



Short Communication

Length-Weight Relationship of Four Fish Species from Liujiang River, China

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ABSTRACT

Length-weight relationships (LWRs) were estimated for four fish species [*Spinibarbus hollandi* (Oshima, 1919), *Distoechodon tumirostris* (Peters, 1881), *Bangana decora* (Peters, 1881), *Ptychidio longibarbus* (Fang, 1981)] from Liujiang River, China. Fishes were collected from local fish markets that using various fishing gears such as gillnets, castnets and shrimp cages in July and December 2018. The LWRs parameters a and b values for the four species varied 0.008861-0.02018 and 3.041-3.367. New maximum standard lengths for one species was presented in this paper. And the LWRs for two species: *Bangana decora* and *Ptychidio longibarbus* is reported for the first time. The result will be very helpful in fisheries management and species conservation.

Article Information

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Authors' Contributions

SZ and YL designed the study, performed the research, analysed the data and wrote the paper. YL and WC collected the data and wrote the manuscript. XL conceived and designed of the study.

Key words

Length-weight relationship, *Spinibarbus hollandi*, *Distoechodon tumirostris*, *Bangana decora*, *Ptychidio longibarbus*.

Liujiang River (107°27'-110°34' E, 23°41'-26°30' N) is the second largest tributary of the Pear River, with the length of 755 km and basin area of 5.8×10^4 km². It is located in subtropical regions, which presents a high diversity of fish species. There were 9 dams cascade on trunk stream of the Liujiang River, which serious threatened the fish habitat, diversity and resources, it is urgent to carry out targeted protection work. The information of the LWRs is very useful to estimate population growth in fish communities and the conservation and management strategies for fish stocks (Li *et al.*, 2015; Kimmerera *et al.*, 2005). Basic biological information for most fish species in Liujiang River is still rare. In the present study, our objective is to determine LWRs for four freshwater species in Liujiang River, and two of them which no available LWRs information in FishBase (Froese and Pauly, 2019).

Materials and methods

According to the fish breeding seasonal pattern, the investigations were carried out twice in July and December 2018 in Liujiang River. Fishes were collected from local fish markets that using various fishing gears such as drifting gillnets, castnets and shrimp cages. Specimens were identified to species level according to Chen (1998), Zhou *et al.* (2005), Zhang (2016) and Zheng (1989). Fish were measured for standard length (SL) to the nearest 1mm

and total weight (TW) to the nearest 0.1 g. All scientific names, authors and years were checked against FISHBASE (www.fishbase.org). The length-weight relationship was established using linear regression analysis, W vs. L (natural logarithms-transformed): $\ln W = \ln a + b \ln L$; where, W is total weight (TW g), L is standard length (SL cm), a is the intercept and b is the slope (Leonart *et al.*, 2000). The power of the relationship was calculated r^2 (coefficient of determination). Within species, log-log plots were constructed to remove outliers. The 95% confidence limits for b (CL 95%) were calculated to determine if the hypothetical value of isometry fell within these limits (Froese, 2006). In all cases, a significance level (α) of 5% was adopted. All statistical analysis was performed in the software R 3.6.3.

Results

In this present study, four species belonging to Cyprinidae family were collected, and the length and weight data used to analyze length-weight relationships. Descriptive statistics and estimated LWR parameters are given in Table I. The numbers of individual fish specimens varied from 13 to 47 (Table I). The r^2 values ranged from 0.901 to 0.996; values of b varied from 3.041 (*Spinibarbus hollandi*) to 3.367 (*Ptychidio longibarbus*), and all species except for *Ptychidio longibarbus* fell within the range $2.5 < b < 3.5$ recommended by Froese (2006). Intercept value (a) ranged between 0.008861 for *Distoechodon tumirostris* and 0.02018 for *Spinibarbus hollandi*.

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Table I.- Descriptive statistics and length-weight relationship parameters for four fish species from Liujiang River, China.

