Journal of Aquatic Biology & Fisheries | 2021 | **9** | pp. 29-32

ISSN 2321–340X

Length–Weight Relationships of Eight Fish Species from the Kayamkulam Estuary in Kerala, India

Remya, R.[1], Amina, S.[2] and Bindu, L.[2*]

[1]*Research Department of Zoology, Sanatana Dharma College, Alappuzha, Kerala, India-688003.*
[2]*Post Graduate Department of Zoology, Milad-E-Sherief Memorial College, Kayamkulam, Alappuzha, Kerala, India-690502.*
**Email: bindukylm@gmail.com*

Abstract

The Length–weight relationships of eight fish species, *Etroplus suratensis* (Bloch, 1790), *Pseudetroplus maculatus* (Bloch, 1795), *Liza parsia* (Hamilton, 1822), *Carangoides praeustus* (Bennett, 1830), *Oreochromis mossambicus* (Peters, 1852), *Mugil cephalus* (Linnaeus, 1758), *Scatophagus argus* (Linnaeus, 1766) and *Escualosa thoracata* (Valenciennes, 1847) from the gill net(mesh size: 30-70 mm) collections of Kayamkulam estuary in Kerala were estimated from October 2016 to September 2017. The results indicated that almost all fish species exhibited a negative allometric growth in these waters. The exotic cichlid *O. mossambicus* exhibited a better growth compared to other indigenous fishes. The *b* values in the length–weight relationships were determined as 2.068, 2.896, 2.307, 2.491, 2.998, 2.516, 1.616 and 1.567 for *E. suratensis, P. maculatus, L. parsia, C. praeustus, O. mossambicus, M. cephalus, S. argus* and *E. thoracata* respectively. The coefficient of determination is significantly different for all species (r^2 < 0.95).

1. Introduction

Length-weight relationship (LWR) is an important factor in the biological study of fishes, which indicated the species status in an environment and characterize patterns of the growth(Froese, 2006; Kharat *et al.*, 2008). It is used for estimating the weight of the fish of a given length and can be used in studying gonad development, rate of feeding and maturity conditions (Blackwell *et al.*, 2008). In spite of having different applications, length-weight relationship data are still insufficient for many fish species throughout the world. From the Kayamkulam estuary of Kerala also length-weight relationship of most of the fish species were undocumented, the present study provides basic length-weight relationships of *Etroplus suratensis* (Bloch, 1790), *Pseudetroplus maculatus* (Bloch, 1795), *Liza parsia* (Hamilton, 1822), *Carangoides praeustus* (Bennett, 1830), *Oreochromis mossambicus* (Peters, 1852), *Mugil cephalus* (Linnaeus, 1758), *Scatophagus argus* (Linnaeus, 1766) and *Escualosa thoracata* (Valenciennes, 1847) from these waters.

2. Materials and Methods

The study was conducted in the Kayamkulam lake (9°22 N and 9°162 N and 76°252 E and 76°322 E), a brackish water system in the Alappuzha district of Kerala harboring many endemic fish species. A total of 2160 specimens representing eight different species belonging to five Families were collected from October 2016 to September 2017 using gillnets (mesh size: 30-70mm) and were identified as *E. suratensis*, *P. maculatus*, *L. parsia*, *C. praeustus*, *O. mossambicus*, *M. cephalus*, *S. argus* and *E. thoracata* (Nelson, 2006; Froese and Pauly, 2017). Total length (L_T) and total weight (W_T) of specimens were measured to the nearest 0.1 cm and 0.01 g respectively. For each species, the length weight relationship ($W_T = a L_T^b$) was estimated using log transformed linear regression equation, $\log (W_T) = \log (a) + b \log (L_T)$, where W_T is the total wet weight (g), L_T is the total length (cm), a is the intercept, and b is the slope of the relationship (Le Cren, 1951). Regression parameters (a and b) with 95% confidence limit (CL) and the determination coefficient (r^2) value were estimated (Froese, 2006). Values of b smaller, equal and larger than 3 indicated negative allometry, isometry and positive allometry respectively (Kuriakose, 2017). The length-weight relationships were determined after the exclusion of outliers identified graphically by plotting length and weight pairs (Froese *et al.*, 2011). Data were analyzed using IBM SPSS statistics version 20 and MS Excel 2010.

3. Results

Among the eight selected fishes, except *O. mossambicus* all others were native to the area. Relative growth coefficient (b) was ranged from 1.567 to 2.998. *S.argus* (1.616) and *E.thoracata* (1.567) have comparatively lower b values. All the fishes exhibited negative allometric growth pattern (b<3) and r^2 values ranged from 0.7 to 0.92 (Fig.1). Length-weight relationships with the descriptive regression parameters of the equations are presented in Table 1.

