



Morphometric Analysis of the Wild *Ompok pabda* (Hamilton-Buchanan, 1822) from Suleman Mountain Range, Dera Ghazi Khan Region, Pakistan

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Received 13th January 2015 and Revised 23rd September 2015

Abstract: *Ompok pabda* is important food fish in mountainous areas of Pakistan. Its population has become vulnerable in Pakistan. Morphometric studies are critical for sustainable fishery management. Various external morphometric parameters were analyzed for 34 specimens of *Ompok pabda* collected from Suleman Mountain Range, Dera Ghazi Khan Region, Pakistan. Most of the morphometric relationships had significant correlation values. Condition factor (K) also reflects significant correlation with wet body weight, while non-significant correlation with total length. Most of the parameters showed isometric growth.

Keywords: External Morphometry, Regression, Vulnerable, Suleman Mountain Range

1. INTRODUCTION

Ompok pabda (Hamilton-Buchanan, 1822) is an indigenous cat fish of the family Siluridae and is commonly known as 'Pahari Pafta' in Pakistan. It is geographically distributed from Burma, Bangladesh, and India to Pakistan and Afghanistan (Parameswarn *et al.*, 1971; Jayaram, 1999; Mirza, 2004; Banik *et al.*, 2012). Morphometrics is measurements of different external body parts of an organism (Talwar and Jhingran, 1991) and considered as one of the easiest and authentic methods for the identification of specimen (Nayman, 1965). Morphometric data is used for the biological evaluation of a species especially its ontogenetic interactions between rearing conditions. The growth patterns of morphometric characters are used to identify developmental thresholds in the ontogeny of several fish species (Kovac *et al.*, 1999).

Ompok pabda has been listed as endangered in several countries of the world like India (IUCN, 2013) and in Pakistan its population has been evaluated to be vulnerable (Rafique and Khan, 2012). Although, being economically valuable, this species has not been considered attractive in aquaculture due to its small natural population size and poor larvae survival (Banik and Malla, 2011). To the best of our knowledge, there has been no work on morphometric studies of *Ompok pabda* in the past in Pakistan. However, several researchers have reported work on morphometric studies of this species (Banik *et al.*, 2012). The present study is the first attempt to provide information on external morphometrics in relation to body size and

condition factor (K) of *Ompok pabda* from mountainous region of Dera Ghazi Khan, Pakistan.

2. MATERIALS AND METHODS

34 specimens of wild *Ompok pabda* (immature and adult) were captured from different localities of Suleman Mountain Range, Dera Ghazi Khan Region, Punjab, Pakistan during the year 2013 using different fish gears i.e. cast net, scoop net and drag net. Collected fishes were transported alive to laboratory of zoology department, Government Post Graduate College, Dera Ghazi Khan, Punjab, Pakistan in a plastic container. The fishes were killed and blotted dry on a paper towel and weighed to the nearest 0.1 g on an electrical balance (MP-3000 Chyo, Japan). Various body morphometric measurements were made using wooden measuring tray with a millimeter scale and vernier caliper.

The length and weight relationships were calculated by using the formula; $W = aL^b$ (Ricker, 1975). Where, W is weight in g, L is total length in cm, 'a' is constant and b is growth exponent (regression coefficient). These parameters are then converted to logarithmic form using the formula; $\log W = \log a + b \log L$. The 'a' and its 95 % confidence limits has been transformed as antilog. The condition factor (K) was determined by using formula $K = W \times 100 / L^3$ (Pauly, 1983). Where, K = condition factor, W = wet body weight, L = total length. Statistical analyses including regression, correlation coefficients and comparison between the regression coefficients were carried out using MS Excel with SPSS 20.

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3. **RESULTS AND DISCUSSIONS**

The central tendency values with means $\pm$ standard deviation along with ranges of measured morphometric data are given in **(Table-1)**. Total length (TL) values ranged from 10.30 – 18.90 cm with a mean value of 15.06 cm while wet body weight (W) ranged from 8.50 – 57 g with mean of 26.08 g.

There were highly significant relationships among most of the morphometric measurements with total length and wet body weight. By keeping total length on x-axis and other morphometric values on y-axis, the maximum correlation was found for TL vs FL ($r = 0.988$, $P < 0.001$) and minimum for TL vs CPL ($r = 0.194$, $P > 0.05$) **(Table 2)**. The slope 'b' for total length versus body weight found to be 3.048, which showed isometric growth, while for other morphometric measurements, it ranged - 0.864 to 1.630. Most of the parameters showed isometric growth ($b = 1$), while TL vs DFB and TL vs CPL showed negative allometric growth ($b < 1$). TL vs PostOL, TL vs BD and TL vs CPW showed positive allometric growth ($b > 1$). Similarly, wet body weight on x-axis and other morphometric measurements on y-axis, maximum correlation was found between wet body weight versus total length and fork length ($r = 0.950$, $P < 0.001$) and minimum between wet body weight and caudal peduncle length ($r = 0.154$, $P > 0.05$). The value of slope 'b' showed either isometric growth ($b = 0.33$) or negative allometric growth ($b < 0.33$) for most of the relationships. However, W vs Post OL and W vs Pec FB and W vs CPW showed positive allometric growth ($b > 0.33$), **(Table 3)**. The mean value of K for *Ompok pabda* was 0.723. The correlation between condition factor (K) and wet body weight ($r = 0.357$, $P < 0.05$) was significant, however, between condition factor (K) and total length ($r = 0.048$, $P > 0.05$) was non-significant.

