Family Nemacheilidae

Stone loaches

A large family with 49 genera and more than 840 known species (more than 2000 may exist) from the rivers of Asia, Europe, and Ethiopia. Nemacheilid loaches are the second largest family of cypriniform fishes and the least known large group within freshwaters in Asia. Actually, 112 known species of nemacheilid loaches are recognised in West Asia. However, further species will be discovered in the future. Stone loaches are occasionally confused with spined loaches of the family Cobitidae, which also possess three pairs of barbels. In contrast to stone loaches, spined loaches have an erectable suborbital spine that they use for defense. Such a spine is absent in stone loaches; both families have very different general appearances. In many *Oxynoemacheilus* and *Paraschistura* species, males exhibit an exposed lachrymal bone called a suborbital flap or groove. In contrast, other species lack this character. The shape of this structure can be used for identification purposes. There have been speculations that the suborbital flap or groove exposure is a seasonal character. However, this still needs to be demonstrated, and further research is required.

Figure 48. Suborbital groove in front of the eye in a male of *O. angorae*.

The generic structure of nemacheilid loaches from West Asia has been confused for a long time. Species have been placed in *Nemacheilus* (an East Asian genus), *Barbatula* (a European and North Asian genus), *Orthrias* (a synonym of *Barbatula*), *Nun* (a synonym of *Oxynoemacheilus*), *Ilamnemacheilus* (a synonym of *Oxynoemacheilus*), and *Metaschistura* (a synonym of *Paraschistura*). Molecular studies have demonstrated that eight genera can be recognised in West Asia, with *Oxynoemacheilus* being the most speciose and widespread. However, the situation still needs to be fully settled, as *Seminemacheilus* turns out to be nested within *Oxynoemacheilus* in some phylogenetic analyses, while in others, it represents its own genus. Indeed, both genera are similar in many characters and poorly distinguished. *Triplophysa stoliczkai* has been recorded from the Sistan basin in Iran, subsequently identified as *Paraschistura alta*.

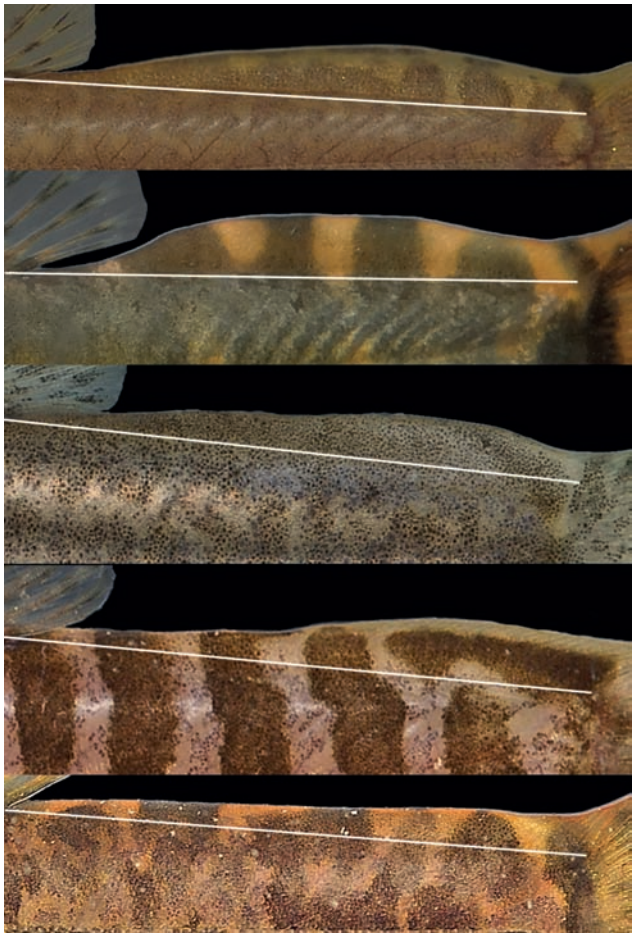

Figure 49. Adipose crests and adipose ridge (lowermost figure) on caudal peduncle in Nemacheilidae. The crest is convex, while the ridge is straight. The white line shows the proximal base of the crest and ridge.

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Nemacheilid loaches inhabit a wide range of water bodies, typically found in swift-flowing water, where they feed on small invertebrates. Up to five nemacheilid species and up to three species of *Oxynoemacheilus* have been found in syntopy, making identifying species in the field challenging. Syntopic species are usually found in different microhabitats, often in different current velocities. However, the ecological niche separation in different loaches has yet to be studied. All species appear to spawn for the first time at 1 year; most individuals seem to be multiple spawners but spawn only one to two seasons. Biological details are unknown for almost all species. **Further reading.** Tang et al. 2006 (phylogeny); Šlechtová et al. 2007 (phylogeny); Prokofiev 2009 (genera); Freyhof et al. 2011 (diversity); Kottelat 2012 (diversity); Jouladeh-Roudbar et al. 2015c (*Paraschistura alta* record from Iran); Hashemzadeh Segherloo et al. 2016b (West Asian genera).

Key to genera of *Nemacheilidae* in West Asia

1a - Subterranean species, body whitish or pink; eye reduced, externally invisible.
……*Eidinemacheilus*
1b - Epigean species, body with large brown blotches, bars, a stripe, marbled or mottled colour pattern; eye fully developed.
……2

2a - Dorsal origin clearly behind vertical of pelvic origin; anus situated more than two eye diameters in front of anal origin.
……*Turcinoemacheilus*
2b - Dorsal origin in front, above, or slightly behind vertical of pelvic origin; anus situated about one eye diameter or less in front of anal origin.
……3

3a - Pectoral in male remarkably longer than in female; male with many small nuptial tubercles on head, especially on cheek and on upper pectoral (absent in *Seminemacheilus*).
……4
3b - Pectoral in male not longer than in female; male without small nuptial tubercles on head or on pectoral.
……5

4a - Suborbital flap or groove always absent in male; caudal very slightly emarginate, truncate, or slightly rounded; pectoral in male reaching beyond pelvic origin when adpressed; epural bone in caudal skeleton absent.
……*Seminemacheilus*
4b - Suborbital groove present or absent in male; caudal deeply emarginate or truncate; if suborbital groove absent and caudal slightly emarginate or truncate, then pectoral in male not reaching beyond pelvic origin when adpressed; epural bone in caudal skeleton present.
……*Oxynoemacheilus*

5a - A prominent dorsal adipose crest on caudal peduncle, not supported by procurrent caudal rays; flank marbled, mottled, or with an irregularly shaped midlateral stripe.
……*Paracobitis*
5b - No dorsal adipose crest on caudal peduncle, or, if dorsal adipose crest present, supported by procurrent caudal rays and caudal peduncle, usually with regularly shaped bars.
……6

6a - Colour pattern on flank with regularly- or irregularly set bars, often dissociated into irregularly shaped blotches, especially on flank in front of dorsal origin; most species with prominent black spot at base of unbranched dorsal rays and on first and sometimes second branched rays; a dark-brown or black bar or 1–2 black blotches at caudal base; no whitish or yellowish triangular patch on posteriormost upper and lower caudal peduncle; caudal deeply emarginate or forked.
.....*Paraschistura* + *Schistura*
6b - Colour pattern on flank with a marbled or mottled pattern, usually with a dark-brown or grey irregularly shaped, midlateral stripe, often restricted to caudal peduncle; no prominent black spot at base of unbranched dorsal rays or on first or second branched rays; no dark-brown or black bar or blotch at caudal base; a prominent whitish or yellowish triangular patch on posteriormost upper and lower caudal peduncle; caudal slightly emarginate.
.....*Sasanidus*

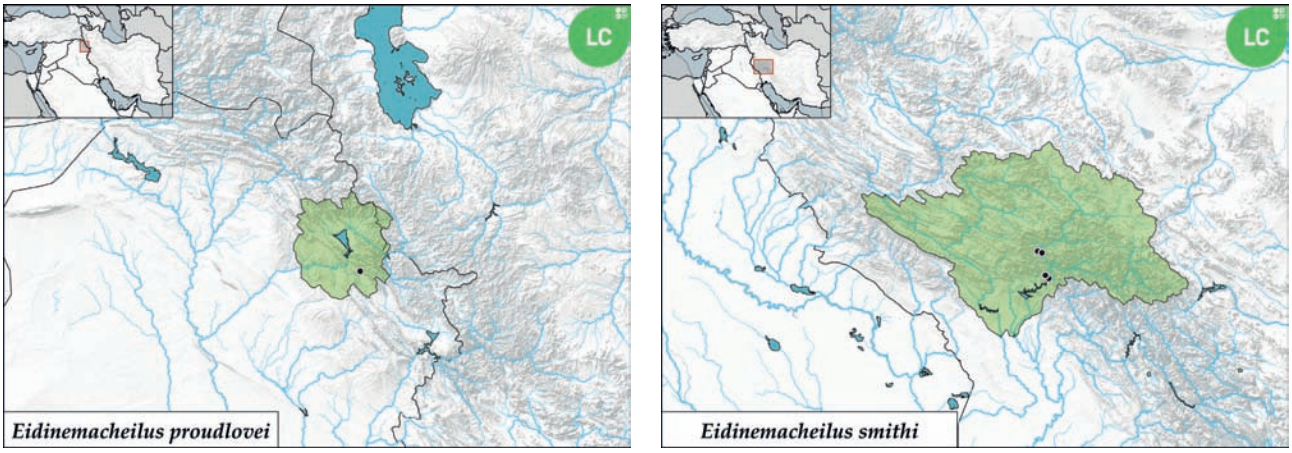
Eidinemacheilus

The two species are troglomorphic inhabitants of underground waters in the Zagros Mountains. They are superficially quite different, and molecular data suggest that both are not closely related. The phylogenetic relationships of *Eidinemacheilus* and other genera remain unresolved. *Eidinemacheilus* may be a relict genus in the Zagros, but the diversity of nemacheilid loaches in South Asia needs to be better understood. Therefore, epigean *Eidinemacheilus* species may be found there in the future. As troglomorphic fishes lack colour patterns and face very different evolutionary challenges, potential epigean *Eidinemacheilus* should be identified by molecular characters. **Further reading.** Hashemzadeh Segherloo et al. 2016b (description & phylogeny).

Eidinemacheilus proudlovei

Common name. Tabin blind loach.
Diagnosis. Distinguished from *E. smithi* by: ● dorsal adipose crest absent / ● 8+8 or 8+7 branched caudal rays / ● jaws enlarged / ● head canal system fully developed. Size up to 54 mm SL.
Distribution. Iraq: An aquifer near Kanishok in Tabin drainage. Tabin flows into Lesser Zab.
Habitat. Underground waters.
Biology. No data.
Conservation status. LC; as with all subterranean species, its distribution is difficult to understand, and threat levels may be low.
Further reading. Freyhof et al. 2016b (description).

Eidinemacheilus proudlovei; ephemeral spring in Tabin Gorge; Iraq; ~50 mm SL.



Eidinemacheilus smithi; Loven, Iran; 28 mm SL.

Eidinemacheilus smithi

Common name. Zagros blind loach.

Diagnosis. Distinguished from *E. proudlovei* by: • dorsal adipose crest present / • 7+7 branched caudal rays / • jaws normally developed / • head canal system reduced. Size up to 53 mm SL.

Distribution. Iran: Loven spring in Ab-e Sirum (or Ab-e Serum) valley near Tang-e Haft, and springs around Tuveh in Karun drainage. Probably more widespread.

Habitat. Underground waters.

Biology. No data.

Conservation status. LC; as with all subterranean species, its distribution is difficult to understand, and threat levels may be low.

Further reading. Greenwood 1976 (description); Freyhof et al. 2014b (diagnosis).

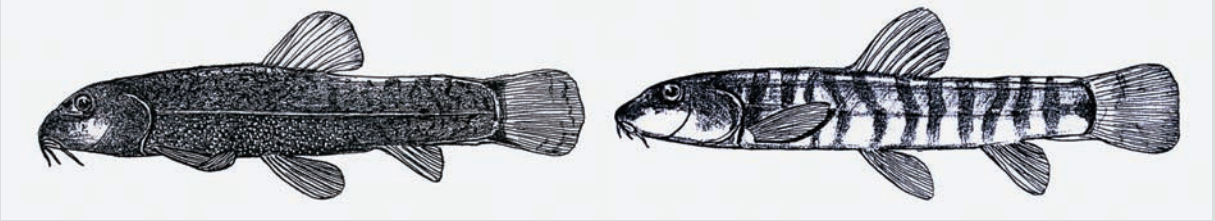


Figure 50. *Oxynoemacheilus* is the most species-rich genus of freshwater fish in West Asia. Many have small ranges, and several new species await their discovery and description. These two undescribed species from Türkiye have not been found since the 1970s. From left: Stream Nif in Gediz drainage, stream Melendiz at Ihlara. © T. Nalbant.

Reductive evolution in subterranean fishes? In most habitats, the initial observation of most organisms is one of adaptation. *Esox* are adapted for predation, while *Alburnus* are adapted for fast swimming. In contrast, subterranean animals are characterised by losses rather than gains. These organisms have much-reduced eyes and pigments and often have no or few scales. This has long fascinated biologists, dating from the time of Lamarck in the late 18th century. In no other group of biota has Lamarck's view of use and disuse persisted so long to influence modern biology as in troglobionts. Even Darwin's explanation of eyeless subterranean animals was a straightforward Lamarckian one and did not involve adaptation and the struggle for existence. In his 1859 work, Darwin wrote, "Their [eyes] loss may be attributed to disuse" (Darwin, 1859). Subsequently, authors proposed neutralistic explanations instead of natural selection to account for the phenomenon of "reductive evolution." However, this view shifted in the late 20th century, with troglomorphic features now regarded as highly adaptive to subterranean environments and selection identified as a significant driver of species adaptation to subterranean habitats. Compared to their surface-dwelling counterparts, subterranean species exhibit many constructive biological changes yet display regressive alterations, exemplified by the reduction of eyes. Indeed, the reduction of the eye is an adaptation that conserves energy. There is evidence to suggest that different changes may be connected by pleiotropy. Pleiotropy occurs when a single gene influences multiple phenotypic traits. Consequently, a mutation in a pleiotropic gene may affect some or all traits simultaneously. This contemporary perspective on the distinctive characteristics of troglomorphic species offers a novel and significant opportunity to advance our comprehension of the phenomenon of "reductive" evolution. **Further reading.** Darwin 1859 (origin of species); Cluver & Pipan 2009 (adaptation in cavefish).

Oxynoemacheilus

This is the most speciose genus of freshwater fishes in the Western Palaearctic, with 68 known species, and the largest in West Asia, with 64 species. It is distributed throughout West Asia and one species is found in Central Asia (*O. oxianus*). Three species are found in Europe in Albania and Greece (*O. bureschi*, *O. pindus*), and the northern Caucasus (*O. merga*). *Oxynoemacheilus* are found virtually everywhere, with one or more species in almost all habitats. They belong to the standard repertoire of nearly every river, stream, and spring. However, this genus is absent in Iran from the Caspian basin, east of the Sefid, and from many of the endorheic basins in southern Iran. It is also absent from the rivers south of the Mond, where mostly loaches of the genus *Paraschistura* are found, and from all the Arabian Peninsula.

Mature males are typically smaller than females, with upward-curled pectorals that are longer than those of females. These rays are stiffer, wider, and covered by numerous rows of minute tubercles. Outside the spawning season, it can be challenging to distinguish between sexes. In many species, adult males have a suborbital slit or groove below the modified lachrymal bone. However, this slit or groove is absent in many other species. In some species, a small groove may be present in the posterior outline of the lachrymal bone. In other species, the lachrymal bone may be visible but completely covered by skin.

Oxynoemacheilus bergianus x *Oxynoemacheilus euphraticus*; Great Zab drainage, Iraq; 70 mm SL. Individuals in this population have one or the other type of mtDNA indicating hybridisation.

Identifying *Oxynoemacheilus* species is often challenging, particularly for slender species with a deeply emarginate caudal and a suborbital groove in the male. Such species are usually widely distributed and may exhibit variations in colour patterns within and between populations. Unfortunately, in slender *Oxynoemacheilus*, several populations without morphological and only small differences in mtDNA had been recognised as separate species, indicating a need for a conceptual framework of boundaries between populations and species. Some of these are not accepted here. Many other species have a stout, massively built body, a slightly emarginate or even truncate caudal, and no suborbital groove in male. These species are often locally endemic. In sympatry, the caudal fin's shape and the caudal peduncle's depth can be useful to distinguish between most species. It has been demonstrated that the diversity in body shapes observed in *Oxynoemacheilus* does not fully correspond to the phylogeny of the different species, as slender and stout species may be closely related. However, nuclear DNA characters may lead to very different phylogenetic patterns if analysed in the future. Some stout species form monophyletic groups in *Oxynoemacheilus*, but slender species are a highly polyphyletic group. Notably, there are a variety of intermediate morphotypes within this large genus.

We know that the diversity of *Oxynoemacheilus* presented in this book sometimes not conforms to simplistic, tree-based patterns, as introgressive hybridisation between species has occurred. In several species, isolated populations differ only by small molecular differences without morphological differences, and we do not accept these as species. Of course, we observe the species diversity of *Oxynoemacheilus* (and other genera) to be streamlined with clusters of minimal COI differences and new species to be described with only 'invented' morphological differences. This process has already begun. Here, the concept of "old species" should be applied to avoid false species decriptions. **Further reading.** Prokofiev 2009 (genera); Freyhof et al. 2011 (diversity); Kottelat 2012 (diversity).

Variability in colour pattern of *Oxynoemacheilus cilicicus* left from top: lower Seyhan drainage; 50 mm SL; lower Ceyhan drainage; 55 mm SL; river connecting Lakes Gölbaşı and Azaplı; 53 mm SL; spring Çöçelli, Ceyhan drainage; 50 mm SL; right from top: Göksu delta, 55 mm SL; 55 mm SL; 55 mm SL; 52 mm SL.

Keys to species of *Oxynoemacheilus* in West Asia

Caspian basin, including Lake Urmia and Namak basins

Oxynoemacheilus bergi is a valid species from the Kura drainage. However, it needs to be better known to be included in the key. It may be a senior synonym of *O. bergianus*, but this hypothesis awaits confirmation. *Oxynoemacheilus merga* from the European Caspian basin in Azerbaijan, north of Baku, is excluded from the coverage of this book. Most *Oxynoemacheilus* species have individuals with a completely or almost complete plain brown colour pattern. The identification of species by colour pattern requires the examination of more than one or a few individuals.

1a - Suborbital groove absent in adult male; flank with 12–17 distinct, regularly shaped, and set bars; caudal slightly emarginate or truncate.
……*O. cyri*
1b - Suborbital groove present in adult male; flank without bars or bars very irregularly shaped, and set; caudal emarginate or furcate.
……2

2a - Caudal slightly emarginate; flank mottled, with a midlateral series of indistinct blotches, often forming an irregularly shaped midlateral stripe, without distinct bars or large blotches; caudal–peduncle depth 1.3–1.6 times in its length.
……*O. veyselorum*
2b - Caudal deeply emarginate or furcate; flank pattern with distinct bars or large blotches, not forming a midlateral stripe; caudal–peduncle depth 2.0–3.2 times in its length.
……3

3a - Flank mottled or with large, irregularly shaped, squarish, or vertically elongate blotches, usually as wide or narrower than interspaces; lateral blotches on caudal peduncle usually interrupted in size and/or shape at or above lateral midline; one central or no black, grey or brown blotch or short bar on caudal base, its colour identical to blotches on caudal peduncle.
……*O. bergianus*
3b - Flank with wide, irregularly shaped bars, much wider than interspaces; bars on caudal peduncle not interrupted in size and shape at lateral midline; an upper and a lower bold, black or dark-brown blotch on caudal base, often fused into a bar, its colour distinctly darker than bars on caudal peduncle.
……4

4a - Caudal emarginate, with many small brown blotches on rays arranged in 3–6, narrow, pale-brown bands; flank usually with irregularly shaped and spaced, dark-brown bars, often split in middle, irregularly shaped and narrower than interspaces, or flank almost plain brown.
……*O. elsae*
4b - Caudal forked, with 1–3 wide and very bold bands; flank with brown bars or vertically elongate blotches, much wider than interspaces, usually regularly set.
……*O. brandtii*

Black and Marmara Sea basins

No external characters are known to distinguish *O. banarescui* (Devrekani, Filyos), *O. bergianus* (Kızılırmak), *O. fatsaensis* (Elekçi, Yeşilırmak), and *O. simavicus* (Sursuluk, Sakarya, Büyük Melen). These four species are related and can only be distinguished by molecular characters.