Family	Species	N	SL range (cm)		TW range (g)		Length-weight relationships (LWR)				
			Min	Max	Min	Max	<i>a</i>	<i>b</i>	<i>r</i> ²	<i>a</i> CL 95%	<i>b</i> CL 95%
Cyprinidae	<i>Spinibarbus hollandi</i> Oshima, 1919	43	6.0	32.2	4.2	771.4	0.02018	3.041	0.996	0.01708-0.02384	2.969-3.114
	<i>Distoichodon tumirostris</i> Peters, 1881	47	5.8	34.5	2.0	903	0.008861	3.238	0.988	0.006757-0.01162	3.133-3.343
	<i>Bangana decora</i> Peters, 1881*	13	7.6	24.8	12.2	640.0	0.01266	3.298	0.975	0.004990-0.03213	2.961-3.636
	<i>Ptychidio longibarbus</i> Fang, 1981*	14	10	19.5	27.6	230	0.01133	3.367	0.901	0.002227-0.05762	2.751-3.984

N, number of individuals; SL range, standard length range; TW range, total weight range; Min, minimum; Max, maximum; *a*, intercept; *b*, slope; CL, confidence limits; *r*², coefficient of determination. Bold, maximum standard lengths exceeding those in FISHBASE; *No LWR reference in FishBase.

Discussion

For studying relationship between length and weight of fishes is widely considered to be an important way to understand fish growth and reproduction (Le Cren, 1951). The LWRs of four species in Liujiang were highly significant, with *r*² values > 0.9. The values of parameter *b* remained within the expected range of 2.5-3.5 (Froese, 2006). The difference of *b*-values might be related with several factors, such as species, gonad maturity, season, or environmental conditions (Yin, 1995).

The numbers of some fish species examined in the present study is relative small. For example, *Bangana decora* and *Ptychidio longibarbus* only 13 and 14 individuals were collected, which because of its limited suitable habitats. Population of four fish species is relatively scarce in Liujiang River, China, and there were no available data of LWRs for two of them in FishBase (Froese and Pauly, 2019). New maximum standard lengths for *Ptychidio longibarbus* was presented in this paper, and the LWRs for two species: *Bangana decora* and *Ptychidio longibarbus* is reported for the first time.

In conclusion, this study provides basic biological information on LWRs for four fish species that will be useful for fishery management and conservation in Liujiang River.

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Statement of conflict of interest

The authors declare no conflict of interest.

References

- Chen, Y.Y., 1998. *Fauna Sinica, Osteichthyes, Cypriniformes II*. Science Press, Beijing, China.
- Froese, R., 2006. *J. appl. Ichthyol.*, **22**: 241-253. <https://doi.org/10.1111/j.1439-0426.2006.00805.x>
- Froese, R. and Pauly, D., 2019. *FishBase, version 06/2019*. World Wide Web electronic publication. Retrieved from <https://www.fishbase.org>
- Kimmerera, W., Aventa, S.R., Bollensa, S.M., Feyrerb, F., Grimaldob, L.F., Moylec, P.B., Nobrigaa, M. and Visintainera, T., 2005. *Trans. Am. Fish. Soc.*, **134**: 481-495.
- Le Cren, E.D., 1951. *J. Anim. Ecol.*, **20**: 201-219. <https://doi.org/10.2307/1540>
- Li, L., Wei, Q.W., Wu, J.M., Xie, X., Ren, L. and Du, H., 2015. *J. appl. Ichthyol.*, **31**: 242-243. <https://doi.org/10.1111/jai.12622>
- Lleonart, J., Salat, J. and Torres, G.J., 2000. *J. Theoret. Biol.*, **205**: 85-93. <https://doi.org/10.1006/jtbi.2000.2043>
- Yin, M.C., 1995. *Fish ecology*. China Agricultural Press, Beijing, China.
- Zhang, C.G., 2016. *Species diversity and distribution of inland fishes in China*. Science Press, Beijing, China.
- Zheng, C.Y., 1989. *Fishes in Pearl River*. Science Press, Beijing, China.
- Zhou, J. and Zhang, C.G., 2005. *Freshwater fishes of Guangxi, China*, 2nd edition. Guangxi People's Publishing House, Nanning, China.