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Original Article

First record of the Amur goby *Rhinogobius lindbergi* Berg 1933 (Gobiidae) from the Tigris River drainage, Iran

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Abstract: Iran harbors a great faunistic diversity especially in freshwater fishes from different endorheic and exorheic basins with about 32 reported exotic fishes. Fishes are widely introduced and translocated aquatics due to anthropological activities. The present study reports first occurrence of the Amur goby, *Rhinogobius lindbergi* Berg 1933 (Gobiidae), from the Gaveh River, a tributary of Sirvan River drainage and Eivashan River, a tributary of Kashkan River system. In addition, we present meristic and morphometric data of the specimens herein examined. The collected specimens probably introduced to the rivers along with other exotic species as accidental introduction. Therefore, an effective management strategy required to minimize their negative impacts.

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Introduction

Fishes are widely introduced and translocated aquatics (Esmaeili et al., 2014) by wide ranges of mechanisms such as aquaculture, sport fishing, control of malaria, research and accidental introductions (Coad, 1996; Mooney and Cleland, 2001; Esmaeili et al., 2007, 2011). Iran harbors a great faunistic diversity especially in freshwater fishes with 297 species in 109 genera, 30 families and 24 orders reported from different endorheic and exorheic basins (Esmaeili et al., 2018). About 32 species in 12 families have been introduced or translocated and some of them are well-established in different Iranian water bodies (Khaefi et al., 2014; Esmaeili et al., 2014; Mousavi-Sabet and Eagderi, 2014, 2015; Radkhah et al., 2016).

Members of the genus *Rhinogobius* (Gill, 1859) with 66 species are distributed in Japan, Korea, Taiwan, Hainan, Philippines, China, Russia, Vietnam, Laos, Cambodia, Thailand and the Amur River basin of eastern Asia (Chen et al., 2008; Suzuki et al., 2016, Coad 2018; Froese and Pauly; 2016). They are mainly amphidromous, non-diadromous, land-locked, and fluvial species (Mizuno and Goto, 1987; Iguchi and Mizuno, 1991; Akihito et al., 2002), as well as lake–river migratory and lentic species in Lake Biwa, Japan (Takahashi and Okazaki, 2002).

The lake goby, *R. similis,* has been recorded from different Iranian inland waters, including the Kashaf and Hari rivers, Hari River basin (Coad and Abdoli, 2000), Anzali Wetland, Caspian Sea basin (Coad, 2018), Zarineh River, Urmia Lake basin (Eagderi and Moradi, 2017) and Jajrud River, Namak Lake basin (Eagderi et al., 2017). Shakirova and Sukhanova (1994), Sal'nikov (1995) and Aliev et al. (1988) reported *R. similis* from some water bodies of Turkmenistan on the east-north borders of Iran. Vasil'eva and Vasil'ev (1995) and Vasil'eva and Kugac (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. *Rhinogobius lindbergi* Berg 1933 is described species from Amur and Ussuri rivers, Russia and the Iranian specimens probably have been originated from the Amur River basin via

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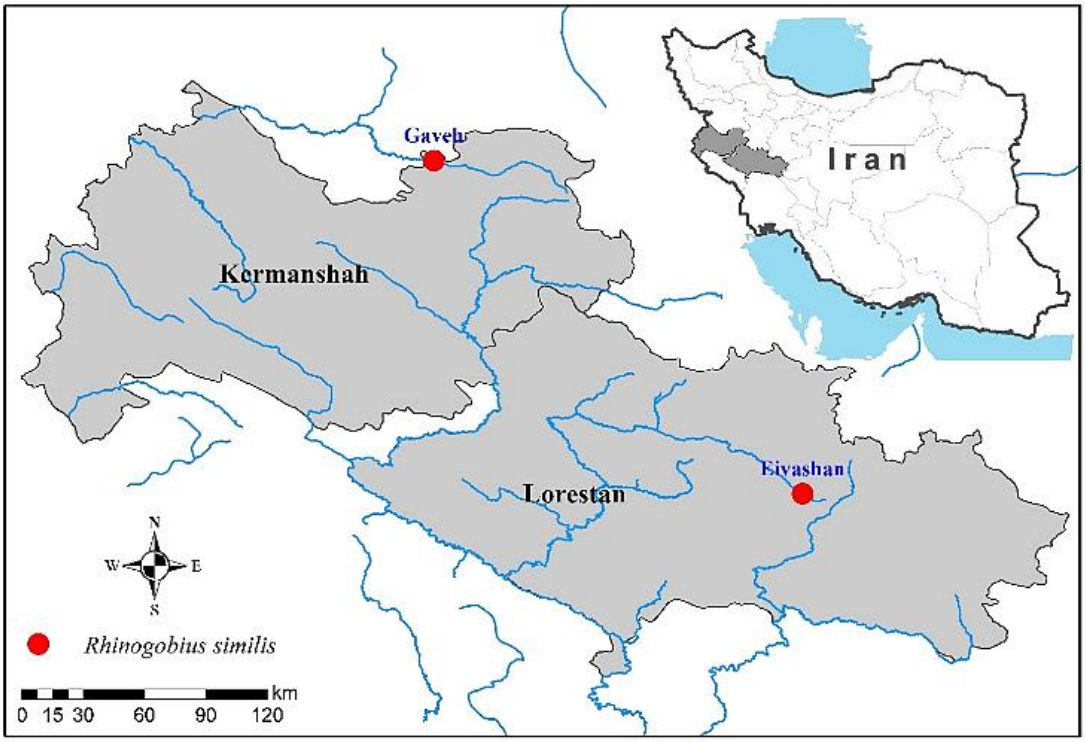

