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Short Communication

Length-weight relationship of brackish water finfish *Thryssa kammalensoides* Wongratana, 1983 from Chilika Lagoon, India

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The length-weight relationship (LWR) of brackish water finfish *Thryssa kammalensoides* Wongratana, 1983 is reported for the first time during the study. Specimens (n = 862) were caught with the help of local fisherman from Chilika lagoon, east coast of India during monsoon (September-October, 2018) and post-monsoon (November, 2018-January, 2019). The maximum total length recorded in this study is the new record for the species. The data revealed that LWR of *T. kammalensoides* of Chilika shows a significant LWR during monsoon ($r^2 = 0.872$) whereas moderate ($r^2 = 0.470$) during post-monsoon.

[Keywords: Chilika, Length-weight relation, fish, *Thryssa kammalensoides*]

Introduction

Estuaries and lagoons are the unique coastal systems which support the life cycle of many teleosts¹. Chilika lagoon, situated in the northeast coast of India is the largest brackish water lagoon of Asia and has earned various titles with respect to its rich ecosystem and biodiversity. The ichthyofaunal biodiversity of Chilika lagoon is recorded as 317 species². Later, Suresh *et al.*³ updated the list to 336 species. Three species from family Ophichthidae⁴⁻⁶ and one species of Ogcocephalidae⁷ were reported in recent times along with one species *Ophichthus chilensis* was revalidated⁸ resulting in a total of 341 species. Recently, Karna *et al.*⁹ reported a species from family Synanceiidae which makes the total number of fish species in Chilika as 342.

Among fishes, the length-weight relationship (LWR) is considered as an important tool to analyze their population. Its applications range from simple

estimation of an individual's weight to the indication of fish body condition factor or inferences regarding sexual development¹⁰. Knowledge of this relationship also helps to identify energy utilized for growth or reproduction as a natural cyclic phenomenon of natural populations¹⁰.

In India, quite a number of studies have been undertaken related to LWR of different fishes living in brackish water^{1,10}. A reasonable number of studies have also been undertaken related to the LWR of fishes available in Chilika lagoon. Karna *et al.*¹ studied the LWR of *Valamugil speigleri* from Chilika lagoon. The LWR of *Etroplus suratensis* was studied from Chilika lagoon by Karna *et al.*¹⁰. Karna & Panda¹¹ studied the LWR of 20 fish species of Chilika lagoon. Panda *et al.*¹² reported the LWR of six species, *Daysciaena albida* (Cuvier, 1830), *Eleutheronema tetradactylum* (Shaw, 1804), *Etroplus suratensis* (Bloch, 1790), *Mystus gulio* (Hamilton, 1822), *Nematalosa nasus* (Bloch, 1795) and *Osteogeneiosus militaris* (Linnaeus, 1758) from Chilika lagoon¹². Karna¹³ studied the LWRs of *T. purava*, *T. polybranchialis* and *T. mystax* from Chilika lagoon.

Genus *Thryssa* has 24 species distributed worldwide¹⁴ and the LWRs has been studied for 12 species, *T. polybranchialis*¹³, *T. gautamiensis*¹⁵, *T. baelama*¹⁶, *T. setirostris*¹⁷, *T. vitrirostris*¹⁷, *T. dussumieri*¹⁸, *T. dayi*¹⁹, *T. mystax*^{13,20}, *T. hamiltonii*^{18,21}, *T. kammalensis*²¹, *T. malabarica*^{19,21} and *T. purava*^{13,21}. *Thryssa kammalensoides* Wongratana, 1983 commonly known as Godavari *Thryssa* has its distribution limited to the Indian Ocean and has been reported only from Chilika lake², Chandipur²², off false point²² (Odisha), Godavari estuary²³, and Uppada²⁴ (Andhra Pradesh) in the east coast of India. The present study reports the LWRs of *T. kammalensoides*.

Materials and Methods

Data on the total length and weight of *T. kammalensoides* collected from Chilika lagoon during monsoon (September-October, 2018) and post-monsoon (November, 2018-January, 2019) were used for length-weight analysis and determining the condition factor. The total length of the fish was measured accurately to the nearest 1 mm with a

measuring tape and wet weight was determined to the nearest 1 gm using an electronic balance. 862 samples of *T. kammalensoides* with a length range from 75 mm to 166 mm and wet weight from 3 gm to 30 gm were collected for analysis and interpretation respectively. The length-weight relationship was estimated by the equation proposed by LeCren²⁵,

$$W = aL^b$$

After logarithmic transformation of the length-weight data this equation may be expressed as

$$\text{Log } W = \log a + b \log L$$

Where, 'W' is the weight of the fish in gram, 'L' is the total length of the fish in mm, 'a' is the intercept of the regression curve (coefficient related to body form), and 'b' is the regression coefficient (exponent indicating isometric growth). 'a' and 'b' values were estimated from a linear regression between length and weight of the fishes¹².