4. Discussion

The b values of the length-weight relationships of the selected fish species exhibited notable variations from the isometric value (Froese, 2006) and varied from 1.567 in *E. thoracata* to a 2.998 for *O. mossambicus*. The regression values were significantly different (p < 0.05) with r^2 values varying noticeably from species to species. The growth pattern (b) within the same species can be

Received on: 02-10-2020; Revised on:16-05-2021; Accepted on: 03-05-2021

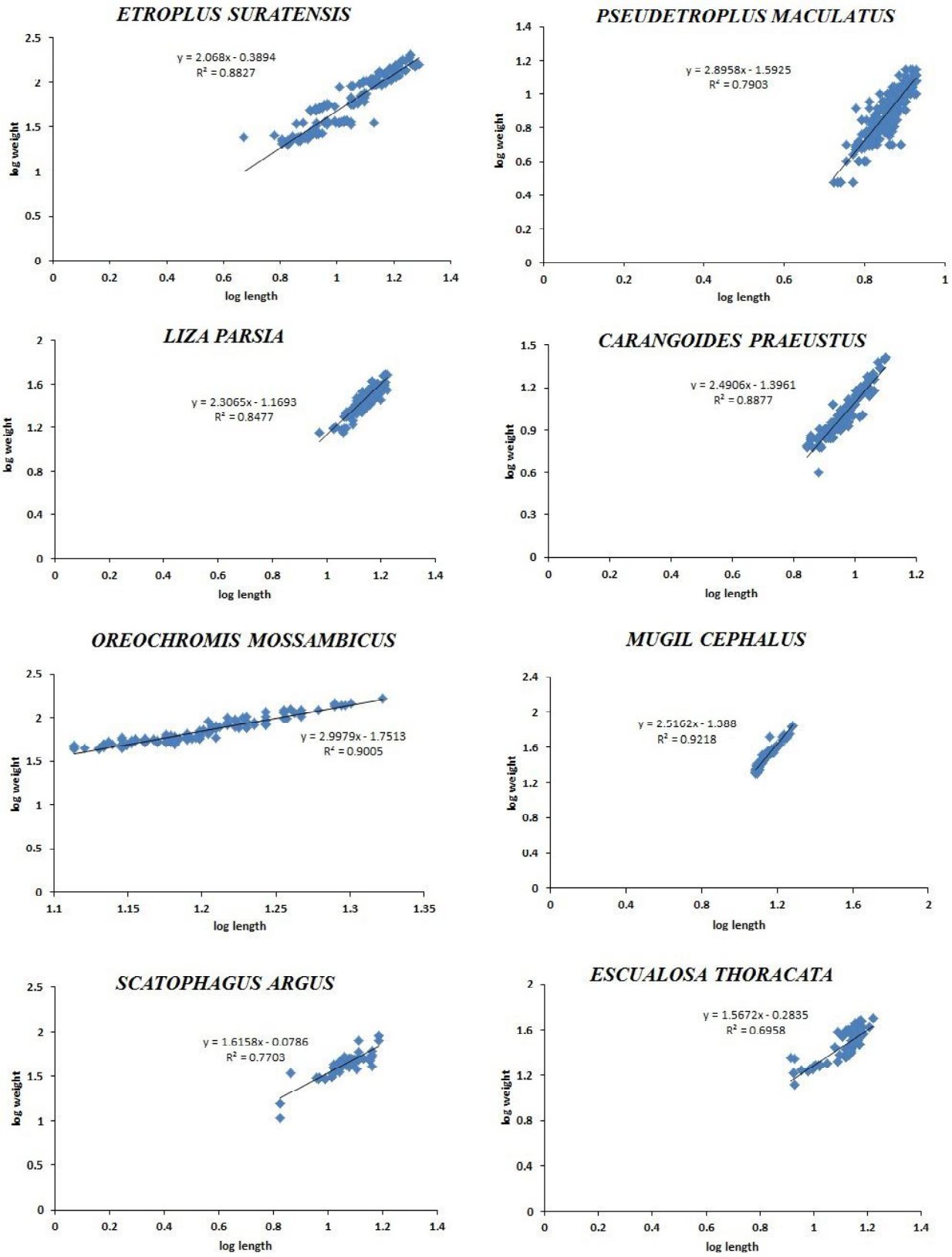

Fig. 1. Length-weight relationship of fish species from the Kayamkulam estuary in Kerala

changeable, depending on the season, food availability, population, sex, environmental conditions or physiology (Freitas *et al.*, 2017). The table 2 shows some of the previous reports on the growth pattern of these fishes from Indian waters. Gandhi *et al*. (2013) reported *b* value ranging 2.479 to 2.842 for *S. argus* from the gulf of Mannar region and Gurjar *et al*. (2017) reported *b* value ranging 2.752 to 2.856 for *E. thoracata* from the Ratnagiri coast of Maharashtra. But in the present study they were within the range of 1.56 to 1.62. Only two species, *P. maculatus* and *O. mossambicus* exhibited better growth compared to other parts of the country. The establishment