1a - Suborbital groove absent in adult males.
……*O. seyhanensis*
1b - Suborbital groove present in adult males.
……2

2a - Caudal–peduncle depth 6–10 % SL.
……*O. banarescui*, *O. bergianus*, *O. fatsaensis*, *O. simavicus*
2b - Caudal–peduncle depth 10–13 % SL.
……3

3a - A median incision in upper lip in most individuals.
……*O. cemali*
3b - No median incision in upper lip.
……4

4a – Caudal with a wide, bold band in middle or posterior half.
……*O. phasicus*
4b – Caudal with 1–3 narrow, pale bands.
……5

5a - Distance between pectoral and pelvic origins 25–28 % SL; caudal slightly emarginate.
……*O. angorae*
5b - Distance between pectoral and pelvic origins 29–34 % SL; caudal moderately emarginate.
……*O. marmaraensis*

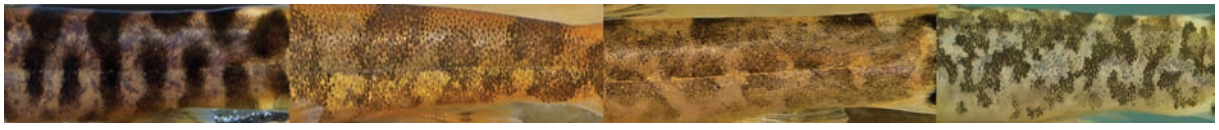


Figure 51. Colour pattern on caudal peduncle of *Oxynoemacheilus*: From left: barred, marmorate, marbled, and mottled. In marmorate patterns, blotches are larger and clearer with wider interspaces than marbled ones.

Aegean basin
1a - Belly without scales; caudal slightly emarginate or almost truncate, middle caudal ray 84–98 % of longest upper caudal ray length.
……*O. anatolicus*
1b - Belly with few, small, embedded scales; caudal emarginate, middle caudal ray 71–91 % of longest upper caudal ray length.
……2

2a - Body depth almost uniform between dorsal and caudal base (i.e., ratio of body depth at posterior of dorsal base to body depth at caudal base is equal or almost equal to 1).
……3
2b - Body depth decreasing between dorsal and caudal base (i.e., ratio of body depth at posterior of dorsal base to body depth at caudal base is greater than 1).
……4

3a - Body depth at dorsal origin 17–18 % SL; caudal peduncle 12–13 % SL, length of middle caudal ray 19–23 % SL; dorsal and ventral adipose crests present on caudal peduncle behind vertical of posterior anal base.
……*O. theophilii*
3b - Body depth at dorsal origin 15–17 % SL; caudal peduncle 10–12 % SL; length of middle caudal ray 16–19 % SL; no dorsal and ventral adipose crests on caudal peduncle behind vertical of posterior anal base.
……*O. fatmae*

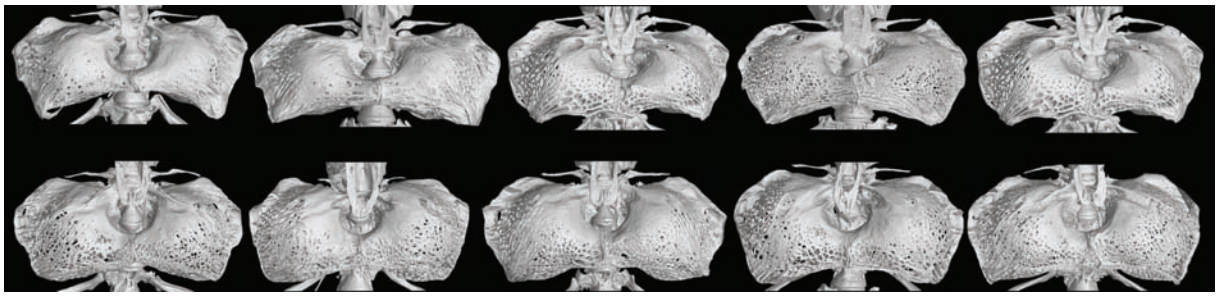


Figure 52. In Nemacheilidae, the swim bladder is situated in a bony capsule (ventral view in 10 individuals of *Oxynoemacheilus germencicus*). The structure and shape of this capsule has often been used in identification. We find the preparation of this capsule too difficult, and the variability of its characters needs to be better understood to use it as a standard character for identification.

4a - Caudal–peduncle depth 1.0–1.3 times in caudal–peduncle length; caudal peduncle 13–16 % SL; flank with coarse mottling, without bars or blotches.
…….*O. kottelati*
4b - Caudal–peduncle depth 1.3–2.2 times in caudal–peduncle length; caudal peduncle 16–22 % SL; flank with bars and/or blotches, rarely with fine mottling.
…….5

5a - Caudal–peduncle depth 1.3–1.5 times in caudal–peduncle length; scales on belly present from pelvic base to midline between pectoral- and pelvic origins.
…….*O. eliasi*
5b - Caudal–peduncle depth 1.5–2.2 times in caudal–peduncle length; scales on belly restricted between pelvic bases, rarely found more anteriorly.
…….*O. germencicus*

Central Anatolia and rivers flowing to the Bay of Antalya
1a - Flank without scales, with many roundish blotches or small spots, without bars or elongated blotches.
…….*O. ciceki*
1b - Flank with scales, mottled or with bars and / or elongated blotches.
…….2

2a - Caudal–peduncle depth 2.2–2.6 times in caudal–peduncle length.
…….*O. isauricus*
2b - Caudal–peduncle depth 1.2–2.1 times in caudal–peduncle length.
…….3

3a - Caudal deeply emarginate, middle caudal ray 65–76 % of longest upper caudal ray length.
…….*O. mediterraneus*
3b - Caudal slightly emarginate or almost truncate, middle caudal ray 71–98 % of longest upper caudal ray length.
…….4

4a - Belly with few, small, embedded scales; caudal emarginate, middle caudal ray 76–91 % of longest upper caudal ray length.
…….*O. nasreddini*
4b - Belly without scales; caudal slightly emarginate or almost truncate, middle caudal ray 84–98 % of longest upper caudal ray length.
…….5

5a - Flank with a series of dark-brown midlateral blotches usually fused into a wide, irregularly shaped midlateral stripe, rarely a mottled pattern.
……*O. angorae*
5b - Flank with irregularly set and shaped distinct or confluent blotches and spots forming a marbled or mottled pattern, with large, roundish brown blotches in some individuals.
……6

6a - Pre-dorsal back usually with 3–4 saddles; flank completely covered by scales.
……*O. anatolicus*
6b - Pre-dorsal back with dark-brown fine mottled pattern, without saddles; few isolated scales on flank in front of dorsal origin.
……7

7a - Dorsal and ventral adipose crests not elevated from dorsal profile, straight, rarely convex, caudal peduncle highest at end of hypural complex; dorsal adipose crest reaching behind vertical of posterior anal base, absent in some individuals; caudal–peduncle depth 1.5–1.9 times in its length; shortest middle caudal ray is 83–91 % of longest ray of upper caudal lobe; usually flank with irregularly set and shaped, distinct, large blotches forming a marbled pattern.
……*O. eregliensis*
7b - Dorsal and ventral adipose crests elevated from dorsal profile, usually with convex margin, caudal peduncle shallower at end of hypural complex and at maximum height of dorsal adipose crest; dorsal adipose crest reaching to or exceeding vertical of anal base; caudal–peduncle depth 1.2–1.6 times in its length; shortest middle caudal ray is 88–98 % of longest ray of upper caudal lobe; usually flank with irregularly set and shaped confluent small blotches and spots forming a mottled pattern, rarely with larger blotches forming a marbled pattern.
……*O. axylos*

Göksu, Seyhan, Ceyhan, and Orontes rivers, plus coastal drainages within their bounds
1a - Suborbital groove absent in male.
……2
1b - Suborbital groove present in male.
……6

2a - Caudal slightly emarginate, almost truncate.
……*O. seyhanensis*
2b - Caudal deeply emarginate or forked.
……3

3a - Lateral line terminating above anal base or on hypural complex; many isolated and embedded scales on back and flank in front of dorsal origin.
……*O. ceyhanensis*
3b - Lateral line terminating anterior to or below dorsal base, rarely above anus or anal base; no or very few (*O. namiri*) isolated and embedded scales on back and flank in front of dorsal origin.
……4

4a - Flank pattern, usually with 6–17, very distinct and regularly shaped and set bars, usually all or most flank-bars, at least behind dorsal base, extending to middorsal saddles and usually meeting contralateral.
……*O. namiri*
4b - Flank pattern mottled or with many, very narrow, irregularly shaped and set, pale-brown bars, usually flank-bars separated from middorsal saddles and not meeting contralaterals.
……5

5a - Lateral line with 23–45 pores; infraorbital canal with 10–13 pores; body depth at dorsal origin 1.2–1.4 times in HL.
……*O. amanos*
5b - Lateral line with 13–23 pores; infraorbital canal with 8–10 pores; body depth at dorsal origin 1.0–1.2 times in HL.
……*O. cilicicus*

6a - Caudal pattern very indistinct, almost or completely absent.
……*O. seyhanicola*
6b - Caudal with dark-brown bands of elongated blotches.
……7

7a - A bold, black blotch or spot at upper and lower caudal base.
……8
7b - One central, bold-brown blotch or no blotch on caudal base, often an irregularly shaped black bar at caudal base.
……10

8a - Flank and caudal peduncle with marbled colour pattern, without series of midlateral blotches or bars.
……*O. argyrogramma*
8b – A series of midlateral blotches on caudal peduncle, in some individuals, flank with bars.
……9

9a - 5–7 flank bars, irregularly shaped and set, extending to middorsal saddles and meeting contralateral; caudal peduncle 1.8–2.4 times longer than deep.
……*O. shehabi*
9b - A midlateral series of large blotches, disconnected from saddles on back; caudal peduncle 1.4–1.8 times longer than deep.
……*O. sarus*

10a - Caudal–peduncle depth 1.4–1.9 times in its length.
……11
10b - Caudal–peduncle depth 1.8–3.5 times in its length.
……13

11a - Middle caudal ray 64–74 % of length of longest ray in upper caudal lobe.
……*O. hamwii*
11b - Middle caudal ray 83–92 % of length of longest ray in upper caudal lobe.

12a - Flank with irregularly set and shaped confluent small blotches and spots forming a mottled pattern, rarely with larger blotches forming a marbled pattern; pre-dorsal back with blotches or a dark-brown, fine, mottled pattern, without saddles; few isolated scales on the flank in front of the dorsal origin.
……*O. eregliensis*
12b - Flank with a series of dark-brown midlateral blotches usually fused into a wide, irregularly shaped midlateral stripe, rarely a mottled pattern; pre-dorsal back usually with 3–4 saddles; flank completely covered by scales.
……*O. angorae*

13a - A yellowish triangle at upper and lower posteriormost portions of caudal peduncle; caudal–peduncle depth 1.8–2.4 times in its length; caudal emarginate, middle caudal ray 80–91 % of length of longest ray in upper caudal lobe.
……*O. evreni*
13b - No yellowish triangles at posteriormost portion of caudal peduncle; caudal–peduncle depth usually 2.0–3.0 times in its length; caudal deeply emarginate, middle caudal ray 70–84 % of length of longest ray in upper caudal lobe.
……*O. bergianus*

Southern Levant (Damascus basin, Litani, and Jordan drainages)

1a - Suborbital groove absent in adult male; body scaleless or scales restricted to flank behind dorsal base, with few isolated scales on anterior flank in some individuals.
……2
1b - Suborbital groove present in adult male; back and flank covered by scales.
……4

2a - Body completely scaleless; 9–11½ branched dorsal rays.
……*O. galilaeus*
2b - Anterior flank scaleless or with few isolated scales, caudal peduncle with densely set scales; 8–9½ branched dorsal rays.
……3

3a - Lateral line terminating before vertical of dorsal origin; body depth at dorsal origin 20–25 % SL.
……*O. panthera*
3b - Lateral line terminating about at vertical of dorsal origin; body depth at dorsal origin 16–20 % SL.
……*O. leontinae*

4a - Lateral line incomplete, terminating between vertical or dorsal and anal base, usually to anal base.
……*O. pantheroides*
4b - Lateral line complete, terminating at or almost at caudal base.
……*O. insignis*

Euphrates, Qweiq drainages, and Lake Van basin

1a - Lateral line incomplete, terminating anterior to dorsal origin or above anal base.
……2
1b - Lateral line complete, reaching to caudal base.
……5

2a - Flank with distinct bars; an upper and a lower black spot at caudal base; caudal peduncle with a long, high dorsal adipose crest; crest with yellowish or whitish margin, reaching beyond vertical through anal origin, usually below last dorsal rays when folded down; flank with isolated and deeply embedded scales.
……*O. tigris*
2b - Flank with a mottled, marbled, or marmorated pattern, often with narrow, indistinct bars on caudal peduncle or a series of dark-brown blotches; colour pattern on caudal base not differentiated from flank pattern, with or without a black bar, never with two black spots; caudal peduncle without or with a short dorsal adipose crest, crest without white margin, reaching to middle of caudal peduncle or to vertical through anal base; flank without scales.
……3

3a - A central pore in supratemporal canal; a bold bar on caudal base, usually M-shaped, fused with a roundish or vertically elongate, dark-brown blotch at vertical midline; caudal usually with wide, bold, dark-brown bands.
……*O. arsaniasus*
3b - No central pore in supratemporal canal; a mottled or marmorated pattern on caudal base, without bold bar; caudal with narrow, indistinct, pale-brown bands.
……4

4a - Caudal–peduncle length 1.0–1.3 times its depth; body width at dorsal origin 13–17 % SL; dorsal adipose crest on caudal peduncle high, not reaching to vertical through last anal ray base in individuals larger than 50 mm SL.
……*O. ercisianus*

4b - Caudal–peduncle length 1.3–1.6 times its depth; body width at dorsal origin 11–13 % SL; dorsal adipose crest on caudal peduncle shallow, reaching to vertical through last anal ray base in individuals larger than 50 mm SL.
……*O. muefiti*

5a - Suborbital groove or flap absent in male.
……6
5b - Suborbital groove present in male.
……7

6a - Caudal peduncle without adipose crest or ridge; flank with a distinct midlateral series of large, roundish, or horizontally elongated brown blotches and a row of small brown blotches between upper pelvic base and lowermost caudal base.
……*O. paucilepis*
6b - Caudal peduncle with a shallow, wide, often long adipose ridge; flank with a brown mottled or marmorated pattern, with irregularly shaped brown bars, especially on flank behind dorsal origin in some individuals.
……*O. kaynaki*

7a - Caudal slightly emarginate.
……*O. araxensis*
7b - Caudal deeply emarginate or slightly forked.
……8

8a - One central or no black, grey or brown blotch or short bar on caudal base, its colour identical to blotches on caudal peduncle; upper lip without median incision.
……*O. bergianus*
8b - A bold upper and a lower black blotch or spot on caudal base, often overlaid by a dark-brown or black chevron-shaped bar; upper lip with a median incision.
……9

9a - Flank and caudal peduncle with marbled colour pattern, without bars; caudal–peduncle depth 1.4–1.8 times in caudal–peduncle length.
……*O. argyrogramma*
9b - Caudal peduncle, and in some individuals also flank, with bars; caudal–peduncle depth 2.0–2.8 times in caudal–peduncle length.
……*O. euphraticus*

Kor basin
1a - Caudal deeply emarginate; no dorsal crest on caudal peduncle.
……*O. persa*
1b - Caudal slightly emarginate or truncate; shallow dorsal crest on caudal peduncle.
……*O. tongiorgii*

Tigris drainage
The Tigris is the biodiversity hotspot for *Oxynoemacheilus,* but not all species have been described, especially from Iraq and Iran. Many species have small ranges, and their distribution might help identify them.

1a - Suborbital groove absent in male.
……2
1b - Suborbital groove present in male.
……8

2a - Lateral line incomplete, terminating in front of or above anal base.
……3
2b - Lateral line complete, terminating behind vertical of anal base or at caudal base.
……5

3a - Scales present on back and flank in front of anus; central pore in supratemporal canal present.
……*O. frenatus*
3b - Scales absent on back and flank in front of anus; central pore in supratemporal canal absent.
……4

4a - Lateral line very short, terminating slightly behind pectoral base, not reaching vertical through dorsal origin; a midlateral series of small, horizontally elongated, dark-brown blotches often fused into an irregularly shaped midlateral stripe, one additional stripe above and below midlateral stripe in many individuals.
……*O. gyndes*
4b - Lateral line long, terminating under dorsal base or above anal base; flank with vertically elongated, irregularly shaped blotches or narrow bars.
……*O. kiabii*

5a - Posterior process of bony air-bladder capsule directed posteriorly.
……*O. zagrosensis*
5b - Posterior process of bony air-bladder capsule directed laterally.
……6

6a - 8+8 branched caudal rays; caudal–peduncle depth 1.0–1.2 times in caudal–peduncle length; interorbital distance 1.1–1.4 times in snout length; colour pattern on flank behind dorsal base mottled or marmorated.
……*O. zarzianus*
6b - 10+9, 9+9, or 9+8 branched caudal rays; caudal–peduncle depth 1.3–1.8 times in caudal–peduncle length; interorbital distance 1.4–1.9 times in snout length; colour pattern on flank behind dorsal base with bars or vertically elongated blotches.
……7

7a - Very indistinct, fuzzy bars or vertically elongated blotches on caudal peduncle; maxillary barbel reaching to anterior eye margin or middle of eye; interorbital distance 1.4–1.5 times in snout length; caudal–peduncle depth 1.3–1.4 times in caudal–peduncle length.
……*O. chomanicus*
7b - Distinct bars or vertically elongated blotches on flank behind dorsal origin; maxillary barbel reaching beyond middle of eye, usually to posterior eye margin; interorbital distance 1.6–1.9 times in snout length; caudal–peduncle depth 1.2–1.3 times in caudal–peduncle length.
……*O. kentritensis*

8a - Flank naked, only caudal peduncle behind anus with scales; lateral line incomplete; caudal slightly emarginate.
……*O. hazarensis*
8b - Flank completely covered by scales; lateral line complete; caudal deeply emarginate or forked.
……9

9a - Flank with a distinct series of midlateral blotches, fused to each other or fused into a stripe, isolated patches of blotches, or a row of small dark-brown spots below lateral series of blotches.
……*O. hanae*
9b - Flank mottled or marmorated, lower flank without colour pattern or colour pattern of midlateral flank reaching down to lower flank.
……10

10a - Upper lip without or with very short median incision.
……11
10b - Upper lip with well-developed median incision.
……13

11a - One central or no black, grey or brown blotch or short bar on caudal base, its colour identical to blotches on caudal peduncle.
……*O. bergianus*
11b - Two bold, black blotches or spots at caudal base, distinctly darker than flank pattern, usually prominent in life and preserved fish, in some individuals overlaid by a chevron-shaped, dark-brown or black bar.
……12

12a – Flank with very dense mottling between blotches on flank; caudal–peduncle depth 1.7–3.1 times in its length.
……*O. karunensis*
12b – No dense mottling in interspaces between blotches on flank; caudal–peduncle depth 1.4–1.7 times in its length.
……*O. chaboras*

13a – Last bars on caudal peduncle narrower than interspaces.
……*O. kurdistanicus*
13b – Last bars on caudal peduncle as wide or wider than interspaces.
……14

14a – Juveniles larger than 20 but smaller than 45 mm SL with intense mottled pattern between midlateral blotches on flank.
…… *O. marunensis*
14b – Juveniles larger than 20 but smaller than 45 mm SL with poorly developed mottling between midlateral blotches on flank.
……*O. euphraticus*

Oxynoemacheilus amanos

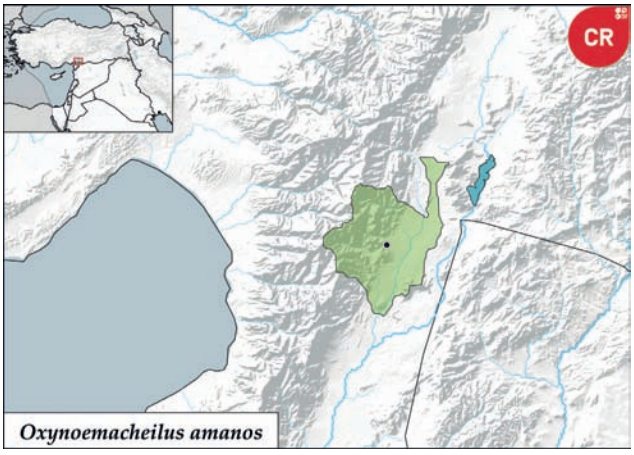
Common name. Hassa loach.

