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Study of Length-weight Relationship of *Epinephelus diacanthus* (Valenciennes, 1828) Spinycheek Grouper from Mumbai, North West Coast of India

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Abstract

The length weight relationship of *Epinephelus diacanthus* (Valenciennes, 1828) was assessed from Mumbai, North West coast of India. Fish samples were collected monthly between August, 2019 and February, 2020 from the trawlers of New Ferry Wharf, Mumbai. These samples were analysed using regression analysis to study the relationship between total length (L) and total weight (W), both measured with precision to the nearest 0.1 cm and 0.01 g, respectively. The length range reported was 13 to 44 cm with the weight range varying between 87 to 550 g. The parameter b was estimated to be about 3.06 with R² value of 0.883. Due to its important role as an apex predator, its conservation and management is important.

Keywords:

Length-weight relationship, Mumbai, *E. diacanthus*,

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Introduction

Spinycheek grouper, *Epinephelus diacanthus* (Valenciennes, 1828) is a commercially important demersal species along the west coast of India along the Eastern Arabian Sea. Spinycheek grouper is small size grouper which is distributed on the continental shelf of the northern Indian Ocean from the Gulf of Aden to Sri Lanka, Madras (Heemstra and Randall, 1993; Froese and Pauly, 2016) as well as in the Lakshadweep and Andaman Islands of India (Rekha *et al.*, 2011). These groupers both adults and juveniles are carnivorous in nature, feeding primarily on crabs, fishes (Valenciennes, 1828). Adult groupers being commercially important species are highly prone to overfishing leading to declining population trends. Spawning behaviour and slow growth of the species have also added to declining population. Being protogynous in nature, steps have been formulated to capture these species after attaining minimum size which are necessary to conserve the species. Hermaphroditism and gonadal sex inversion is a normal mode of reproduction in serranids (Atz, 1964). Serranids as sequential hermaphrodites function as males in one phase of life and eventually change to females in another phase. The gonad of groupers is an admixture of ovarian and testicular tissues at the transitional stage. Length-weight relationship of fish offers appreciated basic biological data essential for fishery management and conservation (Froese, 2006). In fact, the relationship provides valuable insights during forecasting (Ricker, 1975), assessment of biomass of fishes (Kimmerer, 2004) and life cycle assessments of fishes (Petrakis and Stergiou, 1995). In order to manage fish populations, length-weight

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relationships (LWRs) are an essential approach that is frequently used (Mir *et al.*, 2012). LWRs give information on the overall condition of the stocks. (Froese *et al.* 2014; Le Cren, 1951). Fishery researchers and managers frequently utilise LWRs for estimating weight from length in fish yield analysis. Utilising the variables a and b in the length-weight (L/W) relationship $W = aL^b$, it enables in visualising specific population, regardless of individual variance, henceforth providing an idea of the condition (Le Cren, 1951) and fitness of the fish population. Growth, food availability and sexual maturity are among the baseline data for stock management provided by the LWR (Al-Zibdah and Odat 2007; Karna *et al.*, 2012).

Materials and methods

The fish specimens were collected monthly once from August 2019 to February 2020 from trawl nets of New Ferry Wharf landing centre of Mumbai (Fig. 1)

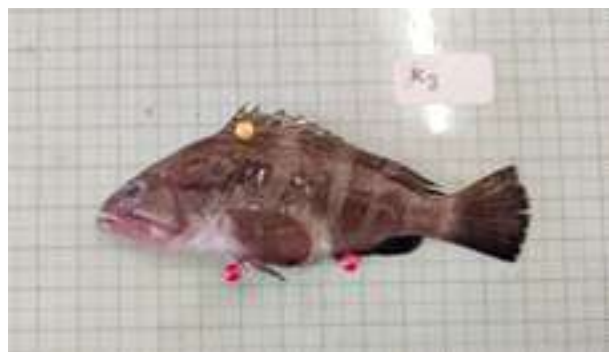


Fig 1: Image of *Epinephalus diacanthus*

The total length and body weight were assessed for 210 fish specimens. The total length was examined in centimetre to the nearest of 0.01 cm and weight was assessed in grams nearest to 0.01 g. The length-weight relationship were examined using the equation $W = aL^b$ (Froese, 2006; Le Cren, 1951), where, “W” denotes total weight of fish specimens in grams and “L” denotes total length in cm, “a” specifies the intercept and the exponent ‘b’ specifies the slope of the regression line (Froese, 2006). The coefficient of determination (R^2) of a and b was also examined at 95% confidence limits.