Table 1. Descriptive statistics and estimated parameters of Length-weight relationships for eight fish species collected from the Kayamkulam lake

Sl. No.	Species	L_T (cm) Range	L_T (cm) Mean±SD	W_T (g) Range	W_T (g) Mean±SD	N	*a*	*b*	r^2 *	CL(*a*)	CL(*b*)
1	*Etroplus suratensis*	4.7-19.5	11.42±3.51	20.0-204.7	71.22±40.0	197	0.678	2.068	0.882	0.606-0.757	1.961-2.174
2	*Pseudetroplus maculatus*	5.3-8.5	7.34±0.59	3.0-14.0	8.60±2.02	635	0.204	2.896	0.79	0.184-0.225	2.779-3.012
3	*Liza parsia*	9.4-16.8	13.74±1.3	14.2-49.0	29.06±6.34	354	0.31	2.307	0.847	0.276-0.348	2.204-2.410
4	*Carangoides praeustus*	7.0-12.6	9.08±1.13	4.0-26.0	10.145±3.78	448	0.248	2.491	0.887	0.229-0.269	2.408-2.573
5	*Oreochromis mossambicus*	13.0-21.0	15.81±1.67	44.0-166.9	72.51±26.80	145	0.174	2.998	0.9	0.143-0.212	2.833-3.163
6	*Mugil cephalus*	8.0-18.1	11.26±1.97	10.0-115.0	28.07±19.31	120	0.249	2.516	0.922	0.214-0.290	2.383-2.650
7	*Scatophagus argus*	6.7-15.3	11.53±1.56	10.7-89.41	44.06±10.74	125	0.924	1.616	0.768	0.783-0.918	1.458-1.773
8	*Escualosa thoracata*	8.2-16.7	13.11±1.93	13.0-50.0	30.28±8.83	136	0.739	1.567	0.7	0.607-0.899	1.410-1.764

N: sample size; *a* and *b* are the parameters of the weight–length relationship; range, Mean±SD are the minimum- maximum, mean and standard deviation respectively; r^2: coefficient of determination; CL (*a*) and CL (*b*): 95% conûdence intervals of *a* and *b*

Table 2. Length and weight characteristics - *a* and *b* values reported earlier from India, for the selected fish species

Sl. No.	Species	Length range(cm)	Weight range(g)	*a*	*b*	r^2	Location	Source
1	*Etroplus suratensis*	7.5–31.0	7.0-402	0.0193	2.67	0.963	Vembanad lake	Roshni *et al.*, 2015
2	*Pseudetroplus maculatus*	4.2–9.5	2.0–14.0	0.0148	2.72	0.966	Vembanad lake	Roshni *et al.*, 2015
3	*Liza parsia*	13.3-28.8	20.0-200	0.0055	3.19	0.974	Cochin estuary	Renjini and Nandan, 2011
4	*Carangoides praeustus*	6.8–24.8	4.1–244.0	0.006	3.29	0.987	Chilika Lake	Karna *et al.*, 2018
5	*Oreochromis mossambicus*	9.0-22.0	10.0-150	0.029	2.85	-	Idukki Reservoir	Nair, 1988
6	*Mugil cephalus*	10.0-54.0	-	0.0178	2.86	0.992	Vellar estuary	Murugan *et al.*, 2012
7	*Scatophagus argus*	5.0-34.0	-	-	2.661	0.975	Gulf of Mannar	Gandhi *et al.*, 2013
8	*Escualosa thoracata*	6.9-11.0	3.25-13.59	1.79	2.853	0.901	Ratnagiri coast of Maharashtra	Gurjar *et al.*, 2017

of exotic cichlid, *O. mossambicus* in landings is noteworthy and needs attention as it poses severe threat to the endemic fish fauna in many natural water bodies of Kerala (Kurup *et al.*, 2002; Raghavan *et al.*, 2008).

In the present study, most of the indigenous fish species in the Kayamkulam estuary showed a negative allometric growth pattern. This may be due to poor environmental conditions especially pollution and scarcity of food items in the ecosystem. Moreover, the present paper emphasizes the importance of length-weight relationship for native fish species from the Kayamkulam estuary. This information helps in amplifying the biological knowledge of the species distribution and sustainable fishery exploitation.