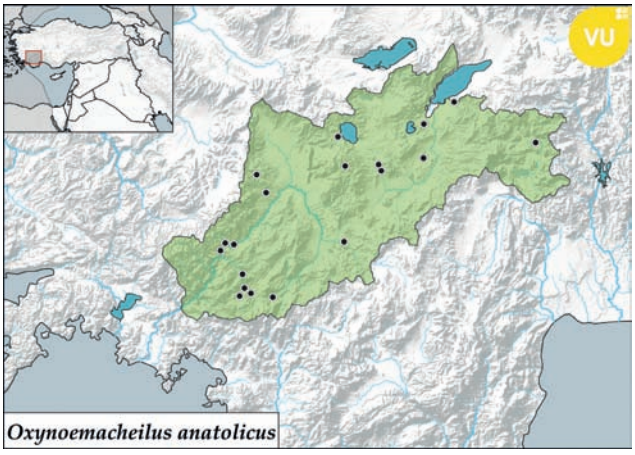
Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Cilicia and northern Levant by: ○ suborbital groove absent in male / ○ caudal deeply emarginate / ○ lateral line incomplete with 23–45 pores, terminating between vertical of dorsal origin and anus / ○ 10–13 pores in infraorbital canal / ○ flank pattern mottled or with many, very narrow, irregularly shaped and set, pale-brown bars, usually flank-bars separated from middorsal saddles and not meeting contralaterals / ○ flank and back posterior to dorsal base covered by scales / ○ body depth at dorsal origin 1.2–1.4 times in HL. Size up to 71 mm SL.

Distribution. Türkiye: Spring İncesu at Hassa, a northern tributary of Orontes.

Oxynoemacheilus amanos; spring İncesu at Hassa; 66 mm SL.

Many freshwater fish have small distribution areas in West Asia, but few are as small as the spring İncesu, the only habitat of *Oxynoemacheilus amanos.*





Habitat. Only known from one spring but expected to occur in nearby slow-flowing streams.
Biology. No data.
Conservation status. CR; known only from a small population in a very small, unprotected spring. Expected to decline.
Remarks. Related to *O. cilicicus* from adjacent Ceyhan drainage.
Further reading. Kaya et al. 2021 (description).

Oxynoemacheilus anatolicus
Common name. Burdur loach.
Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Aegean basin and Central Anatolia by: ○ caudal emarginate, shortest middle caudal ray 84–98 % of longest ray of upper caudal lobe / ○ no prominent dorsal crest on caudal peduncle / ○ pre-dorsal back usually with 3–4 saddles / ○ flank completely covered by scales / ○ belly

Oxynoemacheilus anatolicus; Düğer, Lake Burdur basin, Türkiye; 55 mm SL.

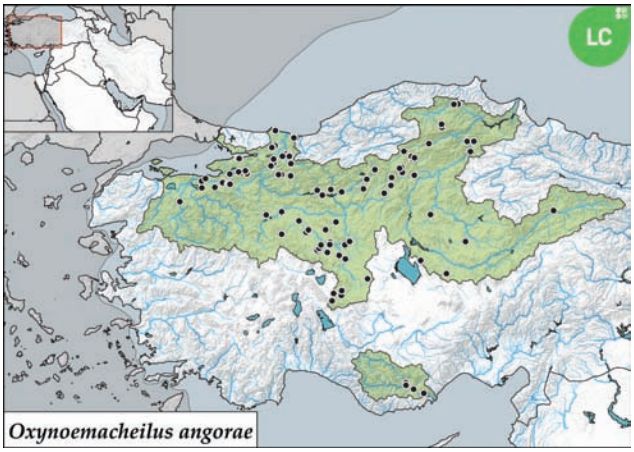
without scales / ○ head length 24–27 % SL / ○ suborbital groove present in male / ○ caudal–peduncle depth 1.3–1.6 times in its length. Size up to 86 mm SL.
Distribution. Türkiye: Dalaman drainage and four spring-fed streams in Central Anatolia: Düger, Ereçay at Elmacık near Kemer, Karamanlı reservoir, and Pınarbaşı.
Habitat. Slow-flowing streams with dense vegetation and sand, mud, or gravel substrate.
Biology. Lives up to 5 years. Spawns after first winter. First spawn recorded in March.
Conservation status. VU; appears to be declining within its small range.
Remarks. Superficially similar loaches in Lake Salda basin may also belong to this species.
Further reading. Erk'akan et al. 2008b (description); Geiger et al. 2014 (molecular data); Innal 2019 (biology, distribution).

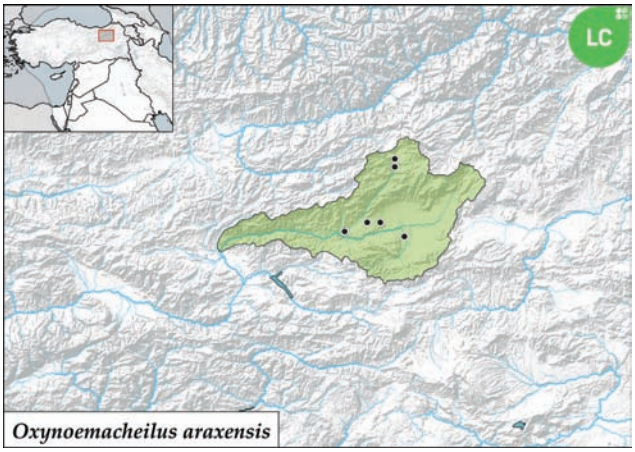
Oxynoemacheilus angorae; Bayındır, Sakarya drainage, Türkiye; ~60 mm SL.

Oxynoemacheilus angorae; Porsuk subdrainage, Sakarya drainage, Türkiye; ~60 mm SL

Oxynoemacheilus angorae

Common name. Angora loach.
Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Marmara, and Black Sea basins, and Central Anatolia by: ○ caudal–peduncle depth 1.5–1.8 times in its length / ○ caudal slightly emarginate, shortest middle caudal ray 88–92 % of longest ray of upper caudal lobe / ○ belly without scales / ○ no prominent dorsal crest on caudal peduncle / ○ suborbital groove present in male / ○ flank marbled, often with a series of midlateral blotches fused to a wide, irregularly shaped midlateral stripe / ○ upper part of cheek mottled / ○ tip of pectoral usually not reaching





Oxynoemacheilus araxensis; upper Euphrates drainage, Türkiye; 71 mm SL. © M. Özuluğ.

pelvic origin in male / ○ distance between pectoral and pelvic origins 25–28 % SL / ○ no median incision in upper lip / ○ axillary pelvic lobe absent / ○ colour pattern on flank anterior to dorsal origin usually interrupted by pale-beige lateral line. Size up to 98 mm SL.

Distribution. Türkiye: Susurluk east to Kızılırmak drainages and endorheic Lakes İznik and Ilgın basins, also in Göksu drainge.

Habitat. A wide range of habitats, from swift mountain streams, banks of large rivers, springs to muddy lakes with dense vegetation. Moderately rheophilic, avoids very fast currents.

Biology. Spawns first time, usually at age 1; most individuals spawn for 1–2 seasons. Multiple spawner. Feeds on relatively large benthic invertebrates. Tolerant of moderate organic pollution and stream channeling.

Conservation status. LC.

Further reading. Yazıcıoğlu & Yazıcı 2016 (biology); Yoğurtçuoğlu et al. 2022 (distribution); Kaya et al. 2025a (record in Göksu).

Oxynoemacheilus araxensis

Common name. Erzurum loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Euphrates drainage by: ○ caudal slightly emarginate / ○ lateral line complete / ○ suborbital groove present in male / ○ flank mottled or with 6–9 irregularly shaped dark-grey blotches, often fused, forming a lateral stripe / ○ caudal peduncle without high adipose crest or ridge / ○ flank covered by scales. Size up to 90 mm SL.

Distribution. Türkiye: Upper Karasu, a tributary of Euphrates west of Erzurum.

Habitat. Moderately fast-flowing streams.

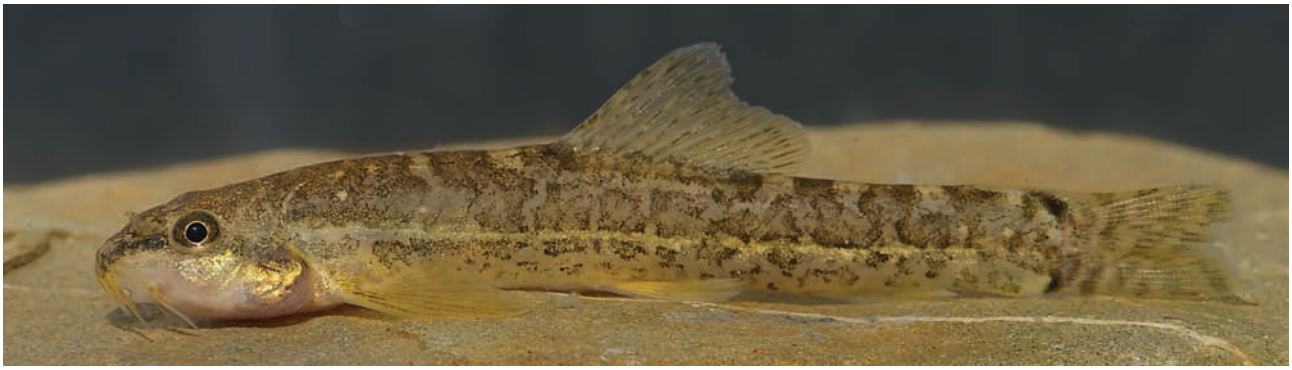
Biology. No data.

Conservation status. LC; appears to be declining within its small range.

Remarks. Despite its name, this species is restricted to the Euphrates drainage and has not been found in the Aras (Caspian basin).

Further reading. Bănărescu et al. 1978 (description); Freyhof et al. 2019 (distribution).

Oxynoemacheilus argyrogramma; Merziman, Euphrates, Türkiye; 56 mm SL.



Oxynoemacheilus argyrogramma; Qweiq drainage, Türkiye; 50 mm SL.

Oxynoemacheilus argyrogramma

Common name. Two-spot loach.

Diagnosis Distinguished from other species of *Oxynoemacheilus* in Euphrates and Qweiq drainages by: ○ lateral line complete / ○ flank covered by scales / ○ two distinct and prominent black blotches at posteriormost caudal base, often overlaid by a dark-brown or black chevron-shaped bar / ○ caudal moderately deep emarginate / ○ flank and caudal peduncle with marbled colour pattern, without bars / ○ caudal peduncle without high adipose crest or ridge / ○ upper lip with a median incision / ○ suborbital groove present in male / ○ caudal–peduncle depth 1.4–1.8 times in caudal–peduncle length. Size up to 62 mm SL.

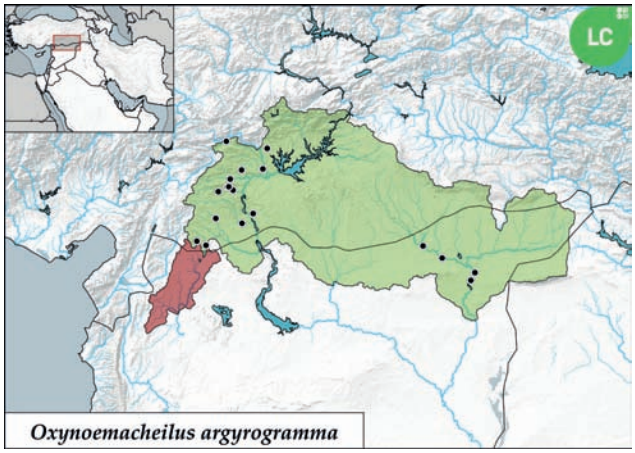
Distribution. Qweiq drainage in Türkiye and Syria. South-western Euphrates drainage in Türkiye, and most likely in adjacent Syrian Euphrates. In Gölbaşı lakes in uppermost Ceyhan and potentially more widespread in Ceyhan.

Habitat. Wide range of habitats in moderately fast-flowing waters, from small hill streams to banks of large rivers. Rarely found in stagnant waters as reservoirs.

Biology. No data.

Conservation status. LC.

Further reading. Heckel 1847 (description).



Oxynoemacheilus arsaniasus; upper Euphrates drainage, Türkiye; 90 mm SL.

Oxynoemacheilus arsaniasus

Common name. Murat loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Euphrates drainage by: ○ scales absent / ○ supratemporal canal with one central pore / ○ lateral line incomplete, reaching to vertical through a point between about of one snout length in front of dorsal origin and middle of caudal peduncle / ○ suborbital groove absent in male / ○ caudal slightly emarginate / ○ pelvic axillary lobe absent / ○ no or a shallow dorsal and ventral adipose crest in individuals larger than 50 mm SL / ○ dark-brown bar or a vertically elongated blotch on caudal base or a bar fused with a roundish or vertically elongate, dark-brown blotch at vertical midline / ○ caudal usually with wide, bold, dark-brown bands / ○ caudal–peduncle length 1.3–1.6 times its depth / ○ prepelvic length 48–53 % SL. Size up to 97 mm SL.

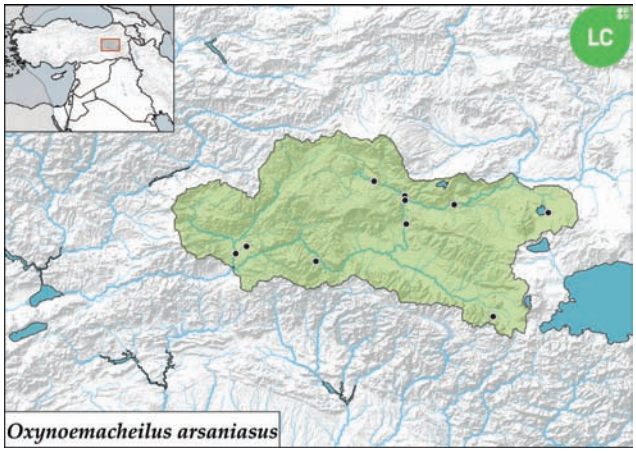
Distribution. Türkiye: Murat drainage, a major tributary of Euphrates and in Güroymak spring near Bitlis. Potentially more widespread in Euphrates.

Habitat. Fast-flowing streams and rivers with gravel or rock substrate.

Biology. No data.

Conservation status. LC. Extirpated from Syrian part of Qweiq.

Further reading. Freyhof et al. 2019b (description).



Oxynoemacheilus axylos; Sarı Yayla, Lake Tuz basin, Türkiye; 73 mm SL.

Oxynoemacheilus axylos; Gölyazı, Lake Tuz basin, Türkiye; 60 mm SL.

Oxynoemacheilus axylos

Common name. Lake Tuz loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Central Anatolia and rivers flowing to Bay of Antalya by: ● elevated dorsal and ventral adipose crests, usually with convex margin and reaching to or exceeding vertical of anal base / ○ caudal–peduncle depth 1.2–1.6 times in its length / ○ caudal almost truncate, middle caudal ray 88–98 % of longest ray of upper caudal lobe / ○ head length 24–27 % SL / ○ flank usually with irregularly set and shaped, confluent, small blotches and spots, forming a mottled pattern or rarely with larger blotches forming a marbled pattern. Size up to 73 mm SL.

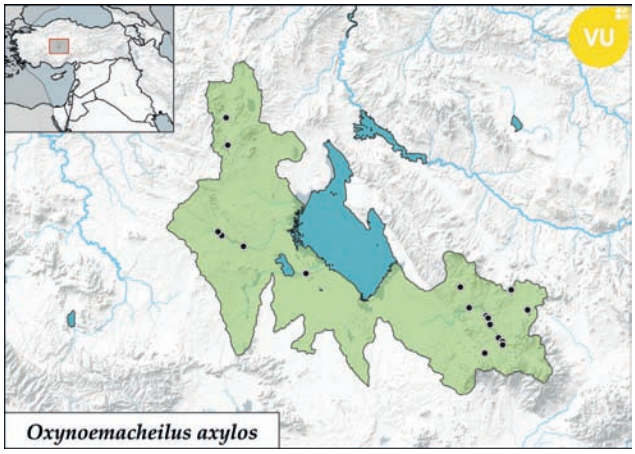
Distribution. Türkiye: Pınarbaşı spring in İnsuyu, Lakes Samsam and Gök in Kozanlı, and Melendiz drainage (Ihlara Valley), all in Lake Tuz basin.

Habitat. Moderately fast-flowing and standing waters of springs and streams with gravel substrate.

Biology. No data.

Conservation status. VU; appears to be declining within its small range.

Further reading. Yoğurtçuoğlu et al. 2022 (description).



Devrekani is a major habitat of *Oxynoemacheilus banarescui* that is quite abundant in such fast-flowing stretches.

Oxynoemacheilus banarescui; Devrekani drainage, Türkiye, 70 mm SL. © M. Özuluğ.

Oxynoemacheilus banarescui

Common name. Paphlagonian sportive loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in the Black Sea basin by: ○ caudal–peduncle depth 7–10 % SL, usually 2.0–3.0 times in its length, very rarely 1.6–3.0, without high adipose crest or ridge / ○ caudal emarginate, middle caudal ray 80–90 % of length of longest ray in upper caudal lobe / ○ lateral line complete / ○ flank covered by scales / ○ suborbital groove present in male / ○ one central or no black, grey or brown blotch or short bar on caudal base, its colour identical to blotches on caudal peduncle / ○ no yellowish triangles at posteriormost portion of caudal peduncle / ○ pelvic very long, reaching or almost reaching to anus / ○ pectoral in male very long, reaching or almost reaching to pelvic origin / ○ flank mottled or with large, irregularly shaped, squarish, or vertically elongate blotches, usually as wide or narrower than interspaces / ○ lateral blotches on caudal peduncle usually interrupted in size and/or shape at or above lateral midline. Size up to 78 mm SL.

Distribution. Türkiye: Filyos and Devrekani drainages in Black Sea basin.

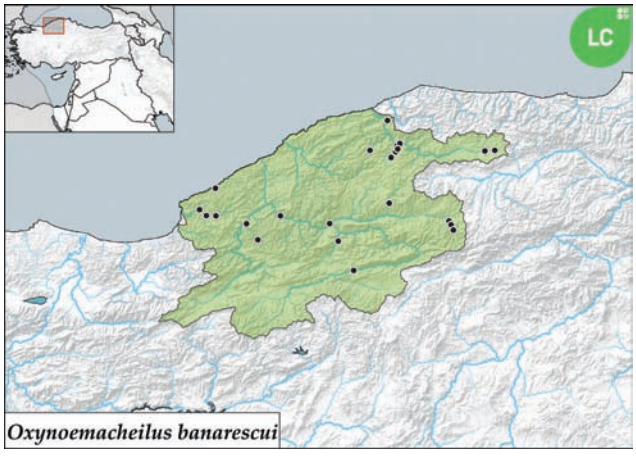
Habitat. Fast-flowing streams and rivers with gravel or rock substrate.

