



## LENGTH AND WEIGHT PARAMETERS OF THE LOACH, *Oxynoemacheilus veyseli* (NEMACHEILIDAE) IN BOZKUŞ CREEK (KARS-TURKEY)

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**Abstract:** This study describes the length–weight relationship (LWR) of *Oxynoemacheilus veyseli* from the Bozkuş Creek (Aras River Basin) in Turkey. A total of 46 specimens were obtained by electroshock methods between May 2011 and September 2013. Total lengths ranged from 3.9 to 10.0 cm. The length–weight relationship showed a negative allometric growth ( $b = 2.8211$ ;  $R^2 = 0.97$ ). The study presents the first reference on LWR (length-weight relationship) for this species.

**Keywords:** *Oxynoemacheilus veyseli*, length-weight relationship, Aras River, allometric growth

### Bozkuş Deresi (Kars-Türkiye)'nde *Oxynoemacheilus veyseli* (Nemacheilidae)'nin Boy Ağırlık Parametreleri

**Öz:** Bu çalışmada *Oxynoemacheilus veyseli*'nin Bozkuş Deresi (Aras Nehir Havzası)'nden boy-ağırlık ilişkisi açıklanmaktadır. Mayıs 2011 - Eylül 2013 tarihleri arasında elektroşok yöntemleriyle toplam 46 örnek toplanmıştır. Toplam uzunluklar 3,9 ile 10,0 cm arasında değişmiştir. Boy-ağırlık ilişkisi negatif bir allometrik büyüme göstermiştir ( $b = 2,8211$ ;  $R^2 = 0,97$ ). Çalışmada, bu tür için boy-ağırlık ilişkisi ile ilgili ilk referansı sunulmuştur.

**Anahtar Kelimeler:** *Oxynoemacheilus veyseli*, boy-ağırlık ilişkisi, Aras Nehri, allometrik büyüme

## INTRODUCTION

The family Nemacheilidae or stone loaches are small fishes occurring in freshwaters of Asia, Europe and Northeast Africa. Most of the presently described 704 species and 46 genera are found in South and Southeast Asia (Kottelat, 2012). The genus *Oxynoemacheilus* has a wide geographic distribution throughout Europe and Asia (Freyhof et al., 2011). About 40 species of *Oxynoemacheilus* live in Anatolia (Çiçek et al., 2019). There is very little information available on the length weight relationships of *Oxynoemacheilus* species. It is only known for *O. eregliensis*, *O. samanticus*, *O. mesudae*, *O. evreni*, *O. simavicus*, *O. angorae*, *O. hamwii* and *O. theophilii* (Gaygusuz et al., 2012; Erkakan et al., 2013; Erkakan et al., 2014; Innal et al., 2015; Birekcikliğil et al., 2016; Özcan and Altun, 2016; Yazıcıoğlu and Yazıcı, 2016).

Length–weight relationships have important implications for fisheries science and population dynamics (Erzini, 1994). This information is necessary to calculate the standing stock biomass (Martin-Smith, 1996), condition indices, in the analysis of ontogenetic changes (Safran, 1992) and several other aspects of fish population dynamics (Morato et al. 2001).

Aras River basin provide essential spawning and rearing habitat for many loach species. *Oxynoemacheilus veyseli* Çiçek, Eagderi & Sungur, 2018 has described from upper Aras drainage by Çiçek et al., 2018. The aim of this study was to report the first data on length-weight relationship for *O. veyseli* living in the Aras River drainage, Kars Province, Turkey.

