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Research Article

Threatened fishes of the world: *Seminemacheilus ahmeti* Sungur, Jalili, Eagderi & Çiçek, 2018 (Teleostei: Nemacheilidae) with a suggestion of the IUCN Red List category

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Abstract

Seminemacheilus ahmeti is an endemic nemacheilid fish from the Sultan Marsh, an endorheic subbasin of Kızılırmak Basin, central Anatolia, Turkey. Its populations have been declining gradually during the last four decades due to various ecological changes in its habitats, leading to increased concern and the need for conservation. This study reviews the available data on taxonomy, ecology, distribution, and threats to the natural habitats of *S. ahmeti* and recommends actions for the sustainable conservation of its remaining isolated population. Since no IUCN category has been determined for the species, it was concluded that the IUCN category should be Critically Endangered (CR), taking into account the criteria.

Keywords: Sultan Marsh, motley loach, Red List, endemic, conservation, Türkiye

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Introduction

The genus *Seminemacheilus* was described by transferring *Nemacheilus lendlii* Hanko, 1925 (Banarescu & Nalbant, 1995). This genus has six valid species (Çiçek et al. 2020) distributed in Central Anatolia, Turkey. Several works have studied the distribution, taxonomy, and biology of *Seminemacheilus* in Turkey (Erk'akan et al., 2007; Sungur et al., 2018; Çiçek, 2020; Yoğurtçuoğlu et al., 2020; Seçer et al., 2022; Şahin et al., 2022). Recently, *S. ahmeti* was described from the Sultan Marshes, Kızılırmak Basin, Kayseri Province, Turkey. Therefore, this work aimed to review the available data regarding this threatened species.

Taxonomy and Systematics

Seminemacheilus ispartensis was described from Isparta Creek, Isparta, Western Mediterranean Basin (Erk'akan et al., 2007). Later, *S. ahmeti*, *S. dursunavsari*, *S. attalicus*, *S. tubae*, and *S. ekmekciae* were described (Çiçek, 2020; Yoğurtçuoğlu et al., 2020), however, *S. tubae* was treated as a junior synonym of *S. dursunavsari* (Şahin et al., 2022).

Order Cypriniformes

Family Nemacheilidae Regan, 1911 (brook loaches)

Genus *Seminemacheilus* Bănărescu & Nalbant, 1995

***Seminemacheilus ahmeti* Sungur, Jalili, Eagderi & Çiçek, 2018**: 467, Figs. 1-4, 5b, 6b, 7b [Sultan Marshes near Yeşilova Village, Kızılırmak Basin, Kayseri Province, Turkey, 38°12'05.26"N, 35°13'19.76"E. Holotype: NHVUIC 2017-06-17] (Figure 1).

Synonym: None. The previous report of *Seminemacheilus lendlii* in the marsh refers *S. ahmeti* (Yerli et al., 1994).

Common name: Ahmet's motley loach.

Local name: Ahmet alaca çöpçüsü (in Turkish).

Remarks: Members of the genus *Seminemacheilus* show random patterning along the body, especially on the sides, in the form of distinct but irregular darknesses in high contrast with the light background. In Turkish, the term "alaca (motley)" is used as both a noun and an adjective to describe the juxtaposition of two or more highly contrasting colors in a mixed pattern. The name "alaca çöpçü (motley loach)" is suggested for the genus *Seminemacheilus* instead of crested loach or pond loach, which are already used. Regionally, no name is used for *S. ahmeti*; therefore, we chose Ahmet alaca çöpçüsü (Ahmet's motley loach) as a local name for it.

Figure 1. Illustration of *Seminemacheilus ahmeti* from Sultan Marshes.

Description: Body stout, deep, and short with a broad head and blunt snout in dorsal and lateral views and a hump at nape in some specimens; deepest part of body at midline between nape and dorsal-fin origin and widest part at pectoral-fin base or behind operculum; eye relatively large; mouth arched, processus dentiformis absent, thick lower lip markedly furrowed with a deep median incision; barbels long, outer rostral barbel reaching to middle of maxillary barbel or vertical to posterior edge of eye, inner one reaching to anterior margin of eye, maxillary barbel reaching behind vertical of posterior margin of eye. Dorsal fin with 3-4 unbranched and 6½-8½ branched rays, anal fin with 4 unbranched and 5½ branched rays, pectoral fin with 1 unbranched and 10-12 branched and pelvic-fin with 1 unbranched and 4-6 branched rays, caudal fin with 8+8 rays (Sungur et al., 2018).

Size: Largest known specimen, 54.7 mm in SL.

