

Oxynoemacheilus phoxinoides (Erk'akan, Nalbant & Özeren, 2007): a junior synonym of *Oxynoemacheilus angorae* (Steindachner, 1897)

Erdoğan ÇİÇEK^{*1}, Soheil EAGDERI², Sevil SUNGUR³

¹Department of Biology, Faculty of Art and Sciences, Nevşehir Hacı Bektaş Veli University, 50300, Nevşehir, Turkey.

²Department of Fisheries, Faculty of Natural Resources, University of Tehran, Karaj, Iran.

³Health Services Vocational School, Nevşehir Hacı Bektaş Veli University, 50300, Nevşehir, Turkey.

Corresponding author: *E-mail: erdogancicek@nevsehir.edu.tr

Abstract

Oxynoemacheilus phoxinoides described from the Iznik Stream, Marmara basin, Turkey based on an awkward description. This study aimed to test the synonymy hypothesis of *O. angorae* and *O. phoxinoides* due to its uncomplete description and very low genetic distance of 0.2% with *O. angorae*. Morphometric and meristic characters of *O. phoxinoides* are largely overlapping or even identical with those of *O. angorae*, a species known from Sakarya basin. *Oxynoemacheilus phoxinoides* is treated as a junior synonym of *O. angorae*.

Keywords: Lake İznik, Sakarya basin, Genetic distance, Biodiversity.

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Introduction

The nemacheilid family has 49 species in Turkey, belonging to six genera, viz. *Barbatula*, *Oxynoemacheilus*, *Paracobitis*, *Schistura*, *Seminemacheilus* and *Turcinoemacheilus* (Çiçek et al. 2015, 2016, 2018; Kaya et al. 2016; Turan et al. 2019). The taxonomic status of the nemacheilid loaches is still complicated (Prokofiev 2009, 2010; Sayyadzadeh et al. 2016, 2017), especially in the Middle East because of the difficulties in the diagnosis of the genera and high number of poorly diagnosed species described from this area (Freyhof et al. 2011; Sayyadzadeh et al. 2016). Hence, description of a new taxa of nemacheilid solely on the basis of morphometric characters and coloration can be led to errors (Prokofiev 2009; Freyhof et al. 2012).

Among the nemacheilids, the members of the genus *Oxynoemacheilus* has 41 reported species in Turkey (Çiçek et al. 2015, 2016, 2018; Kaya et al. 2016; Turan et al. 2019), and a recent study on the spatial heterogeneity of freshwater fishes in the Mediterranean revealed that some species of this genus have very low genetic differences (Geiger et al. 2014), suggesting their synonymy. *Oxynoemacheilus angorae* and *O. phoxinoides* are examples in this regard showing a k2p genetic distance of 0.2% (Gieger et al. 2014). Hence, we collected and compared materials from type localities of both species to test the synonymy hypothesis of *O. angorae* and *O. phoxinoides*.

Material and Methods

The specimens of *O. angorae* and *O. phoxinoides* were collected by electrofishing device. After anaesthesia using MS222, they were fixed in 4% buffered formaldehyde and then stored in 70% ethanol after 48 hours. Specimens were deposited at ichthyological collection of Nevşehir Hacı Bektaş Veli University. Measurements were made using a digital caliper to the nearest 0.1 mm. Methods for counts and measurements of morphological characters follows Kottelat and Freyhof (2007). The last two branched rays articulating on a single pterygiophore bone in the dorsal and anal fins were considered as "1½". The data are presented as standard and head lengths.

Abbreviations used: SL, standard length, HL, lateral head length, NHVUIC, Nevşehir Hacı Bektaş Veli University Ichthyology Collection, Nevşehir.

Results

Morphometric data of *O. angorae* and *O. phoxinoides* is given in Table 1. Meristic characteristics of both species were as D III/7-8, A III/5, P I/9-11, V II/6-7. We found all morphometric and meristic characters of *O. angorae* and *O. phoxinoides* overlap largely (Table 1). In addition, general appearances and coloration of *O. angorae* and *O. phoxinoides* are shown in Figures 1-2. There are no differences in the colour pattern also (Figs. 1-2).



Figure 1. *Oxynoemacheilus angorae*, Turkey: Ankara prov.: Çubuk Stream, Sakarya river basin, (above) NHVUIC1801-1, 62.7 mm SL, and (below) NHVUIC1801-2, 64.7 mm SL.



Figure 2. *Oxynoemacheilus phoxinoides*, Turkey: Yalova prov.: Altinova Stream, Marmara basin, (above) NHVUIC1802-13, 56.5 mm SL, and (below) NHVUIC1802-10, 51.6 mm SL.

Table 1. Morphometric characteristics of *Oxynoemacheilus phoxinoides* (NHVUIC1802-1-15) and *Oxynoemacheilus angorae* (NHVUIC1801-1-15).