## MATERIAL AND METHODS

The study was carry out in the Bozkus Creek, Aras River drainage, Kars Province, Turkey (Bozkuş stream, N 40° 29' 57" E 42° 48' 4"). This study area is tributary of Aras River. This river flows from Turkey to Georgia, then to Azerbaijan, where it receives the Aras as a right tributary, and enters the Caspian Sea. Fish samplings were carried out in the Bozkuş stream from May 2011 to September 2013 by using an electrofishing device. During the study period, four different fish species were caught in the Bozkuş stream: *Alburnoides*

*eichwaldii*, *Capoeta capoeta*, *Squalius turcicus*, *Leucalburnus satunini*. In general, the habitat of this species is gravelly, sandy, clean water with plenty of oxygen. They were fixed in %5 solution of formaldehyde and then placed in %72 ethanol. Specimens were measured to the nearest 0.1 cm total length and weighed to the nearest 0.1 g total weight. Sex was recognized by macroscopic observation of gonads. The total length–weight relationship was determined using the equation  $W = a L^b$  (Froese, 2006) and logarithmically transformed into  $\log W = \log a + b \log L$  where  $W$  is the weight of the fish in grams and  $L$  is the length of the fish measured in centimetres. “a” the intercept of the regression and “b” the slope or regression coefficient. The significance of the b value was tested by t-test. The Kolmogorov–Smirnov test was used to analyse size frequency distributions of both sexes.

## RESULTS

46 specimens of *O. veyseli* were collected during the study period. Sample size, length, weight, parameters for  $a$  and  $b$ , and  $r^2$  values are given for males, females and both sexes combined in Table 1. Length and weight frequency distributions and length-weight relationship of *O. veyseli* are shown in Figure 1. The size frequency distributions of males and females were not significantly different (Kolmogorov–Smirnov test,  $p > 0.1$ ). Specimens of *O. veyseli* ranged from 3.9 to 10 cm in total length and from 0.5 to 8.6 g in total weight. Total length ranged from 4.9 to 9.9 cm in males, from 3.9 to 10 cm in females. Weight ranged from 0.9 to 6.6 g in males, from 0.5 to 8.6 g in females. The mean total length and weight of males were higher than females. Length–weight relationships were fitted to the equation  $W = 0.0105xL^{2.8635}$  ( $R^2=0.97$ ) for females and  $W = 0.0093xL^{2.8822}$  ( $R^2=0.98$ ) for males and  $W = 0.0111xL^{2.8211}$  ( $R^2=0.97$ ) for both sexes combined.

Table 1. Sample size, length, weight, parameters for  $a$  and  $b$ , and  $r^2$  values of *Oxynoemacheilus veyseli*

| Sex             | N  | Total length (cm) | Weight (g)      | a      | b      | $r^2$  |
|-----------------|----|-------------------|-----------------|--------|--------|--------|
|                 |    | Range (Min-Max)   | Range (Min-Max) |        |        |        |
| Female          | 28 | 3.9-10            | 0.5-8.6         | 0.0105 | 2.8635 | 0.9667 |
| Male            | 18 | 4.9-9.9           | 0.9-6.6         | 0.0093 | 2.8822 | 0.984  |
| All individuals | 46 | 3.9-10            | 0.5-8.6         | 0.0111 | 2.8211 | 0.9657 |

