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Length-weight relationship of 11 fish species from tropical estuarine ecosystem along the central west coast of India

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Short communication

Abstract

Length weight relationship is reported for 11 fish species collected from the Mandovi-Zuari estuarine system along the west coast of India. The species studied were *Osteomugil cunnesius* (Valenciennes, 1836), *Chelon parsia* (Hamilton, 1822), *Alepes kleinii* (Bloch, 1793), *Alepes djedaba* (Forsskål, 1775), *Scatophagus argus* (Linnaeus, 1766), *Sillago sihama* (Forsskål, 1775), *Platycephalus indicus* (Linnaeus, 1758), *Ambassis ambassis* (Lacepède, 1802), *Thryssa mystax* (Bloch & Schneider, 1801), *Terapon jarbua* (Forsskål, 1775) and *Lactarius lactarius* (Bloch & Schneider, 1801). The '*b*' values ranged from 2.64-3.31. As a major result of this study, new records of maximum length were observed for *O. cunnesius* and *A. kleinii*.

Keywords: *Estuary, Mandovi-Zuari, length-weight relationship, maximum length*

Introduction

Length-weight relationship (LWR) is a standard analytical method, which provides biological information on fish species. The pattern of LWR establishes an association between the two basic measurements of fish, length and weight and helps to calculate the expected weight from known length of fish and vice versa (Kuriakose, 2017). LWR forms a basic requirement for studying the biology, taxonomy and ecology (Vega-Cendejas *et al.*, 2017), population dynamics (Kohler *et al.*, 1995), life history (Petrakis and Stergiou, 1995), stock structure (Sreekanth *et al.*, 2014), stock assessment (Chu *et al.*, 2012), biomass measurement (Froese *et al.*, 2011) and analysis of ontogenic changes (Ferraton *et al.*, 2007) in fish species.

Estuaries harbour a wide variety of fish species (Sreekanth *et al.,* 2016). Mandovi and Zuari rivers along with their man-made interconnecting Camberjua canal forms one of the largest estuarine system on the west coast of India (Quasim and Gupta, 1981; Padmavati and Goswami, 1996), and the species inhabiting in this system represents both true estuarine and marine species (Baker and Sheppard, 2005; Franco *et al.,* 2012). Small scale traditional fishery dominates in this region with major contributions from gillnet fishery (Sreekanth *et al.,* 2016), where 600-1000 tonnes of fish are landed every year (Sreekanth *et al.,* 2017). LWR of seven fish species, excluding the species that has been reported in present study, is available from this estuarine complex (Sri Hari *et al.,* 2018). In this study, LWR of eleven fish species namely *Osteomugil cunnesius* (Valenciennes, 1836), *Chelon parsia* (Hamilton,

