Research Article

Open Access

CrossMark

Length–weight relationships of four fish species from Zhoushan, China

Abstract

The length–weight relationships(LWR) were determined for four fish species (*Johnius fasciatus* Chu, Lo & Wu, 1963, *Gerres japonica* Bleeker, 1854, *Sillago sihama* Forskal, 1775 and *Konosirus punctatus* Temminck & Schlegel,1846) belonging to four families. Samples of four kinds of fish were collected from Zhoushan of China in four times, once every four months. Bottom trawling was used to catch four kinds of fish. The sampling time was from July 2018 to July 2019. This study provides the LWR parameters for *Johnius fasciatus, Gerres japonica, Sillago sihama and Konosirus punctatus*. The purpose of this study is to provide reference for the reasonable development and protection of these four fishery resources.

Keywords: length-weight relationship, fishery resources

Kun Zhang,[1,3] Hua Zhang,[2] Hongling Ping,[1,3] Liqin Liu,[1,3] Lihua Jiang,[1,3] Li Gong,[1,3] Zhenming Lü,[1,3] Bingjian Liu[1,2,3]

[1]National engineering Laboratory of Marine Germplasm Resources Exploration and Utilization, Zhejiang Ocean University, China
[2]Key Laboratory of Tropical Marine Bio-resources and Ecology, Chinese Academy of Sciences, China
[3]National engineering research center for facilitated marine aquaculture, Marine science and technology college, Zhejiang Ocean University, China

Correspondence: Bingjian Liu, National engineering Laboratory of Marine Germplasm Resources Exploration and Utilization, Zhejiang Ocean University, China, Tel +86 580 8180386, Email bjetbj@163.com

Received: September 28, 2020 | **Published:** October 12, 2020

Introduction

Zhoushan is located in the east of Zhejiang Province, which is rich in fishery resources. However, in recent years, fish resources have been seriously damaged by human activities, such as overfishing, chemical pollution and non-native species. Therefore, the length-weight relationship (LWR) is important data for fishery research.[1,2] Chinese Sea supports highly diverse and endemic species of fishes.[3] Meanwhile, Length–weight relationship (LWR) is a basic tool in fish science and fisheries management.[4] This paper introduces the relationship between body length and body weight of four kinds of fishes.

Materials and methods

Working with local fishermen, from July 2018 to July 2019, fish samples were collected using commercial trawls (mesh size: 10mm), once every three months, four times in total. The weight and body length of the four kinds of fish were measured immediately after catching, in the laboratory. The body weight and body length of the four kinds of fish were measured to 0.1g and 0.1cm respectively. Then the morphological method was used to identify the four kinds of fish. The expression of the relationship function between body length and body weight is $W=aL^b$, where W is the weight (g) and L is the total length (cm), was fitted with a simple linear regression model using log-transformed data.[5] The 95% confidence interval (CI) was determined for parameters a and b.[2]

Results

The analysis results of the four fishes in this study were showed in Table 1.These kinds of fish have commercial value, which is very common in the local area, and the most abundant species was *Johnius fasciatus*. For these four kinds of fish, the values of parameter b varied between 2.89 and 3.41 and the coefficient of determination values (r^2) ranged from 0.951-0.975.

Table 1 Parameters of relationship between length and weight of four fishes in Zhoushan of China from July 2018 to July 2019

Family	Species	Common name	N	Total length range (cm)	Weight range (g)	a	b	95% CI of a	95% CI of b	r^2
Sciaenidae	*Johnius fasciatus* Chu, Lo & Wu, 1963	Cá Uốp	29	7.8-9.9	7.6-18.1	0.0235	2.89	0.0056-0.0604	2.53-3.27	0.951
Gerridae	*Gerres japonica* Bleeker,1854	Japanese silver-biddy	24	6.9-9.2	7.4-20.2	0.0342	2.93	0.0246-0.0732	2.36-3.49	0.956
Sillaginidae	*Sillago sihama* Forskal,1775	northern whiting	27	8.7-12.2	5.3-18.7	0.0291	3.41	0.0279-0.0525	3.22-3.80	0.961
Clupeidae	*Konosirus punctatus* Temminck & Schlegel,1846	Konoshiro gizzard shad	30	8.6-13.4	8.6-20.8	0.0038	3.12	0.0028-0.0101	2.98-3.75	0.975

N, number of individuals; a, intercept; b, regression coefficient; CI, confidence limits; r^2, coefficient of determination (Adjusted R-squared).

Discussion

In our study, parameter b ranged from 2.89 for *Johnius fasciatus* to 3.41 for *Sillago sihama*, and the range of parameter a is 0.0029 for *Sillago sihama* to 0.342 for *Gerres japonica*. The r^2 values in all LWRs of all fish species were >0.95 and the values of parameter b remained within the expected range of 2.5–3.5.[2] In selected fish stocks, the calculated "b" value is within the estimated range of 2.5 to 3.5, taking into account the different variables that affect these values such as growth stage, food supply, feeding rate, gonadal development and spawning, which can be considered within the expected range of fish stocks.[2,6] In this study, the correlation coefficient of LWR of *Johnius fasciatus* was the lowest 0.951, and the correlation coefficient of LWR of *Konosirus punctatus* was extremely high, reaching 0.975. The analysis results of *Johnius fasciatus* in this study are basically consistent with those of Lei et al.[5] The parameters of these assessments should be measured only as annual averages for these species, as the data are collected over a considerable period of time and do not represent any particular season.[7] In a word, this study provides basic LWR data of four kinds of fish species, and provides a certain reference value for the reasonable development and protection of Fisheries in Zhoushan of China. Further research is certainly needed, including more parameters than length and weight, in order to better understand and manage fisheries resources in this highly valuable ecosystem.

Conflicts of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

Ethics approval

The sample collection was strictly conducted under national ethical guidelines (Regulations for Administration of Affairs Concerning Experimental Animals, China, 1988) for animal husbandry and humane treatment.

Acknowledgements and Funding

References

1. Le Cren ED. The length-weight relationship and seasonal cycle in gonad weight and condition in the Perch (*Perca fluviatilis*). *Journal of Animal Ecology*. 1951;20:201–219.

2. Froese R. Cube law, condition factor and weight-length relationships: History, meta-analysis and recommendations. *Journal of Applied Ichthyology*. 2006;22(4):241–253.

3. Xiong W, Zhu G, Wang Z, Ye N. Length-weight relationships of four fish species from mangrove of Zhanjiang, China. *Journal of Applied Ichthyology*. 2017;34(1):167–168.

4. Xiong W, Tao J, Zhang D, et al. Length-weight relationships for four small fish species caught in wetland of central Y angtze River, China. *Journal of Applied Ichthyology*. 2015;31(1):219–220.

5. Lei J, Su J, Xiong W, et al. Length-weight relationships of two fish species from sanniang bay of guangxi, china. *Journal of Applied Ichthyology*. 2018;34(4):990-991.

6. Safran P. Theoretical analysis of the weight-length relationship in fish juveniles. *Marine Biology*. 1992;112:545–551.

7. Naranji MK, Velamala GR, Netto Ferreira AL. Length-weight relationships of 10 coastal fish species from the Visakhapatnam coast, India. *J Appl Ichthyol*. 2019;35:1172–1175.