Coloration: Body whitish grey in live individuals and yellowish or yellowish brown in preserved individuals (Figure 2). Plain brown head with tiny spots or mottling on top, cheeks with dark brown mottled spots, without color pattern ventrally. Irregular dark brown blotches and spots on flanks (sometimes fused as strips) arranged as two or three longitudinal rows, reducing its number posteriorly, a dark-brown strip on the lateral line, belly white or yellowish without color pattern or scattered tiny spots particularly around the anal fin base (Sungur et al., 2018).

Sexual dimorphism: Males bear a longer pectoral fin and a shallow suborbital depression in some specimens. Males with a longer pectoral fin and a shallow suborbital depression in some specimens have tiny breeding tubercles in the anterior part of the body (in front of the dorsal fin and head) during spawning season.

Distribution: *Seminemacheilus ahmeti* is known only from the small creeks that flow to the Sultan Marshes, an endorheic subbasin of Kızılırmak Basin, Kayseri Province, Central Anatolia, Turkey (Figure 3). We carried out field trips in all parts of the subbasin and neighbouring areas; however, an extensive survey failed to find specimens anywhere outside of the Sultan Marshes.

Figure 2. Live specimen of *Seminemacheilus ahmeti* from Sultan Marshes.

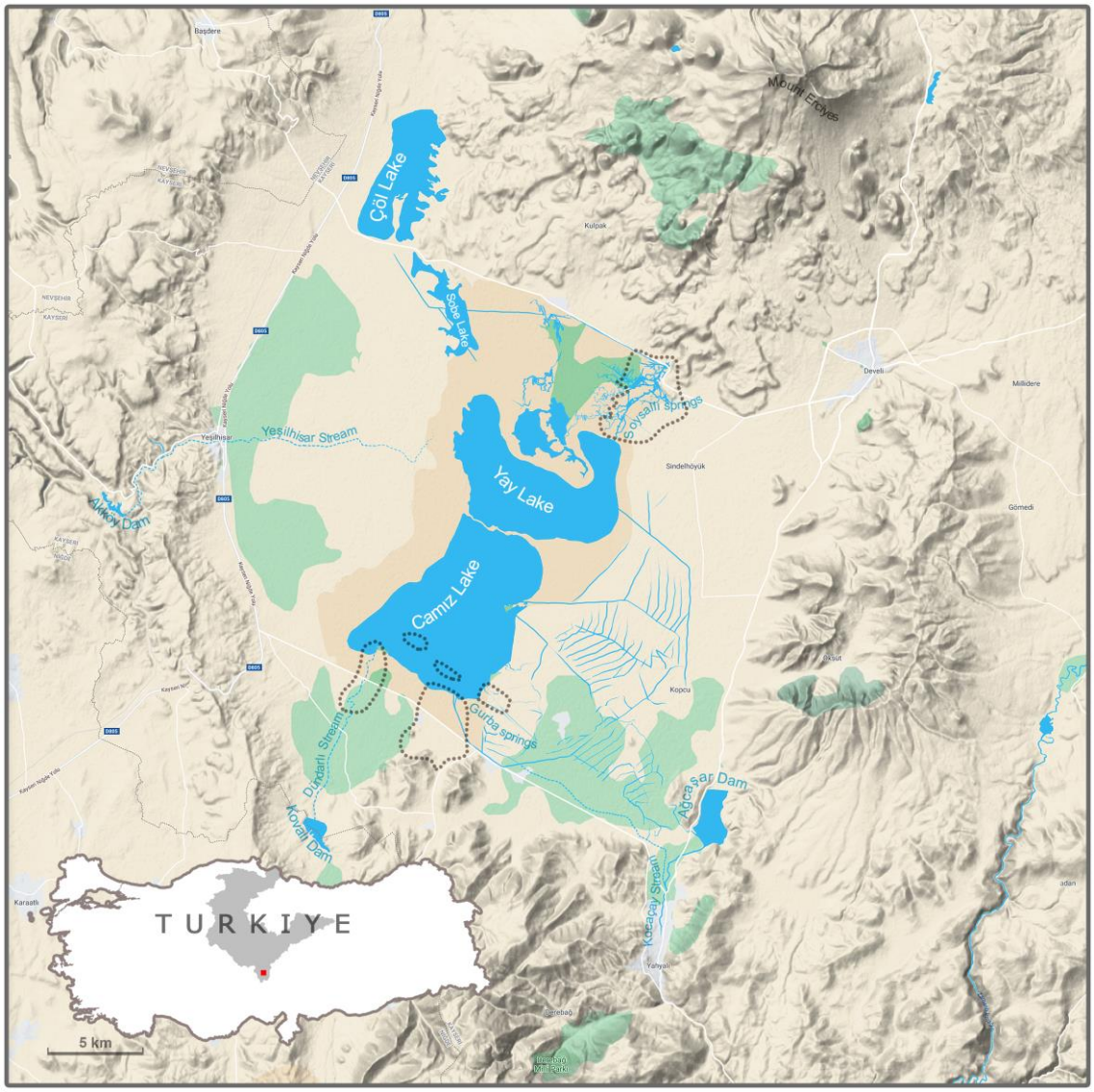

Figure 3. Geographic distribution map of *Seminemacheilus ahmeti* in Kızılırmak basin and Sultan Marsh

Habitat and ecology: Sultan Marsh is not a monolithic body of water but is in the form of unconnected wetlands fed by springs in different regions. This species lives in some small ponds and streams in different parts of the marshes (Figure 4). In this area, the substrate consists of mud, gravel, and plant debris, and the water is calm-running and almost transparent, covered by dense periphytonic vegetation.

Figure 4. Natural habitat of *Seminemacheilus ahmeti* from Sultan Marsh (Soysallı Springs: a-c) 38°22'56.7''N-35°21'26.9''E; 38°23'23.3''N-35°21'55.8''E; 38°23'23.3''N-35°21'55.8''E; Gurba Springs: d-f) 38°12'05.2''N-35°13'19.6'E; 38°11'53.31''N-35°13'54.1''E; 38°11'56.6''N-35°13'54.2''E).

Food and feeding: No data are available.
Reproduction: No data are available. During the field studies, juvenile individuals were found between May and October.

Population: This species occupies a narrow range of the marsh. Population density is low, therefore rarely encountered.

