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Length-Weight Relationships and Condition Factor of *Oreochromis mossambicus* (Peters, 1852) from Manchar Lake Distt. Jamshoro, Sindh, Pakistan

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Abstract: *Oreochromis mossambicus* are among the most widely distributed exotic fishes in the world and mostly used for food. The present study was undertaken to unveil information on the length-weight relationships (LWRs) and condition factor (Kn) of freshwater fish *Oreochromis mossambicus* (Peters, 1852) from Manchar Lake District Jamshoro, after post super flood in Sindh. Fish were studied by examining 364 specimens (Male 186 and female 78) collected from August 2011 to July 2012. These were 10-26 cm in total length (TL) and 19.8- 295 g in weight. Length-weight relationships calculated were, Log W = -1.8007+3.0556 × Log L (Combined population), Log W = -1.7802+3.0406 × Log L (male population) and Log W = -1.8062 + 3.0577× Log L (female population). The relative condition factor (Kn) for Combined population was 0.87 – 1.07 (Mean 1.0023±0.0671), while for male 0.86 – 1.09 (Mean 1.0027 ± 0.0733) and females 0.87 – 1.07 (Mean 1.0020 ±0.0631). The Length-weight relationships and condition factor indicate isometric and satisfactory growth of *Oreochromis mossambicus* in Manchar Lake.

Keywords: *Oreochromis mossambicus* , Manchar Lake, Condition factor, Pakistan

1. INTRODUCTION

Manchar Lake is the largest freshwater floodplain lake in Pakistan. It is located in the west of Indus River, in Jamshoro district, Sindh with an area from 60 Km^2 to as much as 350 Km^2.

Oreochromis mossambicus (Peters, 1852) is a true bony fish belongs to the family Cichlidae and commonly known as tilapia. It is the most common and widely distributed exotic fish in the world (Canonico *et al*., 2005) and mostly used as food (Gupta, and. Acosta, 2004) due to its mild white flesh attracts consumers and hence making it economically important (Courtenay, 1989). The family Cichlidae is highly diversified with a wide range of distribution spreading across Africa and most part of India and Ceylon (Balarin, 1979). This fish can live in brackish water, so imported by many countries (Mirza, 1990). *O.mossambicus* was first introduced in Pakistan in 1951 from Indonesia and Thailand (Frose and Pauly, 2011). In Pakistan some work on length-weight of *Oreochromis* (Naeem *et al*., 2010a, 2011a) and proximate of farmed Tilapia (O. mossombicus) is available (Naeem *et al*., 2011b).

The growth and condition of fish can be estimated through Length-weight relationship (LWR) and condition factor (Kn) studies (Okgerman, 2005). Length-weight relationship is helpful in conversion of growth in weight and growth in length equation to estimate the biomass from length observations and stock assessment models (Wootton, 1990; Moutopoulos and Stergiou, 2002). The aim of present study is to provide information on the Length-weight relationships (LWRs) and Condition factor (Kn) of *O. mossambicus* in Manchar Lake Sindh, Pakistan.

2. MATERIALS AND METHODS

Monthly fish samples were collected from August 2011 to July 2012 from the catch of fisherman at Manchar Lake (District Jamshoro). The fish sample comprised of a total 364 specimens (186 male and 178 female) having total length (TL) 10-26 cm (males) and 10-25.6 cm (females), weighing 23.64-286.30 g (males) while females 23.85-283.67 g. Before weighing all fishes were dried using paper towels and were weighed on portable digital balance with a sensitivity of 0.1 g. Body length measurements were made to the nearest 0.1 cm using a measuring tray.

The LWRs were calculated using equation $W= a L^b$, where

W = total weight (g),

L = total length (cm),

a = coefficient related to body form and,

b = exponent indicating isometric growth when equal to 3.0.

The parameters *a* and *b* were estimated by linear regression on the transformed equation: Log W= log a + b log L. The smooth mean weight W, for each length group have been computed from Le Cren,s modified formula $Kn = W/a L^b$ (Le Cren, 1951) that can be expressed as,

$Kn = W/\hat{W}$, where,

W = observed weight and,

$\hat{W}$ = calculated weight

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Relative condition factor (Kn) for males, females and combined sexes were calculated for each 2 cm length intervals.

