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Range extension of the lake goby *Rhinogobius similis* Gill, 1859 (Teleost: Gobiidae) to Urmia Lake basin in northwestern Iran

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Abstract. The lake goby *Rhinogobius similis* Gill, 1859 (Gobiidae), formerly reported from the Hari River in (Hari River basin) and Anzali Wetland (Caspian Sea basin), was recorded for the first time in the Zarinehrud River of the Urmia Lake basin. This extension of its recorded range showing the extension of distribution of the species further to west. The collected specimens probably introduced to this river along with eight other exotic species from the Caspian Sea basin as accidental introduction. Therefore, an effective management strategy required to minimize their negative impacts.

Key words: Zarinerud River, Iran, Zoogeography, Gobiidae.

Fishes are one of the aquatic groups which have been widely introduced and translocated to many parts of the world (Esmaeili et al. 2014). Non-native fish species were primarily introduced into aquatic ecosystems of Iran due to anthropological activity with introducing mosquitofish (*Gambusia holbrooki*) in the 1920s to control malaria (Coad 1996, Esmaeili et al. 2007, 2011). Since then, about 32 species in 10 orders and 12 families have been introduced or translocated into Iranian inland waters (Esmaeili et al. 2014, Khaefi et al. 2014,). Aquaculture, sport fishing, control of malaria, research and accidental introductions are main reasons for these introductions (Coad 1996, Esmaeili et al. 2007).

The Asiatic freshwater goby genus *Rhinogobius* (Gill, 1859) with 66 species is found in Japan, Korea, Taiwan, Hainan, Philippines, China, Russia, Vietnam, Laos, Cambodia, Thailand and the Amur River basin of eastern Asia (Chen et al. 2008, Coad 2016). The life histories of *Rhinogobius* species indicate that the genus includes mainly amphidromous, nondiadromous, land-locked, fluvial species (Mizuno & Goto 1987, Iguchi & Mizuno 1991, Akihito et al. 2002), as well as lake–river migratory and lentic species in Lake Biwa, Japan (Takahashi & Okazaki 2002).

Rhinogobius similis has been recorded from the Kashaf and Hari rivers (Abdoli et al. 2000, Coad & Abdoli 2000) and Anzali Wetland (Coad 2016) of the Iranian inland waters. Shakirova & Sukhanova (1994), Sal'nikov (1995) and Aliev et al. (1988) reported *R. similis* from the Tedzhen River, Karakum Canal and Kopetdag Reservoir in Turkmenistan on the northern borders of Iran. Vasil'eva & Kuga (2008) pointed out that the *Rhinogobius* introduced to Central Asia is *R. cheni* (Nichols, 1931), a Chinese species of the Yangtze River, and this could be the species found in Iran. Therefore, the Iranian specimens probably have been originated from the Amur River basin via Tedzhen River of Turkmenistan (Coad 2016). This species has been now found in the Zrinehrud River of Urmia Lake basin showing the extension of its distribution further to west.

Four specimens of *R. similis* were collected at the Zarinehrud River (46°54'4.8"E, 34°27'48.52"N) (West Azarbaijan Province, near Shahin-Dej city) in 29 July 2013 during fieldwork on the ichthyofauna of Zarinehrud River by electrofishing device (Fig. 1). The collected specimens were preserved in 4% buffered formaldehyde after anesthetizing with 1% clove solution and transferred to the laboratory for further processing. The taxonomic key given by Chen *et al*. (2008) and Coad (2016) were used to identify specimens.

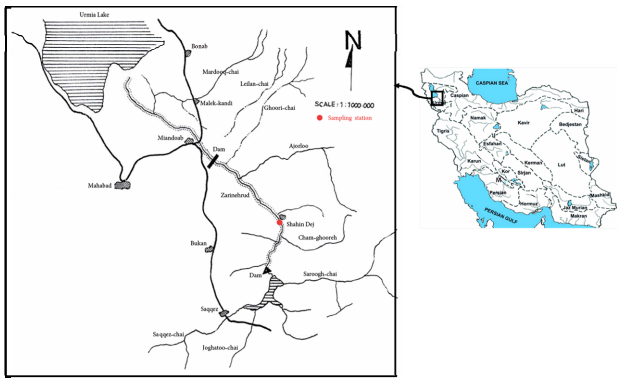

Figure 1. Map of sampling station from Zarinehrud River in the Urmia Lake basin (red dot = sampling site).

Meristic characteristics of the specimens were counted using a stereomicroscope. A total of 19 morphometric features including: total length (TL), standard length (SL), head length (HL), body depth (H), pre-dorsal distance1 (aD1), pre-dorsal distance2 (aD2), pre-pelvic distance (aP), pre-anal distance (aA), dorsal fin base1 (db1), dorsal fin base2 (db2), anal fin base (ab), ventral fin length (vl), pectoral fin length (pl), distance between pectoral and ventral fins (P-V), caudal peduncle length (lpc), caudal peduncle depth (h), snout length (Snl), postorbital distance (poO) and eye diameter (o) were measured using a caliper to the nearest 0.1 mm. The percentage ratios of morphometric characters in relations to SL and HL were analyzed. Methods for taking counts and measurements follow Hubbs & Lagler (1958).

