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

Fazli, H[1]*; Moghim, M.[2]

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

Of six species of sturgeon in the Caspian basin, five anaderomous species occur in the Iranian waters: Persian sturgeon *Acipenser persicus* Borodin, 1897; Russian sturgeon *A. gueldenstaedti* 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).

References

Bagenal, T. B. and Tesch, F.W., 1978. Age and growth. In: Methods for assessment of fish production in freshwaters. 3rd edn. T. Bagenal (Ed.). IBP Handbook No. 3. Blackwell Scientific Publications, Oxford, UK, pp. 101–136.

Carlander, K. D., 1969. Handbook of freshwater fishery biology. Vol. 1. The Iowa State University Press, Ames IA, 752 pp.

Froese, R. and Pauly, D. (Editors). 2011. FishBase. World Wide Web electronic publication. www.fishbase.org, version (accessed 29 December 2012).

Froese, R., 1998. Length-weight relationships for 18 less-studied fish species. J. Appl. Ichthyol. 14, 117-118.

Froese, R., 2006. Cube law, condition factor and weight-length relationships: history, meta-analysis and recommendations. J. Appl. Ichthyol. 22, 241-253.

Gonçalves, J. M. S., Bentes, L., Lino, P. G., Ribeiro, J., Canario, A. V. M. and Erzini, K., 1997. Weight-length relationships for selected fish species of the small-scale demersal fisheries of the south and south-west coast of Portugal. Fish Res. 30, 253-256.

Levin, A., 1997. The distribution and migration of sturgeons in the Caspian Sea. In: Sturgeon Stocks and Caviar Trade Workshop (Proceedings of the Sturgeon Stocks and Caviar Trade Workshop, Bonn, 9-10 October, 1995). V.J. Birstein, A. Bauer and A. Kaiser-Pohlmann, eds. IUCN, Gland, Cambridge, Bonn, pp. 13-20.

Martin-Smith, K. M., 1996. Length/weight relationships of fishes in a diverse tropical fresh-water community, Sabah, Malaysia. J. Fish Biol. 49, 731-734.

Moghim, M., Kor, D., Tavakoloieshkalak, M. and Khoshghalb, M. B., 2006. Stock status of Persian sturgeon (*Acipenser persicus* Borodin, 1897) along the Iranian coast of the Caspian Sea. J. Appl. Ichthyol. 22, 99-107.

Petrakis, G. and Stergiou, K. I., 1995. Wight-length relationships for 33 fish species in Greek waters. Fish Res. 21. 465-469.