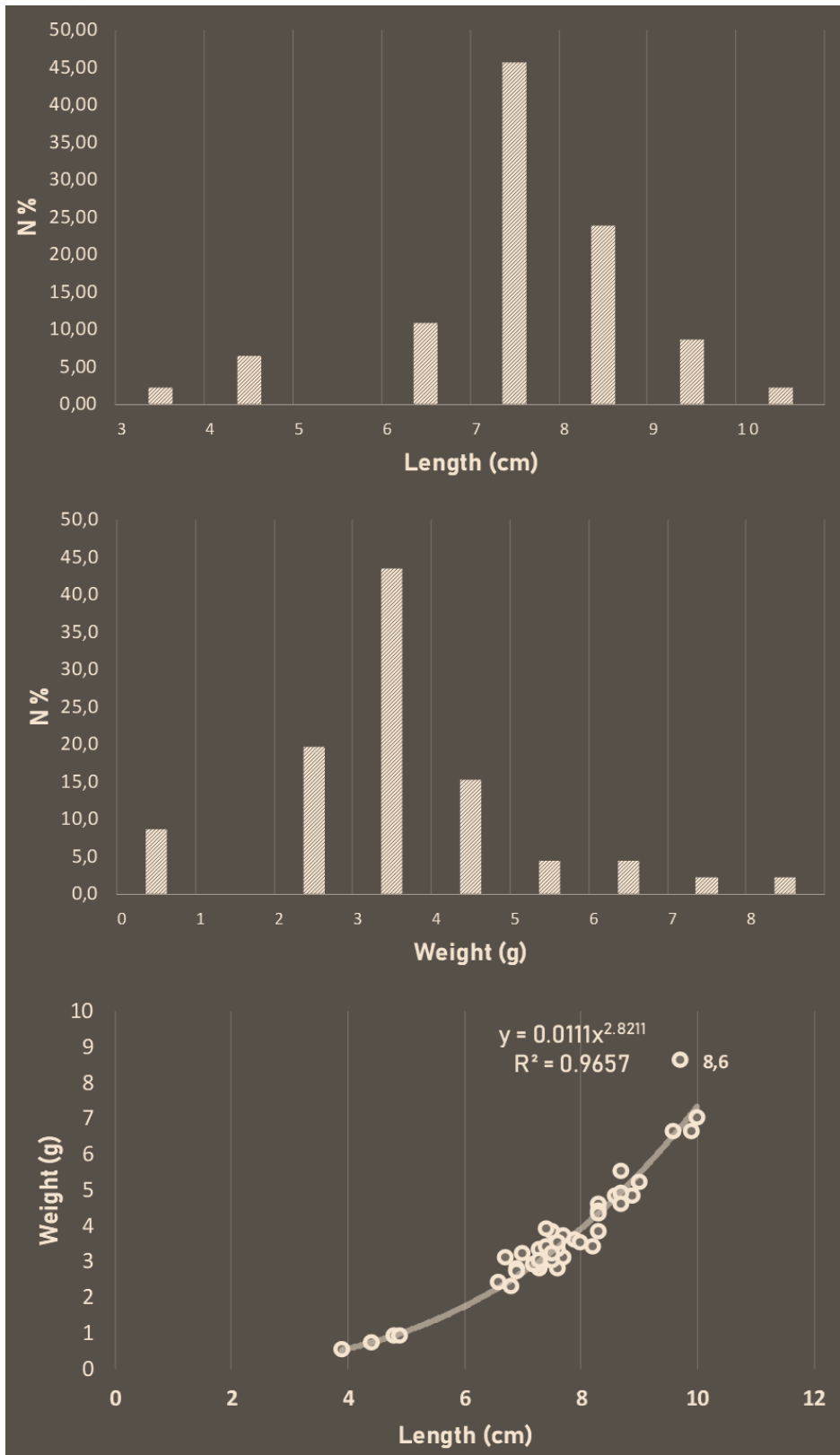


Figure 1. Length and weight distributions and Length-weight relationship (LWR) of *Oxynoemacheilus veyseli*

## DISCUSSION

The value of  $b$  were within the limits of 2.5-3.5 commonly reported for teleosts by Froese (2006). The length–weight relationship showed a negative allometric growth ( $b = 2.8211$ ;  $r^2 = 0.97$ ,  $p < 0.05$ ). The  $r^2$  values indicate a high correlation degree of length and weight. Negative allometric growth determined in this study was in accordance with results reported in earlier studies (Erk'akan *et al.*, 2014; Innal *et al.*, 2015). Relationships between length and weight for species of *Oxynoemacheilus* genus have been described by several authors, and both isometric and allometric growth from various water bodies have been reported for species of *Oxynoemacheilus* genus (Table 2).