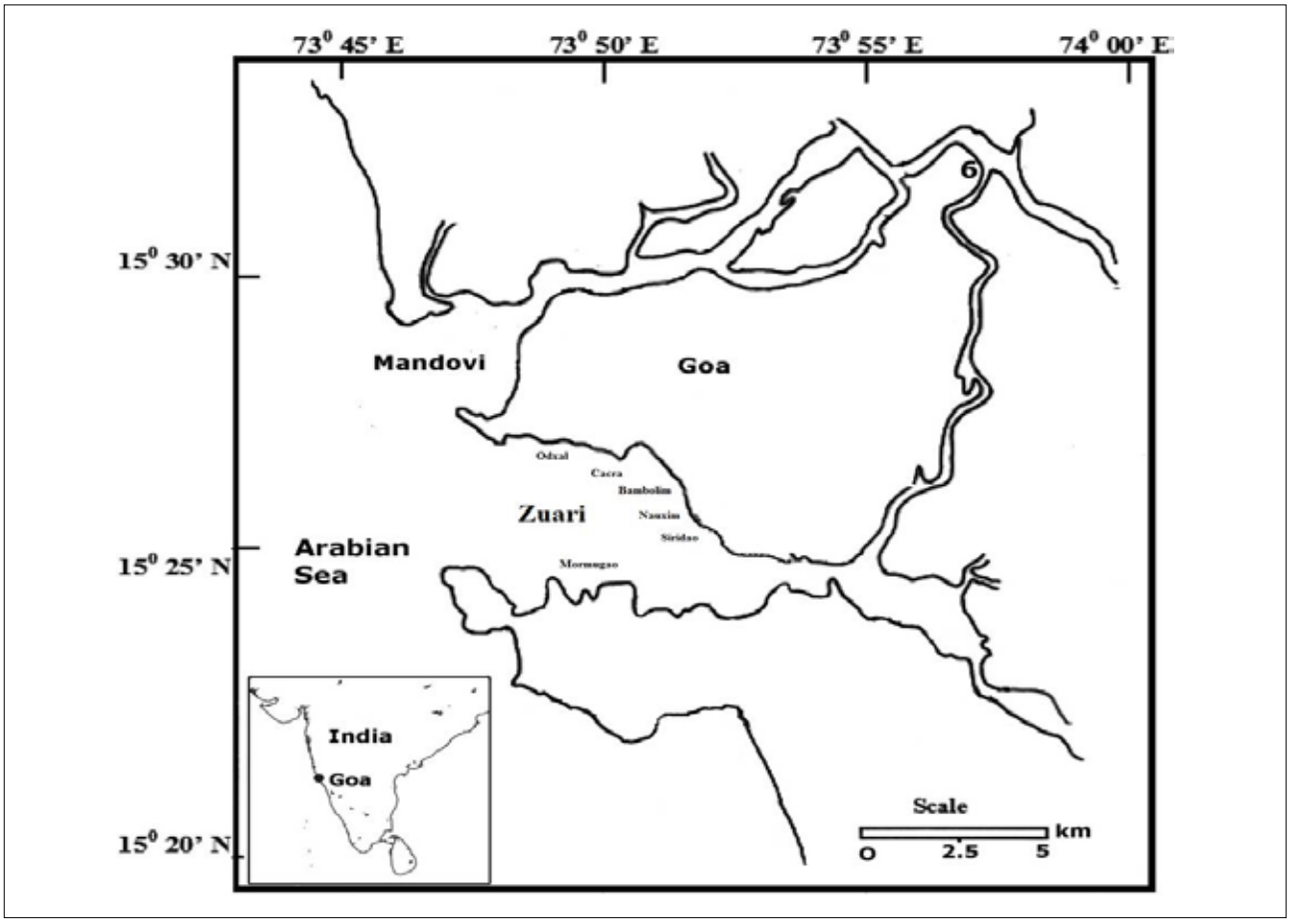

Fig. 1. Map showing the Mandovi-Zuari Estuarine system along central west coast of India

1822), *Alepes kleinii* (Bloch, 1793), *Alepes djedaba* (Forsskål, 1775), *Scatophagus argus* (Linnaeus, 1766), *Sillago sihama* (Forsskål, 1775), *Platycephalus indicus* (Linnaeus, 1758), *Ambassis ambassis* (Lacepède, 1802), *Thryssa mystax* (Bloch & Schneider, 1801), *Terapon jarbua* (Forsskål, 1775), and *Lactarius lactarius* (Bloch & Schneider, 1801) are described.

Material and methods

Study area

Mandovi-Zuari estuarine system is one of the largest estuarine ecosystems along the west coast of India (lat. 15° 25′ 15° 30′ N and long 73° 45′ - 73° 59′ E). This ecosystem receives a large influx of freshwater during southwest monsoon and little during the rest of the year (Shetye *et al.*, 2007) which have impact on fish composition.

Sample collection

Fish specimens were collected every month from January 2017 to February 2018. The fishes were caught by using surface and bottom set gill nets with mesh size between 30-86 mm and length 100-400 m. After collection, fishes were brought to the laboratory in iced conditions. The total length (TL) and total weight (TW) of the fishes were measured using digital vernier caliper and weighing balance to the nearest 0.1 cm and 0.1g respectively. The scientific name of the fishes was verified using FishBase (Froese and Pauly, 2018).

The LWR was calculated using the formula given by Le Cren (1951)

$W = aL^b$ ..... (1)

Where, W = total weight (g), L= total length (cm); '*a*' and '*b*' are the parameters of LWR which denote scaling coefficient allied to body and regression coefficient, respectively.

