THE LENGTH-WEIGHT RELATIONSHIP OF THE DUCKBILL SLEEPER *Butis butis* (Hamilton, 1822)

MỐI QUAN HỆ GIỮA CHIỀU DÀI VÀ KHỐI LƯỢNG CỦA CÁ BỐNG TRÂN *Butis butis* (Hamilton, 1822)

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Tóm tắt - Cá bống trân Butis butis (Hamilton, 1822) là loài cá có vai trò thực phẩm quan trọng ở Đồng bằng sông Cửu Long, Việt Nam; nhưng thông tin về quan hệ giữa chiều dài và khối lượng (LWR) và hình thức tăng trưởng của loài này vẫn chưa được biết đến. Nghiên cứu này được thực hiện ở Nhà Mát và Gành Hào, Bạc Liêu nhằm bổ sung kiến thức thiết yếu về LWR và hình thức tăng trưởng của loài này. Kết quả phân tích 141 mẫu cá bắt được bằng lưới đáy từ 6/2015 đến 5/2016 cho thấy số lượng cá đực nhiều hơn cá cái. Trung bình chiều dài của cá đực (10,28±0,25 cm) khác biệt không có ý nghĩa thống kê so với cá cái (10,29±0,39 cm). Tương tự, trung bình khối lượng của cá đực (13,04±1,08 g) gần bằng với cá cái (13,70±1,59 g). Khối lượng của loài này có thể được ước lượng từ chiều dài đánh bắt vì hệ số xác định của LWRs của loài này cao. Loài này thuộc nhóm tăng trưởng bất đẳng do hệ số tăng trưởng của chúng nhỏ hơn 3 (chiều dài tăng nhanh hơn khối lượng).

Từ khóa - *Butis butis;* tăng trưởng bất đẳng; tương quan chiều dài và khối lượng; hệ số dốc; Bạc Liêu.

Abstract - The Duckbill sleeper Butis butis (Hamilton, 1822) is an important fish for food in the Mekong Delta, Vietnam; however, information about the fish length and weight relationship (LWR) and growth pattern have not been known. The present study is conducted in Nha Mat and Ganh Hao, Bac Lieu to contribute fundamental knowledge about LWR and growth pattern of this goby. Data analysis based on a total of 141 individuals fish caught by gill nets from June 2015 to May 2016 shows that male B. butis outnumber females. The mean length of males (10.28±0.25 cm) is not significantly different from its counterpart (10.29±0.39 cm). Similarly, the average weight of males (13.04±1.08 g) is near to females (13.70±1.59 g). The fish weight could be estimated from fish length because of high determination values of LWRs. It displays negative allometric growth since its slope value is lower than three (fish length increases faster than fish weight).

Key words - *Butis butis;* negative allometric growth; length-weight relationship; slope value; Bac Lieu.

1. Introduction

The Duckbill sleeper *Butis butis* (Hamilton, 1822), a gobiid species of Eleotridae family, distributed from the marine to the freshwater in Indo-West Pacific regions, ranging from East Africa to Fiji [11] and in the Mekong Delta, Vietnam [15, 16, 22]. This goby is a commercial fish in the Mekong Delta especially in Bac Lieu Province; however, there is little known about this goby such as external morphology, distribution and environmental adaptation [22, 11]. Meanwhile, its LWRs, a fundamental indicator for fish stock assessment and management [18, 12, 2, 8], are limited. Additionally, its growth parameter, e.g., slope parameter (*b*), a bio-indicator for fish growth pattern determination [10], has not been known. This study aims to provide fundamental knowledge about its LWRs and growth pattern which will be used for fishery stock assessment at the study site.

2. Solutions

The gill nets (1.5 mm in cod end mesh size) were used to collect monthly fish specimens along mangrove forests at Nha Mat (9°12'15.8"N 105°43'51.8"E) and Ganh Hao (9°06'12.9"N 105°29'47.8"E), Bac Lieu, Vietnam from June 2015 to May 2016. Fish specimen were stored in 10% formalin plastic jars after collection and transported to the Laboratory. Fish length and weight were determined to the nearest 0.1 cm and 0.01g, respectively, after sexing based on its external genital morphology, e.g., oval shape in female and triangle shape in male [9].

Fish length and weight relationships are calculated using the equation $W = a \times TL^b$ of Ricker (1973) [19], where W is fish weight, TL is the fish total length, and *a* (intercept) and *b* (slope value) are two model parameters. The *a* and *b* values are obtained by using logarithmic form $LogW = Loga + b \times LogTL$ [10].

The differences in fish length and weight and percentage of male and female *B. butis* were tested using t-test and χ^2 test, respectively. The variations in growth parameter (*b*) with genders are also examined by t-test. The linear regression is used to determine the LWRs of this goby. All tests are set at the meaningful value of 5% and performed by Minitab v17.0.

3. Study results and comments

3.1. Sex ratio and morphometric data

Female *Gobus vittatus* outnumbers its counterparts as males do nest tending [14], that is also found in the goby *Gobius niger* [20], while the proportion of female *B. butis* (n = 48) is significantly less than males (n = 93, χ^2 = 14.36, P < 0.05). Unlike *B. butis*, the 1:1 of sex ratio is found in some gobiid species distributing in the same habitat with *B. butis* including *Pseudapocryptes elongatus* [21], *Boleophthalmus boddarti* [4], *Parapocryptes serperaster* [5, 8], *Trypauchen vagina* [6] and *Oxyeleotris urophthlamus* [7].

