LENGTH–WEIGHT RELATIONSHIPS OF FOUR FRESHWATER FISH SPECIES FROM SUBARNAREKHA RIVER AT PASCHIM MEDINIPUR, WEST BENGAL, INDIA

#**Sujit Kisku[1]**, #**Deep Sankar Chini[1]**, **Manojit Bhattacharya[2]**, **Avijit Kar[1]**, **Shampa Patra[3]**, **Mrinmay Ghorai[4]**, @**Bidhan Chandra Patra[1]**

[1] Centre For Aquaculture Research, Extension & Livelihood, Department of Aquaculture Management & Technology, Vidyasagar University, Midnapore- 721102, West Bengal, India .
[2] ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata- 700 120, West Bengal, India.
[3] Department of Zoology, Sabang Sajani Kanta Mahavidyalaya, Lutunia, Paschim Medinipur-721 166, West Bengal, India.
[4] Department of Zoology, Panskura Banamali College, Panskura R.S., Purba Medinipur, Panskura, West Bengal 721152, India.
#*Authors contributed equally the work.*
@Corresponding author: Professor Bidhan Chandra Patra, D.Sc
Mail id: *patrabidhan1962@gmail.com*

ABSTRACT
Present investigation emphasized on the Length-weight relationships (LRWs) of four freshwater fish species from the Subarnarekha River stretch of Paschim Medinipur District, West Bengal, India. Four Fish sample were collected and examined from the mentioned river sites May, 2017 to August, 2018 in a 15 days interval with the help of gill-nets (mesh size with 0.4 cm to 3.0 cm), scoop-nets (from 0.3×0.3 cm to 0.5×0.5 cm mesh size) and cast-nets (from 1.0×1.0 cm and 0.5×0.5 cm mesh size with up to 4.0 m^2 area) and also from the local fisher folk. In this LWRs analysis all the data are very much significant (all $r^2 > 0.95$) and the *b* values are reside in between 2.957 to 3.110.

KEYWORDS: Length–weight relationships, Freshwater fish, Subarnarekha River.

INTRODUCTION

For the assessment of fish biology, fish biomass and its local habitat the LWRs (length-weight relationships) data is a very important tool (Chini et al. 2018). Like other morphometric parameters, LWRs data may be changed depending on the lifecycle and other factors (Bhattacharya *et al.,* 2018). The LWRs of four freshwater fish species (*Hyporhamphus affinis, Opsarius barna, Pachypterus atherinoides* and *Lepidocephalichthys guntea*) were calculated to make available new LWRs from Subarnarekha River stretch of Paschim Medinipur, West Bengal. The information about LWRs can also help to develop the conservation strategies on specified fish habitat.

MATERIALS AND METHODS

Fish samples were collected from 26 different fishing sites of Subarnarekha river stretch (GPS start point, Lat 22°12′58.77″N; Long 86°43′42.51″E near Hatibari Forest Range and GPS end point, Lat 21°54′47.38″N; Long 87°14′30.92″E near Kunarpur) in the area of Paschim Medinipur district. *Osparius barna* sampled from upstream and *Hyporhamphus affinis* sampled from downstream and other two mentioned fish species were also collected from the Subarnarekha River and its extensions. These fish samples were collected in between May, 2017 to August, 2018 in a 15 days interval. Specimens are captured by using gill-nets with different mesh size (0.4 cm to 3.0 cm), scoop-nets (from 0.3×0.3 cm to 0.5×0.5 cm mesh size), cast-nets (1.0×1.0 cm and 0.5×0.5 cm mesh size with 3.0 to 4.0 m^2 area) and also from the local fisherfolk.