Biology. No data.

Conservation status. LC.

Remarks. No external characters are known to distinguish this species from *O. bergianus*, *O. fatsaensis*, and *O. simavicus*, all of which are diagnosed by molecular characters. As these four species are allopatric, the distribution area should help in identification.

Further reading. Delmastro 1982 (description); Yoğurtçuoğlu et al. 2020a (distribution); Freyhof 2022 (revision of *O. bergianus* group).



***Oxynoemacheilus bergi* and other names of Caspian loaches.** It is challenging to ascertain the number of valid species and their correct names. This often necessitates travel to type localities in remote areas. One such case is explained here. *Nemacheilus bergi* was described from the Kura drainage in Azerbaijan and was treated as a valid species without examining fish from the type locality or any other justification. In the same study, *N. alasanicus* from the upper Alazani in the Georgian Kura drainage was treated as a synonym of *N. bergi*, again without examining any materials or arguments. Early authors clearly distinguished *N. bergi* from *Oxynoemacheilus brandtii*. The account of *O. bergi* does not correspond to *O. cyri*, another species known from the Kura. *Oxynoemacheilus bergi* could be a third species of *Oxynoemacheilus* in the Kura, which has yet to be found (again). The account on *O. bergi* does not correspond to *O. veyselorum*, which has only been found in the adjacent Aras. However, it cannot be ruled out that *O. bergi* might be conspecific with the species identified as *O. bergianus*, also found in the Aras drainage. Nevertheless, there are no records of *O. bergianus* from the Kura, and fieldwork in late 2024 aimed to resolve the issue but failed to find it. If *O. bergianus* were conspecific with *O. bergi*, it would become a junior synonym of *O. bergi*. It was also suggested that two other loaches occur in the Alazani, a tributary of the Kura: *N. angorae alasanicus* and *N. brandtii gibbusnazus*. Indeed, only *O. brandtii*, very common in the Kura, has been recently found in the Alazani. *Nemacheilus angorae alasanicus* might be conspecific with *O. bergianus,* and both could be conspecific with *O. bergi*. These species should be re-examined based on materials from their type localities, and considerable efforts should be made to find the mysterious *Oxynoemacheilus bergi* and *O. alasanicus*. This is a complex issue, demonstrating that even with the publishing of this book, many questions need to be resolved. **Further reading.** Berg 1898, Gratzianov 1907 (*O. bergi*); Elanidze 1983 (Alazani loaches).

Oxynoemacheilus bergi; Kura drainage, Azerbaijan; 50 mm SL. © S. Eagderi.

Oxynoemacheilus bergi

Common name. Agstafa loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Caspian basin by: ○ caudal moderately deeply emarginate / ○ caudal–peduncle depth two times in its length. Size up to 71 mm SL.

Distribution. Azerbaijan: Agstafa, a tributary of Kura.

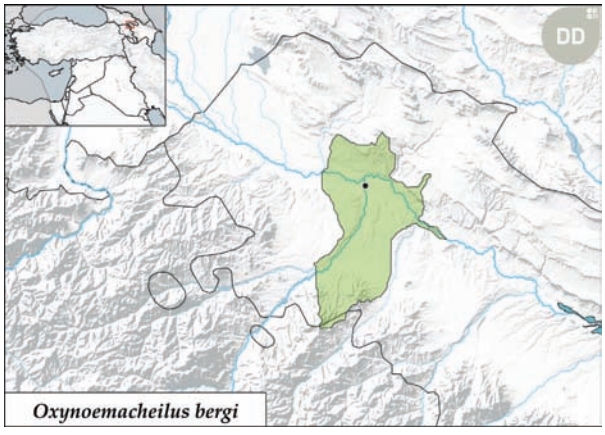
Habitat. No data.

Biology. No data.

Conservation status. DD; due to the very poor knowledge of this species.

Remarks. This species might be conspecific with *O. bergianus*.

Further reading. Çiçek et al. 2018 (rediscovery); Freyhof et al. 2021b (discussion).



Oxynoemacheilus bergianus; upper Euphrates drainage, Türkiye; 59 mm SL.

Oxynoemacheilus bergianus

Common name. Sportive loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Seyhan, Black Sea, and Caspian basins as well as Euphrates and Tigris drainages by: ○ caudal–peduncle depth 6–10 % SL, usually 2.0–3.0 times in its length, very rarely 1.8–3.5, without high adipose crest or ridge / ○ caudal deeply emarginate, middle caudal ray 70–84 % of length of longest ray in upper caudal lobe / ○ lateral line complete / ○ flank covered by scales / ○ upper lip without a median incision / ○ suborbital groove present in male / ○ one central or no black, grey, or brown blotch or short bar on caudal base, its colour identical to blotches on caudal peduncle / ○ no yellowish triangles at posteriormost portion of caudal peduncle / ○ pelvic very long, reaching or almost reaching to anus / ○ pectoral in male very long, reaching or almost reaching to pelvic origin / ○ flank mottled, marmorate, or with large, irregularly shaped, squarish, or vertically elongate blotches, usually as wide or narrower than interspaces / ○ lateral blotches on caudal peduncle usually interrupted in size and/or shape at or above lateral midline. Size up to 71 mm SL.

Distribution. Kızılırmak drainage in Anatolian Black Sea basin, upper Zamantı (Seyhan) drainage in Mediterranean basin, upper Euphrates and upper Tigris including Greater Zab, Sirvan south to Doiraj, and Meymeh. Also, in Caspian basin, from Sefid in Iran north-west to Aras and Lake Namak and Urmia basins.

Habitat. Moderate to fast-flowing waters with coarse gravel and small boulders.

Biology. No data.

Conservation status. LC.

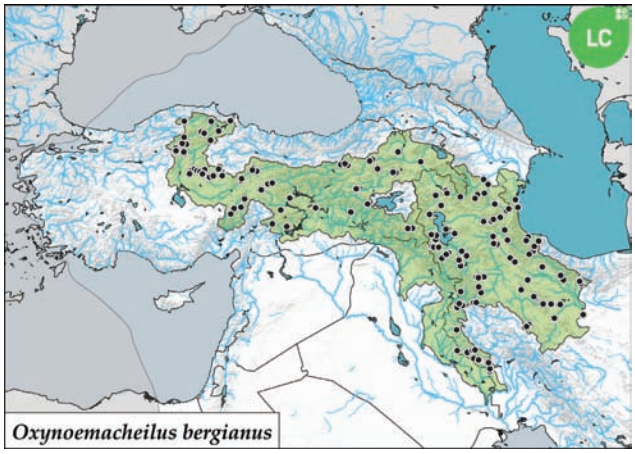
Oxynoemacheilus bergianus; Seyhan drainage, Türkiye; 62 mm SL.

Oxynoemacheilus bergianus; upper Tigris, Türkiye; 61 mm SL.

Remarks. This is the most widespread of all *Oxynoemacheilus* species. *Oxynoemacheilus erdali* from the upper Murat drainage in Türkiye, *O. lenkoranensis* from Azerbaijan, *O. longipinnis* and *O. parvinae* from Iran, and *O. samanticus* from Seyhan in Türkiye are synonyms. No consistent morphological or colour pattern differences between these populations have been found or confirmed, and they show very small molecular differences. Recently published morphological differences are fabricated to support populations with very small molecular differences as separate species. *Oxynoemacheilus longipinnis* has been described as a separate genus, *Ilamnemacheilus*, based on a malformed individual with 10½ branched dorsal rays, several multiplied vertebrae, and a shortened caudal peduncle.

There appear to be no records of *O. bergianus* from the Kura drainage, but further fieldwork is required to confirm its presence. If this species is found to be conspecific with *O. bergi* from the Kura, then *O. bergi* would take precedence over *O. bergianus*. No external characters are known to distinguish *O. bergianus* from *O. banarescui*, *O. fatsaensis,* and *O. simavicus*, all of which are diagnosed by molecular characters. Published morphological differences are based on small sample sizes or are intentionally falsified. As these four species are allopatric, the range should aid identification.

Further reading. Derjavin 1934 (description); Abdurakhmanov 1962 (description of *Nemacheilus lenkoranensis*); Balık & Bănărescu 1978 (description of *O. samanticus*); Coad & Nalbant 2005 (description of *Ilamnemacheilus longipinnis*); Erk'akan et al. 2007 (description of *O. erdali*); Freyhof 2016a (generic position of *I. longipinnis*); Sayyadzadeh et al. 2016 (description of *O. parvinae*); Sayyadzadeh et al. 2017 (re-description of *O. longipinnis*); Kaya et al. 2016 (distribution); Freyhof 2022 (revision of *O. bergianus* group).



Oxynoemacheilus bergianus; upper Euphrates drainage, Türkiye; 60 mm SL.

Oxynoemacheilus brandtii; Aras drainage, Türkiye; 65 mm SL. © M. Özuluğ.

Oxynoemacheilus brandtii; Aras drainage, Türkiye; 48 mm SL. © M. Özuluğ.

Oxynoemacheilus brandtii

Common name. Caucasian loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Caspian basin by: ● caudal forked, usually with 1–3, wide and very bold bands / ○ an upper and a lower bold, black or dark-brown blotch on caudal base, usually fused into a bar, its colour distinctly darker than bars on caudal peduncle / ○ flank with wide, irregularly shaped bars, much wider than interspaces / ○ bars on caudal peduncle not interrupted in size and shape at or above lateral midline, rarely with a mottled pattern / ○ suborbital groove present in male / ○ caudal–peduncle depth 2.5–3.2 times in its length. Size up to 70 mm SL.

Distribution. Kura and Aras drainages.

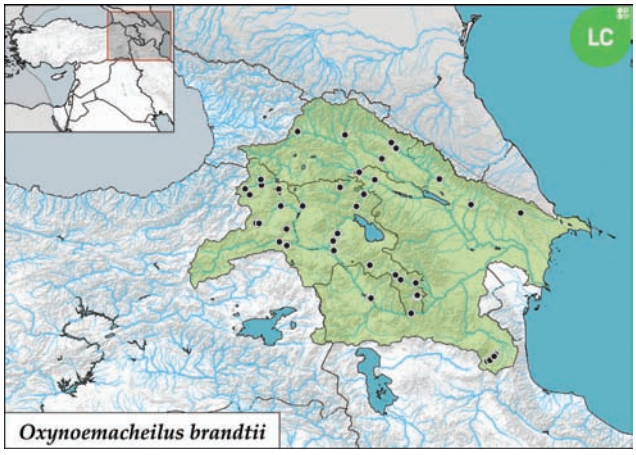
Habitat. Fast to very fast-flowing streams and rivers with gravel or rock substrate. Usually found in riffles and rapids in middle of river.

Biology. No data.

Conservation status. LC.

Remarks. Populations studied from the Aras drainage share their mtDNA sequence with *O. elsae* but are identified as *O. brandtii* by morphological characters. *Nemacheilus brandtii gibbusnazus* from the upper Alazani in Georgian Kura drainage has been treated as a synonym, but the identity of this population may require further investigation.

Further reading. Kessler 1877 (description); Berg 1949b (description); Kaya et al. 2020a (distribution); Freyhof et al. 2021b (diagnosis, distribution).



Oxynoemacheilus cemali; Çoruh drainage, Türkiye; ~65 mm SL. © M. Özuluğ.

Oxynoemacheilus cemali; Çoruh drainage, Türkiye; ~80 mm SL. © M. Özuluğ.

Oxynoemacheilus cemali

Common name. Çoruh loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Black Sea basin by: ○ suborbital groove present in male / ○ axillary pelvic lobe present / ○ a median incision in upper lip in most individuals / ○ lateral line complete / ○ caudal deeply emarginate / ○ dorsal adipose crest on caudal peduncle absent / ○ tip of pectoral almost reaching vertical through dorsal origin in male / ○ 7–15 dark-grey saddles on back, 3–7 in front of dorsal origin / ○ 9–15 irregularly shaped dark-grey bars on flank posterior to dorsal origin in most individuals / ○ colour pattern on flank not interrupted by whitish lateral line / ○ caudal–peduncle length 18–21 % SL / ○ caudal–peduncle depth 10–13 % SL. Size up to 95 mm SL.

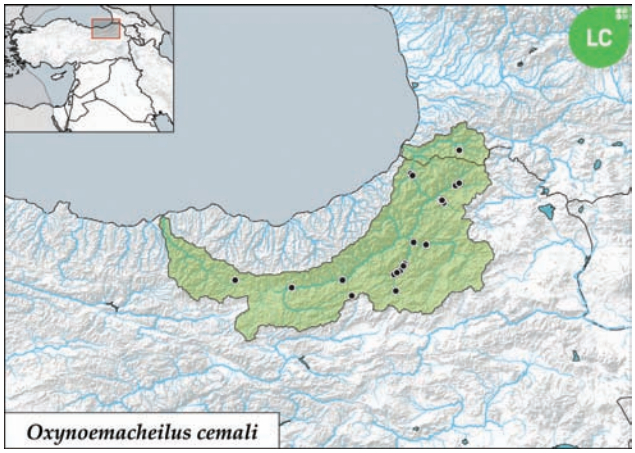
Distribution. Çoruh drainage in Türkiye and Georgia, as well as in upper part of Doğankent stream, a coastal river in Eastern Black Sea basin.

Habitat. Moderately fast-flowing waters in streams with gravel substrate.

Biology. No data.

Conservation status. LC.

Further reading. Turan et al. 2019a (description); Kuljanishvili et al. 2020 (distribution).



Oxynoemacheilus ceyhanensis; Ceyhan drainage, Türkiye; 50 mm SL.

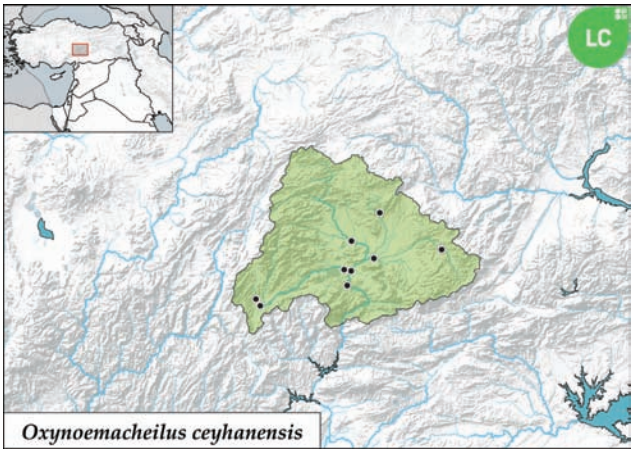
Oxynoemacheilus ceyhanensis

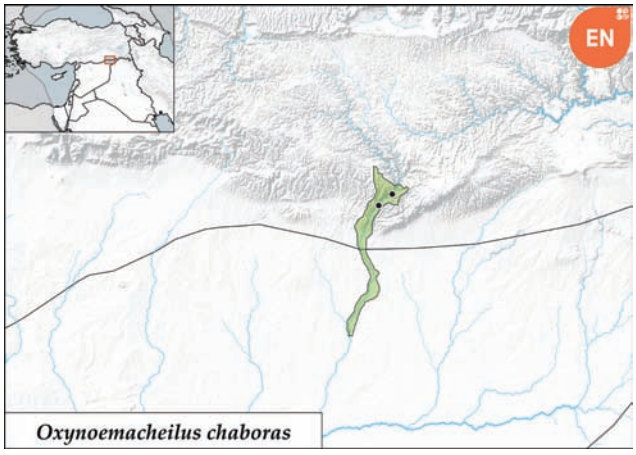
Common name. Elbistan loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Cilicia and northern Levant by: ○ caudal deeply emarginate, length of middle caudal ray 1.1–1.3 times in length of longest unbranched ray in upper caudal lobe / ○ lateral line complete, terminating at caudal base or on hypural complex / ○ suborbital groove absent in male / ○ flank and back behind dorsal base covered by many isolated and embedded scales / ○ no prominent dorsal crest on caudal peduncle / ○ caudal–peduncle depth 1.4–1.6 times in its length / ○ body depth at dorsal origin 18–20 % SL / ○ head length 25–27 % SL. Size up to 57 mm SL.

Distribution. Türkiye: Upper Ceyhan drainage.

Habitat. Moderately fast-flowing waters in streams with gravel substrate.





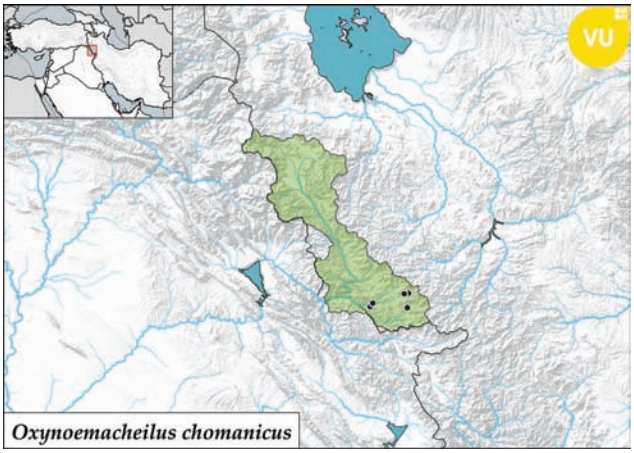
Oxynoemacheilus chaboras; stream Beyazsu, Türkiye; 51 mm SL.

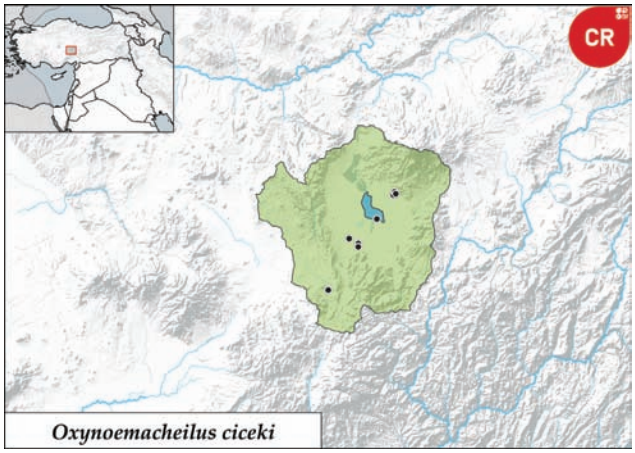
Biology. No data.
Conservation status. LC.
Remarks. The distribution of this species needs to be better understood as it has usually been confused with *O. cilicicus*, a species found in the lower Ceyhan drainage.
Further reading. Erk'akan et al. 2007 (description); Kaya et al. 2020b (distribution).

Oxynoemacheilus chaboras
Common name. Khabur two-spot loach.
Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Euphrates drainage by: ○ flank with a distinct series of midlateral blotches, fused to each other or fused into a stripe, below lateral series of blotches with isolated patches of blotches or a row of small dark-brown spots / ○ two distinct and prominent black blotches at posteriormost caudal base, usually overlaid by a dark-brown or black chevron-shaped bar / ○ suborbital groove present in male / ○ no or a very short median incision in upper lip / ○ lateral line complete, terminating behind vertical of anal base or at caudal base / ○ flank completely covered by scales / ○ caudal–peduncle depth 1.4–1.7 times in its length / ○ caudal deeply emarginate or forked. Size up to 60 mm SL.
Distribution. Türkiye and most likely adjacent Syria: Beyazsu north of Nusaybin in Khabur drainage, a tributary of Euphrates.
Habitat. Fast-flowing waters in streams with gravel substrate.
Biology. No data.
Conservation status. EN; restricted range and ongoing threats such as droughts.
Further reading. Kaya et al. 2024c (description).

Oxynoemacheilus chomanicus; Lesser Zab drainage, Iraq; 62 mm SL.

