Length–weight and length–length relationships for three *Sillago* species (Sillaginidae) from the Persian Gulf

M. S. Alavi-Yeganeh | S. N. Mirhadi | M. Nasri

**INTRODUCTION**

There are three species of genus *Sillago* in the Persian Gulf, including the Arabian sillago *Sillago arabica* McKay & McCarthy, 1989, slender sillago *Sillago attenuata* McKay, 1985 and silver sillago *Sillago sihama* (Forsskål, 1775). The species of *Sillaginidae* family are widespread throughout the Indian Ocean and the western Pacific Ocean, but the distribution range of *S. arabica* and *S. attenuata* is restricted to the Persian Gulf (www.fishbase.org). All *Sillaginids* are of small to moderate size and popular commercial fish throughout their range (McKay, 1992).

For the Persian Gulf fish species, there are a few studies (Alavi-Yeganeh, Shojaei, Taghavi Motlagh, Hakimelahi, & Taheri Mirghaed, 2016; Deyrestani, Alavi-Yeganeh, & Sadeghizadeh, 2015; Naderi, Zare, & Azvar, 2013), but no previous reports for length–weight or length–length relationships (LWRs and LLRs) of the sillaginid species Persian Gulf. The aim of this study was to obtain comprehensive information on LW and LL relationships for these species.

**MATERIALS AND METHODS**

A total of 220 *Sillago* specimens were collected from August 2015 to January 2016 by cast net (10 mm mesh size) and beach seine (15 mm mesh size) in four locations from east to west along the northern Persian Gulf coast of Iran: Bandar-abbas (27°10′N, 56°20′E), Kangan (27°50′N, 52°03′E), and the beaches of Dayer (27°50′N, 51°56′E) and Bushehr (29°00′N, 50°50′E). Identification of species was carried out according to McKay and McCarthy (1989), McKay (1992) and Kaga (2013). Total length (TL) and standard length (SL) measurements were taken with a digital caliper (0.01 cm accuracy) and body weight (BW) measurements taken with a digital scale (0.1 g accuracy). Specimens were preserved in neutralized and buffered formalin fixative and catalogued in the Aquatic Animal Collection of Tarbiat Modares University, Iran. Visual inspection of outliers by log–log plots of length and weight values were performed; extreme outliers attributed to data error were omitted from the analyses (Froese, 2006). The LWR was calculated by applying the exponential regression equation \( W = a L^b \), where \( W \) is the total weight (g), \( L \) is the total length (cm), \( a \) is the intercept and \( b \) is the slope of log-transformed linear regression (Bagenal, 1978).

**RESULTS**

The LLR regressions of the three *Sillago* species are given in Table 1 and the LWR parameters are presented in Table 2.

**DISCUSSION**

The slope (\( b \)) of the LW relationship for all three species was within the expected range of 2.5–3.5 (Froese, 2006) and varied from a minimum of 3.043 for *S. attenuata* to a maximum of 3.440 for *S. arabica*. The
intercept \((a)\) values indicated an elongated body shape in these three *Sillago* species (Froese, 2006). The Bayesian length–weight predictions provided in FishBase (http://www.fishbase.org) for *Sillago* species and other elongated body shape fish species were comparable with our estimates, indicating the utility of the approach described by Froese, Thorson, and Reyes (2014). A new maximum TL record for *S. arabica* appears to be 15.7 cm (Table 2), compared with 15.0 cm as previously reported for this species (McKay, 1992). This paper provides the first published reference of LW relationships for the Arabian sillago (*S. arabica*) and slender sillago (*S. attenuata*) to aid in fishery research, management and conservation of Sillaginids in the Persian Gulf.

**ACKNOWLEDGEMENTS**

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**REFERENCES**


### TABLE 1  Length–length relationship comparison of total length (TL) and standard length (SL) of three sillaginid species, Persian Gulf, August 2015–January 2016

<table>
<thead>
<tr>
<th>Species</th>
<th>N</th>
<th>TL Range (cm)</th>
<th>SL Range (cm)</th>
<th>Equation</th>
<th>a</th>
<th>95% CI of a</th>
<th>b</th>
<th>95% CI of b</th>
<th>r²</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Sillago arabica</em></td>
<td>50</td>
<td>11.10–15.70</td>
<td>9.3–34.2</td>
<td>(TL = a \times b) SL</td>
<td>0.0025</td>
<td>0.0015–0.0043</td>
<td>3.440</td>
<td>3.232–3.649</td>
<td>.959</td>
</tr>
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<td><em>Sillago attenuata</em></td>
<td>76</td>
<td>10.60–17.93</td>
<td>10.0–41.7</td>
<td>(SL = a \times b) TL</td>
<td>0.0066</td>
<td>0.0044–0.0099</td>
<td>3.043</td>
<td>2.890–3.197</td>
<td>.959</td>
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<td><em>Sillago sihama</em></td>
<td>94</td>
<td>10.72–20.84</td>
<td>7.0–70.8</td>
<td>(SL = a \times b) SL</td>
<td>0.0054</td>
<td>0.0037–0.0079</td>
<td>3.092</td>
<td>2.955–3.230</td>
<td>.956</td>
</tr>
</tbody>
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N, sample size; \(a\), intercept; \(b\), slope; CI, confidence intervals.

### TABLE 2  Length–weight relationship parameter descriptive statistics and estimates for three sillaginid species, Persian Gulf, August 2015–January 2016

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<th>W Range (g)</th>
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N, number of individuals; \(a\), intercept; \(b\), slope; CI, confidence intervals; \(r²\), coefficient of determination.