Table 2. Estimated length weight parameters of *Oxynoemacheilus* species

| Species               | Locality                  | N       | TL            | W             | a           | b          | r <sup>2</sup> | Reference                          |
|-----------------------|---------------------------|---------|---------------|---------------|-------------|------------|----------------|------------------------------------|
| <i>O. mesudae</i>     | Küfe Creek                | 14      | 6.6 - 8.9     | 2.2 - 5.2     | 0.0161      | 2.628      | 0.951          | Erk'akan <i>et al.</i> , 2014      |
| <i>O. evreni</i>      | Çayır Creek               | 27      | 5.4 - 9.4     | 1.4 - 6.7     | 0.0128      | 2.788      | 0.921          | Erk'akan <i>et al.</i> , 2014      |
| <i>O. veyseli</i>     | Bozkuş Creek              | 46      | 3.9-10.0      | 0.5-8.6       | 0.0111      | 2.821<br>1 | 0.965<br>7     | Present study                      |
| <i>O. theophilii</i>  | Bozcay Creek              | 10      | 3.1-5.6       | 0.25-<br>1.18 | 0.01        | 2.898      | 0.94           | Innal <i>et al.</i> , 2015         |
| <i>O. samanticus</i>  | Karaboğaz Creek           | 40      | 4.5 - 8.6     | 0.6 - 4.3     | 0.0085<br>1 | 2.919      | 0.919          | Erk'akan <i>et al.</i> , 2014      |
| <i>O. angorae</i>     | Kılıçözü Stream           | 10<br>3 | 3.5-9.8       | 0.38-<br>6.58 | 0.0098      | 2.929      | 0.963          | Yazıcıoğlu and Yazıcı, 2016        |
| <i>O. theophilii</i>  | Dalaman Stream            | 10      | 6.4-7.9       | 2.51-<br>4.88 | 0.011       | 2.989      | 0.93           | Innal <i>et al.</i> , 2015         |
| <i>O. theophilii</i>  | Cüneyt Creek              | 17      | 6.6-10.5      | 2.3-11        | 0.007       | 3.07       | 0.96           | Innal <i>et al.</i> , 2015         |
| <i>O. angorae</i>     | Kızılırmak River<br>Basin | 12<br>7 | 2.8-8.6       | 0.22-<br>6.18 | 0.008       | 3.102      | 0.94           | Birekcikliğil <i>et al.</i> , 2016 |
| <i>O. theophilii</i>  | Duger Spring              | 13      | 3.9-5.8       | 0.56-<br>2.09 | 0.007       | 3.188      | 0.94           | Innal <i>et al.</i> , 2015         |
| <i>O. eregliensis</i> | Melendiz Creek            | 76      | 1.65-<br>10.3 | 0.1-7.3       | 0.005       | 3.196      | 0.979          | Erk'akan <i>et al.</i> , 2013      |
| <i>O. angorae</i>     | Sögütözü Beynam           | 24      | 4.4 - 8.3     | 0.8 - 6.6     | 0.0062<br>2 | 3.228      | 0.992          | Erk'akan <i>et al.</i> , 2014      |
| <i>O. angorae</i>     | Balıklı Stream            | 30      | 4.7–7.3       | 0.86–<br>3.56 | 0.006       | 3.237      | 0.882          | Gaygusuz <i>et al.</i> , 2012      |
| <i>O. simavicus</i>   | Karaçaltı Creek           | 17      | 4.6-7.1       | 0.6-2.5       | 0.0044      | 3.261      | 0.953          | Erk'akan <i>et al.</i> , 2014      |
| <i>O. theophilii</i>  | Yiğitler Creek            | 9       | 5.5-8.9       | 1.1-5.4       | 0.004       | 3.293      | 0.98           | Innal <i>et al.</i> , 2015         |
| <i>O. hamwii</i>      | Gölbaşı Lake              | 28      | 5.0–8.8       | 0.6–3.65      | 0.0021      | 3.52       | 0.955          | Özcan and Altun, 2016              |

In conclusion, this study provides basic information on LWR for this species not yet available in the international literature. The data would also be useful for fishery biologists and managers in Turkey.