Oxynoemacheilus chomanicus
Common name. Choman loach.
Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Tigris drainage by: ○ dorsal profile straight / ○ caudal peduncle with very indistinct, fuzzy bars or vertically elongated blotches / ○ flank completely covered by scales / ○ caudal slightly emarginate / ○ lateral line complete, terminating behind vertical of anal base or at caudal base / ○ suborbital groove absent in adult male / ○ maxillary barbel reaching to anterior eye margin or middle of eye / ○ colour pattern on anterior part of flank not interrupted by unpigmented zone along lateral line / ○ one central pore in supratemporal





canal / ○ no median incision in upper lip / ○ interorbital distance 1.4–1.5 times in snout length / ○ caudal–peduncle depth 1.3–1.4 times in caudal–peduncle length / ○ 9+8 branched caudal rays / ○ posterior process of bony air-bladder capsule directed laterally. Size up to 77 mm SL.

Distribution. Iran and Iraq: Headwaters of Choman and Lesser Zab.

Habitat. Moderately fast-flowing waters in streams with gravel and rock substrate.

Biology. No data.

Conservation status. VU; appears to be declining within its small range.

Remarks. *Oxynoemacheilus chomanicus*, *O. zarzianus*, *O. zagrosensis,* and loaches identified as *O. frenatus* are superficially very similar and occur in Lesser Zab drainage. The distribution of these species needs to be better known, and identification may be difficult.

Further reading. Kamangar et al. 2014 (description); Sayyadzadeh & Esmaeili 2020 (discussion of Iranian and Anatolian populations of *O. frenatus*).

Oxynoemacheilus ciceki; Soysallı, Türkiye; 60 mm SL.

Oxynoemacheilus ciceki

Common name. Sultan loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Central Anatolia and rivers flowing to Bay of Antalya by: ● scales absent / ○ caudal–peduncle depth 1.1–2.2 times in caudal–peduncle length / ○ caudal slightly emarginate / ○ flank with roundish blotches in variable size, without bars / ○ a small median incision in upper lip / ○ pelvic axillary lobe very small or absent / ○ lateral line complete. Size up to 60 mm SL.

Distribution. Türkiye: Sultan marshes in Develi depression.

Habitat. Standing water of springs on gravel substrate.

Biology. No data.

Conservation status. CR; see comments under *Pseudophoxinus elizavetae*.

Further reading. Sungur et al. 2018a (description); Soyubelli 2018 (biology); Çiçek & Sungur 2020 (conservation).

Oxynoemacheilus cilicicus; lower Seyhan drainage, Türkiye; 50 mm SL.

Oxynoemacheilus cilicicus

Common name. Cilician loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Cilicia and northern Levant by: ○ caudal deeply emarginate, middle caudal ray 1.2–1.4 times in length of longest ray of upper caudal lobe / ○ lateral line with 13–23 pores terminating anterior to dorsal origin or slightly behind dorsal base / ○ infraorbital canal with 8–10 pores / ○ suborbital groove absent in male / ○ flank and back behind dorsal base covered by scales / ○ caudal–peduncle depth 1.0–1.4 times in its length / ○ body depth at dorsal origin 1.0–1.2 times in HL / ○ body depth at dorsal origin 20–24 % SL / ○ head length 22–25 % SL / ○ flank pattern mottled or with many, very narrow, irregularly shaped and set, pale-brown bars, usually flank-bars separated from middorsal saddles and not meeting contralateral. Size up to 58 mm SL.

Distribution. Türkiye: Lower Göksu east to Ceyhan drainage.

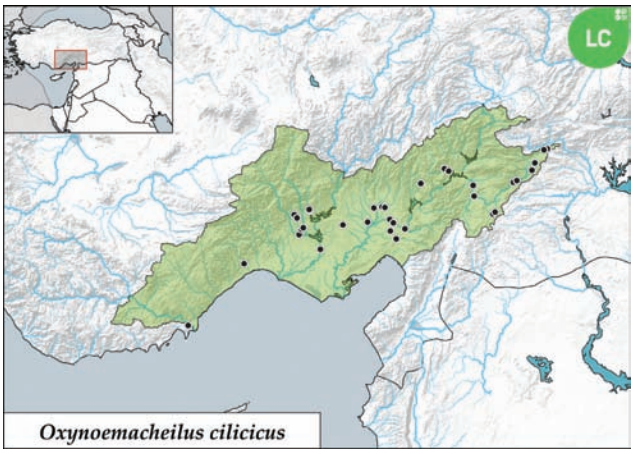
Habitat. Small streams to larger rivers. In slow or moderately fast-flowing stretches, usually along banks. Also along banks of reservoirs and in irrigation canals.

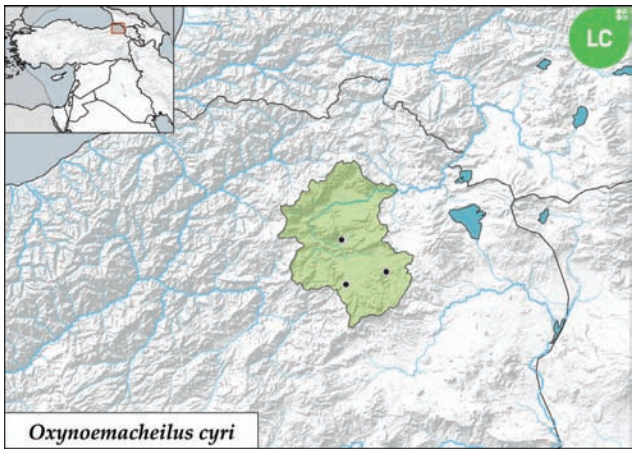
Biology. No data.

Conservation status. LC.

Remarks. Distribution of this species and superficially similar *O. ceyhanensis* from upper Ceyhan needs to be better explored.

Further reading. Kaya et al. 2020b (description).





Oxynoemacheilus cyri; Kura drainage, Türkiye; ~60 mm SL. © M. Özuluğ.

Oxynoemacheilus cyri

Common name. Kura banded loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Caspian basin by: ● suborbital groove absent in male / ● flank with 12–17 distinct, regularly shaped and set bars / ● caudal very slightly emarginate or truncate. Size up to 74 mm SL.

Distribution. Türkiye: Ardahan plateau in upper Kura drainage.

Habitat. Slow or fast-flowing streams with gravel or rock bottoms and clear water.

Biology. No data.

Conservation status. LC; has a small range in upper Kura drainage; its habitat is intact, the species is common, and no threats are known.

Remarks. It is a phylogenetically isolated species, restricted to a small area at high altitudes. It appears to be endemic to Türkiye and has never been found in downstream Armenia.

Further reading. Berg 1910 (description); Kaya et al. 2020a (distribution).

Oxynoemacheilus eliasi; Şaşal, Türkiye; ~55 mm SL.

Oxynoemacheilus eliasi

Common name. Küçük Menderes loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Aegean basin by: ○ inner axial stripe absent / ○ tip of pectoral usually not reaching to or reaching pelvic origin in male / ○ belly with small embedded scales / ○ body depth decreasing between dorsal and caudal base / ○ scales present from midline between pectoral- and pelvic bases to pelvic base / ○ caudal–peduncle depth 1.3–1.5 times in its length / ○ caudal emarginate, middle caudal ray 71–84 % of length of longest ray in upper caudal lobe / ○ two dark-brown blotches on caudal base, rarely connected to each other / ○ flank with bars and/or blotches. Size up to 65 mm SL.

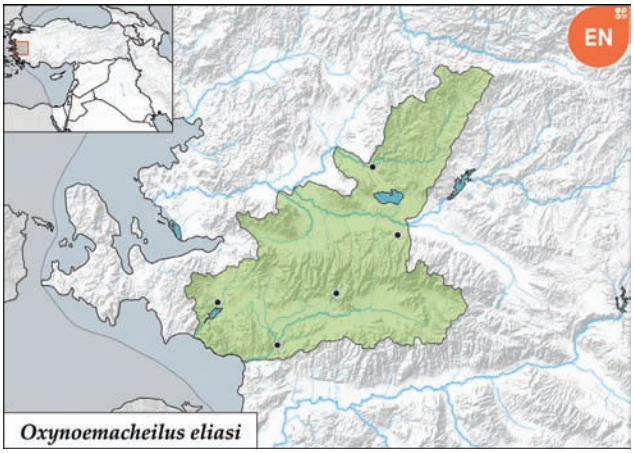
Distribution. Türkiye: Küçük Menderes, Tahtalı and Gediz drainages.

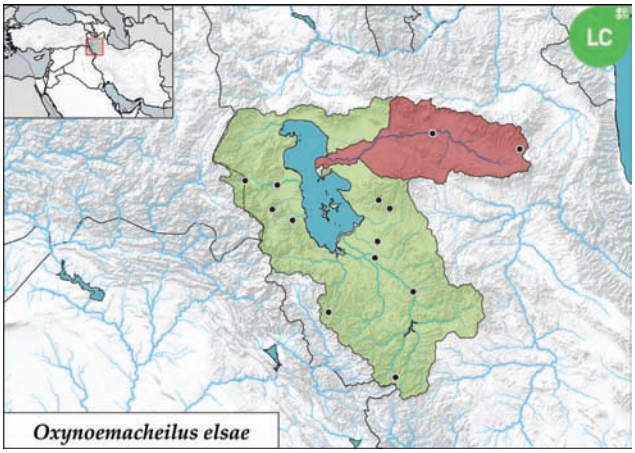
Habitat. Standing and flowing waters of springs and streams on gravel substrate.

Biology. No data.

Conservation status. EN; appears to be declining within its small range.

Further reading. Yoğurtçuoğlu et al. 2022 (description).





Oxynoemacheilus elsae; Lake Urmia basin, Iran; 55 mm SL.

Oxynoemacheilus elsae

Common name. Urmia loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Caspian basin by: ○ caudal emarginate, usually with 3–6, narrow, pale-brown band / ○ an upper and a lower bold, black or dark-brown blotch on caudal base, often fused into a bar, it's colour distinctly darker than bars on caudal peduncle / ○ flank with irregularly shaped and spaced, dark-brown bars, often split in middle, more narrow than interspaces, or flank is almost plain brown / ○ bars on caudal peduncle not interrupted in size and shape at or above lateral midline / ○ suborbital groove present in male / ○ caudal–peduncle depth 2.3–2.9 times in its length. Size up to 68 mm SL.

Distribution. Iran and Türkiye: Zarrineh, Simineh, Mahabad, Barandoz, Nazlo, and Soufi drainages in Lake Urmia basin.

Habitat. Rivers and streams with fast-flowing water and gravel or boulder substrate.

Biology. No data.

Conservation status. LC.

Remarks. *Oxynoemacheilus brandtii* from Aras shares mitochondrial DNA with this species, but these fish can be identified as *O. brandtii* and not as *O. elsae.*

Further reading. Eagderi et al. 2018b (description); Kaya 2020b (distribution in Türkiye); Freyhof et al. 2021b (diagnosis).

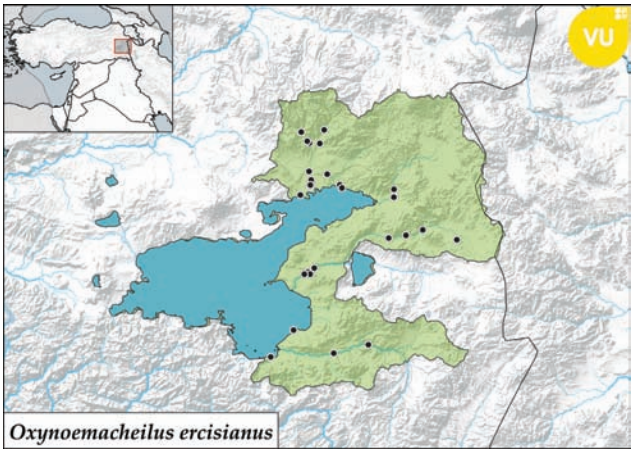
Oxynoemacheilus ercisianus; Zilan, Lake Van basin, Türkiye; ~60 mm SL. © M. Özuluğ.

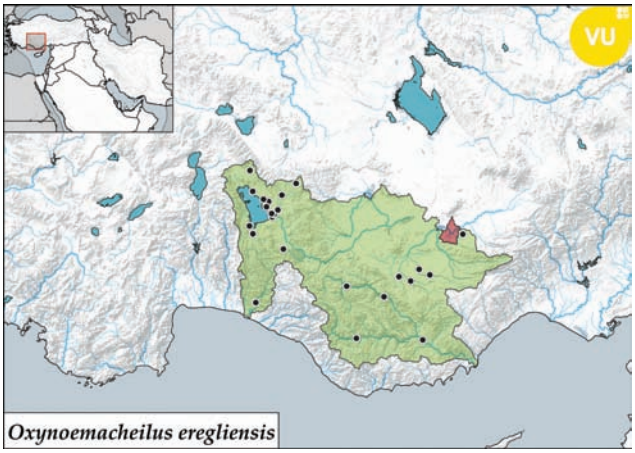
Oxynoemacheilus ercisianus

Common name. Van loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in adjacent Euphrates drainage by: ○ scales absent / ○ lateral line incomplete not reaching or reaching below dorsal base / ○ suborbital groove absent in male / ○ caudal slightly emarginate / ○ supratemporal canal without central pore / ○ pelvic axillary lobe absent / ○ dorsal adipose crest on caudal peduncle high, not reaching to vertical through last anal ray base in individuals larger than 50 mm SL / ○ caudal–peduncle length 1.0–1.3 times its depth / ○ body width at dorsal origin 13–17 % SL / ○ flank with a marmorated pattern or with large, irregularly shaped and narrowly spaced dark-brown bars or blotches, usually more

prominent on flank behind dorsal base / ○ caudal base with mottled colour pattern, without bold, black bar or bold, black spots upper and lower caudal base. Size up to 82 mm SL.
Distribution. Türkiye: Lake Van and its tributaries Zilan, Deli, Bendimahi and Karasu.
Habitat. Moderately flowing streams and rivers with gravel or rock substrate. Also, in microbialites of Lake Van itself, at a maximum depth of 13 m and about 500 m offshore.
Biology. No data.
Conservation status. VU; appears to be declining within its small range.
Remarks. *Nemacheilus pulsiz* is a synonym.
Further reading. Erk'akan & Kuru 1986 (description); Krupp 1992a (description of *Nemacheilus pulsiz*); Freyhof et al. 2019b (diagnosis, distribution); Akkuş et al. 2021 (habitat in Lake Van).





Oxynoemacheilus eregliensis; Lake Beyşehir basin, Türkiye; ~70 mm SL.

Oxynoemacheilus eregliensis
Common name. Ereğli loach.
Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Central Anatolia and rivers flowing to Bay of Antalya by: ○ caudal slightly emarginate, shortest middle caudal ray 83–91 % of longest ray of upper caudal lobe / ○ belly without scales / ○ no prominent dorsal crest on caudal peduncle / ○ dorsal adipose crest reaching behind vertical of posterior anal base, absent in some individuals / ○ flank usually with irregularly set and shaped, distinct, large blotches forming a marbled pattern / ○ few isolated scales on flank in front of dorsal origin / ○ head length 24–26 % SL / ○ caudal–peduncle depth 1.5–1.9 times in its length. Size up to 90 mm SL.
Distribution. Türkiye: Lake Beyşehir and Suğla basins, Yeşildere (Karaman) in Central Anatolia, also in Göksu and Manavgat drainage in southern Anatolia.
Habitat. Small streams and springs with gravelly, sandy, or muddy bottoms and slow-flowing water.
Biology. No data.
Conservation status. VU; appears to be declining within its small range. Extirpated in Ereğli, elsewhere often in very small water bodies.
Remarks. *Oxynoemacheilus atili* is a synonym.
Further reading. Bănărescu et al. 1978 (description); Yoğurtçuoğlu et al. 2022 (distribution); Innal 2019 (size); Kaya et al. 2025a (record in Göksu).

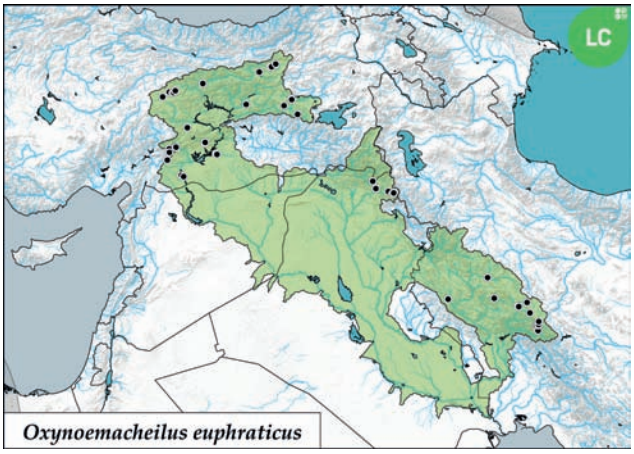
Oxynoemacheilus euphraticus; Göksu, Euphrates drainage, Türkiye; 60 mm SL.

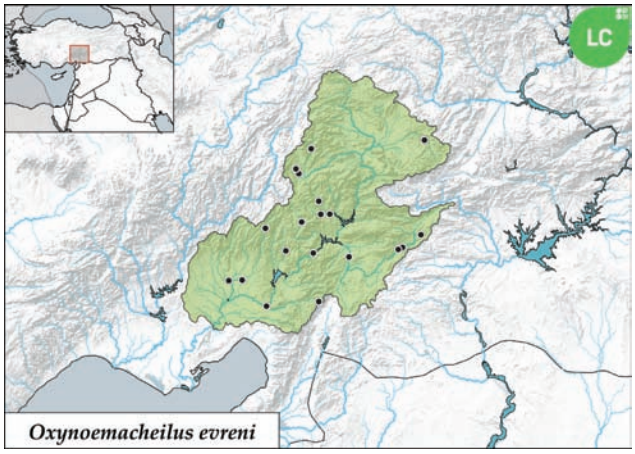
Oxynoemacheilus euphraticus; Great Zab drainage, Iraq; 55 mm SL.

Oxynoemacheilus euphraticus

Common name. Fırat loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Euphrates and Tigris drainages by: ○ two distinct and prominent black blotches at posteriormost caudal base, often overlaid by a dark-brown or black chevron-shaped bar / ○ lateral line complete / ○ juveniles larger than 20 but smaller than 45 mm SL with poorly developed mottling between midlateral blotches on flank / ○ last bars on caudal peduncle as wide or wider than interspaces / ○ upper lip with well-developed median incision / ○ flank covered by scales / ○ caudal forked / ○ caudal peduncle without high adipose crest or ridge / ○ suborbital groove present in male / ○ caudal peduncle, and in some individuals also flank, with bars / ○ caudal–peduncle depth 2.0–2.8 times in caudal–peduncle length. Size up to 70 mm SL.





Distribution. Euphrates, Tigris, and Karun drainages.
Habitat. Streams and rivers with gravel substrate and fast to very fast-flowing water.
Biology. No data.
Conservation status. LC.
Remarks. The distribution of this species is still incompletely known and it is not recorded from Lesser Zab and Meymeh. It is superficially very similar to *O. kurdistanicus* and *O. marunensis*, and these species appear to have formed hybrid populations in some parts of the Tigris drainage. *Oxynoemacheilus freyhofi* from the Karun drainage is a synonym.
Further reading. Bănărescu & Nalbant 1964 (description); Jouladeh-Roudbar et al. 2016e (description as *O. freyhofi*); Freyhof & Özuluğ 2017 (synonyms).

Oxynoemacheilus evreni; Ceyhan drainage, Türkiye; 60 mm SL.