Fish samples were identified and classified taxonomically followed by standard protocol (AG 1991; Kisku et al. 2017; Nelson et al. 2016). After that, the TL (total length) and W (weight) of fish samples were calculated by using scale (TL ±0.1 cm) and digital weight machine (W ±0.01gram) with external power supply. The LWRs were measured by: *Log W = log a + b log L* formula, (in which, *b*= regression slope, *a*= regression intercepts and r^2= coefficient of determination) and the 95% CL (confidence limits) for *a* and *b* was also verified in which outliers of *log* transformed data were removed (Ricker 1973 and Froese 2006). Besides, the growth type also analyzed where b-values =3, then the growth type of fish species is known as isometric, but when b> 3, the growth is considered as positive allometric and when b<3 become consider as negative allometric growth for the particular fish species (Yapici *et al.,* 2015; Froese, 2006).

RESULTS

The statistical data on LWRs are given in Table 1 and Figure 1(a to d). The maximum (Max) and Minimum (Min) and range of TL (cm) and W (g) of mentioned fish species; *"a"* (intercept), *"b"* (slope), r^2 values and CL values at 95% level, growth type are also determined for the examined four species.

Table.1 : Length-weight relationship (LWRs) parameters and all statistical data for four fish species from river Subarnarekha stretch of Paschim Medinipur, West Bengal from May, 2017 to August, 2018 (every 15 days interval).

Family and Scientific Name	Total Length (cm) Min-Max	Weight (g) Min-Max	Parameters of the LWR n	α	b	CL 95% a	CL 95% b	r^2	Growth Type
1. Hemiramphidae *Hyporhamphus affinis* (Günther, 1866)	10.1-23.7	2.72-36.62	84	0.0026	2.957	0.002-0.003	2.863-3.053	0.979	-Ve Allometric
2. Cyprinidae *Opsarius barna* (Hamilton, 1822)	4.1-14.4	0.66-21.17	103	0.0084	3.001	0.007-0.009	2.954-3.099	0.985	Isometric
3. Schilbeidae *Pachypterus atherinoides* (Bloch, 1794)	5.1-16.2	1.12-42.12	157	0.0053	3.110	0.005-0.006	3.036-3.160	0.984	+Ve Allometric
4. Cobitidae *Lepidocephalichthys guntea* (Hamilton, 1822)	4.8-14.3	0.87-32.92	146	0.0059	3.103	0.005-0.007	3.034-3.172	0.982	+Ve Allometric

N: sample numbers; Min: Minimum; Max: Maximum; a: Intercept; b: slope; CL: confidence interval; r2: correlation coefficient.
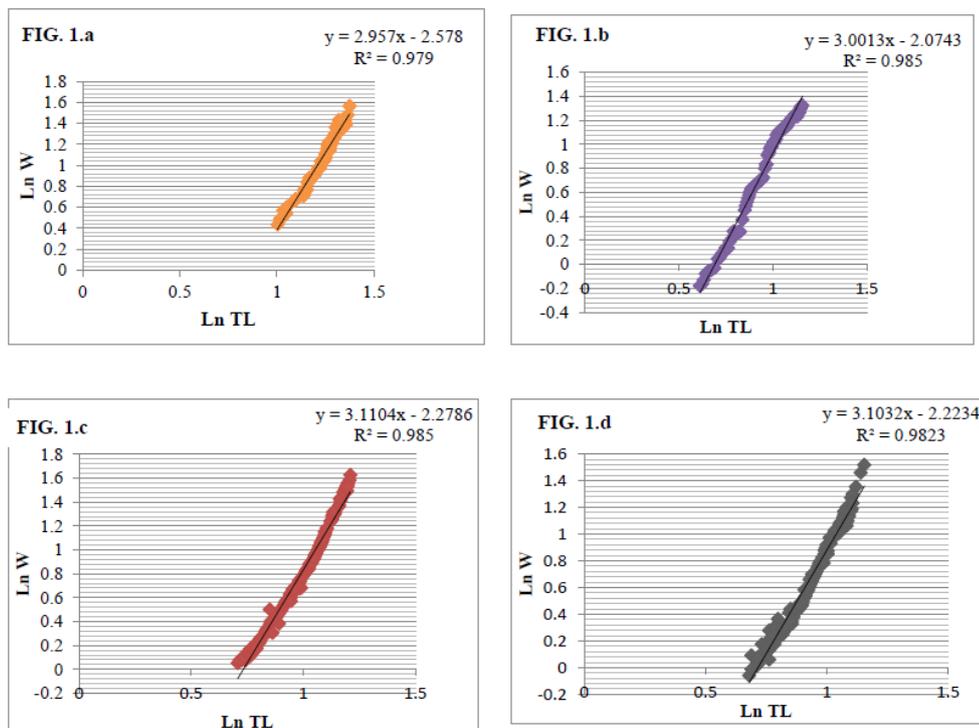