Co-existing species: A total of four endemic fish species of Sultan Marsh, viz. *Aphanius danfordii* (Cyprinodontidae), *Pseudophoxinus elizavetae* (Cyprinidae), *Cobitis joergbohleni* (Cobitidae), and *Oxynoemacheilus ciceki* (Nemacheilidae), along with three translocated species *of Cyprinus carpio* (Cyprinidae), *Tinca tinca* (Tincidae), and *Esox lucius* (Esocidae). By the way, five species *of Capoeta damascina, Garra turcica* (Cyprinidae), *Squalius seyhanensis* (Leuciscidae), *Oxynoemacheilus seyhanensis* (Nemacheilidae), and *Silurus glanis* (Siluridae), *entered* via a newly constructed tunnel in 2012 for water transfer from Seyhan Basin by Zamanti Tunnel, are found in Sultan Marsh. However, none of these species have yet reached the main body of the marsh, and their distributions are restricted in some channels (Çiçek and Sungur, 2020). Since Sultan Marsh is not a single body of water, different species can be found at different locations throughout.

IUCN Status evaluation

The conservation status and threat have not yet been determined for this species. We evaluated the species to determine the IUCN category of the species based on five criteria (A–E) used to evaluate if a taxon belongs in an IUCN threatened category (critically endangered, endangered, or vulnerable) (IUCN, 2014).

IUCN Red List Category and Criteria: Critically Endangered (CR) [A1ace/B1abc+2abc, ver 4)]

Population trend: Decreasing

Population severely fragmented: Yes

The continuing decline of mature individuals: Yes

Habitat and Ecology:

System: Freshwater (=Inland waters)

Habitat Type: Wetlands (inland)

Geographic Range: Turkey (endemic)

Range Description: The species is only known from the Sultan March endorheic basin, Kayseri, Turkey.

Threats:

Climate change & severe weather: Droughts

Natural system modifications:

Dams & water management/use

Abstraction of surface water (agricultural use)

Abstraction of groundwater (agricultural use)

Other ecosystem modifications

Invasive and other problematic species, genes & diseases:

Invasive non-native/alien species/diseases

Pollution

Agricultural & forestry effluents

Nutrient loads

Herbicides and pesticides

Threats in detail. Dams (Kovali, Akköy, and Ağcaşar) and pumping water from the aquifer for irrigation are the main hydrological alterations in Sultan Marsh, especially during the last three decades (Figure 5a). These factors have led to habitat fragmentation, which has affected *S. ahmeti* populations. In addition to anthropogenic impacts, some springs have dried up or their water has decreased due to the effects of global climate change. Thus, the marsh area has shrunk (Figure 5c-f). Hence, suitable distribution areas for the species have narrowed and even disappeared completely in some regions.