Oxynoemacheilus evreni
Common name. Ceyhan sportive loach.
Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Cilicia and northern Levant by: ○ caudal emarginate, middle caudal ray 80–91 % of length of longest ray in upper caudal lobe / ○ caudal with dark-brown bands of elongated blotches / ○ a yellowish triangle at upper and lower posteriormost portions of caudal peduncle / ○ one central, bold-brown blotch or no blotch on caudal base, often an irregularly shaped black bar at caudal base / ○ lateral line complete / ○ flank and back behind dorsal base covered by scales / ○ suborbital groove present in male / ○ no prominent dorsal crest on caudal peduncle / ○ flank posterior to dorsal base and caudal peduncle with a series of bold, usually irregularly shaped bars reaching from dorsal midline almost to ventral midline / ○ caudal–peduncle depth 1.8–2.4 times in its length. Size up to 68 mm SL.
Distribution. Türkiye: Ceyhan drainage.
Habitat. Small streams to larger rivers. In fast-flowing stretches usually in riffles with gravel substrate.
Biology. No data.
Conservation status. LC.
Remarks. Seyhan drainage records are subject to confirmation.
Further reading. Erk'akan et al. 2007 (description); Erk'akan et al. 2014 (size); Freyhof et al. 2021a (distribution).

Oxynoemacheilus fatmae; Güzelhisar drainage, Türkiye; 70 mm SL.

Oxynoemacheilus fatmae

Common name. Güzelhisar loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Aegean basin by: ○ belly with few, small, embedded scales / ○ caudal emarginate, middle caudal ray 71–91 % of length of longest upper caudal ray / ○ body depth almost uniform between dorsal and caudal base (ratio of body depth at posterior of dorsal base to body depth at caudal base is equal or almost equal to 1) / ○ body depth at dorsal origin 15–17 % SL / ○ caudal peduncle 10–12 % SL / ○ length of middle caudal ray 16–19 % SL / ○ no dorsal and ventral adipose crests on caudal peduncle behind vertical of posterior anal base. Size up to 70 mm SL.

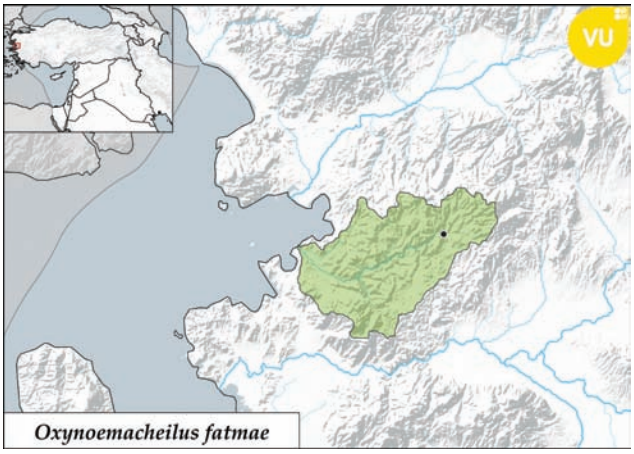
Distribution. Türkiye: Güzelhisar drainage in northeastern Aegean basin.

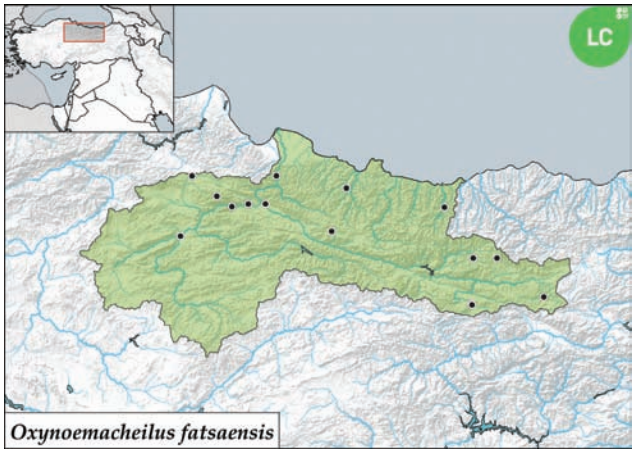
Habitat. Moderate to fast-flowing streams with gravel substrate.

Biology. No data.

Conservation status. VU.

Further reading. Turan et al. 2024b (description).





Oxynoemacheilus fatsaensis; Yeşilırmak drainage, Türkiye; 50 mm SL. © M. Özuluğ.

Oxynoemacheilus fatsaensis

Common name. Yeşilırmak sportive loach.

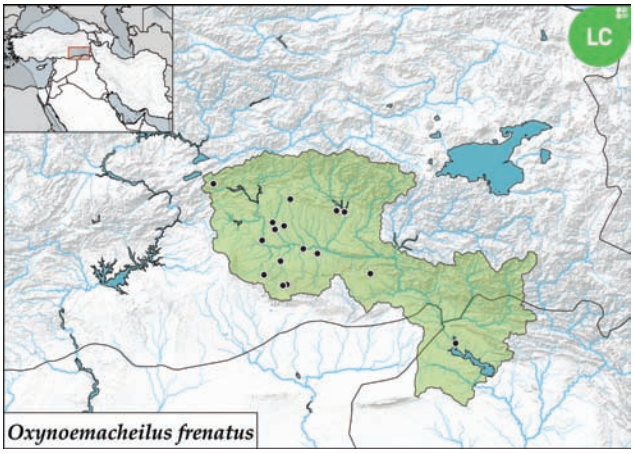
Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Black Sea basin by: ○ caudal–peduncle depth 7–9 % SL, usually 2.0–2.6 times in its length, without high adipose crest or ridge / ○ caudal emarginate, middle caudal ray 80–90 % of length of longest ray in upper caudal lobe / ○ lateral line complete / ○ flank covered by scales / ○ suborbital groove present in male / ○ one central or no black, grey or brown blotch or short bar on caudal base, its colour identical to blotches on caudal peduncle / ○ no yellowish triangles at posteriormost portion of caudal peduncle / ○ pelvic very long, reaching or almost reaching to anus / ○ pectoral in male very long, reaching or almost reaching to pelvic origin / ○ flank mottled or with large irregularly shaped, squarish or vertically elongate blotches, usually as wide or narrower than interspaces / ○ lateral blotches on caudal peduncle usually interrupted in size and/or shape at or above lateral midline. Size up to 75 mm SL.

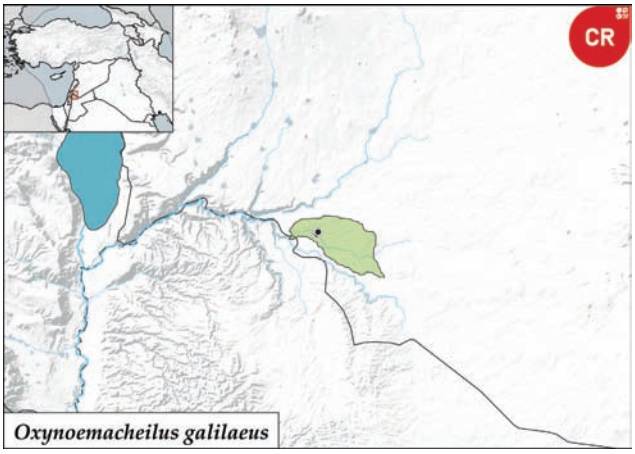
Distribution. Türkiye: Yeşilırmak drainage and adjacent coastal stream Elekçi.

Habitat. Fast-flowing water in streams and rivers with gravel substrate.
Biology. No data.
Conservation status. LC.
Remarks. No external characters are known to distinguish this species from *O. bergianus*, *O. banarescui,* and *O. simavicus*, and all species are diagnosed only by molecular characters. Published differences are based on small sample sizes or are spurious. As these four species are allopatric, the distribution areas should help in identification.
Further reading. Saygun et al. 2021 (description); Freyhof et al. 2022 (revision of *O. bergianus* group).

Oxynoemacheilus frenatus; Tigris at Diyarbakır, Türkiye; ~70 mm SL.

Oxynoemacheilus frenatus
Common name. Mesopotamian loach.
Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Tigris drainage by: ○ lateral line incomplete, terminating in front of or above anal base / ○ caudal slightly emarginate / ○ flank mottled or marbled without bars / ○ colour pattern on anterior part of flank, often interrupted by an unpigmented zone along lateral line / ○ a shallow dorsal crest on caudal peduncle / ○ one central pore in supratemporal canal / ○ suborbital groove absent in male / ○ scales present on back and flank in front of anus. Size up to 75 mm SL.
Distribution. Mosul and upper Tigris drainage down to Batman drainage.
Habitat. Moderately fast-flowing to standing waters of springs, streams, and rivers with muddy or gravelly bottoms.
Biology. No data.
Conservation status. LC.
Remarks. Recently not recorded from rivers downstream of Batman. Superficially, very similar but genetically very different loaches occur in Iranian Lesser Zab, and these have also been identified as *O. frenatus*. It is impossible to say whether the populations from the upper Tigris are the same as those from Mosul. Only when new material from Mosul becomes available will the identity of Anatolian and Iranian populations be finally resolved.
Further reading. Heckel 1843 (description); Freyhof et al. 2017a (discussion of Anatolian and Iranian populations); Sayyadzadeh & Esmaeili 2020 (discussion of Iranian and Anatolian populations).





Oxynoemacheilus galilaeus; Lake Muzayrib, Syria; ~55 mm SL.

Oxynoemacheilus galilaeus

Common name. Galilean loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in southern Levant by: ● 9–11½ branched dorsal rays / ● body scaleless / ○ caudal slightly emarginate or truncate / ○ no dorsal crest on caudal peduncle / ○ suborbital groove absent in male. Size up to 64 mm SL.

Distribution. Syria: Lake Muzayrib basin.

Habitat. Lacustrine, along shores.

Biology. No data.

Conservation status. CR; Lake Muzayrib has been reported to be drying up, and the species may be extinct. No fieldwork has been carried out since 2008 to investigate the situation.

Remarks. Described from Lake Tiberias but later speculated to be from Lake Hula or Lake Muzayrib. The single type specimen corresponds well to the Lake Muzayrib population, while all fish we see from Tiberias and Hula do not. Fish from Hula and Tiberias are similar to the type of *O. galilaeus* in being scaleless and in number of anal and dorsal rays (all individuals from Hula are reported to have 6½ branched anal rays). These fish also have a very different colour pattern from *O. galilaeus* (large spots or bars on the flank vs. fine mottled pattern in *O. galilaeus*) and body shape (deep body vs. slender in *O. galilaeus*), and we identify them as *O. leontinae*. *Oxynoemacheilus galilaeus* is diagnosed by 6½ branched anal rays; this character is variable (Muzayrib), and few individuals have 6½ (including type), most have 5½ branched anal rays. It has been placed in a separate genus: *Nun*, based on fish from the Hula basin, but as *Nun* was described based on *O. leontinae*, this is its type species.

Further reading. Günther 1865 (description); Bănărescu et al. 1982 (description of *Nun* based on Hula population); Krupp & Schneider 1989 (distribution); Bănărescu & Nalbant 1995 (Figure of *Nun*); Prokofiev 2009 (osteology of Hula population); Freyhof et al. 2011 (generic placement based on Muzayrib population); Prokofiev & Golubtsov 2013 (revalidation of *Nun* based on Hula population).

Lake Muzayrib in Syria is the only habitat known for *Oxynoemacheilus galilaeus*. The lake has been reported to have dried out, and the species might now be extinct.

Oxynoemacheilus germencicus; Büyük Menderes drainage, Türkiye; ~60 mm SL.

Oxynoemacheilus germencicus

Common name. Carian loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Aegean basin by: ○ caudal emarginate / ○ flank with scales / ○ caudal–peduncle depth 1.5–2.2 times in its length / ○ no prominent dorsal crest on caudal peduncle / ○ suborbital groove present in male / ○ scales on belly restricted between pelvic bases, rarely exceeding anteriorly / ○ inner axial stripe absent / ○ tip of anal reaching to or slightly beyond ventral adipose crest, if present / ○ belly with few, small, embedded scales / ○ tip of pectoral usually not reaching to or reaching pelvic origin in male / ○ body depth decreasing between dorsal and caudal base / ○ flank with bars and/or blotches, rarely plain or mottled. Size up to 83 mm SL.

Distribution. Türkiye: Büyük Menderes and Gediz drainages.

Habitat. Moderately fast-flowing to stagnant waters of springs, streams, and rivers with muddy or gravelly bottoms.

Biology. No data.

Conservation status. LC.

Remarks. *Oxynoemacheilus cinicus* and *O. mesudae*, both from Büyük Menderes, are synonyms.

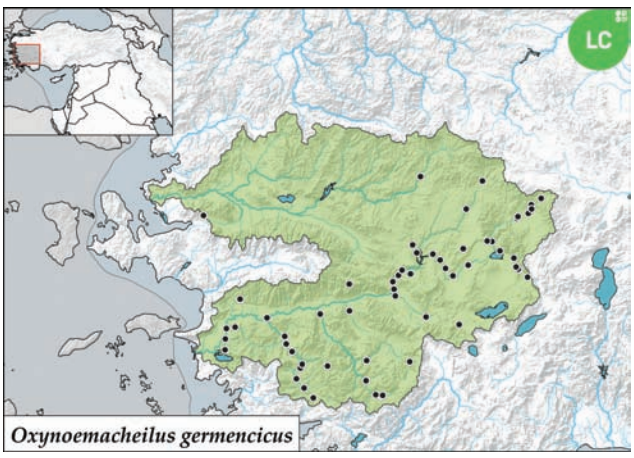
Further reading. Erk'akan et al. 2007 (description of *O. germencicus* and *O. cinicus*); Erk'akan 2012 (description of *O. mesudae*); Yoğurtçuoğlu et al. 2022 (revision, distribution).

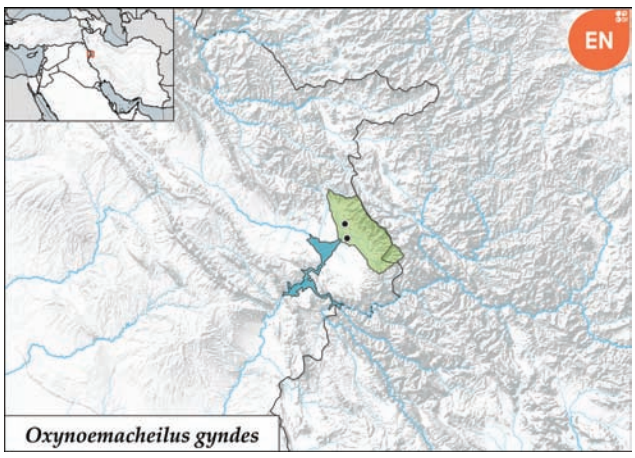
Oxynoemacheilus germencicus; Büyük Menderes drainage, Türkiye, 46 mm SL.

Oxynoemacheilus germencicus; Büyük Menderes drainage, Türkiye, 55 mm SL.

Oxynoemacheilus germencicus; Işıklı spring, Türkiye, 79 mm SL.

The Zalm in Iraqi Kurdistan is a tributary to the Sirvan. It is the habitat of *Oxynoemacheilus gyndes, O. hanae*, *O. marunensis, Paracobitis molavii,* and *Turcinoemacheilus inexpectatus*.





Oxynoemacheilus gyndes; Sirvan drainage, Iraq; female, 54 mm SL.

Oxynoemacheilus gyndes; Sirvan drainage, Iraq; male, 52 mm SL.

Oxynoemacheilus gyndes

Common name. Zalm loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Tigris drainage by: ● lateral line incomplete, terminating slightly behind pectoral base / ● body naked except very dorsal part of caudal peduncle / ● a midlateral series of small, horizontally elongated, dark-brown blotches often fused into an irregularly shaped midlateral stripe, one additional stripe above and below midlateral stripe in many individuals / ○ 3–4 lateral pores and no central pore in supratemporal canal / ○ caudal slightly emarginate / ○ suborbital groove absent in male / ○ upper lip without median incision. Size up to 57 mm SL.

Distribution. Iraq: Zalm, a headwater of Sirvan in Tigris drainage.

Habitat. Moderately fast-flowing and standing waters of streams, backwaters, and springs with muddy bottoms.

Biology. No data.

Conservation status. EN; appears to be declining within its very small range.

Remarks. *Oxynoemacheilus gyndes* is a very distinctive species, not closely related to other loaches in its genus.

Further reading. Freyhof & Abdullah 2017 (description).

Oxynoemacheilus hamwii; lower Orontes drainage, Türkiye; 60 mm SL.

Oxynoemacheilus hamwii

Common name. Orontes sportive loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Cilicia and northern Levant by: ● yellowish triangle at upper and lower posteriormost portions of caudal peduncle / ○ one central, bold-brown blotch or no blotch on caudal base, often an irregularly shaped black bar at caudal base / ○ caudal deeply emarginate with dark-brown bands of elongated blotches / ○ middle caudal ray 64–74 % of length of longest ray in upper caudal lobe / ○ lateral line complete or almost complete terminating behind vertical of anus / ○ flank covered by scales, sparsely set on anterior, densely set on posterior flank / ○ no prominent dorsal crest on caudal peduncle / ○ suborbital groove present in male / ○ flank in juveniles with a midlateral series of horizontally elongate blotches, adults with a brown marbled pattern / ○ caudal–peduncle depth 1.4–1.9 times in its length. Size up to 64 mm SL.

Distribution. Orontes drainage in Türkiye and northern Syria (Afrin).

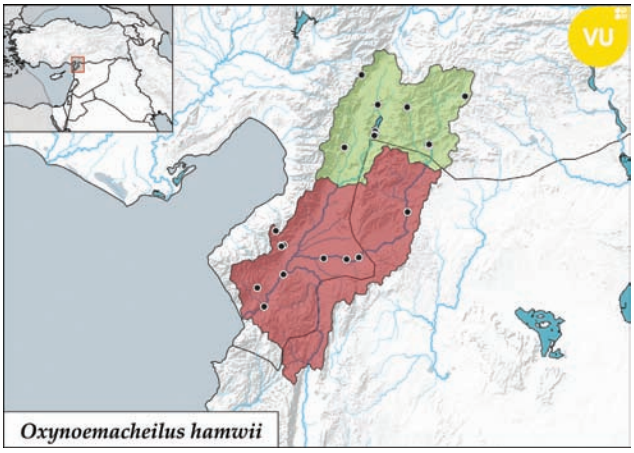
Habitat. Moderately fast-flowing water in streams and rivers with gravel substrate.

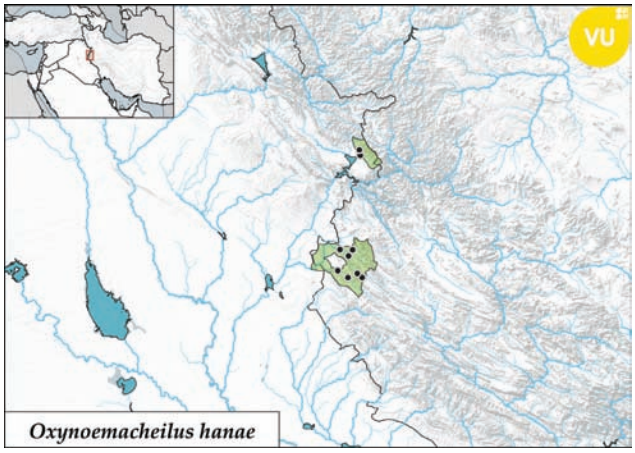
Biology. No data.