Abbreviations: D1 and D2, 1st and 2nd Dorsal fins; A, Anal fin; LSR, longitudinal scale row.

Four specimens of *R. similis* range 26.0-38.5 mm in standard length (Fig. 2) were collected from the Zarinehrud River at Shahin-Dej (Azarbaijan Province, Iran). The general body shape of *R. similis* is displayed in Figure 2. The meristic counts of the preserved specimens were following: D1: 6-7; D2: I, 8; A: 6-8, LSR: 26-28. Morphometric characteristics are presented in Table 1.

Four other exotic fish species including *Rhodeus amarus*, *Hemiculter leucisculus*, *Pseudorasbora parva* and *Carassius gibelio* were collected along five native species during sampling from Zarinehrud River (Table 2).

Figure 2. Lateral view of *R. similis* collected from the Zarinehrud River in the Urmia Lake basin, Iran.

Table 1. Morphometric characteristics (Mean±SD) of *Rhinogobius similis* from Zarinehrud River in the Urmia Lake basin, Iran (SD=Standard Deviation; Min=Minimum; Max=Maximum; Number of specimens=4).

Characters	Mean ± SD	Min - Max
TL (mm)	51.954±1.917	50.0-53.6
SL (mm)	44.447±2.430	41-53
%Standard Length		
TL	116.98±0.03	114.77-120.56
Body depth	17.83±0.01	16.93-19.31
Pre-dorsal L1	37.92±0.02	35.48-39.27
Pre-dorsal L 2	57.88±0.02	55.33-59.35
Pre-pelvic	31.55±0.02	28.56-32.64
Pre-anal L	64.99±0.02	62.48-67.19
D fin base L1	12.81±0.00	12.25-13.70
D fin base L2	17.52±0.00	16.49-18.71
A fin base L	15.24±0.00	14.98-15.73
V fin L	14.95±0.03	12.63-19.47
P fin L	16.17±0.02	14.46-19.50
pectoral-ventral L	3.56±0.00	3.32-4.22
Caudal peduncle L	21.16±0.02	19.39-23.32
Caudal peduncle D	10.11±0.00	9.94-10.25
Head Length	25.97±0.01	24.00-26.90
%Head Length		
Snout L	32.00±0.02	30.29-34.10
Postorbital L	55.09±0.02	52.43-57.10
Eye diameter	24.04±0.01	23.50-24.86

Table 2. List of captured species in sampling stations of the Urmia Lake basin, Iran.

Species	Native
Carassius gibelio	No
Squalius turcicus	Yes
Capoeta capoeta	Yes
Romanogobio macropterus	Yes
Alburnus atropatenae	Yes
Rhodeus amarus	No
Barbus cyri	Yes
Oxynoemacheilius bergianus	Yes
Pseudorasbora parva	No
Hemiculter leucisculus	No
Rhinogobius similis	No

Rhinogobius similis is found on shallow sandy bottoms and on the upper surface of large stones in shallow water (Kopylets & Dukravets1981). This species is distinguished with an elongate body which is compressed posteriorly, a depressed head, a long snout, anterior nostrils are tubular, the tongue is not notched, and teeth are simple (Coad 2016). Meristic and morphometric characteristics of the collected specimen were in the range of those reported by Coad (2016) and Chen *et al*. (2008). Vasil'eva & Kuga (2008) pointed out that the introduced species in Iran could be *R. cheni*. The collected specimens have no brownish black blotch on their nape and their longitudinal scale row were 26-28 less versus 34-36 reported for *R. cheni*. Therefore they are not *R. cheni* based on identification key provided by Chen et al. (2008).

The new record of *R. similis* from the Zarinerud River of Urmia Lake basin, an endorheic basin (Esmaeili et al. 2011) shows the range extension of this species further to west from previous records of this species in Iran. The new habitat of this species is about 300 km west of the closest previous record i.e. Anzali Wetland (the Caspian Sea basin). This species probably introduced to this river along with commercially important cyprinids from the Caspian Sea basin as accidental introduction.

A total of 10 species were collected during sampling that five of them (50%) were exotic to the Urmia Lake basin. Also, *Hypophthalmichthys molitrix*, *H. nobilis* and *Cyprinus carpio* are other exotic species recorded from this river (Coad & Abdoli 1993, Coad 1996, Esmaeili et al. 2011, Radkhah et al. 2016). Introductions always cause risks for the native biota and present an ecological risk if the species is able to integrate itself successfully into the ecosystem (Gozlan & Newton 2009), resulting in possible detrimental interactions with native species (Gozlan et al. 2010, Esmaeili et al. 2014). Eight reported exotic fishes from the Zarinerud River can competes with native fishes for food and habitat and consume their eggs and young. Therefore, an effective management strategy needs to minimize their negative impacts.

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