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Length–weight relationships of *Johnius coitor* (Hamilton, 1822), *Osteobrama cotio* (Hamilton, 1822), and *Gonialosa manmina* (Hamilton, 1822), from the River Ganga, India

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Abstract

The relationship between length and weight of three fish species *Johnius coitor* (Family Sciaenidae), *Osteobrama cotio* (Family Cyprinidae) and *Gonialosa manmina* (Family Clupeidae) unknown to Fishbase were studied from the Allahabad waters of the river Ganga in India. Fishes were captured bi-monthly from March 2017 to June 2018 using gill nets and cast nets of various mesh sizes. The *b* values determined from length–weight relationships (LWRs) were 3.246, 3.373 and 3.024 for *J. coitor*, *O. cotio* and *G. manmina*, respectively.

1 | INTRODUCTION

Length–weight relationships (LWRs) contribute important information to our studies on stock assessment, and population dynamics, provided a standardized sampling methodology is employed over a long term. They are part of biological investigations in fisheries (Beverton & Holt, 1957; Chu, Hou, Tsong-Ueng, & Wang, 2012; Ruiz-Campos, Gonzalez-Acosta, & Cruz-Aguero, 2006; Vicentin, Dos, Costa, & Suárez, 2012). Some of the recent reports on LWRs from India are that of Borah et al. (2017); Karna et al. (2017); Panda et al. (2016); Baitha et al. (2018). Basic information on length–weight relationships of *J. coitor*, *O. cotio* and *G. manmina* are lacking in the Ganga river system. In this context, the present investigation was undertaken to establish a relationship between the two variables viz. length and weight of the three fish species.

2 | MATERIALS AND METHODS

For the collection of specimens, samplings were carried out at various locations in the Ganga River around Allahabad during the period from March 2017 to June 2018 using cast nets (mesh size 6–14 mm) and gill

nets (mesh size 10–16 mm). The samples were transported in iced condition to the laboratory immediately after their capture for analysis. At laboratory, fish samples were identified to species level according to Talwar and Jhingran (1991) and Jayaram (2006). Subsequently, lengths were measured and weights determined. Total lengths (TL) of every specimen were measured with the help of digital caliper from the tip of the snout (mouth closed) to the extended caudal fin tip to the nearest 0.1 mm and total weights were measured by digital weighing machine to the nearest 0.01 g. The length weight relationship was determined by linear regression equation as $W = aL^b$ i.e., $\log W = \log a + b \log L$ where *a* is the intercept and *b* is the slope of the linear regression of the log-transformed weight (g) against the total length (cm), respectively (Le Cern, 1951). The statistical significance, 95% confidence intervals (CIs) of the parameters *a*, *b* and coefficient of determination (*r*²) were estimated.

3 | RESULTS

The sample size (*N*), size range, weight (*W*) range, regression parameters of *a* and *b* and coefficient of determination (*r*²) of the three fish species are given in Table 1. The *r*² values of *J. coitor*, *O. cotio* and *G. manmina* were calculated as 0.994, 0.979 and 0.952, respectively. All

TABLE 1 Estimated parameters from length-weight relationships of fishes collected bimonthly from Ganga River, around the area of Allahabad during March 2017–June 2018

Species	N	TL range (cm)	W range (g)	a	95% CL of a	b	95% CL of b	r ²	SE (b)
<i>Johnius coitor</i> (Hamilton, 1822)	48	4.9–16.9	0.73–41.41	0.0042	0.0036 – 0.0050	3.246	3.176 – 3.316	0.994	0.034
<i>Osteobrama cotio</i> (Hamilton, 1822)	121	5.5–10.5	1.47–14.09	0.0050	0.0041 – 0.0060	3.373	3.286 – 3.461	0.979	0.044
<i>Gonialosa manmina</i> (Hamilton, 1822)	244	4.3–11.3	0.82–14.11	0.0098	0.0084 – 0.0115	3.024	2.938 – 3.110	0.952	0.043

Note. N: sample size; TL: total length; W: body weight; a: intercept; b: slope of the linear regression; CL: confidence limits; SE (b): standard error of slope b; r²: coefficient of determination.

length-weight relationships were highly significant ($p < 0.001$) with r² values ranging between 0.944 to 0.979.

4 | DISCUSSION

For the selected three fish species, *J. coitor*, *O. cotio* and *G. manmina* calculated b values of the regression were within the expected range of 2.5–3.5 as per Froese (2006). The present study describes the first reference on LWRs for these three species. The maximum total length records in this paper are for all three species slightly smaller than those previously recorded (Froese & Pauly, 2018). The maximum length sizes observed in this study were 13.8 cm SL, 10.50 cm TL and 11.3 cm TL, respectively. The reduction in maximum sizes of all the three fish species might be due to the overfishing, size selectivity of the fishing gears, habitat modification and pollution in the river Ganga (Natarajan, 1989; Sarkar et al., 2011; Vass, Tyagi, Singh, & Pathak, 2010). This information would be useful for conservationists and fishery biologists for sustainable fishery management and conservation in the Ganga River.

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