



Length-Weight Relationships of Five Indigenous Fish Species From the Daya Bay, China

Song Jiang¹, Xiaoqi Guo^{2*}, Zhenbiao Ye³, Ziying He⁴, Jieyi Wang¹

¹Shenzhen Base of South China Sea Fisheries Research Institute, Chinese Academy of Fishery Sciences, Shenzhen, China

²Guangdong Agricultural Technology Promotion Center, Guangzhou, China

³Zhuhai Changfeng Aquatic Seed Technology Co., LTD, China

⁴Guangzhou Yutou Aquaculture seedlings Co.LTD, China

Correspondence

Xiaoqi Guo

Guangdong Agricultural Technology
Promotion Center, Guangzhou, 510145,
China

E-mail: 13826008062@163.com

Abstract

The present study describes new estimates of length-weight relationships (LWRs) for 5 indigenous fish species collected from the South China Sea, Daya Bay (22°30'-22°50' N, 114°29'-114°49' E). The fishes were collected quarterly (Spring, Summer, Autumn and Winter) from 2019 to 2021 with multi mesh composite gill nets (35.0 m long, 4.0 m high, and mesh size 15.0–116.0 mm). Total length (to nearest 0.01 cm, L) and total weight (to nearest 0.01 g, W) were determined. The estimate of coefficient b for species ranged positively from 2.489 to 4.146, respectively. The coefficient of determination (r^2) for each species with range of 0.93–0.97. Findings of this study have implications in the management and conservation of the species-specific fisheries resources within the geographical range.

Introduction

Daya Bay is an important bay in the South China Sea, located between the Red Bay and Dapeng Bay in the eastern part of Guangdong Province. Daya Bay located between latitude 22°30'-22°50' N and longitude 114°29'-114°49' E [1,2]. Daya Bay is located north of the coastal mountain range, with the eastern and western sides covered by the Pinghai Peninsula and Dapeng Peninsula, with a depth of 26 kilometers, a total area of 650 square kilometers, and a coastline of 52 kilometers [3]. The salinity of the seawater in Daya Bay ranges from 25 ‰ to 30.69 ‰, and it is rich in aquatic resources, making it one of the important fishing grounds in Guangdong Province [4,5]. With intense fishing pressure in Daya Bay, overfishing and high by-catch levels have become a matter of great apprehension [6]. To assess the current status of fish stocks, this study describes the length-weight relationship (LWR) for five fishes from Daya Bay.

Materials and methods

This study was carried out in Daya Bay (22°30'-22°50' N, 114°29'-114°49' E) in South China Sea. A total of 24 sampling areas were distributed covering the whole bay, and fish specimens were collected quarterly (Spring, Summer, Autumn and Winter) with multi mesh composite gill nets (mesh size: 9.2×9.2 cm, 4.9×4.9 cm, 1.5×1.5 cm, 2.8×2.8 cm, 11.6×11.6 cm, 1.6×1.6 cm, 6.5×6.5 cm, 4.8×4.8 cm; 3.1×3.1 cm, 7.2×7.2 cm, 5.1×5.1 cm; with 4.0 m long for each mesh,

and a total length of 35 m.) from 2021 to 2022. The soaking time of the gill nets usually set for 12 h, fish specimen was individually identified according to the morphological classification in the laboratory. Total length (L) was accurate to 0.01 cm with caliper, and body weight (W) was accurate to 0.01 g.

Length-weight relationship was calculated as $W = aL^b$, where a is the intercept and b is the exponent or the slope. The curvilinear relation was converted into linear form by logarithmic transformation: $\log(W) = \log(a) + b \times \log(L)$. The parameters “ $\log(a)$ ” is the intercept and “ b ” is the slope [7]. The log-log plots were developed to detect and exclude outliers before regression. Degree of linear association between total length and weight was estimated from the coefficient of determination (r^2). Outliers, identified from logarithmic plots of length and weight, mostly due to damage caused by trawling were excluded from the analysis [7-10]. Sampling was carried out round the year, for three years and therefore, the present estimates are assumed to be independent of temporal influence.

Results

The sample size, length range (TL), weight range (BW), and LWRs with 95% CI of a and b , and coefficient of correlation (r^2) of 5 indigenous fish species collected from river Daya Bay are shown in table 1. Slope of the linear regression (b) value ranged from 2.489 to 4.146. All the LWRs were highly significant ($P < 0.05$) with coefficients of determination (r^2) ranging from 0.9–0.97.

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Table 1. Descriptive statistics and estimated length-weight relationship parameters for 5 indigenous fish species collected in Daya Bay

Species	N	Size range in cm (mean \pm SE)	Weight range in gm (mean \pm SE)	Antilog a	95% CI of a	b	95% CI of b	r ²
<i>Siganus guttatus</i> (Bloch, 1787)	421	8.40-22.30 (17.16 \pm 2.31)	13.60-203.40 (89.28 \pm 38.42)	0.02442	0.00578-0.00694	3.119	2.874-3.256	0.96
<i>Pseudosciaena polyactis</i> (Bleeker, 1877)	81	6.38-13.62 (10.15 \pm 1.02)	4.08-37.25 (18.36 \pm 5.87)	0.04367	0.00542-0.00861	4.146	3.748-4.374	0.94
<i>Jaydia lineata</i> (Temminck & Schlegel, 1842)	56	1.81-13.23 (8.11 \pm 1.38)	0.61-33.95 (20.14 \pm 3.77)	0.04495	0.03621-0.05613	2.489	2.354-2.702	0.97
<i>Drepane punctata</i> (Linnaeus, 1758)	176	5.24-37.16 (19.37 \pm 2.56)	1.36-1208.4 (562.17 \pm 40.96)	0.00541	0.00282-0.00962	3.406	3.251-3.703	0.93
<i>Trachinotus ovatus</i> (Linnaeus, 1758)	238	5.63-38.25 (18.52 \pm 3.54)	1.42-1301.4 (587.39 \pm 48.37)	0.00562	0.00271-0.00946	3.328	3.184-3.692	0.95

Discussion

This study provided first basic information on LWRs for *Siganus guttatus*, *Pseudosciaena polyactis*, *Jaydia lineata*, *Drepane punctata* and *Trachinotus ovatus*, and wider size range for *D. punctata* and *T. ovatus*, though some of the estimates are to be considered as tentative because of the limited size range covered. Thus, further studies are needed to assure a better insight into the morphometrics of these species

In the present study, b value for all the 5 fish species were within the range of 2.489-4.146. Differences in b values can be attributed to various intrinsic and extrinsic factors viz., sample size and size range of the specimens caught, environmental conditions, feeding habit, sex and sexual maturity, and general fish health affect [11-13], which are not accounted in this study. Moreover, LWRs in this study may be affected by many factors, such as sampling season, section location, stomach fullness, sex ratio and growth phase. This research can be helpful for further assess the fishery research of Daya Bay, South China Sea in China.

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Data availability statement

The authors confirm that the data supporting the findings of this study are available within the article and its supplementary materials.

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