FIG. 1. Length-weight relationship (LWRs) of **(a.)** *Hyporhamphus affinis* **(b.)** *Opsarius barna* **(c.)** *Pachypterus atherinoides* **(d.)** *Lepidocephalichthys guntea* in linear form.

DISCUSSIONS

The *b* value in the equation which are derived from the LWRs of four freshwater fish sampled data are within the standard range value of *b* (2.5–3.5) as known fact (Froese 2006) with highly significant correlation data ($r^2 > 0.95$). The values for the regression slopes (parameter *b*) reflects the body shape of the species (Froese et al. 2014) where *b* values are ranged from 2.957 to 3.110 in this work. LWRs data on *Hyporhamphus affinis* (Günther, 1866) has included in this study where *b*=2.957. Moreover, different type of factors such as population dynamics, fishing time, sexual dimorphisms, local habitat, food chain, gonad maturity, age, nutritional values, specimen size, and seasonal changes might also have effected in LWRs analysis (not considered in this study).

CONCLUSION

This work will help as an essential database for upcoming studies on behalf of ecological, fishery stock management and fish biomass studies. The LWRs have shown that *H. affinis* have the negative allometric, *O. barna* have the isometric, and rest of the four other mentioned fish species have positive allometric growth type which have shown the present habitat scenario in Subarnarekha river stretch in Paschim Medinipur district.

ACKNOWLEDGEMENT

REFERENCES

AG TPJ. (1991). Inland fishes of india and adjacent countries. Vol. I and II. New Delhi, India:Oxford-IBH Publishing Co., Pvt. Ltd.Pp 1158.

Bhattacharya M., Kar A., Chini D.S., Malick R.C., Patra B.C., Patra S. and Das B.K. (2018). Length–weight relationship of nine Clupeiform fish species from the Digha coast, West Bengal, India. *J Appl Ichthyol.*34:1351–1353.

Chini D.S., Bhattacharya M., Kar A., Malick R.C., Patra B.C., Patra S. and Das B.K. (2018). Length–weight relationships of three freshwater fish species from Rupnaryan and Kangsabati River, West Bengal, India. *J Appl Ichthyol.*

Froese R. (2006). Cube law, condition factor and weight–length relationships: history, meta-analysis and recommendations. *J Appl Ichthyol.* 22:241-253.

Froese R., Thorson J.T. and Reyes Jr. R. (2014). A Bayesian approach for estimating length-weight relationships in fishes. *J Appl Ichthyol.* 30:78-85.

Kisku S., Chini D.S., Bhattacharya M., Kar A., Parua S., Das B.K. and Patra B.C. (2017). A cross-sectional study on water quality in relation to fish diversity of Paschim Medinipur, West Bengal, India through geoinformatics approaches. *Egypt. J. Aquat. Res.* 43:283-289.

Nelson J. S., Grande T. C., and Wilson, M. V. H. (2016). Fishes of the World. 5th edn. Hoboken, NJ: *John Wiley and Sons.* Pp 707.

Ricker W (1973). Linear regressions in fishery research. *J. Fish. Res. Bd. Can.* 30:409-434.

Yapici S., Karachle P. K. and Filiz H. (2015). First length–weight relationships of 11 fish species in the Aegean Sea. *J Appl Ichthyol.* 31(2): 398-402.