Results

The collected samples were segregated to different total length groups such as 01-50 mm, 51-100 mm, 101-150 mm and 151-200 mm to understand their population (Fig. 1). The size of *T. kammalensoides* ranged between 75-166 mm. It was observed that, during both the seasons (monsoon and post-monsoon), the length group 101-150 mm was dominant. No individuals found below the length of 50mm during the entire study period. Specimens belonging to length group of 151-200 mm were few (13 no.) during monsoon season and very few (03 no.) during post-monsoon.

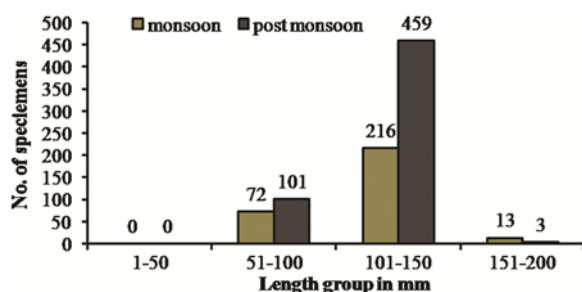


Fig. 1 — LWR in log form for *T. kammalensoides* during monsoon and post-monsoon

The estimated statistical parameters of the length-weight relationship are given in Table 1, together with the number of specimens measured (N), the TL ranges in mm (min. and max.) and weight ranges in g (min. and max.), the intercept of the regression curve (a), 95 % Confidence Intervals of "a" (lower and higher), the regression coefficient (b), 95 % confidence interval of "b" (lower and higher) and the coefficient of determination (r^2) derived from the length-weight relationship¹¹. The estimated intercept and growth coefficient for *T. kammalensoides* are nearly -10.351 and 2.683, respectively.

To understand the length-weight relationship of the species, the independent value length in log form is plotted along X-axis and the dependent value weight in log form is plotted along Y-axis for the entire study period as well as monsoon and post-monsoon season (Fig. 2).

The entire study period shows positive linear regression between Log W and Log L of *T. kammalensoides* but not perfect type (Fig. 2a). However, *T. kammalensoides* shows a significantly higher LWR during monsoon with a higher b value of 2.872 (Fig. 2b) whereas moderate during post-monsoon with the b value of 2.420 (Fig. 2c), which might be related to the breeding season. The regression coefficient (r^2) was calculated as 0.872 (Fig. 2a) and 0.470 (Fig. 2b) during monsoon and post-monsoon, respectively.

Discussion

During the study, the maximum total length measured for *Thryssa kammalensoides* was 166 mm where the weight was 30 gm. According to the FishBase¹⁴, the maximum length of *T. kammalensoides* was recorded as 112 mm. The present total length of 166 mm of *T. kammalensoides* recorded during this study constitutes a new record for the species.

During the present study, it is observed that the specimens of *T. kammalensoides* collected mostly belong to the length group of 101-150 mm. This suggests that the length group 101-150 mm is dominant in the population of *T. kammalensoides* of Chilika or the gears used for capturing the fish is targeted to capture this size group.

Table 1 — Estimated parameters of length-weight relationship of *T. kammalensoides* from Chilika lagoon

Species Name	N	TL (mm)	W (gm)	a	95 % CI of a	b	95 % CI of b	r^2
<i>T. kammalensoides</i>	862	75	3	-10.351	-10.931	2.683	-10.931	0.681
		166	30					

