Length-weight relationship of five native fish species from Chashma Barrage at the Indus River, Pakistan

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Length-weight relationships (LWRs) of *Wallago attu*, *Hypophthalmichthys molitrix*, *Catla catla*, *Ctenopharyngodon idella* and *Mastacembelus armatus* were estimated as $W = 0.141 L^{2.384}$, $W = 0.041 L^{2.654}$, $W = 0.014 L^{2.966}$, $W = 0.011 L^{2.952}$ and $W = 0.013 L^{2.565}$ correspondingly in this study.

[Keywords: Length, Weight, Relationship, Fish, Chashma Barrage, Pakistan]

Introduction

Length-weight relationships (LWRs) have many applications in the field of fishery science and therefore are, frequently, regarded as very useful tools. Their role is diverse such as they are used in biomass assessment, individual fish weight, species distribution, condition indices, life history comparison and fishery management.

The Indus River originates in the Tibetan Plateau and finally flows into the Arabian Sea. It is the longest river, 3180 km, in Pakistan. Its waters are rich in ichthyo-faunal diversity, which plays an important role in blue economy. Various studies have been conducted on the faunal diversity of this river but LWRs of only few fish species have been investigated.

This study is the first recording of LWRs of five commercially important native fish species i.e. *Wallago attu* (Bloch & Schneider, 1801), *Hypophthalmichthys molitrix* (Valenciennes, 1844), *Catla catla* (Hamilton, 1822), *Ctenopharyngodon idella* (Cuvier & Valenciennes) and *Mastacembelus armatus* (Lacepede, 1800) by using descriptive statistics found in the Indus River waters.

Materials and Methods

In total 273 fish samples, both sexes combined, belonging to five different species viz. *W. attu* (52), *H. molitrix* (57), *C. catla* (59), *C. idella* (56) and *M. armatus* (49) and three families viz. Siluridae, Cyprinidae and Mastacembelidae were analyzed in order to collect length-weight data for each specimen.

Total length (cm) and total weight (g) measurements, June to November 2015, were taken at Chashma Barrage landing site.

Chashma Barrage is the major landing site on the Indus River. Total length was taken nearest to cm whereas total weight to g. Collected samples were identified according to Talwar and Jhingaran. LWRs were investigated by using linear regression equation $W = aL^{b}$. In this mathematical expression $W$ stands for weight in g, $a$ represents the intercept, $L$ indicates length in cm and $b$ stands for slope. Log graphs were employed to remove outliers before performing descriptive statistics analysis. Microsoft Excel 2007 was used to execute statistical analysis.
Table 1— Computed LWRs parameters of five native fish species from Chashma Barrage at the Indus River, Pakistan

<table>
<thead>
<tr>
<th>Family/Species</th>
<th>n</th>
<th>Length range (cm) Min. - Max.</th>
<th>SD (L)</th>
<th>Weight range (g) Min. - Max.</th>
<th>SD (W)</th>
<th>Regression parameters $a$</th>
<th>b</th>
<th>$r^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Siluridae</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W. attu</td>
<td>52</td>
<td>22.9 - 83.3</td>
<td>15.5</td>
<td>100 - 4100</td>
<td>1220.2</td>
<td>0.141</td>
<td>2.384</td>
<td>0.951</td>
</tr>
<tr>
<td>H. molitrix</td>
<td>57</td>
<td>32 - 71.5</td>
<td>11.8</td>
<td>720 - 4150</td>
<td>1105.7</td>
<td>0.041</td>
<td>2.634</td>
<td>0.948</td>
</tr>
<tr>
<td>C. catla</td>
<td>59</td>
<td>30 - 71.3</td>
<td>12.4</td>
<td>350 - 5000</td>
<td>1382.1</td>
<td>0.014</td>
<td>2.966</td>
<td>0.988</td>
</tr>
<tr>
<td>C. idella</td>
<td>56</td>
<td>50.5 - 83.8</td>
<td>11.1</td>
<td>900 - 5100</td>
<td>1300.7</td>
<td>0.011</td>
<td>2.952</td>
<td>0.967</td>
</tr>
<tr>
<td>Mastacembelidae</td>
<td>49</td>
<td>35.6 - 73.7</td>
<td>12.7</td>
<td>120 - 800</td>
<td>232.1</td>
<td>0.013</td>
<td>2.565</td>
<td>0.972</td>
</tr>
</tbody>
</table>

Note: n, sample size; SD, standard deviation; L, length; W, weight; $a$, intercept; $b$, slope; $r^2$, goodness of fit.

Results

LWRs for W. attu, H. molitrix, C. catla, C. idella and M. armatus were computed as $W = 0.141 L^{2.584}$, $W = 0.041 L^{2.654}$, $W = 0.014 L^{2.966}$, $W = 0.011 L^{2.952}$ and $W = 0.013 L^{2.565}$ respectively. Other observations and calculations are listed in Table 1.

Discussion

This pioneer study reveals LWRs of some commercially important native species from the Indus River waters which have not been reported previously. Weight and length of all the sampled fish species fall into the expected range. However, values of $a$ and $b$ showed sometimes deviations from the predicted ones. These differences may be due to the sampling techniques applied. It should be noted that readings were taken from fresh samples. In addition to this, local environment and hydro-biological characters are probably responsible for observed differences which should be further investigated. However, these findings provide baseline data for further research on the assemblage structure of ichthyo-fauna of the Indus River. The results of this research can also be used for life history comparison and to investigate population morphological characters.

Conclusion

This study concludes that the LWRs of five fish species i.e. W. attu, H. molitrix, C. catla, C. idella and M. armatus is computed as $W = 0.141 L^{2.584}$, $W = 0.041 L^{2.654}$, $W = 0.014 L^{2.966}$, $W = 0.011 L^{2.952}$ and $W = 0.013 L^{2.565}$ correspondingly.

Acknowledgements

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References