## REFERENCES

- Birecikligil, S.S., Çiçek, E., Öztürk, S., Seçer, B., Celepoğlu, Y., 2016. Length-length, length-weight relationship and condition factor of fishes in Nevşehir Province, Kızılırmak River Basin (Turkey). *Acta Biologica Turcica*, 29: 72-77.
- Çiçek, E., Eagderi, S., Sungur, S. 2018. *Oxynoemacheilus veyseli*, a new nemacheilid species from the upper Aras River drainage of Turkey (Teleostei: Nemacheilidae). *Iranian Journal of Ichthyology*, 5(3): 232-242.
- Çiçek, E., Eagderi, S., Sungur, S. 2019. *Oxynoemacheilus phoxinoides* (Erk'akan, Nalbant & Özeren, 2007): a junior synonym of *Oxynoemacheilus angorae* (Steindachner, 1897). *FishTaxa*, 4:13-17
- Erk'akan, F., Innal, D., Özdemir, F. 2013. Length–weight relationships for ten endemic fish species of Anatolia. *Journal of Applied Ichthyology*, 29: 683-684.
- Erk'akan, F., Innal, D., Özdemir, F. 2014. Length–weight relationships for some endemic stone and spine loach species in Anatolia. *Journal of Applied Ichthyology*, 30: 244–245.
- Erzini, K. 1994. An empirical study of variability in length at age of marine fishes. *Journal of Applied Ichthyology*, 10: 17–41.
- Freyhof, J., Erk'akan, F., Özeren, C., Perdices, A. 2011. An overview of the western Palaearctic loach genus *Oxynoemacheilus* (Teleostei: Nemacheilidae). *Ichthyological Exploration of Freshwaters*, 229: 301-312.
- Froese, R. 2006. Cube law, condition factor and weightlength relationships: history, meta-analysis and recommendations. *Journal of Applied Ichthyology*, 22: 241–253.
- Gaygusuz, Ö., Aydın, H., Emiroğlu, Ö., Top, N., Dorak, Z., Gürsoy Gaygusuz, Ç., Başkurt, S., Tarkan, A.S. 2012. Length–weight relationships of freshwater fishes from the western part of Anatolia, Turkey. *Journal of Applied Ichthyology*, 29: 285– 287.
- Innal, D., Özdemir, F., Dogangil, B., 2015. Length -Weight relationships of *Oxynoemacheilus theophilii* (Teleostei: Nemacheilidae) from Turkey. *International Journal of Fisheries and Aquatic Studies*, 2: 249-250.
- Kottelat, M. 2012. *Conspectus cobitidum*: an inventory of the loaches of the world (Teleostei: Cypriniformes: Cobitoidei). *Raffles Bulletin of Zoology*, 26: 1–199.
- Martin-Smith, K.H. 1996. Length/weight relationships of fishes in a diverse tropical freshwater community, Sabah, Malaysia, *Journal of Fish Biology*, 49: 731-734.
- Morato, T., Afonso, P., Lourinho, P., Barreiros, J.P., Santos, R.S., Hash, R.D.M. 2001. Length–weight relationships for 21 coastal fish of the Azores, north-eastern Atlantic. *Fisheries Research*, 50: 297–302.
- Özcan, G., Altun, A. 2016. Length–weight and length-length relationships for four freshwater fish species from Gölbaşı Lake (Hatay), Turkey, *Journal of Applied Ichthyology*. 32: 1350-1352.
- Safran, P. 1992. Theoretical analysis of the weight±length relationships in the juveniles. *Marine Biology*, 112: 545-551.
- Yazıcıoğlu, O., Yazıcı, R. 2016. The Length-Weight, Length-Length Relationship and Condition Factor of Angora Loach, *Oxynoemacheilus angorae* (Steindachner, 1897) Inhabiting Kılıçözü Stream in Kızılırmak River Basin (Central Anatolia Turkey). *Turkish Journal of Agriculture - Food Science and Technology*, 4: 1165-1168