Length-weight relationships of five species of sturgeon in the Iranian waters of the Caspian Sea

Fazli, H1*; Moghim, M.2

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1,2- Caspian Sea Ecology Research Center, P.O.Box: 961, Khazar-abad, Sari, Iran
*Corresponding author's email: fazlihasan@gmail.com

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Of six species of sturgeon in the Caspian basin, five anadromous species occur in the Iranian waters: Persian sturgeon Acipenser persicus Borodin, 1897; Russian sturgeon A. gueldenstaedtii Brandt & Ratzeburg, 1833; stellate A. stellatus Pallas, 1771; ship A. nudiventris Lovetsky, 1828 and beluga Huso huso (Linnaeus, 1758) (Levin, 1997). In recent years, Persian sturgeon comprises the largest proportion of the total Iranian commercial catch (Moghim et al., 2006).

The length-weight relationship (LWR) parameters are important in fish biology and can give information on stock condition, condition indices and several aspects of fish population dynamics (Bagenal and Tesch, 1978; Martin-Smith, 1996; Gonçalves, et al., 1997). Also, these relationships have been used in the conversion fish length and body weight to provide some measure of biomass (Froese, 1998). In the present study, LWR provided for five very valuable sturgeon species from southern Caspian Sea in Iran.

This study was carried out in Iranian coastal waters of the Caspian Sea and covers two data collection series: 1. Commercial catch data, carried out during 1990-1992. 2. by-catch of juvenile sturgeons in beach seines which target for other bony fish, during 1990-2012. All species were identified to species and fork length (FL) measured to the nearest 1 cm for matured and 0.5 cm for juvenile samples, and weighed to the nearest 100 g for matured and 1 g for juvenile samples.

The LWR, \( W = aL^b \) was calculated using the logarithmic transformation of the linear regression equation: \( \log W = \log a + b \log FL \), where \( W \) is the weight of fish, \( a \) is the intercept of the regression and \( b \) is the regression coefficient (Bagenal and Tesch, 1978). The statistical significance level of \( r^2 \) was estimated, and the b-value for each species was
tested by t-test to verify if it was significantly different from 3.

A total of 7004 specimens belonging to 5 valuable sturgeon species were analyzed. Result of LWR regressions are shown in Table 1. Estimates of the coefficient \( b \) ranged between 2.99 (for \( A. stellatus \)) to 3.21 (for \( A. gueldenstaedti \)). These results in accordance with the range values of the parameter \( b \) should normally encountered in fishes, which fall between 2.5 and 3.5 (suggested by Carlander, 1969 and confirmed by Froese, 2006).

In the FishBase database, there are only the LWR information of three species: \( H. huso \), \( A. stellatus \) and \( A. nudiventris \) (Froese and Pauly, 2011), but covered only matured fishes. As pointed out by Petrakis and Stergio (1995), use of the length-weight relationship should be limited to the sizes in the estimation of the parameter.

Only one species, \( A. stellatus \), showed isometric growth, thus this species grows in length and weight in equal shares. Other species showed positive allometric growth pattern, according to the t-test (Table 1). Values of the correlation coefficient \( (r^2) \) changed between 0.85 and 0.99, were all statistically significant (\( P<0.0001 \)). Moreover, these results provide the first reference on LWR for \( A. persicus \) in the Caspian basin (and \( A. gueldenstaedti \)) and have no LWR information recorded in FishBase (Froese and Pauly, 2011).

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References