Fish length and weight of *B. butis* do not significantly vary with genders (t-test, P > 0.05 in all cases, Table 1). Likely, a similarity in fish size is found in some other gobies including *Pseudapocryptes elongatus* [21], *Periophthalmus barbarus* [1], *Parachaeturichthys*

ocellatus [17] and *O. urophthlamus* [7]. It suggests that these gobies can reach noteworthy size.

Table 1. *The morphometric data of male and female B. butis at the study site*

Genders	Mean±SE	
	Fish length	Fish weight
Male	10.28±0.25 cm	13.04±1.08 g
Female	10.29±0.39 cm	13.70±1.59 g
t-test	0.02	0.34
P-value	0.99	0.73

3.2. Weight-length relationship

In this study, this goby displays the positive relationship between fish length and weight for males, females, and combined sex because of the high value of determination parameters ($R^2 > 0.79$, $P < 0.05$ in all cases, Fig. 1). Likely, other gobies living in the same habitat with *B. butis* show strong positive LWRs such as *P. elongatus* [21], *B. boddarti* [3], *P. serperaster* [8], *T. vagina* [6] and *O. urophthlamus* [7]. Furthermore, the strong positive LWRs are also found in other fishes like *Periophthalmus barbarus* [1] and *Parachaeturichthys ocellatus* [17].

B. butis show negative allometric growth pattern in the present study as the slope parameter of the species (2.74±0.12 SE, Fig. 1) is less than the isometric threshold of three based on the scale of Froese and Binohlan (2000). This growth trend is also found in *I. melastoma* ($b < 3$) (Mahmood et al. 2012), but not in *Periophthalmus argentilineatus* and *P. spilotus* displaying positive allometric growth ($b > 3$) (Khaironizam and Norma-Rashid 2002). Unlike *B. butis*, other co-occuring gobies like *P. elongatus* [21], *B. boddarti* [3], *P. serperaster* [8], *T. vagina* [6] and O. *urophthlamus* [7]. It seems that *B. butis* do not adapt well to its habitat compared to other gobiid speices, and the fish growth pattern is species-specific. Other fishes like *Barbatula barbatula* (Oscoz et al. 2005) and *P. barbarus* (King and Udo 1998) also display isometric growth. Fish growth pattern could be regulated by environmental conditions as the b value of *Gobius niger* varies with its habitats, ranging from 2.81 (Black Sea), 2.89 (Egypt), to 3.85 (Mediterranean) [13].

4. Conclusion

The present study show that male *B. butis* outnumbers its counterpart, and fish length and weight do not vary with gender. The strong positive LWRs of thís species indicate that its stock could be estimated. It displays negative allometric growth pattern.

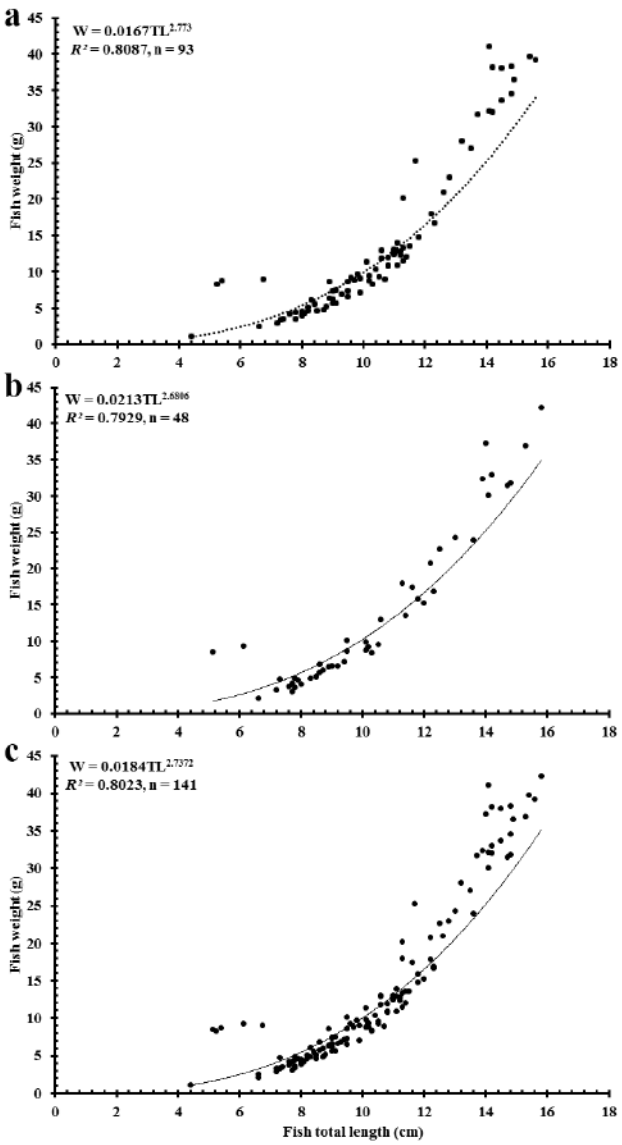

Figure 1. *The length-weight relationship of males (a), females (b) and total fish (c)*

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