3. RESULTS AND DISCUSSIONS

Length-weight relationships(LWRs)

Male length frequency distribution showed a range 10-26 cm while weight range was 19.8-295 g (Table 1). The LWRs estimated by linear regression, the equations produced are as under, **(Fig. 1)**

Log W = -1.7802+ 3.0406 Log L (Males)

The female length frequency distribution showed a range 10-25.6 cm while weight range was 19.9-290 g (Table 2). The LWRs estimated by linear regression, the following equation for females was developed **(Fig. 2).**

Log W = -1.8062+ 3.0577 Log L (Females)

The combined sex length frequency distribution showed a range 10-26 cm while weight range was 19.8-295 g. The LWRs estimated by linear regression, the equation for combined sexes **(Fig. 3)** is as follows,

Log W = -1.8007+ 3.0556 Log L (Combined)

Relative condition factor

The relative condition factor (Kn) of a size range 0.86-1.09 (SD± 0.073, mean 1.003) in males, 0.87-1.07 (SD± 0.063, mean 1.002) in females and 0.87-1.07 (SD± 0.067, mean 1.002) in combined sexes, respectively **(Table 1-3).**

The Length-weight relationships of *O. mossambicus* are presented in Table 2. If the specific gravity and morphology of a fish remain unchanged during its life, the value of regression coefficient *b* will be exactly 3.0 in the relation $W = a L^b$ ((Ricker, 1963; Bagenal and Tesch, 1978; Wooten, 1990). In present study the values of *a* and *b* computed were, -1.7802, 3.0406 (males), -1.8062, 3.0577 (females) and -1.8007, 3.0556 (combined population).

In our study the value of *b* was 3.055 which is slightly different from the results of (Naeem *et al*., 2010a) that is 2.93 whereas our results showed that almost isometric growth, where *b* = 3.05. Regression slope showed isometric growth which indicates that the small specimens have same form and condition as of large specimens (Frose, 2006; Percin and Akyol, 2009).

The value of *b* in *O. mossambicus* was compared with the work of other researchers for other fish species. The results of LWRs are in general agreement with those reported by Arslan *et al*., (2004) in *Salmo trutta* and in female *O. mossambicus* (Naeem *et al*., 2011b). Our estimation was compared by log *a* versus *b* on fish Base (Frose and Pauly, 2011) was applied and found to be very close to those existing for *O. mossambicus.* The value of *b* was quite different from other closely related species of the same genus, *O. niloticus*, (*b* = 2.72) as reported by Naeem *et al*., (2010 a,b; 2011a, c, d). The Variation may be due to factors like number of specimens examined, habitat, seasonal variations, health condition and differences in the observed length ranges of specimens examined (Tesch, 1971; Bagenal and Tesch, 1978; Wooten, 1998). It is also evident that pronounced seasonal fluctuations in ecological conditions result changes in condition factor due to feeding and seasonal cycles (Das, 1977).

The relative condition factor showed variation in all size groups. The highest Kn values were found in smaller fishes, which is in agreement with Shafi and Quddus (1974). We conclude that the growth of *O. mossambicus* in Manchar Lake is isometric and satisfactory.

Table 1. Descriptive statistics and estimated parameters of length-weight relationships, f (Female) m (Male) c (Combined sexes) and n (sample size).

Sex	*n*	Length range (cm)	Weight range (g)	*a*	95% CL		*b*	95% CL		r^2
M	186	10-26	19.8-295	-1.7802	-2.1249	-1.4356	3.0406	2.7653	3.3158	0.963
F	78	10-25.6	19.9-290	-1.8062	-2.1111	-1.5241	3.0577	2.8329	3.3021	0.963
C	364	10-26	19.8-295	-1.8007	-2.1202	-1.4812	3.0556	2.8003	3.3108	0.963

Table 2. Length –weight relationship of *Oreochromis mossambicus* in Manchar Lake, District Jamshoro.

Length Groups (cm)	Male			Female			Combined sexes		
	No.of males	Length (cm)Mean+SD	Mean weigh (g)	No.of females	Length (cm)Mean+SD	Mean weigh (g)	No.of specimens	Length (cm)Mean+SD	Mean weigh (g)
10-12	16	10.9±+0.66	23.6	20	11.0±0.70	23.8	36	10.9±0.68	23.7
12-14	40	13.3±0.58	44.2	33	13.3±0.55	43.8	73	13.3±0.56	44
14-16	47	15.2±0.54	67.4	41	15.2±0.56	67.5	88	15.2±0.54	67.5
16-18	41	17.1±0.56	80.5	47	17.0±0.57	80.5	88	17.0±0.56	80.5
18-20	13	19.2±0.66	145.6	11	18.9±0.67	132.1	24	19.1±0.66	139.5
20-22	14	21.4±0.49	191.5	12	21.4±0.53	189.6	26	21.4±0.50	190.6
22-24	6	23.5±0.65	265	5	23.5±0.53	264.3	11	23.5±0.57	264.6
24-26	9	25.5±0.55	286.3	9	25.3±0.58	283.6	18	25.3±0.51	284.9
Total	**186**			**178**			**364**		

Table 3. Relative condition factor (Kn) for male, female and combined sexes of *Oreochromis mossambicus* at different size groups.