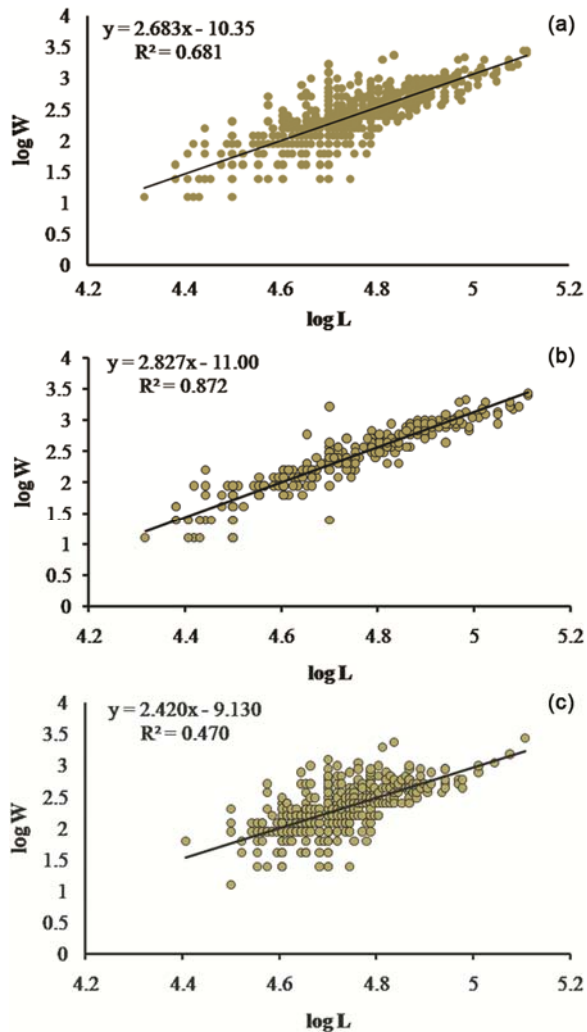


Fig. 2 — LWR regression in log form for *T. kammalensoides* during entire study period (a), monsoon (b) and post-monsoon (c)

The comparison of *b* value from the same ecosystem of Chilika for different species suggests that the growth pattern in *T. kammalensoides* is comparatively less than the other species. Probably *T. kammalensoides* might be prone to ecological stress or inter specific competition for the niche and food sources in the ecosystem. A table with a comparative LWR of the *Thryssa* species from Chilika lagoon as well as from different parts of the world is given in Table 2. The Table 2 suggest that the *b* value in most of the *Thryssa* species is more than 3.0 and enjoy a healthy growth in the ecosystem except a very few places.

The present study revealed that *T. kammalensoides* shows a significant LWR during monsoon where *b* value is close to 3.0 whereas moderate during post-monsoon. The regression coefficient (r^2) was

Table 2 — Comparative LWR of the *Thryssa* species from Chilika lagoon as well as from other parts of the world

Species	<i>b</i>	r^2	Study Location
<i>Thryssa polybranchialis</i> ¹³	3.326	0.976	Chilika
<i>Thryssa baelama</i> ¹⁶	3.317	-	New Caledonia
<i>Thryssa setirostris</i> ¹⁷	3.637	0.921	South African estuary
<i>Thryssa vitrirostris</i> ¹⁷	3.189	0.997	South African estuary
<i>Thryssa dussumieri</i> ¹⁸	1.585	0.837	Korangi-Phitti Creek
<i>Thryssa dayi</i> ¹⁹	3.248	0.989	Cochin
<i>Thryssa mystax</i> ^{13,20}	3.081	0.983	Chilika
	2.459	0.869	Porto novo
<i>Thryssa hamiltonii</i> ^{18,21}	3.362	0.924	Korangi-Phitti Creek
	3.085	0.96	Digha
<i>Thryssa kammalensis</i> ²¹	3.09	0.95	Digha
<i>Thryssa malabarica</i> ^{19,21}	3.237	0.979	Cochin
	3.065	0.96	Digha
<i>Thryssa purava</i> ^{13,21}	3.026	0.986	Chilika
	3.005	0.96	Digha
<i>Thryssa kammalensoides</i> (Present study)	2.683	0.681	Chilika

calculated as 0.872 and 0.470 during monsoon and post-monsoon respectively. The LWR in fish is affected by various factors like temperature, salinity, food, gonad maturity, sex, diet, stomach fullness, health, preservation techniques as well as season and habitat^{1,10}. Difference in their LWR during monsoon and post-monsoon is probably related to the breeding season of the species.

Conclusion

The study is the first hand study on the LWR of *Thryssa kammalensoides* from Chilika lagoon which documented a lower *b* value of 2.683 for the species. The *b* value is less than 3.0 and comparatively lesser than other *Thryssa* species reported from the Chilika lagoon by other authors which is probably due to ecological stress for the *T. kammalensoides* or inter specific competition for the niche and food sources in the ecosystem. Higher LWR during monsoon in comparison to post-monsoon is probably related to the breeding season of the species.

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Conflict of Interest

No potential conflict of interest was reported by the authors.

Author Contributions

NS, DM and LS: Field observations, collection, preservation, identification and manuscript preparation; SR, SP and AM: Identification, manuscript preparation and critical analysis.

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