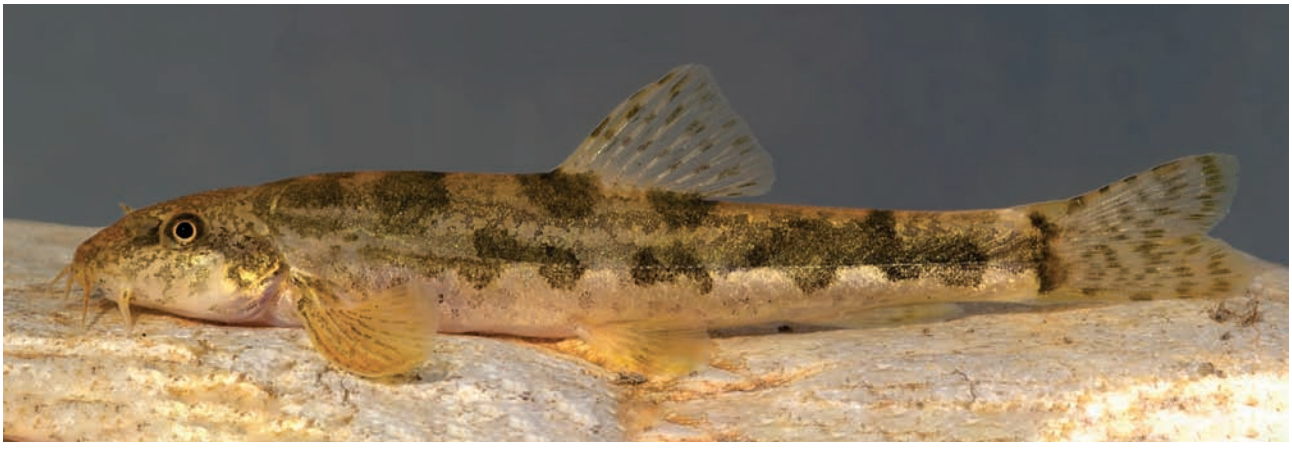
Conservation status. VU; appears to be extirpated in lower Orontes and is declining within its small range.

Remarks. Records of this species from the upper Orontes refer to *O. shehabi,* and records from the Euphrates and Tigris are misidentifications of other species, most likely *O. argyrogramma*, *O. chaboras,* and *O. euphraticus*.

Further reading. Krupp & Schneider 1991 (description).







Oxynoemacheilus hanae; Sirvan drainage, Iraq; ~50 mm SL.

Oxynoemacheilus hanae

Common name. Sirvan two-spot loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Tigris drainage by: ○ flank with a distinct series of midlateral blotches, fused to each other or fused into a stripe / ○ isolated patches of blotches or a row of small dark-brown spots below lateral series of blotches / ○ two distinct and prominent black blotches at posteriormost caudal base, usually overlaid by a dark-brown or black chevron-shaped bar / ○ suborbital groove present in male / ○ no or a very

short median incision in upper lip / ○ lateral line complete, terminating behind vertical of anal base or at caudal base / ○ flank completely covered by scales / ○ caudal deeply emarginate or forked. Size up to 61 mm SL.

Distribution. Iran and Iraq: Headwaters of Sirvan and Alvand drainages.

Habitat. Moderately fast-flowing streams and springs with gravel substrate.

Biology. No data.

Conservation status. VU; appears to be declining within its small range.

Remarks. The Iranian population is superficially very similar, but their COI sequence data place them close to *O. marunensis*. They may represent *O. hanae*, introgressed by *O. marunensis*. In the upper Sirvan, *O. hanae* and *O. marunensis* occur in syntopy.

Further reading. Freyhof & Abdullah 2017 (description); Jouladeh-Roudbar et al. 2020 (record from Iran).

Oxynoemacheilus hazarensis; Lake Hazar, Türkiye; ~65 mm SL.

Oxynoemacheilus hazarensis

Common name. Hazar loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Tigris drainage by: ● flank naked, only caudal peduncle behind anus with scales / ○ suborbital groove present in male / ○ lateral line incomplete / ○ caudal slightly emarginate / ○ a deep incision in middle of upper lip / ○ mottled or marmorated colour pattern on flank, not interrupted by an unpigmented zone along lateral line. Size up to 67 mm SL.

Distribution. Türkiye: Lake Hazar basin.

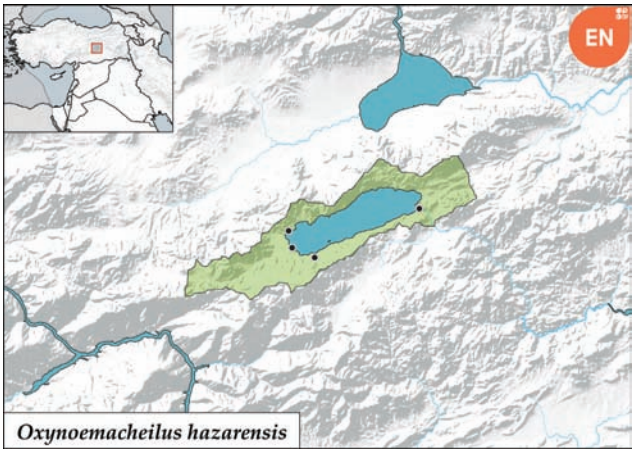
Habitat. Lakeshores and moderately fast-flowing, stagnant waters of streams, backwaters, and springs with muddy bottoms.

Biology. No data.

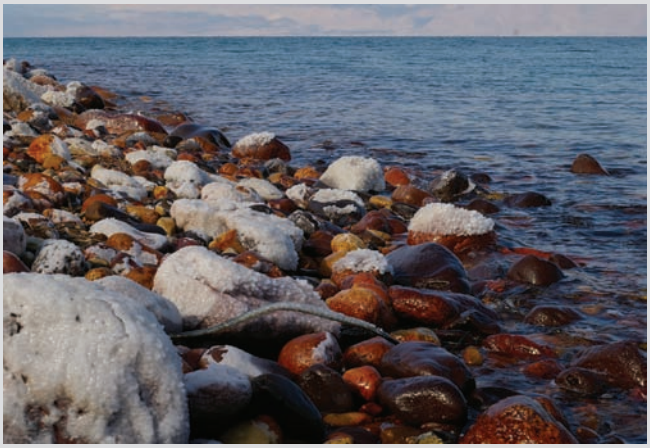
Conservation status. EN; appears to be declining within its very small range.

Remarks. This species is not closely related to other species in the Tigris but belongs to a group of loaches that are mostly found in the Euphrates.

Further reading. Freyhof & Özuluğ 2017 (description); Freyhof et al. 2019b (diagnosis).



The Dead Sea basin and the Jordan. The present-day Jordan-Dead Sea basin results from tectonic activities that commenced during the Miocene/Pliocene transition. The Yizre'el Valley was formed during this period, and the Jordan Valley was lowered. During the Pliocene, the Jordan flowed from south to north and drained along with the Litani via Nahal Qishon toward the Mediterranean. During the Lower Pleistocene, the lowering of the Jordan-Wadi Araba graben continued, forming two endorheic basins: one in the Hula and the other in the Dead Sea region. At that time, the Jordan was no longer connected to the Litani but rather flowed southeastward into the Jordan Valley.



The Dead Sea with the typical salt crusts on stones along its shore (Jordan).

Between 1.50 and 1.25 Mya, the Hula basin became part of the Dead Sea drainage system by breaching the Korazim block, which had previously separated them. During the Pleistocene glacials, a series of successive lakes occupied the Jordan-Dead Sea graben. A large shallow freshwater lake (Lake Samra), covering an area from 50 km south of the Dead Sea to Lake Tiberias, existed during the Riss glacial period (425 ka–130 ka BP). At the same time, a lake entirely flooded the Hula basin, and a river connected the two lakes (Lake Samra and Hula Emeq). Between approximately 70,000 and 18,000 years ago, Lake Samra transformed into the saline Lake Lisan, which subsequently shrank and retreated to form the present-day Dead Sea. This lake was previously less saline than the present Dead Sea, as evidenced by fossil remnants of diatoms, fish, and other organisms. The most recent tectonic activity, approximately 18,000 years ago, resulted in a 300–400 m lowering of the valley to its present depth of −794 m at the bottom. This pronounced subsidence led to the deepening of Hula Emeq and the northern Dead Sea, giving rise to Lake Tiberias (14–18 ka BP). Lake Tiberias, with a surface area of approximately 170 km^2 and a depth of 43 m, is the largest natural freshwater lake in West Asia and the lowest freshwater lake on Earth, situated 209 m below sea level. The Dead Sea is the deepest hypersaline lake in the world, with a depth of almost 400 m below sea level. It is approximately 75 km long and 10–15 km wide. The lake is divided into two basins: a deep northern one (approximately 380 m deep) and a shallow southern one (approximately 2–3 m deep), separated by the Lisan Peninsula. Small springs and rivers drain into this terminal lake, but no surface watercourses ever reach it in the present era, except for Wadi al-Hasa and Wadi Moujib (both in Jordan) after heavy rain. **Further reading.** Alwan 2010 (Jordan).

Oxynoemacheilus insignis; Barada drainage, Syria; ~60 mm SL.

Oxynoemacheilus insignis

Common name. Palestine loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in southern Levant by: ○ caudal emarginate / ○ lateral line complete, terminating at or almost at caudal base / ○ back and flank covered by scales / ○ no prominent dorsal crest on caudal peduncle / ○ suborbital groove present in male. Size up to 100 mm SL.

Distribution. Jordan drainage, Dead Sea, and Damascus basins. In Damascus basin, now limited to Barada and Nahr al Awaj springs west of Damascus.

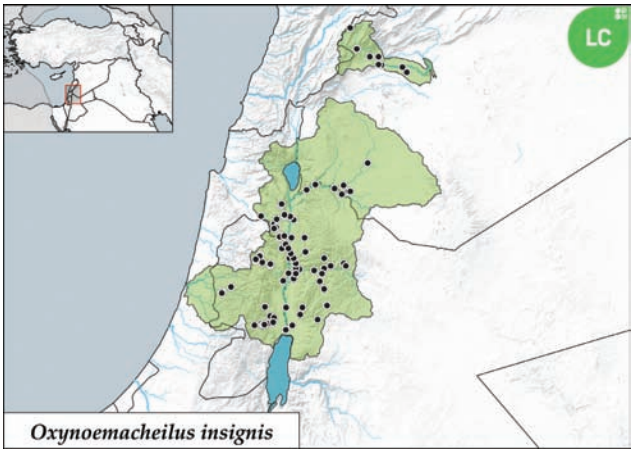
Habitat. Moderately fast-flowing to stagnant waters of springs, streams, and rivers with muddy or gravelly bottoms.

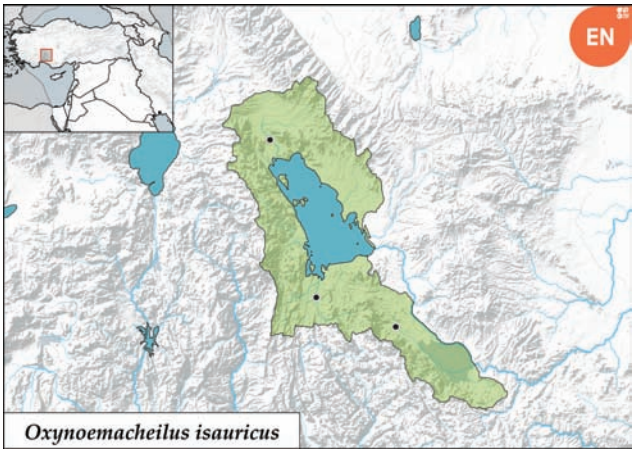
Biology. No data.

Conservation status. LC; likely extirpated from Barada, but still common in headwaters of Nahr al Aouaj and Jordan drainage.

Remarks. Diversity of loaches in Jordan drainage still needs to be better understood. *Oxynoemacheilus insignis* is widespread in all the eastern, left tributaries of the Jordan in Syria and Jordan, from the Yarmouk south to the Zarqa, Moujib, and tributaries of southern Dead Sea. *Noemacheilus insignis tortonesei* from the Zarqa and *N. angorae jordanicus* from Wadi Kufrinja, both in Jordan, are synonyms. *Oxynoemacheilus doriae*, *O. israeliticus* (both from the Bet-She'an Valley, Israel), and *O. pantheroides* (from the Golan Heights, Israel) are usually treated as synonyms of *O. insignis*. Molecular data strongly suggest that *O. pantheroides* is a valid species, possibly endemic to tributaries of Lake Tiberias. *Oxynoemacheilus doriae* and *O. israeliticus* should be re-examined based on fresh material from type localities, as they may also represent valid species.

Further reading. Bănărescu et al. 1982 (description of *O. dori* and *O. israeliticus*); Krupp & Schneider 1989 (synonym of *O. insignis*).





Oxynoemacheilus isauricus; Lake Beyşehir basin, Türkiye; ~50 mm SL.

Oxynoemacheilus isauricus

Common name. Beyşehir sportive loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Central Anatolia and rivers flowing to Bay of Antalya by: ● caudal–peduncle depth 2.2–2.6 times in its length / ○ caudal deeply emarginate, shortest middle caudal ray 71–85 % of longest ray of upper caudal lobe / ○ preanal length 68–74 % SL / ○ head length 21–24 % SL / ○ body depth strongly decreasing between dorsal and caudal bases / ○ flank with scales / ○ flank with a series of irregularly shaped and set, vertically elongated midlateral blotches, usually disconnected from saddles on back, rarely a mottled or marbled pattern / ○ upper part of cheek without or with vermiculated dark-brown spots / ○ tip of anal not reaching ventral adipose crest / ○ prepelvic length 51–51 % SL / ○ suborbital groove present in male. Size up to 63 mm SL.

Distribution. Türkiye: Lake Beyşehir and Suğla basin. Detailed distribution is poorly known.

Habitat. Fast-flowing streams on gravel substrate.

Biology. No data.

Conservation status. EN; appears to be declining within its small range.

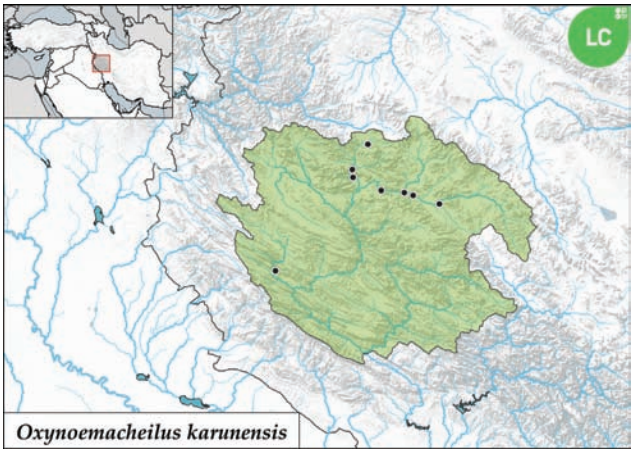
Further reading. Yoğurtçuoğlu et al. 2021b (description).

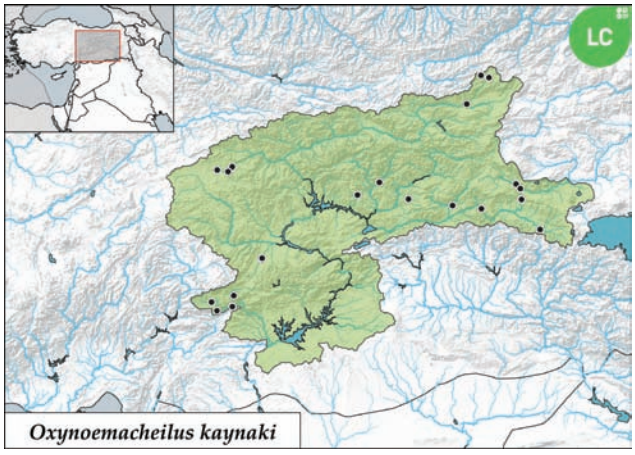
Oxynoemacheilus karunensis; Karkheh drainage, Iran; ~40 mm SL. © K. Borkenhagen.

Oxynoemacheilus karunensis

Common name. Karkheh two-spot loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Tigris drainage by: ○ pelvic axillary lobe absent or rudimentary, shallow and knob-shaped / ○ two distinct and prominent black blotches at posteriormost caudal base, often overlaid by a dark-brown or black chevron-shaped bar / ○ suborbital groove present in male / ○ lateral line complete, terminating behind vertical of anal base or at caudal base / ○ flank completely covered by scales / ○ caudal deeply emarginate or forked / ○ no or very short incision in upper lip / ○ a series of vertically elongated blotches or short bars along lateral midline / ○ dark-brown blotches behind dorsal base narrower than interspaces / ○ caudal peduncle 1.7–3.1 times longer than deep. Size up to 58 mm SL.





Oxynoemacheilus kaynaki; Euphrates drainage, Türkiye; 64 mm SL.

Oxynoemacheilus kaynaki; Euphrates drainage, Türkiye; 68 mm SL.

Distribution. Iran: Gamasiab, Dinevar, and upper Seymareh in Karkheh drainage.
Habitat. Moderately fast-flowing and standing waters of streams, backwaters, and springs with muddy bottoms.
Biology. No data.
Conservation status. LC.
Remarks. The type locally of this species was mistakenly thought to be in Karun drainage. It was later found to be endemic in Karkheh drainage. Fish identified as *O. karunensis* from the Jarrahi drainage had been described as *O. marunensis*.
Further reading. Freyhof 2016a (description).

Oxynoemacheilus kaynaki
Common name. Melid loach.
Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Euphrates drainage by: ○ caudal peduncle with a shallow, wide, and often long dorsal adipose ridge, not elevated from dorsal profile, reaching to middle of caudal peduncle or below last dorsal ray when folded down / ○ lateral line complete / ○ suborbital groove absent in male / ○ pelvic axillary lobe present / ○ flank covered by scales / ○ caudal very slightly emarginate or truncate / ○ flank with a brown mottled or marmorated pattern, with irregularly shaped brown bars, especially on flank behind dorsal origin in some individuals / ○ caudal base with a bold, dark-brown or black bar. Size up to 68 mm SL.
Distribution. Türkiye: Upper Göksu, Kaynarca, and Gül, which are headwaters of Peri Suyu, Sultan Suyu, which flows to Karakaya reservoir, and Kangal, which flows to Keban reservoir, all in Euphrates drainage.
Habitat. Fast to moderately fast-flowing streams with gravel substrate. Usually along margins of streams with muddy substrate.
Biology. No data.
Conservation status. LC.
Further reading. Erk'akan et al. 2008b (description); Freyhof et al. 2019b (diagnosis, distribution).

Oxynoemacheilus kentritensis; Tigris drainage, Türkiye; 75 mm SL.

Oxynoemacheilus kentritensis

Common name. Botan loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Tigris drainage by: ○ distinct bars or vertically elongated blotches on flank behind dorsal origin / ○ colour pattern on anterior part of flank not interrupted by unpigmented zone along lateral line / ○ 10+9, 9+9 or 9+8 branched caudal rays / ○ flank completely covered by scales / ○ caudal slightly emarginate / ○ suborbital groove absent in male / ○ one central pore in supratemporal canal / ○ no median incision in upper lip / ○ lateral line complete, terminating behind vertical of anal base or at caudal base / ○ posterior process of bony air-bladder capsule directed laterally / ○ maxillary barbel reaching beyond middle of eye, usually to posterior eye margin / ○ interorbital distance 1.6–1.9 times in snout length / ○ caudal–peduncle depth 1.2–1.3 times in caudal–peduncle length. Size up to 78 mm SL.

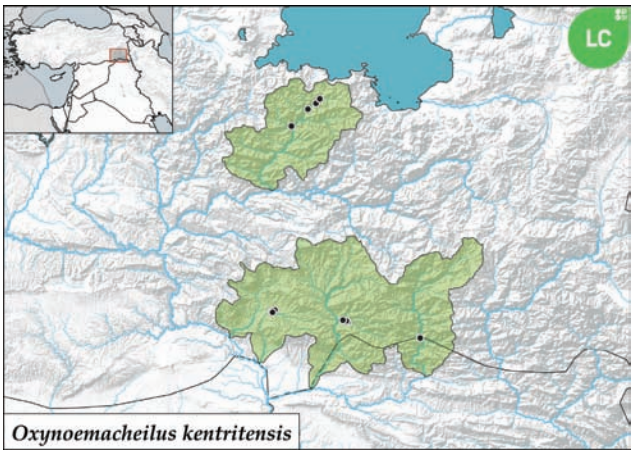
Distribution. Botan, as well as Hezil and Nerduş, entering Tigris in border area of Türkiye, Iraq, and Syria.