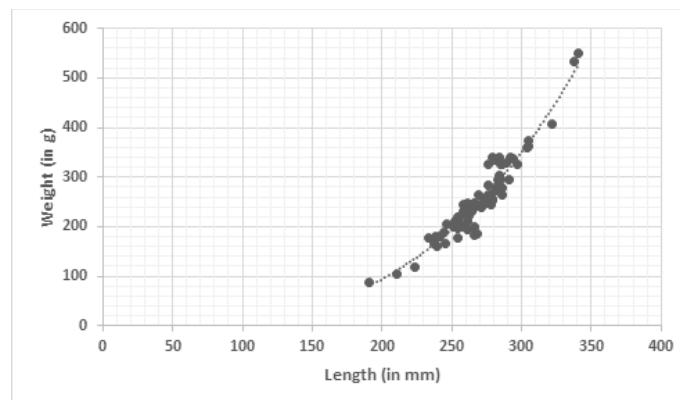


Fig. 2. Pooled length-weight relationship of *Epinephalus diacanthus*

Results and discussion

From the study, the length range which was captured varied between 12.6 to 44.1 cm and weight ranged between 87 to 550 grams with the value of b estimated around 3.06 (Table 1).

In this study, the values of the parameter “b,” for the *E. diacanthus* species, were estimated in the predictable range of 2.5–3.5 aligning with Froese (2006). The results displayed that there is a strong correlation among the two variables (length and weight) with high R^2 of 0.883 (Table 2).

The pooled length-weight relationship for males and females of *E. diacanthus* is $\log W = 0.0033 + 3.05 \log L$ (Figure 2). The length of first capture of this species was more lesser than length at first maturity, 28.1 cm TL as specified in Fish base. This also stated that *E. diacanthus* change from female to male at 28.5–30 cm in length. So most of the captured fishes are female only as they were captured before sex conversion to male happens.

In the present study from Mumbai waters, the exploitation length of *E. diacanthus* ranged between 13 cm and 44 cm showing reduction in maximum length reported in a study by Mohammed *et al.* 2014 from Indian waters where length varied in the range of 13–64 cm. This showed that the fish has come under higher fishing pressure since then. Most of the time, these fish are caught accidentally by trawlers at juvenile stage. As it is a protogynous species, we should

Table 1: Length weight relationship of *E. diacanthus* along the Mumbai coast

Fish species	N	Total length (cm)		Total weight(g)		A	95% CL of a	B	95% CL of b
		(Min)	(Max)	(Min)	(Max)				
E.diacanthus	210	12.64	44.12	87	550	0.0033	0.0160 - 3.0558	2.7937 - 0.0049	3.3178

N-Number of observations, Cl-Confidence limit a, b - parameters of length weight relationship

give time for the growth for the conversion of sex from female into male. As this species was captured at an earlier stage most of them were juveniles and females only. As a conservation measure, there is a need to fix a size of capture 50% of them after conversion of sex into male and rest 50% of them as female. For *E. diacanthus*, the minimum legal size (MLS) that was recommended for capture is 18 cm. (Mohammed et al., 2014). Shakeel and Ahmad (1996) reported that in marketable fishery, the exploitation of groupers smaller than the average maturity length of 30.5 cm for the medium-length category and 40.5 cm for the large-length category has to be stopped. These two length category limitations are predictable to make 80% of grouper species exploited after breed once in their lifetime.

Conclusion

E. diacanthus is a commercially most important demersal resource in the west coast of India. As this species is an apex predator, it plays an important role in maintaining the ecological health and have more food preference. The information is valuable for fisheries managers for conservation and management of this resource.

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Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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