

## **Length-Weight Relationship of Two Goat Fish Species *Parupeneus indicus* (Shaw, 1803) and *Upeneus tragula* Richardson, 1846, (Family Mullidae) from Wadge Bank, South India**

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Received 18 February 2019; Accepted 21 March 2019; Published on 16 April 2019

**Abstract** Length-weight relationships (LWRs) of two important food fish species namely Indian goat fish, *Parupeneus indicus* (Shaw 1803) and freckled goat fish, *Upeneus tragula* (Richardson, 1846) were studied for one year (August 2015 to July 2016) from the selected landing centers along the Wadge Bank coast. These species come under the family Mullidae (Teleostei : Perciformes). A total of 517 fish specimens were collected from trawl landings operated along the selected sampling stations. The estimated  $b$  value for the two species ranged from 2.87 to 2.96. From this study, the negative allometric growth pattern ( $b < 3$ ) was observed for these species.

The  $r^2$  value ranged from 0.983 to 0.987. The result of this study will contribute to the understanding of the fishery managers and fisheries researchers for future studies to formulate proper harvest management.

**Keywords** Length-weight relationship, *Parupeneus indicus*, *Upeneus tragula*, Negative allometric growth, Wadge Bank coast.

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### **Introduction**

The goat fishes are coming under the order Perciformes and the family Mullidae. It is a tropical marine fish and this family consists of 88 species belonging to 6 genera in 2 sub-families (Froese and Pauly 2018). They are mostly distributed in Indo Pacific region. Vivekanandan et al. (2003) reported 16 species of goat fishes from Indian coast. These species are easily identified by their bright red or yellow color and presence of two ling barbels on the chin. *Upeneus tragula* is a shallow water species and this species was found in sand or silty substrata near coral reefs, and seen in estuaries (Randall 2001) whereas, *P. indicus* are often associated with sandy bottom or reefs, up to the depth of 30 m (Allen and Erdmann 2012). The goat fishes *P. indicus* and *U. tragula* species are listed

under IUCN Category as Least concern (IUCN 2018). *U. tragula* is generally caught in different gears like seines, bottom trawls, gill nets and traps also taken as by catch in tropical shrimp trawl fisheries (Randall 2001). The *P. indicus* mainly caught by trawlers, fish traps, and by hook-and-line and also it forms the important food fish and high marketed value fish (Randall 2001). Other than these species some more species also forms an economic importance and it contributed in the minor fishery along the coast of India (Thomas 1969).

The length-weight relationship shows a mathematical relationship between two measurements and to calculate the condition factor (Le Cren 1951) and has a wide range of application in the field of fish population dynamics. It helps to describe some of the basic biological characteristics and provide information on growth status of fishes (Tesch 1968). They provide information on population parameters and also play a main role in comparative growth studied of fishes whether somatic growth was isometric or allometric (Moutopoulos and Stergiou 2002). The length-weight relationship of goat fishes was studied in India by several authors Ali and sanjeevan (1978), Al-Absy and Ajiad (1988), Ameer Hamsa and Rao (1997), Prabha et al. (1998). Gumanao et al. (2016) reported the length-weight relationship of goat fishes from Davao Gulf waters, Philippines and Egypt waters. The biology and population of *U. tragula* was studied from Madras, Tamil Nadu by Mohanraj (2008). The taxonomy and osteology of goat fishes were studied by Thomas (1969). In Wadge Bank region the information about *P. Indicus* and *U. tragula* is very less. Hence, the present study was attempted

to document the length-weight relationship and this information provides the comprehensive report on the length weight relationship of these two species.

## Materials and Methods

The study was carried out for one year period from June 2016 to November 2017 along the Wadge Bank, South India. The selected three landing centers from Wadge Bank region are Kanyakumari (Lat. 8°05'52''N, Long.77°33'50''E) Colachel (Lat. 8°10'17''N, Long, 77°15'11''E) and Vizhinjam (Lat. 8°10'17''N, Long.77°15'11''E). From these selected landing centers fortnightly the samples were collected. Species identification was made by the literature based on the author's Uiblein and Heemstra (2010) and Kumaran and Randall (1984). During this study period a total of 517 specimens of two different species were observed. The Total Lengths (TL) of two species were measured in cm using measuring scale and the body weight was measured in grams with a help of electronic balance. Standard length and weight of the fish were taken at an accuracy of 0.1 cm and 0.1 g using digital vernier caliper and electronic balance. The relationship between the length and weight is expressed by the regression equation  $W=aL^b$  (Froese 2006) which will be converted to Length-weight relationship and it was calculated by the least square method applying the Le Cren (1951) formula  $W=aL^b$  or its logarithmic form,  $\log W=\log a + b \log L$ , Where  $W$ =Weight (in g).  $L$ =Length (in mm) and  $a$  and  $b$  are constants. Regression analysis was used to estimate the intercept ( $\log a$ ) and the regression coefficient or slope ( $b$ ), using Microsoft excel version 2007.