Figure 1. Observed distribution of *Rhinogobius lindbergi* in Kermanshah and Lorestan provinces.

Figure 2. Lateral view of Rhinogobius lindbergi from the Eivashan River, Tigris River drainage, Iran.

Hari River and all other reported *R. similis* from Iran could be *R. lindbergi*. Based on our recent survey, Amur goby, *R. lindbergi,* was found in the Gaveh and Eivashan Rivers, Tigris river system and probably can be found in Iraq and Turkish inland waters as well. Therefore, this paper is aimed to report the first record of *R. lindbergi* from Iranian part of the Tigris river drainage by providing meristic and morphometric data of the specimens herein examined.

Materials and Methods

A total of 15 *R. lindbergi* were collected from the Gaveh River (34°55'53.6"N 47°13'14.0"E), Kermanshah Province and 8 specimens from the Eivashan River (33°27'43.06"N 48°50'44.21"E), Lorestan Province of Iran by electrofishing device in 15 September 2016 and 1 October 2018, respectively (Fig. 1). The collected specimens were preserved in 5% buffered formaldehyde after anesthetizing and transferred to laboratory for further study. The specimens were identified based on Coad (2016), Chen et al. (2008), Suzuki et al. (2016), and Sakai et al. (2000).

Nine meristic characteristics were counted by a stereomicroscope and 31 morphometric features were measured using a caliper to the nearest 0.1 mm (Tables 1, 2). The morphometric data are presented as standard and head lengths. Methods for taking measurements and counts follow Hubbs and Lagler (1958). The specimens were deposited in the Ichthyological

Table 1. Morphometric characteristics of *Rhinogobius lindbergi* from the Gaveh and Eyvashan Rivers, Tigris basin (min=minimum; max=maximum; SD=Standard Deviation).

	Gaveh River				Eyvashan River			
Characters	**Min**	**Max**	**Mean**	**±SD**	**Min**	**Max**	**Mean**	**±SD**
Standard length (mm)	29.5	39.7			30	38	33.4	3.1
% in standard length								
Body depth maximal	16.2	20.7	17.9	1.3	16.6	17.4	17	0.4
Caudal peduncle depth	9.3	11.2	10.5	0.5	9.1	11.2	10.2	1.1
Predorsal 1 length	34.9	40.5	37.9	1.3	35.9	36.9	36.5	0.5
Postdorsal 1 length	59.2	65.1	62.2	1.7	63.1	64.5	64	0.8
Predorsal 2 length	53.9	58.6	56.6	1.2	56.3	58.6	57.6	1.2
Postdorsal 2 length	40.8	45.1	42.9	1.5	45.3	48.7	47.6	2
Preanal length	60.1	64.5	61.9	1.3	56.8	59	58	1.1
Caudal peduncle length	23.0	27.0	24.8	1.3	26.9	28.6	27.5	1
Dorsal-fin1 base length	10.8	16.5	13.3	1.7	7.3	12	10.1	2.5
Dorsal-fin 1 depth	6.0	13.5	9.8	2.5	11	12.4	11.9	0.8
Dorsal-fin 2 base length	14.6	19.7	16.8	1.9	13.1	18.5	15.3	2.8
Dorsal-fin 2 depth	10.6	15.2	13.1	1.7	11.7	15.7	13.8	2
Anal-fin base length	10.2	17.6	14.6	2.1	10.6	18.4	16.9	1.4
Anal-fin depth	7.2	12.3	10.0	1.9	10.5	13.9	12.4	0.8
Pectoral fin length	14.1	23.0	18.2	2.8	15.4	19.7	17.5	2.1
Pectoral – anal-fin origin distance	28.7	37.7	32.5	2.0	30.1	32.6	31.4	1.3
Caudal-fin length	19.6	26.3	22.1	1.7	19.1	20.7	20.1	0.9
Body width	12.9	16.2	14.9	0.8	15.9	17.6	16.4	1
Caudal width	3.0	5.4	3.9	0.6	4.2	4.7	4.5	0.3
Pelvic fin width	9.8	17.1	13.9	2.3	9.1	14.7	12.3	2.1
Pelvic fin length	16.6	20.4	18.6	1.2	16	17.9	16.8	1
Head length (HL)	23.2	29.9	27.0	2.2	24	26.1	25.2	1.8
% in head length								
Snout length	22.5	32.5	27.6	2.6	29.7	31.9	30.4	1.3
Eye horizontal diameter	12.2	22.5	17.8	3.1	12.4	18.3	16.7	3.1
Postorbital distance	45.1	64.8	56.9	4.6	55.5	59.1	57.1	1.8
Head depth at nape	61.2	75.3	67.7	4.9	59.4	80.1	66.6	11.7
Head depth through eye	48.1	62.2	53.5	4.0	48.5	52.9	50.4	2.3
Mouth width	35.2	62.0	45.6	7.8	32.6	61.6	43.2	8.2
Interorbital	7.6	15.5	9.9	2.2	8.1	11.6	10.3	2.7
Head width	56.3	85.0	69.5	9.8	66.3	69.5	67.8	1.6