Length groups (cm)	Male			Female			Combined sexes		
	Observed weight(g)	Calculated weight(g)	Kn	Observed weight(g)	Calculated weight(g)	Kn	Observed weight(g)	Calculated weight(g)	Kn
10-12	23.6	23.83	0.99	23.8	24.18	0.98	23.76	24	0.99
12-14	44.2	43.64	1.01	43.8	42.7	1.02	44.05	43.16	1.02
14-16	67.4	65.07	1.03	67.5	64.6	1.04	67.53	64.85	1.04
16-18	80.5	93.02	0.86	80.5	91.78	1.04	80.5	92.49	0.87
18-20	146	132.8	1.09	132	125.9	1.04	139.5	129.81	1.07
20-22	192	185.8	1.03	190	184.7	1.02	190.7	185.68	1.03
22-24	265	246.8	1.07	264	245.8	1.07	264.7	247.07	1.07
24-26	286	313.7	0.91	284	305.3	0.92	285	308.31	0.92
Mean Kn			**1.0027**			**1.002**			**1.0023**

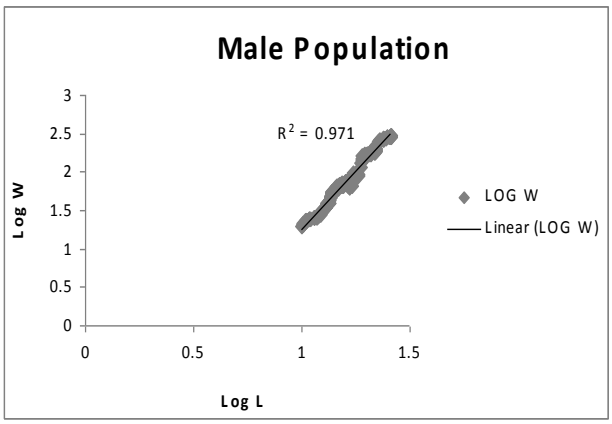

Fig. 1. Coefficient of determination of *O. mossambicus* (Male).

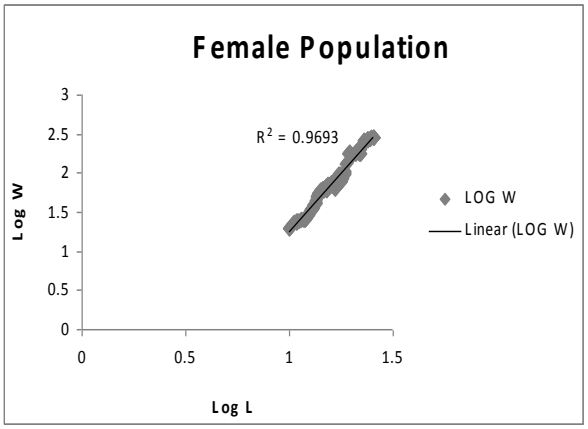

Fig. 2. Coefficient of determination of *O. mossambicus* (Female).

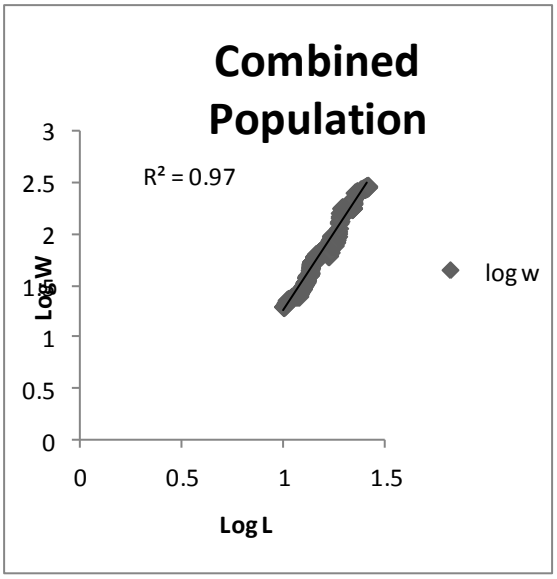

Fig. 3. Coefficient of determination of *O. mossambicus* (Combined).

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