

**SHORT COMMUNICATION**

# First record of *Oxynoemacheilus zarzianus* Freyhof & Geiger, 2017 from Iran (Teleostei: Nemacheilidae)

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## Abstract

*Oxynoemacheilus zarzianus* was described from the Lesser Zab River drainage in Iraqi Kurdistan. Here, we report this species for the first time from the Iranian part of the Sirvan River drainage based on morphological and mtDNA COI barcode sequence characters.

**Keywords:** Freshwater fishes, Taxonomy, Range extension, New record.

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## INTRODUCTION

The loach genus *Oxynoemacheilus* is a species-rich, taxon and Freyhof et al. (2021) reported 26 species to inform in the Euphrates and Tigris drainage. These authors reported nine *Oxynoemacheilus* species in the Iranian part of the Tigris River drainage, viz. *O. bergianus*, *O. chomanicus*, *O. euphraticus*, *O. karunensis*, *O. kiabii*, *O. kurdistanicus*, *O. longipinnis*, *O. parvinae* and *O. zagrosensis*.

Jouladeh-Roudbar et al. (2020) reported *O. gyndes* from Iran, but their picture clearly shows not *O. gyndes* but another species. We examined the fishes identified as *O. gyndes* by Jouladeh-Roudbar et al. (2020) from Sirvan river drainage based on morphological characteristics and mtDNA COI barcode sequences and identified these as *O. zarzianus*. This species was described by Freyhof & Geiger (2017) from the Lesser Zab River drainage, a tributary of the lower Tigris, in Iraqi Kurdistan. Esmaeili et al. (2018) already pointed out that it might also be present in the Iranian part of this river, but until now, its presence was not confirmed. In the current study, we first report *O. zarzianus* from the Iranian part of the Sirvan River drainage.

## Materials and Methods

The collected specimens were anesthetized using 150 mg/L MS22 solution. Then, the fin-clips of two specimens were fixed in 96% ethanol for molecular

works and other specimens were preserved in 5% buffered formaldehyde solution.

**Morphological examination:** Measurements were done using a digital caliper to the nearest 0.1 mm based on Kottelat & Freyhof (2007). Standard length (SL) was measured from the tip of the snout to the end of the hypural complex. The length of the caudal peduncle is measured from behind the base of the last anal-fin ray to the end of the hypural complex, at mid-height of the caudal-fin base. The last two-branched rays articulating on a single pterygiophore in the dorsal and anal fins are noted as “1½”.

**DNA extraction and PCR:** DNA extraction from the collected pectoral-fin tissues was done using the Phenol-chloroform method following Sambrook et al. (1989). The COI gene was amplified using primers FishF1- (5'-TCAACCAACCACAAAGACATTGGC AC-3') and FishR1- (5'-TAGACTTCTGGGTGG CC AAAGAATCA-3') (Ward et al. 2005). Polymerase chain reaction (PCR) conditions were followed Eagderi et al. (2019). A purification Kit (Expin Combo GP—mini; Macrogen incorporation, Korea) was used to purify the PCR products and they were sequenced using the Sanger method by a robotic ABI-3130xl sequencer following the manufacturer's protocol.

**Molecular data analysis:** The generated two DNA sequences were compared to the published *Oxynoemacheilus* sequences using BLASTn



**Fig.1.** *Oxynoemacheilus zarzianus*, top (IMNRF-UT-1222-6): 63.92 mm SL, Garan River, and below (IMNRF-UT-1222-1), 52.20 mm SL, Sirvan River.



**Fig.2.** Garan River after Garan Dam, Iran, Marivan, habitat of *Oxynoemacheilus zarzianus*.

(Altschul et al. 1990). The genetic distances of the generated two DNA sequences were investigated based on the Kimura two-parameter (K2P) distances (Kumar et al. 2008) in Mega7 software (Kumar et al. 2016) compared with other published

*Oxynoemacheilus* sequences.