Museum of Natural Resources Faculty, University of Tehran (IMNRF-UT- 1024).

Results

The collected specimens ranged 29.5-39.7 mm in Standard Length and the general body shape of the collected Amur goby is displayed in Figure 2. The morphometric and meristic data of the specimens are presented in Tables 1 and 2.

Three other exotic fish species, including *Hemiculter leucisculus*, *Pseudorasbora parva* and *Carassius gibelio* along with 10 native fishes, including *Alburnus sellal, Barbus lacerta, Capoeta damascina, C. trutta, Cyprinion macrostomum, Garra rufa, Squalius berak, S. lepidus, Oxynoemacheilus* sp. and *Turcinoemacheilus kosswigi* were collected

Table 2. Meristic characters of *Rhinogobius lindbergi* from the Gaveh and Eyvashan Rivers, Tigris basin (min=minimum; max=maximum; SD=Standard Deviation).

	Gaveh River				Eyvashan River			
Characters	**min**	**max**	**mean**	**±SD**	**min**	**max**	**mean**	**±SD**
First dorsal fin unbranched rays	5	6	5.9	0.3	5	6	5.6	0.3
Second dorsal fin unbranched rays	1	1	1.0	0.0	1	1	1	0
Second dorsal fin branched rays	8	8	8	0.0	8	8	8	0
Pectoral fin rays	17	20	18.9	0.9	17	20	18.3	1
Anal fin rays	8	9	8.5	0.7	8	9	8.3	0.8
Caudal fin rays	15	18	15.4	0.9	15	17	15.8	0.6
Longitudinal scale row	31	33	31.9	0.7	31	32	31.8	0.4
Gill rackers	10	11	10.1	0.4	10	10	10	0
Vertebrate		27				27		

during sampling in Gaveh River. In addition, two other exotic fish species viz. *Cyprinus carpio* and *Oncorhynchus mykiss* along with 6 native species including *A. sellal, C. shajariani*, *C. aculeate*, *C. macrostomum*, *G. rufa* and *Chondrostoma regium* were sampled from the Eivashan River.

Discussion

Rhinogobius lindbergi is native to the lower and middle portion of the Amur River (Novomodny et al., 2004), and was previously known to extend upstream only to the vicinity of the mouth of the Bidzhan River, Russia (Neely et al., 2008). *Rhinogobius lindbergi* is distinguished by having 27 vertebrae, two preopercular canal pores, 19-20 pectoral-fin rays and I, 9 anal-fin rays (Sakai et al., 2000; Li et al., 2018). The collected specimens have similar morphological characters to those reported for *R. lindbergi* (Sakai et al., 2000; Li et al., 2018).

New record of *R. lindbergi* from the Gaveh River, a tributary of Sirvan River and Eivashan River, a tributary of Kashkan River, both from Tigris river drainage shows the range extension of this species further to west and southwest from its previous records. The Sirvan River originates near the Hamadan, in the Zagros Mountains of Iran and then runs west mainly through Eastern Iraq and finally feeds into the Tigris below Baghdad but the Eivashan River origins from Zaghe near Khoramabad city, also in Zagros Mountains of Iran and then runs westward to the Karkhe River, Tigris river drainage (Coad, 2018).

In total of 14 species were collected from Gave River, four of them are exotic to the river. Also, *Hypophthalmichthys molitrix*, *H. nobilis*, and, *C. carpio* are other exotic species recorded from this river that have been released into the lakes of the Soleimanshah and Gavshan dams, reconstructed on the Gaveh River, by Iranian Fisheries Organization (Alizadeh et al., 2016). In the Eyvashan River, three exotic species, including *R. lindbergi*, *C. carpio* and *O. mykiss* were collected. Therefore, *R. lindbergi* probably introduced to this river along with commercially important cyprinids as accidental introduction. Introductions are always led to risks for the native biota if species is able to integrate itself successfully into the ecosystem (Gozlan et al., 2009), and also is resulted in possible detrimental interactions with native species (Gozlan et al., 2010; Esmaeili et al., 2014). Therefore, an effective management strategy needs to minimize their negative impacts.

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