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Range extension and a new locality for the lake goby *Rhinogobius lindbergi* Berg, 1933 in the upper Tigris River drainage, Iran

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Abstract

The occurrence of the exotic *Rhinogobius lindbergi* (Gobiidae) has been previously reported from Hari, Caspian Sea, Namak and Urmia basins of Iran. It is also formerly reported from the Persian Gulf basin, in Iraq and recently from Iranian part of the Tigris River basin. This study reports range extension and a new locality for *R. lindbergi* Berg, 1933 from the upper Tigris River drainage in Iran. The collected specimens probably translocated inadvertently with Chinese major carps, which introduced to the region for aquaculture purpose.

Keywords: Tigris River drainage, Iran, Zoogeography, Gobiidae.
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Introduction

Fishes are one of the aquatic groups which have been widely introduced and translocated to many parts of the world (Muralidharan 2017). 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. 2018). Since then, about 29 species have been introduced or translocated into Iranian inland waters (Esmaeili et al. 2018). Aquaculture, sport fishing, control of malaria, research and accidental introductions are main reasons for these introductions (Coad 1996).

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; Eagderi and Moradi 2017; Eagderi et al. 2018). Shakirova and Sukhanova (1994), Sal'nikov (1995) and Aliev et al. (1988) reported *R. similis* from the Tedzhen River, Kara-kum Canal and Kopetdag Reservoir in Turkmenistan on the northern borders of Iran. *Rhinogobius similis* has been recorded from the Kashaf and Hari rivers (Abdoli et al. 2000; Coad and Abdoli, 1993, 2000) and the Anzali Wetland (Esmaeili et al. 2018) of the Iranian inland waters. This species was recently reported from the Namak, Tigris River and Urmia Lake basins (Eagderi and Moradi 2017; Eagderi et al. 2017; Sadeghi et al. 2018), which show the extension of its distribution in Iranian inland waters. This study reports a new locality for the lake goby *R. lindbergi* in the upper Tigris River drainage, Iran.

Material and Methods

Five specimens of *R. lindbergi* were collected from the Tange-Hamam River (34°33'0.39"N; 45°46'20.02"E), the Tigris-Euphrates system, Kermanshah Province, western Iran, at the border of Iraq on 06 May 2018 by hand-net. The collected specimens were preserved in 10% buffered formaldehyde after anaesthesia and transferred to the laboratory for further processing. The taxonomic key given by Chen et al. (2008) and Sadeghi et al. (2018) were used to identify specimens.

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 base 1

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Figure1. Lateral view of *Rhinogobius lindbergi* collected from Tange-Hamam River, the Tigris river drainage, Iran. Above: male, below: female.

(db1), dorsal fin base 2 (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 and Lagler (1958).

Results

The general body shape of the collected *Rhinogobius lindbergi* is displayed in Figure 1. The meristic counts of the preserved specimens were as following: D1(1st Dorsal fin): 7-8 unbranched rays; D2 (2nd Dorsal fins): I unbranched, 9 branched; A (Anal fin): 7-9 unbranched, LSR (longitudinal scale row): 27-29. Morphometric characteristics of the examined specimens are presented in Table 1. Two other exotic fish species, *Pseudorasbora parva* and *Carassius auratus*, were collected from this river during sampling.

Discussion

The introduction of a non-native species to an ecosystem likely presents an ecological risk if the species is able to integrate itself successfully into the ecosystem (Gozlan and Newton 2009), resulting in possible detrimental interactions with native species or even with the function of the ecosystem (Gozlan et al. 2010; Muralidharan 2017). Exotic fish are introduced to different basins in Iran for various purposes such as aquaculture, sport fishing, malaria controlling, aquarium trade and etc., which are known to be a serious threat to native and endemic fishes (Mousavi-Sabet and Eagderi 2014, 2016; Radkhah et al. 2016; Eagderi and Moradi 2017; Mousavi-Sabet 2018).

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 (Chen et al. 2008). Meristic and morphometric characteristics of the collected specimen were in the range of those reported by Chen et al. (2008) and Sadeghi et al. (2018). Vasil'eva and 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 27-29 less versus 34-36 reported for *R. cheni*. Therefore, they are not *R. cheni* based on identification key provided by Chen et al. (2008) and Sadeghi et al. (2018). The new locality of this exotic species is located in western part of Iran (the Tigris River drainage). This species probably introduced to this river along with commercially important cyprinids as accidental introduction.

Table 1. Morphometric characteristics (Mean±SD) of *Rhinogobius lindbergi* collected from Tange-Hamam River, the Tigris river drainage, Iran (SD=Standard Deviation; Min=Minimum; Max=Maximum; Number of specimens=5).

Characters	Mean ± SD	Min - Max
TL (mm)	53.852±1.813	51.01-52.52
SL (mm)	43.354±2.532	43.02-52.09
%Standard Length		
TL	115.71±0.04	113.33-123.47
Body depth	16.93±0.02	15.98-18.32
Pre-dorsal L1	38.91±0.02	36.41-38.22
Pre-dorsal L 2	58.88±0.02	56.37-58.34
Pre-pelvic	32.56±0.02	29.56-33.62
Pre-anal L	63.99±0.02	61.48-65.18
D fin base L1	13.83±0.00	12.27-13.74
D fin base L2	18.52±0.00	17.55-19.11
A fin base L	14.23±0.00	15.55-14.56
V fin L	13.95±0.02	13.51-18.93
P fin L	17.11±0.02	14.45-18.50
pectoral-ventral L	4.11±0.00	4.32-5.22
Caudal peduncle L	28.15±0.02	19.68-24.35
Caudal peduncle D	11.11±0.00	9.96-11.27
Head Length	26.98±0.01	25.01-27.93
%Head Length		
Snout L	33.01±0.02	32.29-35.10
Postorbital L	56.09±0.02	53.43-58.10
Eye diameter	25.05±0.01	24.53-25.81

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