## RESULTS

See Figure 1 for the general appearance of the fishes collected and Table 1 for morphometric data. The

**Table 1.** Morphometric data of *Oxynoemacheilus zarzianus* (IMNRF-UT-1222; n = 6 and IMNRF-UT-1223; n = 6).

Morphometric traits	<i>O. zarzianus</i> (This study)		<i>O. zarzianus</i> (Freyhof and Geiger 2017)	
	Min-Max	Mean±SD	Min-Max	Mean±SD
Standard length (mm)	48.5-63.92	-	51.2-68.5	-
	In percent of standard length			
Head length	22.3-24.4	23.5±0.8	21.6-25.2	23.8±1.1
Body depth at dorsal-fin origin	17.6-19	18.8±1.1	17.3-21.5	19±0.9
Predorsal length	49.5-52.7	51.4±1.1	48.7-54.5	50.5±1.4
Postdorsal length	32.4-37.9	35.6±2.00	35.4-41.6	38.0±1.3
Preanal length	69.9-74.8	72.9±1.9	72.7-78.4	75.7±1.6
Prepelvic length	48.8-56	52.5±2.6	51.2-54.8	52.8±1.1
Distance between pectoral and pelvic-fin origins	29.8-33	31.3±1.3	29.3-35.1	31.4±1.3
Distance between pelvic and anal-fin origins	17.9-21.6	20.3±1.4	22.0-25.5	23.3±0.9
Distance between vent and anal-fin origin	2.87-3.55	3.19±0.24	2.0-4.4	3.2±0.5
Depth of caudal peduncle	11.4-13.9	12.7±1.0	12.6-15.3	14.3±0.8
Length of caudal peduncle	17.9-19.6	19.2±0.6	13.0-17.8	16.1±1.1
Dorsal-fin depth	15.7-18.6	17.3±1.1	15.0-19.6	17.5±1.2
Anal-fin base length	8.2-12.4	9.3±1.5	8.0-10.5	9.2±0.7
Pectoral-fin length	15.8-18.1	17.4±0.8	16.4-21.5	18.5±1.3
Pelvic-fin length	12.7-14.7	13.8±0.9	12.8-15.8	14.3±0.8
	In percent of head length			
Head depth at eye	43.7-59.7	51.0±5.3	42-52	47.9±2.4
Snout length	36.4-42.9	39.6±2.5	38-46	42.2±2.3
Eye diameter	14.5-16.1	15.2±0.6	12-18	16.0±1.4
Postorbital distance	46.2-52.4	49.9±2.1	44-53	48.4±2.3
Maximum head width	64.4-75.9	69.4±4.5	63-76	69.7±3.9
Interorbital width	38.5-45.2	41.7±2.2	31-40	34.5±2.1
Length of inner rostral barbell	19.7-26.5	22.6±2.4	15-24	19.5±3.1
Length of outer rostral barbell	22.3-27.8	25.5±2.1	21-34	25.6±3.5
Length of maxillary barbell	22.7-32.3	27±3.5	12-26	19.3±4.3

morphometric characters of the Iranian *O. zarzianus* overlapped with those of *O. zarzianus* provided by Freyhof & Geiger (2017) except the prepelvic (17.9-21.6 vs 22.0-25.5% SL) and caudal peduncle (17.9-19.6 vs 13.0-17.8% SL) lengths. All meristic data agree in the Iranian population with those provided by Freyhof & Geiger (2017) that at them the dorsal fin with 8 ½ branched rays, anal fin with 5 ½ branched rays, caudal fin with 8+8 branched rays, pectoral fin with 9-10 (mode 10) and pelvic fin with 6 rays.

The generated DNA barcode sequences of *O. zarzianus* population (OM892833 and OM892837) from Iran showed about 99% similarity with the available sequences of *O. zarzianus* from Iraq (MW378594 and KU928286). The Iranian specimens are distinguished by a minimum K2P genetic distance of 0.3-1.2% from those of the Lesser Zab in Iraqi Kurdistan.

## DISCUSSION

Our finding revealed the wider distribution of *O. zarzianus*, which was previously only known from the Lesser Zab drainage. We collected *O. zarzianus* in two locations in the upper part of the Sirvan (Fig. 2) showing a K2P genetic distance of 0.3-1.2% to those of the Iraqi Kurdistan loach (Freyhof & Geiger 2017), clearly identifying them as conspecific. Freyhof and Geiger (2017) reported 2.6% K2P genetic distances based on the cytochrome b sequences between the different populations of *O. zarzianus* in Iraq; however, all populations fit perfectly diagnosis of *O. zarzianus*, and no morphological differences were found.

Our morphological characteristics of *O. zarzianus* largely overlap with those provided by Freyhof & Geiger (2017), except for the prepelvic and caudal peduncle lengths. These morphological differences could be a result of different methodologies in measuring these characters (Eagderi et al. 2019;



Mouludi-Saleh et al. 2020).