Weight is considered to be a function of length in fish. A relative condition factor greater than one means the fish weighs more than expected for its length; a relative condition factor less than one means the fish weighs less than expected for its length. The value of regression coefficient 'b' would be exactly 3.0 in the relation $W = aL^b$, as form and specific gravity of the fish remains constant during its life span, when $b = 3.0$, growth is considered to be isometric. The value of slope

'b' for length-weight relationships (LWR) was 3.048 in our study which is within the normal range (2.5 to 3.5) as described by Froese (2006).

The present study contributes to the knowledge on length-weight relationships, morphometric measurements and condition factor of *Ompok pabda* and will be useful for fisheries researchers and aquaculture managers. However, further research work on morphometrics of *Ompok pabda* should be carried out considering different habitats, gender and size groups.

ACKNOWLEDGEMENTS

We are thankful to Mr. Muhammad Shafi, fisherman from Fisheries department, Government of the Punjab, Dera Ghazi Khan and local fishermen for providing assistance in fish collection.

Table-1. Central tendency values i.e. mean $\pm$ SD and range of various body measurements of *Ompok pabda*

Body Measurements	Mean $\pm$ SD	Range
Wet body weight (g)	26.08 $\pm$ 11.08	8.50-57.00
Total length (cm)	15.06 $\pm$ 1.96	10.30-18.90
Fork length (cm)	14.28 $\pm$ 2.00	9.50-18.30
Standard length (cm)	13.46 $\pm$ 2.03	8.50-17.70
Pre-orbital length (cm)	1.00 $\pm$ 0.16	0.60-1.48
Eye diameter (cm)	0.63 $\pm$ 0.22	0.36-1.50
Post-orbital length (cm)	1.39 $\pm$ 0.34	0.67-2.00
Head length (cm)	2.71 $\pm$ 0.41	1.08-3.45
Head depth (cm)	2.17 $\pm$ 0.39	1.23-2.80
Pectoral fin length (cm)	1.95 $\pm$ 0.27	1.30-2.50
Pectoral fin base (cm)	0.61 $\pm$ 0.11	0.39-0.80
Body depth (cm)	2.51 $\pm$ 0.46	1.58-3.30
Girth length (cm)	0.68 $\pm$ 0.10	0.45-0.90
Pelvic fin length (cm)	0.90 $\pm$ 0.13	0.60-1.20
Pelvic fin base (cm)	0.39 $\pm$ 0.07	0.20-0.50
Dorsal fin length (cm)	1.42 $\pm$ 0.17	0.93-1.70
Dorsal fin base (cm)	0.33 $\pm$ 0.34	0.20-2.20
Anal fin length (cm)	1.12 $\pm$ 0.12	0.90-1.47
Anal fin base (cm)	7.55 $\pm$ 1.01	6.00-9.50
Caudal peduncle width (cm)	0.84 $\pm$ 0.19	0.40-1.27
Caudal peduncle length (cm)	0.42 $\pm$ 0.47	0.20-2.21
Caudal fin length (cm)	1.67 $\pm$ 0.27	1.05-2.27

Table 2, Descriptive statistics and regression parameters of total length (cm) and different morphometrics for *Ompok pabda*