The parameters '*a*' and '*b*' were calculated by least square method by using logarithmic form of the equation (1)

Log W= Log a + b log L ..... (2)

Table 1. Parameters of LWR of 11 species from Mandovi - Zuari estuarine system from westcoast of India

Family	Fish species	n	Total Length (cm)		Total Weight (g)		a (95% CL of a)		b (95% CL of b)		r^2
			Min	Max	Min	Max					
Mugilidae	*Osteomugil cunnesius* (Valenciennes, 1836)	137	9.19	27.43	9.43	154.63	0.016	0.014-0.019	2.76	2.70-2.82	0.98
	Chelon parsia (Hamilton, 1822)	114	8.21	17.63	12.12	97.66	0.02	0.01-0.02	2.87	2.80-2.94	0.98
Carangidae	*Alepes kleinii* (Bloch, 1793)	69	7.83	14.83	4.48	36.22	0.004	0.004-0.005	3.31	3.23-3,39	0.99
	Alepes djedaba (Forsskål, 1775)	34	8.98	16.55	10.51	67.51	0.009	0.007-0.012	3.16	3.05-3.28	0.98
Scatophagidae	*Scatophagus argus* (Linnaeus, 1766)	82	10.22	24.67	16.43	166.72	0.03	0.02-0.03	2.64	2.58-2.70	0.98
Sillaginidae	*Sillago sihama* (Forsskål, 1775)	64	10.74	24.15	6.87	73.47	0.01	0.007-0.014	2.76	2.64-2.88	0.97
Platicephalidae	*Platycephalus indicus* (Linnaeus, 1758)	41	16.32	44.54	28.54	454.17	0.01	0.007-0.014	2.81	2.72-2.90	0.99
Ambassidae	*Ambassis ambassis* (Lacepède, 1802)	477	4.22	13.52	2.08	66.18	0.02	0.0270-0.0278	2.98	2.97-2.99	0.99
Engraulidae	*Thryssa mystax* (Bloch & Schneider, 1801)	194	8.77	17.64	4.07	35.05	0.008	0.007-0.009	2.87	2.83-2.92	0.98
Teraponidae	*Terapon jarbua* (Forsskål, 1775)	63	9.41	16.78	17.65	102.34	0.021	0.018-0.024	3.01	2.95-3.06	0.99
Lactaridae	*Lactarius lactarius* (Bloch & Schneider, 1801)	83	9.86	22.46	16.43	172.01	0.022	0.018-0.027	2.79	2.76-2.94	0.98

n= number of specimens, TL = Total Length, TW = Total Weight, a and b = parameters of LWR, r^2= regression coefficient, CL= Confidence limit

95% confidence intervals of '*a*' and '*b*' and coefficient of determination (r^2) were also calculated.

Results and discussion

A total of 1358 specimens belonging to 11 species under 9 families were collected and studied for length weight relationship. Coefficient of determination (r^2) in the LWR for all the fish species were higher than 0.97. The scaling coefficient, '*a*' ranged from 0.004 (*Alepes kleinii*) to 0.03 (*Scatophagus argus*). The '*b*' value ranged from 2.64 (*S. argus*) to 3.31 (*A. kleinii*) (Table 1). All the estimated '*b*' values were within the expected range of 2.5-3.5 (Froese, 2006). Fishes such as *A. kleinii, A. djedaba* and *T. jarbua* showed a positive allometric somatic growth with the '*b*' values greater than 3. However, the remaining fish species exhibited a negative allometric growth with '*b*' values less than 3. The variations in '*b*' values of same or different species could be due to various factors, such as sample size, length frequency, type of habitat, ontogenic development, season, population, sex and gonadal maturity (Tesch, 1971; Chen *et al.,* 2017; Hossain *et al.,* 2014). The earlier reported maximum total length (TLmax) for *O. cunnesius* was 26.7 cm (Hussain *et al.*, 2010) and *A. kleinni* was 13.8 cm. In this study, the new TLmax for *O. cunnesius* (27.43 cm) and *A. kleinii* (14.83 cm) were recorded.

Estuaries are one of the important nursery areas for both marine and coastal species (Pasquaud *et al.,* 2015) and these species possess tolerance to varying environmental factors existing in the estuary (Ansari *et al.,* 1995). Study on LWR provides baseline data for planning the management strategies (Srihari *et al.,* 2018). Hence, the LWR obtained in this study will be useful for further assessment of stock and biological parameters that will help in management and conservation of species in the ecosystem.

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