**Examined materials (all from Iran):** *Oxynoemacheilus zarzianus*: IMNRF-UT-1222, 6, 48.5-63.9 mm SL; Kurdistan prov.: Tigris river drainage, Garan River, 35°35'23"N 46°18'58"E; 7 Jun 2020. □ IMNRF-UT-1223, 6, 45.6-56.8 mm SL; Kurdistan prov.: Sirvan River at the Khoshkin village, 35°23'41.53"N 46°15'21.58"E; 7 Jun 2020. □ IMNRF-UT-1099, 2, 46.3-51.2 mm SL; Kermanshah prov.: Leyleh River at the Kelash Leme, 34°54'11"N 46°12'22"E; 25 August 2018.

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## REFERENCES

- Altschul, S.F.; Gish, W.; Miller, W.; Myers, E.W. & Lipman, D.J. 1990. Basic local alignment search tool. *Journal of Molecular Biology* 215(3): 403-410.
- Eagderi, S.; Nikmehr, N. & Freyhof, J. 2019. *Alburnus zagrosensis*, a junior synonym of *Alburnus sellal* (Teleostei: Leuciscidae). *Zootaxa* 4652(2): 367-374.
- Esmaeili, H.R.; Sayyadzadeh, G.; Eagderi, S. & Abbasi, K. 2018. Checklist of freshwater fishes of Iran. *FishTaxa* 3: 1-95.
- Freyhof, J. & Geiger, M. 2017. *Oxynoemacheilus zarzianus*, a new loach from the Lesser Zab River drainage in Iraqi Kurdistan (Teleostei: Nemacheilidae). *Zootaxa* 4273(2): 258-270.
- Freyhof, J. Kaya, C. & Ali, A. 2021. *A critical Checklist of the Inland Fish's Native to the Euphrates and Tigris Drainages*. In *Tigris and Euphrates Rivers: their environment from headwaters to mouth*. In: L.A. Jawad (Ed.). *A Critical Checklist of the Inland Fishes Native to the Euphrates and Tigris Drainages*, Springer-Verlag, Cham. pp: 815-854.
- Jouladeh-Roudbar, A.; Ghanavi, H.R. & Doadrio, I. 2020. Ichthyofauna from Iranian freshwater: Annotated checklist, diagnosis, taxonomy, distribution and conservation assessment. *Zoological Studies* 59.
- Kottelat, M. & Freyhof J. 2007. *Handbook of European freshwater fishes*. Kottelat, Cornol, Switzerland; Freyhof, Berlin, Germany.
- Kumar, S.; Nei, M.; Dudley, J. & Tamura, K. 2008. MEGA: a biologist-centric software for evolutionary analysis of DNA and protein sequences. *Briefings in Bioinformatics* 9(4): 299-306.
- Kumar, S.; Stecher, G. & Tamura, K. 2016. MEGA7: Molecular evolutionary genetics analysis version 7.0 for bigger datasets. *Molecular Biology and Evolution* 33(7): 1870-1874.
- Mouludi-Saleh, A.; Eagderi, S.; Cicek, E. & Sungur, S. 2020. Morphological variation of Transcaucasian chub, *Squalius turcicus* in southern Caspian Sea basin using geometric morphometric technique. *Biologia* 75(10): 1585-1590.
- Sambrook, J.; Fritsch, E.F. & Maniatis, T. 1989. *Molecular Cloning-A Laboratory Manual*. 2nd edn. Cold Spring Harbor Press, Cold Spring Harbor, New York.
- Ward, R.D.; Zemlak, T.S.; Innes, B.H.; Last, P.R. & Hebert, P.D. 2005. DNA barcoding Australia's fish species. *Philosophical Transactions of the Royal Society of London B: Biological Sciences* 360(1): 1847-1857.

## مقاله کوتاه

# اولین گزارش *Oxynoemacheilus zarzianus* Freyhof & Geiger, 2017 از ایران (ماهیان عالی استخوانی: جویبارماهیان)

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**چکیده:** *Oxynoemacheilus zarzianus* از بخش عراقی حوضه رودخانه زاب کوچک توصیف شده است. در اینجا برای اولین بار این گونه از قسمت ایرانی حوضه رودخانه سیروان بر اساس صفات ریخت‌شناختی و توالی ژن میتوکندریایی سیتوکروم اکسیداز I گزارش گردید. **کلمات کلیدی:** ماهیان آب شیرین، آرایه‌شناسی، دامنه گسترش، گزارش جدید.