Figure 5. Human-induced disturbance at the type locality of *Seminemacheilus ahmeti*

Use and Trade: No
Conservation Actions:
Land/water protection
Site/area protection
Conservation Actions in detail. Sultan Marsh is protected as a Ramsar site and national park. However, healthy populations of the species are found outside the park boundaries in the spring-stream system with suitable habitat characteristics. A report on the protection of spring-stream systems and suitable habitats outside the park boundary has been submitted to the Kayseri Provincial Directorate of Nature Conservation and National Parks, and recommendations for habitat protection will be considered (Figures 4d-f).
Conservation recommendations in detail. May come under greater threat. Developing a conservation strategy for the species, estimating the extinction rate, monitoring the habitat, conducting ecological

studies, breeding captives, investigating the possibility of translocation (moving fish to a special reserve where they will have greater protection), engaging the local communities, NGOs, and media in a conservation program, working with the local communities and NGOs, and sharing the conservation knowledge with them, could conserve this endemic crested loach for their future generations.

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Data Availability Statement: The data underlying this article will be shared upon reasonable request to the corresponding author.

Conflicts of Interest: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

Banarescu P., & Nalbant T. T. (1995). A generical classification of Nemacheilinae with description of two new genera (Teleostei: Cypriniformes: Cobitidae). *Travaux du Muséum d'Histoire Naturelle "Grigore Antipa", 35*, 429-496.

Çiçek, E. (2020). *Seminemacheilus dursunavsari*, a new nemachelid species (Teleostei: Nemacheilidae) from Turkey. *Iranian Journal of Ichthyology, 7*(1), 68-77. https://doi.org/10.22034/iji.v7i1.494.

Çiçek, E., Fricke, R., Sungur, S., & Eagderi, E. (2018). Endemic freshwater fishes of Turkey. *FishTaxa, 3*(4), 1-39.

Çiçek, E., & Sungur S. (2020). Ichthyofauna of Sultan Marshes (Turkey) and possible effects of fish invasion from Seyhan Basin on diversity and conservation. *Commagene Journal of Biology, 4*(2), 115-120.

Çiçek, E., Sungur, S., & Fricke, R. (2020). Freshwater lampreys and fishes of Turkey; a revised and updated annotated checklist 2020. *Zootaxa, 4809*(2), 241–270.

Erk'akan F., Nalbant T.T., & Özeren S.C. (2007). Seven new species of *Barbatula*, three new species of *Schistura* and a new species of *Seminemacheilus* (Ostariophysi: Balitoridae: Nemacheilinae) from Turkey. *Journal of Fisheries International, 2*, 69-85.

IUCN. (2012). *Guidelines for Application of IUCN Red List Criteria at Regional and National Levels: Version 4.0*. Gland, Switzerland and Cambridge, UK: IUCN.

Kottelat, M. (2012). Conspectus cobitidum: an inventory of the loaches of the world (Teleostei: Cypriniformes: Cobitoidei). *The Raffles Bulletin of Zoology, Suppl. 26*, 1-199.

Kottelat, M., & Freyhof, J. (2007). Handbook of European freshwater fishes. Publications Kottelat. 646 p.

Şahin, F., Seçer, B., Sungur, S., & Çiçek, E. (2022). Osteological characterization of *Seminemacheilus lendlii* (Hankó 1925) (Actinopterygii: Nemacheilidae). *Acta Biologica Turcica, 35*(4), D7:1-10.

Seçer, B., Kalın Kılıç, E., Sungur, S., & Çiçek, E. (2021). Bazı *Seminemacheilus* ve *Oxynoemacheilus* Türlerinde Osteolojik Karakterizasyonun Değerlendirilmesi. 9. Ulusal Limnoloji Sempozyumu, 04-06 Ağustos 2021 Burdur.

Sungur, S., Jalili, P., Eagderi, S., & Çiçek, E. (2018). *Seminemacheilus ahmeti*, a new species of Nemachelid from Sultan Marshes, Turkey. *Fishtaxa, 3*(2), 466-473.

Yerli, S., Gündüz, E., & Akbulut, A. (1994). *Evaluation of Tropic Status of Sultan Marshes*. Environmental Profile of Kayseri, Sultan Marshes and Erciyes. Publications of Environmental Protection Foundation of Kayseri, No: 2, 129-133.

Yoğurtçuoğlu, B., Kaya, C., Geiger, M. F., & Freyhof, J. (2020). Revision of the genus *Seminemacheilus*, with the description of three new species (Teleostei: Nemacheilidae). *Zootaxa, 4802*(3), 477-501. https://doi.org/10.11646/zootaxa.4802.3.5.