body weight; a: intercept; b: slope of the linear regression; CI: confidence limits; r^2: coefficient of determination; TL in bold: new maximum length range used for LWR estimation).

highly significant ($p < 0.001$). In the present estimation, new TL_{max} was found for species *Bagarius bagarius*.

4 | DISCUSSION

Estimated exponent *b* values were within the expected range (2.5 to 3.5) of Carlander (1969) and Froese (2006) for all species. Also, the confidence limits were within the range of Bayesian predictive limits (Froese & Pauly, 2018). The size ranges covered in these LWR estimates were nearer to the known species specific L_{max}, but in some species sample size was quite low. Therefore, presented results may be considered as species specific. For *Bagarius bagarius*, presented LWR estimate includes a new and larger TL_{max} than in previous studies. Provided results are the baseline information for the studied species which can be used for subsequent biological investigations.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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