Morphometric characters	<i>Oxynoemacheilus angorae</i>		<i>Oxynoemacheilus phoxinoides</i>	
	range	mean±SD	range	mean±SD
Standard length (mm)	55.9-72.1	64.8±5.4	46.3-56.5	51.0±3.0
In percent of standard length				
Body depth maximal	15.5-19.5	17.4±1.2	14.7-16.5	15.6±0.6
Caudal peduncle depth	10.7-13.3	11.8±0.8	9.6-11.1	10.5±0.5
Predorsal length	46.9-52.1	49.3±1.4	47.2-50.4	48.7±0.9
Postdorsal length	36.0-41.4	38.9±1.5	35.9-41.1	38.6±1.4
Prepelvic length	47.7-52.2	48.6±1.2	48.3-53.3	50.5±1.5
Preanal length	71.5-75.3	73.7±1.1	73.3-77.4	75.6±1.3
Caudal peduncle length	15.1-19.2	17.4±1.2	14.1-17.4	16.3±0.9
Dorsal-fin base length	12.7-15.5	13.7±0.7	13.2-16.5	14.7±1.0
Dorsal-fin depth	19.2-22.8	21.3±1.2	18.1-22.8	20.6±1.3
Anal-fin base length	8.6-10.7	9.6±0.5	8.1-10.4	9.1±0.7
Anal-fin depth	15.2-19.0	17.4±1.0	13.6-17.3	16.0±1.1
Pectoral-fin length	18.0-24.5	20.7±2.1	16.2-22.6	20.0±1.6
Pelvic-fin length	14.7-19.0	16.9±1.2	15.0-17.3	16.2±0.7
Pectoral – pelvic-fin origin distance	23.8-27.8	25.8±0.9	24.4-27.8	26.1±1.1
Pelvic – anal-fin origin distance	23.3-26.6	25.0±1.0	22.4-26.4	24.4±1.2
Caudal-fin length	17.4-23.3	20.4±1.6	19.2-22.7	20.6±1.1
Body width	11.7-15.9	13.3±1.1	10.5-14.5	12.4±1.0
Caudal peduncle width maximum	5.1-6.3	5.6±0.4	3.1-6.5	5.2±0.8
Head length	23.4-26.7	24.4±0.9	23.5-26.9	25.4±0.9
In percent of Head length				
Snout length	35.7-43.9	41.4±2.1	35.1-43.5	39.8±2.2
Eye horizontal diameter	17.1-20.5	18.3±1.0	17.3-22.2	19.4±1.1
Postorbital distance	38.7-45.8	43.3±2.0	38.0-49.2	42.3±3.1
Head depth at nape	53.5-64.8	58.5±2.9	52.3-60.9	56.6±2.2
Head width	49.7-60.8	56.5±2.6	53.1-64.7	58.1±3.3
Inter Orbital	28.9-34.5	31.2±1.5	26.3-33.2	28.8±1.8
Inter nasal	20.8-27.8	24.4±1.9	18.0-22.5	20.8±1.4
Mouth width	27.3-39.6	34.0±3.2	28.0-36.4	32.4±2.2
Inner rostral barbel	20.4-30.1	25.8±2.6	21.0-27.5	23.5±2.2
Outer rostral barbel	26.7-37.6	32.7±3.5	23.8-32.5	28.8±2.8
Maxillary barbel	27.9-44.9	37.7±4.8	26.1-36.7	29.9±3.3

Discussion

Oxynoemacheilus angorae (Steindachner, 1897) described from Çubuk Stream, Sakarya basin. This species has been reported from the Marmara, Susurluk, Sakarya and Kızılırmak basins of Turkey. By the way, the species erroneously reported from many basins of Turkey (Özkan et al. 2009; Çoban et al. 2013; Yıldırım et al. 2015; Sağlam et al. 2017) and even in some other neighbour countries (Gabrielyan 2001; Hasankhani et al. 2014; Esmaeili 2018). *Oxynoemacheilus phoxinoides* described from the Iznik (40°41'N, 29°30'E) in Marmara basin (Erk'akan et al. 2007).

Based on the description of *O. phoxinoides*, it is distinguished from *O. angorae*, by having eight branched dorsal-fin rays, five branched anal-fin, deeper head, longer longitudinal eye diameter, shape of mouth, processus dentiformis, length of lower jaw barbels, colouration of body and well-developed adipose crests (Erk'akan et al. 2007). However, these differences have been shown in the description of *O. phoxinoides* only as mean values without providing their ranges (Erk'akan et al. 2007). These morphometric and meristic features overlap in specimens collected from their type localities. Both species have arched mouth with lower lip possessing a deep median interruption. In *O. phoxinoides*, lips are thicker than those of *O. angorae* without furrows (Fig. 3). This

little difference in the shape of mouth may be related to their feeding habitats, since *O. angorae* inhabits in streams with gravel and rocky beds, whereas *O. phoxinoides* found in streams with sandy and muddy bottoms. Therefore their mouth shape difference can be considered as phenotypic plasticity. *Oxynoemacheilus angorae* shows a high level of phenotypic variation between populations in its wide geographic distribution.



Figure 3. Mouth shape in (A) *Oxynoemacheilus angorae* and (B) *Oxynoemacheilus phoxinoides*.

As we were unable to find any differences in the provided diagnostic characters by Erk'akan et al. (2007) between examined specimens of *O. angorae* and *O. phoxinoides* from their type localities, we conclude these two nominal species represent just one species and therefore, *O. phoxinoides* is treated as a junior synonym of *O. angorae*.

Material examined. All from Turkey.

Oxynoemacheilus angorae: NHVUIC1801, 15, 55.9-72.1 mm SL; Turkey: Ankara prov.: Çubuk Stream, Sakarya river basin, 40°20'38.11"N, 33°02'19.95"E, E. Çiçek & S. Sungur.

Oxynoemacheilus phoxinoides: NHVUIC1802, 15, 46.3-56.5 mm SL; Turkey: Yalova prov.: Altinova Stream, Marmara basin, 40°40'38.05"N, 29°31'54.80"E, September 2018, E. Çiçek & S. Sungur.

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