5. References

Blackwell, B.G., Brown, M.L., and Willis, D.W. 2008. Relative Weight (Wr) Status and Current use in Fisheries Assessment and Management. *Rev. Fish. Sci.*, 8:1-144.

Freitas, T.M.S., Souza, J.B.S., Prudente, B.S., and Montag, L.F.A. 2017. Length-weight relationship in ten fish species from the Nhamundá River, the Amazon Basin, Brazil. *.Acta Amazonica*, 47(1): 75 - 78

Froese, R. 2006. Cube law, condition factor and weight–length relationships: history, meta-analysis and recommendations. *J. Appl. Ichthyol*., 22: 241-253.

Froese, R., Tsikliras, A.C., and Stergiou, K.I. 2011. Editorial note on weight-length relations of fishes. *Acta Ichthyol Piscat.*, 41(4): 261–263. doi:10.3750/AIP

Froese, R., and Pauly, D. 2017 Fish Base. World Wide Web Electronic Publication. www.fishbase.org

Gandhi, V., Venkatesan, V., and Zacharia, P.U. 2013. Biometry analysis, length-weight relationship and sexual dimorphism of the Spotted Scat, *Scatophagus argus* (Linnaeus, 1766) (Perciformes: Scatophagidae) from Gulf of Mannar, southeast coast of India. *J. Mar. Biol. Assoc. India*., 55(1):12-16. doi: 10.6024/jmbai.2013.55.1.01743-02

Gurjar, U.R., Sawant, M.S., Takar, S., Pawar, R.A., Nirmale V.H., and Pawase, A.S. 2017. Biometric analysis of White Sardine, *Escualosa thoracata* (Valenciennes, 1847) along The Ratnagiri Coast of Maharashtra, India. *J. Exp. Zool. India*, 20(2): 845-849

Karna, S.K., Suresh, V.R., Mukherjee, M., and Manna, R.K. 2018. Length-weight and Length-length relations of four fish species from the Chilika Lake, East coast of India. *J. Appl. Ichthyol*., 34(1): 224-226. doi:10.1111/jai.13545

Kharat, S.S., Khillare, Y.K., and Dhahanukar, N. 2008. Allometric scaling in growth and reproduction of a freshwater loach *Nemacheilus mooreh* (Sykes, 1839). *Electron. J. Ichthyol*., 4(1): 8-17

Kuriakose, S. 2017. Estimation of length weight relationship in fishes. *In*: Course Manual Summer School on Advanced Methods for Fish Stock Assessment and Fisheries Management. Lecture Note Series No. 2/2017. CMFRI, Kochi, India. pp. 215-220.

Kurup, B.M, Ranjeet, K., and Thomas, R.K. 2002. Biodiversity threat to fish fauna of Periyar lake, Kerala. AC-1. NBFGR-NATP Publication No.4. *Life history traits of freshwater fish population for its utilisation in conservation.* National Bureau of Fish Genetic Resources, Lucknow, India.

Le Cren, E.D. 1951. The length weight relationship and seasonal cycle in gonad weight and condition in the Perch (*Perca fluviatilis*). *J. Anim.Ecol.*, 20(2): 201-219.

Murugan, S., Khan, A.S., Lyla, P.S., Kumar, P.C., Jalal, K.C.A., Kamaruzzaman, B.Y. and John, A.B. 2012. Length weight relationship of *Mugil cephalus* (Linnaeus 1758) in Vellar estuary, Southeast coast of India. Pakistan Journal of Biological Sciences, 15(12): 595-599.

Nair, G.P. 1988. Length weight relationship of *Tilapia mossambicus* of Idukki Reservoir. *Fish. Technol*., 25: 18-20.

Nelson, J.S. 2006. Fishes of the world (4th edn.). John Wiley and Sons, Hoboken, New Jersey, USA. xix+601 p.

Raghavan, R., Prasad, G., Ali, A.P.H. and Pereira, B. 2008. Exotic fish species in a global biodiversity hotspot: observations from River Chalakudy, part of Western Ghats, Kerala, India. *Biol. Invasions*, 10**:** 37–40. https://doi.org/10.1007/s10530-007-9104-2

Renjini, P.K., and Nandan S.B. 2011. Length-weight relationship, condition factor and morphometry of gold spot mullet *Liza parsia* (Hamilton, 1822) from Cochin estuary. *Indian J. Mar. Sci.*, 40(4): 567-571.

Roshni, K., Renjithkumar, C.R., and Kurup, B.M. 2016. Length-weight relationship of two cichlid fish species, *Etroplus suratensis* (Bloch, 1790) and *Etroplus maculatus* (Bloch,1795) from Lake Vembanad, Kerala, India. *J. Appl. Ichthyol*., 32: 1308-1309. doi:10.1111/jai.13141