Equation	a	b	95 % CL of a	95 % CL of b	r
W = a + b TL	0.006	3.048	0.002-0.017	2.688-3.404	0.950
K = a + b TL	0.630	0.048	0.238-1.671	-0.312-0.408	0.048
FL = a + b TL	0.805	1.060	0.684-1.054	1.000-1.120	0.988
SL = a + b TL	0.690	1.094	0.504-0.948	0.978-1.211	0.959
Pre OL = a + b TL	0.108	0.816	0.046-0.255	0.500-1.132	0.681
ED = a + b TL	0.026	1.157	0.005-0.126	0.577-1.738	0.583
Post OL = a + b TL	0.020	1.559	0.005-0.060	1.152-1.966	0.810
HL = a + b TL	0.117	1.155	0.053-0.258	0.864-1.446	0.819
HD = a + b TL	0.097	1.145	0.041-0.225	0.833-1.457	0.797
Pec FL = a + b TL	0.177	0.883	0.097-0.324	0.660-1.105	0.819
Pec FB = a + b TL	0.024	1.186	0.012-0.051	0.911-1.461	0.841
BD = a + b TL	0.093	1.211	0.050-0.175	0.978-1.444	0.882
GL = a + b TL	0.044	1.014	0.026-0.072	0.828-1.200	0.891
Pel FL = a + b TL	0.061	0.992	0.040-0.092	0.838-1.147	0.918
Pel FB = a + b TL	0.035	0.889	0.011-0.112	0.456-1.322	0.594
DFL = a + b TL	0.234	0.665	0.124-0.444	0.428-0.901	0.712
DFB = a + b TL	1.500	-0.615	0.086-26.303	-1.673-0.444	0.205
AFL = a + b TL	0.229	0.588	0.148-0.354	0.426-0.749	0.795
AFB = a + b TL	0.923	0.774	0.524-1.626	0.565-0.984	0.800
CPW = a + b TL	0.010	1.630	0.005-0.020	1.380-1.880	0.920
CPL = a + b TL	3.334	-0.864	0.047-2.370	-2.440-0.712	0.194
CFL = a + b TL	0.136	0.923	0.066-0.281	0.655-1.191	0.778

a= intercept, b = slope, r = correlation coefficient, CL = confidence limits, W = weight, K = condition factor, TL = total length, FL = fork length, SL = standard length, PreOL = pre-orbital length, ED = eye diameter, PostOL = post-orbital length, HL = head length, HD = head depth, PecFL = pectoral fin length, PecFB = pectoral fin base, BD = body depth, GL = girth length, PelFL = pelvic fin length, PelFB = pelvic fin base, DFL = dorsal fin length, DFB = dorsal fin base, AFL = anal fin length, AFB = anal fin base, CPW = caudal peduncle Width, CPL = caudal peduncle length, CFL = caudal fin length

Table 3, Descriptive statistics and regression parameters of body weight (g) and different morphometrics for *Ompok pabda*

Equation	a	b	95 % CL of a	95 % CL of b	r
K = a + b W	0.504	0.111	0.360-0.705	0.006-0.216	0.357
TL = a + b W	5.834	0.296	5.212-6.531	0.261-0.331	0.950
FL = a + b W	5.164	0.318	4.571-5.821	0.280-0.355	0.950
SL = a + b W	4.624	0.333	4.009-5.346	0.288-0.378	0.936
Pre OL = a + b W	0.505	0.211	0.354-0.719	0.100-0.322	0.564
ED = a + b W	0.240	0.289	0.128-0.451	0.091-0.486	0.466
Post OL = a + b W	0.253	0.526	0.182-0.352	0.423-0.630	0.877
HL = a + b W	0.910	0.339	0.659-1.253	0.239-0.440	0.772
HD = a + b W	0.692	0.355	0.506-0.948	0.257-0.453	0.793
Pec FL = a + b W	0.811	0.273	0.647-1.016	0.202-0.343	0.812
Pec FB = a + b W	0.177	0.385	0.139-0.226	0.309-0.462	0.876
BD = a + b W	0.746	0.377	0.590-0.944	0.303-0.450	0.880
GL = a + b W	0.252	0.311	0.207-0.308	0.249-0.372	0.875
Pel FL = a + b W	0.322	0.319	0.284-0.366	0.280-0.358	0.947
Pel FB = a + b W	0.136	0.327	0.093-0.200	0.208-0.447	0.702
DFL = a + b W	0.695	0.223	0.561-0.863	0.156-0.291	0.767
DFB = a + b W	0.482	-0.166	0.167-0.718	-0.498-0.165	0.178
AFL = a + b W	0.610	0.192	0.002-0.706	0.146-0.238	0.833
AFB = a + b W	3.281	0.260	2.748-3.908	0.205-0.315	0.862
CPW = a + b W	0.162	0.509	0.127-0.207	0.433-0.586	0.922
CPL = a + b W	0.637	0.214	0.131-3.105	-0.709-0.281	0.154
CFL = a + b W	0.701	0.269	0.524-0.940	0.178-0.361	0.729

a= intercept, b = slope, r = correlation coefficient, CL = confidence limits, W = weight, K = condition factor, TL = total length, FL = fork length, SL = standard length, PreOL = pre-orbital length, ED = eye diameter, PostOL = post-orbital length, HL = head length, HD = head depth, PecFL = pectoral fin length, PecFB = pectoral fin base, BD = body depth, GL = girth length, PelFL = pelvic fin length, PelFB = pelvic fin base, DFL = dorsal fin length, DFB = dorsal fin base, AFL = anal fin length, AFB = anal fin base, CPW = caudal peduncle Width, CPL = caudal peduncle length, CFL = caudal fin length

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