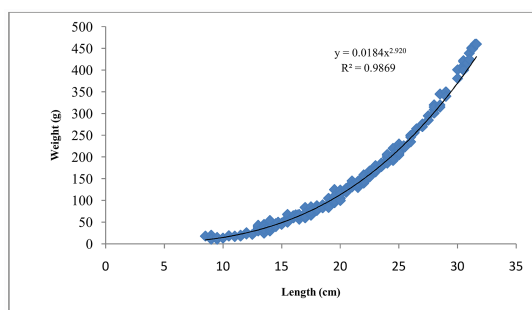


Fig. 1. Length weight relationship of *Parupeneus indicus*.

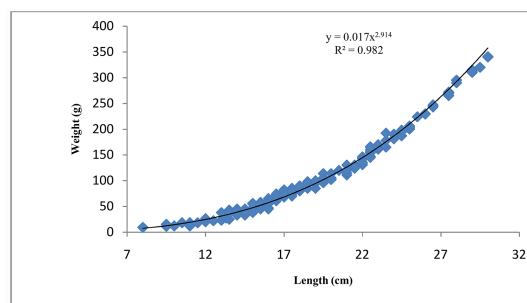


Fig. 2. Length weight relationship of *Upeneus tragula*.

**Table 1.** Parameters of logarithmic regression equation of *Parupeneus indicus* and *Upeneus tragula* from Wadge Bank, South India.

Species name	Sample size (n)	TL (cm) (range)	BW (g) (range)	a	a CI (95%)	b	b CI (95%)	r <sup>2</sup>
<i>Parupeneus indicus</i> (Shaw, 1803)	323	8.50–31.6	11–460.00	0.018	0.0164–0.0204	2.920	2.876–2.950	0.982
<i>Upeneus tragula</i> Richardson, 1846	194	8.00–30.0	9.0–341.00	0.017	0.014–0.020	2.914	2.859–2.968	0.986

## Results

Totally, 517 specimens of *P. indicus* (Shaw, 1803) and freckled goat fish, *U. tragula* (Richardson 1846) belonging to the family Mullidae were analyzed. The length of *P. indicus* and *U. tragula* was plotted the weight (Figs. 1 and 2) and scatter diagram were obtained. The detailed information on sample size, total length (TL) range (cm) total body weight (W) range (g), length-weight relationship (LWR) was collected for these two species and also the parameters such as a and b was observed. The data was analyzed and their range in 95% confidence interval and co-efficient of determination (r<sup>2</sup>) was given in (Table 1, Figs. 1 and 2).

## Discussion

In India there is no report on length-weight relationship of goat fishes particularly in Wadge Bank. The goat fish, *P. indicus* shows very good landings in Southern Indian waters, even though the research on this species was very less. The current study described that the LWR of *P. indicus* and *U. tragula* species. The estimated *b* values of these two species were shows the expected range of 2.5–3.5 (Froese 2006). The r<sup>2</sup> value of *P. indicus* and *U. tragula* is 0.95. These fishes are commonly bigger in size while comparing the varieties of other goat fishes. The minimum length of *P. indicus* was recorded in fish base 8.6 cm and 10 cm (Froese and Pauly 2018), while this study period the recorded length of this species was 8.5 cm and 9 cm. The maximum length of *U. tragula* recorded in fish base is 25 cm (Froese and Pauly 2018) whereas, in the present study showed that 30 cm for the same species caught by trawl net. The maximum total length (TL) was recorded for *U. tragula* 33 cm (Randall and Kulbicki 2006) and it attained the sexual maturity in the length of 10.2 cm (FL) (Pavlov et al. 2014) while

in case of *P. indicus* 40 cm.

The estimated *b* value of *P. indicus* and *U. tragula* was below 3 that are similar to results observed in goat fish species by Gumanao et al. (2016) and Mohanraj, (2008) from Davao Gulf waters, Philippines and Gulf of Mannar, India. However, the present study reveals below 3 indicates negative allometric growth pattern in same species. Studies on length-weight relationship of *P. indicus* and *U. tragula* are limited in Indian waters especially from South Indian waters and the results acquired from this study will contribute to the understanding the fishery managers and fisheries researchers for future studies to formulate proper harvest management.

## Acknowledgement

The authors are very grateful to the Tamil Nadu Dr. J. Jayalalitha Fisheries University (TNJFU) for providing the financial supports. The authors express heart felt thanks to the Dean of Fisheries College and Research Institute, Thoothukudi for the encouragement during the course of this study.

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