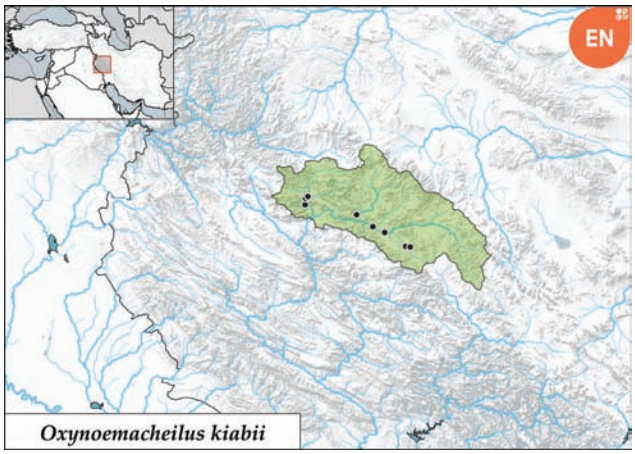
Habitat. Moderately fast-flowing and stagnant waters of gravel-bedded streams.

Biology. No data.

Conservation status. LC.

Further reading. Freyhof et al. 2017a (description).





Oxynoemacheilus kiabii; Karkheh drainage, Iran; ~55 mm SL.

Oxynoemacheilus kiabii

Common name. Longhead Zagros loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Tigris drainage by: ○ two, rarely one or three lateral pores in supratemporal canal and no central pore / ○ suborbital groove absent in male / ○ flank covered by embedded scales, no scales on back in front of dorsal / ○ caudal slightly emarginate / ○ lateral line incomplete, terminating under dorsal base or above anal base / ○ head length 26–30 % SL / ○ flank with vertically elongated, irregularly shaped blotches or narrow bars. Size up to 57 mm SL.

Distribution. Iran: Gamasiab and Dinevar in Karkheh drainage.

Habitat. Moderate to fast-flowing streams with gravel substrate.

Biology. No data

Conservation status. EN; appears to be declining within its very small range.

Further reading. Golzarianpour et al. 2011 (description).

Oxynoemacheilus kottelati; Havran drainage, Türkiye; ~65 mm SL.

Oxynoemacheilus kottelati

Common name. Havran loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Aegean basin by: ○ no shallow dorsal crest on caudal peduncle / ○ suborbital groove present in male / ○ belly with few, small, embedded scales / ○ caudal emarginate / ○ middle caudal ray 71–91 % of length of longest upper caudal ray / ○ body depth decreasing between dorsal and caudal base / ○ caudal–peduncle depth 1.0–1.3 times in caudal–peduncle length / ○ caudal peduncle 13–16 % SL / ○ flank with coarse mottling, without bars or blotches. Size up to 65 mm SL.

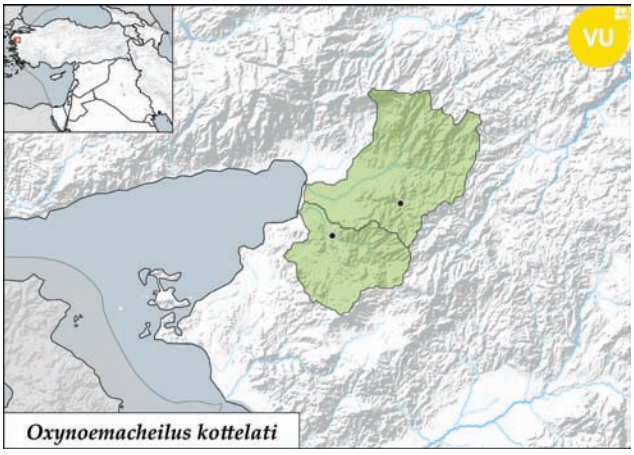
Distribution. Türkiye: Havran and Karınca in northeastern Aegean basin.

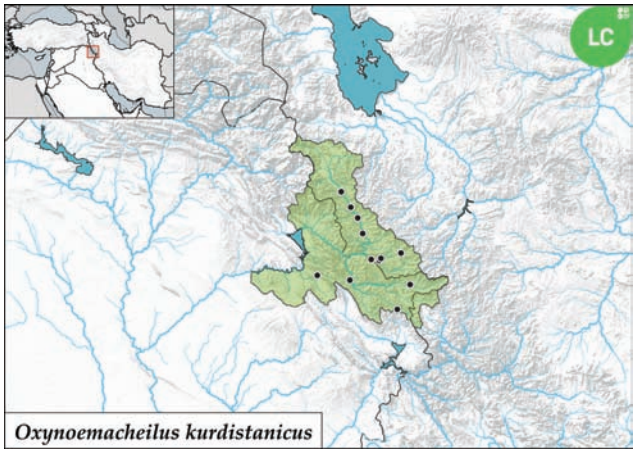
Habitat. Moderate to fast-flowing streams with gravel substrate.

Biology. No data.

Conservation status. VU

Further reading. Turan et al. 2024a (description).





Oxynoemacheilus kurdistanicus; Lesser Zab drainage, Iraq; ~55 mm SL.

Oxynoemacheilus kurdistanicus; Lesser Zab drainage, Iraq; 59 mm SL.

Oxynoemacheilus kurdistanicus

Common name. Lesser Zab loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Tigris drainage by*:* ○ suborbital groove present in male / ○ usually 9½ (rarely 8½) branched dorsal rays / ○ flank with a midlateral row of 6–12 dark-brown, irregularly shaped, vertically elongated bars / ○ last bars on caudal peduncle narrower than interspaces / ○ two distinct and prominent black blotches at posteriormost caudal base, often overlaid by a dark-brown or black chevron-shaped bar / ○ upper lip with a deep median incision / ○ pelvic axillary lobe absent or a very shallow pad / ○ suborbital groove present in male / ○ lateral line complete, terminating at caudal base / ○ body completely covered by scales / ○ caudal deeply emarginate or forked. Size up to 75 mm SL.

Distribution. Iran and Iraq: Lesser Zab drainage.

Habitat. Moderate to fast-flowing streams with gravel substrate.

Biology. No data.

Conservation status. LC.

Further reading. Kamangar et al. 2014 (description).

Oxynoemacheilus leontinae; Lake Tiberias, Israel; 40 mm SL.

Oxynoemacheilus leontinae

Common name. Tiberias loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in southern Levant by: ○ flank scaleless or with few isolated scales / ○ caudal very slightly emarginate or truncate / ○ lateral line terminating about at vertical of dorsal origin / ○ without prominent dorsal crest on caudal peduncle or with short crest on posterior caudal peduncle / ○ suborbital groove absent in male / ○ body depth at dorsal origin 16–20 % SL / ○ 8½-9½ branched dorsal rays / ○ flank with a series of irregularly shaped bars or large, roundish or vertically elongate blotches. Size up to 64 mm SL.

Distribution. Israel: Lake Hula and Tiberias basins.

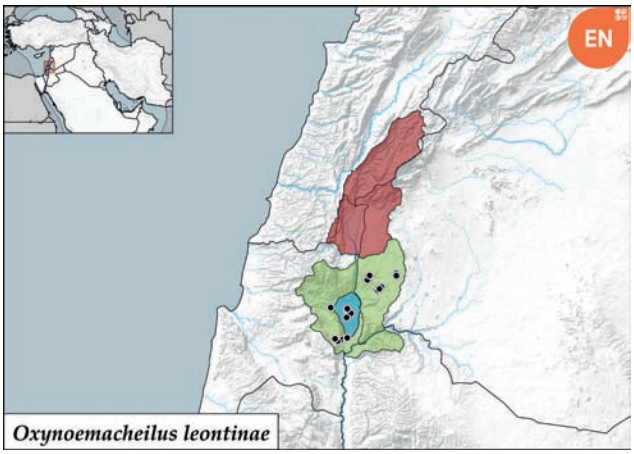
Habitat. Lakeshores and small tributaries.

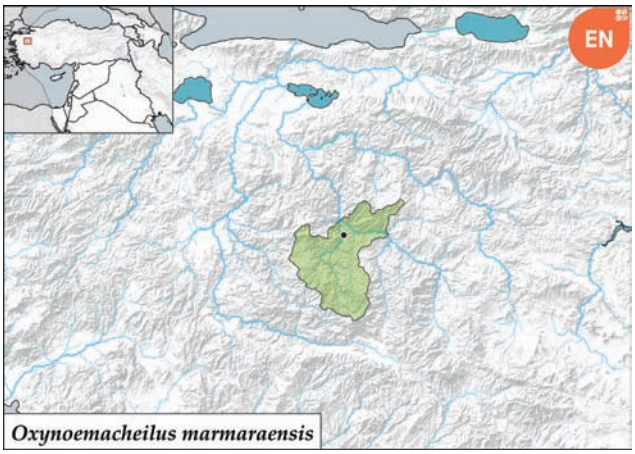
Biology. No data.

Conservation status. EN; appears to be declining within its very small range. Extirpated from Hula and now restricted to Tiberias basin.

Remarks. Often identified as *O. galilaeus* or *O. panthera*.

Further reading. Lortet 1883 (description); Krupp 1985d, Krupp & Schneider 1989 (distribution).





Oxynoemacheilus marmaraensis; Sursuluk drainage, Türkiye; ~75 mm SL.

Oxynoemacheilus marmaraensis

Common name. Marmara loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Marmara and Black Sea basin by: ○ flank with mottled or vermiculate pattern / ○ no axillary lobe at pelvic base / ○ caudal-peduncle depth 1.2–1.6 times in its length / ○ caudal moderately emarginate, lobes slightly rounded / ○ no median incision in upper lip / ○ distance between pectoral and pelvic origins 29–34 % SL / ○ no prominent dorsal crest on caudal peduncle / ○ suborbital groove present in male. Size up to 75 mm SL.

Distribution. Türkiye: Emet drainage, a tributary of Susurluk.

Habitat. Moderately fast-flowing streams.

Biology. No data.

Conservation status. EN; poorly known and potentially more common and less threatened.

Further reading. Turan et al. 2023 (description).

Oxynoemacheilus marunensis; Jarrahi drainage, Iran; ~45 mm SL. © K. Borkenhagen.

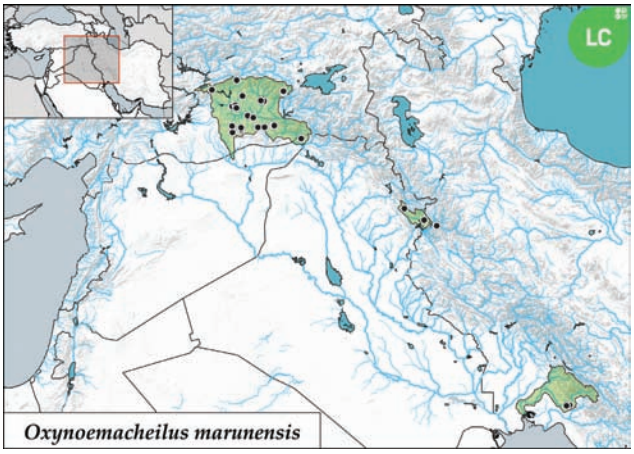
Oxynoemacheilus marunensis; upper Tigris drainage, Türkiye; 75 mm SL.

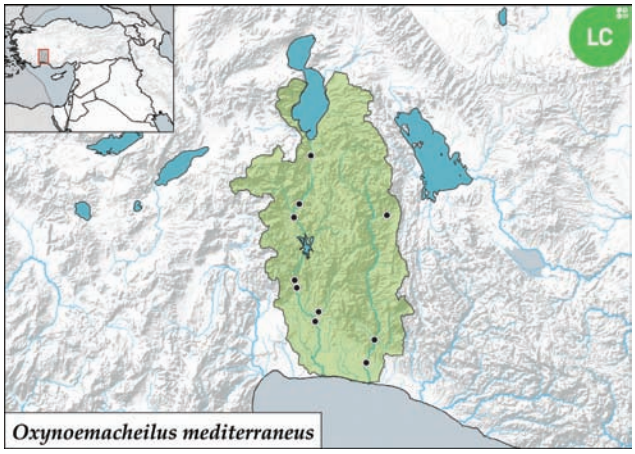
Oxynoemacheilus marunensis

Common name. Tigris two-spot loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Tigris drainage by: ○ flank with a midlateral row of 7–10 dark-brown, irregularly shaped, vertically elongated blotches, overlaid by a marmorated pattern / ○ juveniles larger than 20 but smaller than 45 mm SL with poorly developed mottling between midlateral blotches on flank / ○ two distinct and prominent black blotches at posteriormost caudal base, often overlaid by a dark-brown or black chevron-shaped bar ○ / upper lip r with a well-developed median incision / ○ pelvic axillary lobe small but well developed / ○ suborbital groove present in male / ○ lateral line complete, terminating behind vertical of anal base or at caudal base / ○ flank completely covered by scales / ○ caudal deeply emarginate or forked. Size up to 78 mm SL.

Distribution. Jarrahi drainage (Iran), Sirvan (Iran, Iraq), and upper Tigris and its tributaries (Türkiye).





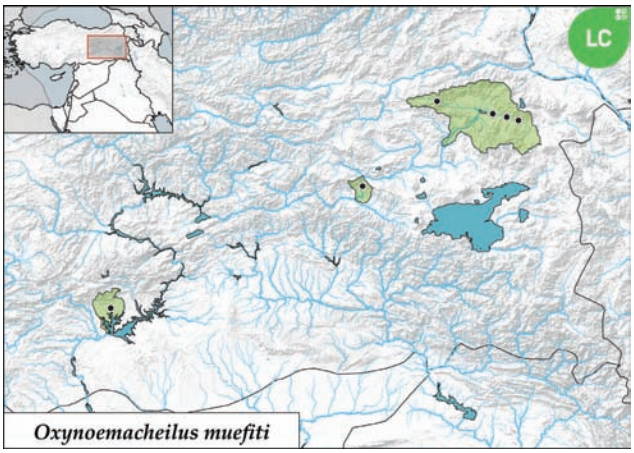
Oxynoemacheilus mediterraneus; Köprüçay drainage, Türkiye; 48 mm SL.

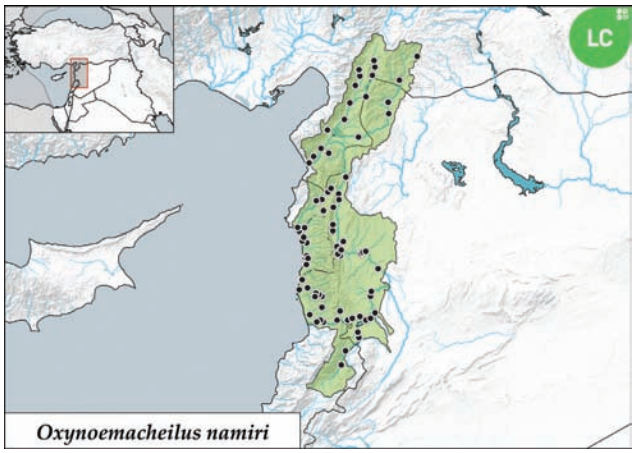
Habitat. Moderately fast-flowing and standing waters of streams, backwaters, and springs with muddy bottoms.
Biology. No data.
Conservation status. LC.
Remarks. This species has not (yet) been recorded from the Greater and Lesser Zab drainages, where it is replaced by *O. euphraticus* (Greater Zab) and *O. kurdistanicus* (Lesser Zab). It also appears to be absent from the Karkheh and Karun drainages. Molecular characters very slightly differentiate major populations in the Jarrahi, Sirvan, and upper Tigris and may be described as different species if clear morphological differences can be worked out.
Further reading. Sayyadzadeh & Esmaeili 2020 (description).

Oxynoemacheilus mediterraneus
Common name. Pamphylian loach.
Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Central Anatolia and rivers flowing to Bay of Antalya by: ○ caudal–peduncle depth 1.2–1.5 times in its length / ● caudal deeply emarginate, shortest middle caudal ray 65–76 % of longest ray of upper caudal lobe / ○ body depth almost uniform between dorsal and caudal bases / ○ flank blotches usually connected to saddles on back / ○ flank with scales / ○ no prominent dorsal crest on caudal peduncle / ○ suborbital groove present in male. Size up to 73 mm SL.
Distribution. Türkiye: Aksu and Köprüçay drainages in Gulf of Antalya.
Habitat. Fast-flowing to almost stagnant waters of streams and rivers with mud or gravel bottoms.
Biology. No data.
Conservation status. LC.
Remarks. Loaches from Lake Eğirdir basin carry the mtDNA of *O. mediterraneus* but are identified as *O. nasreddini* by morphological characters.
Further reading. Erk'akan et al. 2007 (description); Yoğurtçuoğlu et al. 2021a (distribution).

Oxynoemacheilus muefiti; upper Euphrates drainage, Türkiye; 69 mm SL.

Oxynoemacheilus muefiti
Common name. Stout Euphrates loach.
Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Euphrates drainage by: ○ scales absent / ○ lateral line incomplete, not reaching or reaching below dorsal base / ○ suborbital groove absent in male / ○ caudal slightly emarginate / ○ supratemporal canal without central pore / ○ pelvic axillary lobe absent / ○ dorsal adipose crest on caudal peduncle shallow, reaching to vertical through last anal ray base in individuals larger than 50 mm SL / ○ caudal–peduncle length 1.3–1.6 times its depth / ○ body width at dorsal origin 11–13 % SL / ○ flank with fine, brown, mottled colour pattern, usually with narrow, pale-brown bars on flank behind dorsal base, bars confluent with adjacent saddles on back / ○ caudal base with mottled colour pattern, without bold, black bar or bold, black spots upper and lower caudal base. Size up to 70 mm SL.
Distribution. Türkiye: Upper Murat drainage and Eğri, a tributary of Atatürk reservoir. Potentially more widespread in Euphrates.
Habitat. Moderately fast-flowing streams and rivers with gravel or rock substrate.
Biology. No data.
Conservation status. LC.
Remarks. This species is very closely related to *O. ercisianus* from Lake Van basin.
Further reading. Freyhof et al. 2019b (description).





The Orontes in Al Ghab in Syria, habitat of *Oxynoemacheilus namiri*, is heavily affected by pollution.

Oxynoemacheilus namiri; Orontes drainage, Türkiye; 64 mm SL.

Oxynoemacheilus namiri; Afrin, Orontes drainage, Türkiye; 53 mm SL.

Oxynoemacheilus namiri

Common name. Levantine loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Cilicia and northern Levant by: ● flank pattern usually with 6–17, very distinct and regularly shaped and set bars, usually all or most flank-bars, at least behind dorsal base, extending to middorsal saddles and usually meeting contralateral / ○ caudal deeply emarginate, length of middle caudal ray 1.3–1.5 times in length of longest unbranched ray in upper caudal lobe / ○ suborbital groove absent in male / ○ no or very shallow dorsal crest on caudal peduncle / ○ scales absent on flank in front of dorsal, sparsely set below dorsal, densely set on posterior flank, or very few isolated and embedded scales on back and flank in front of dorsal origin / ○ lateral line terminating anterior to or below dorsal base, rarely above anus or anal base, very exceptionally at caudal base / ○ head length 21–24 % SL / ○ body depth at dorsal origin 16–20 % SL / ○ caudal–peduncle depth 1.2–1.4 times in its length. Size up to 84 mm SL.

Distribution. Orontes drainage and coastal streams in Syria from Orontes south to Nahr al-Kabir on Syrian-Lebanese border.

Habitat. Moderately fast-flowing to stagnant waters of springs, streams, and rivers with muddy or gravelly bottoms. Also on banks of reservoirs and in irrigation canals.

Biology. No data.

Conservation status. LC.

Remarks. A population of *O. tigris* from the upper Qweiq in Türkiye shares mtDNA with *O. namiri*, suggesting past hybridisation between these two species and, thus, a close biogeographic link between the Orontes and the Qweiq.

Further reading. Krupp & Schneider 1991 (description).

Oxynoemacheilus nasreddini; Lake Ilgın basin, Türkiye; 75 mm SL.

Oxynoemacheilus nasreddini

Common name. Eber loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Central Anatolia and rivers flowing to Bay of Antalya by: ○ a prominent inner axial stripe along midlateral flank / ○ body usually with a series of vertically elongated blotches / ○ tip of pectoral usually reaching to or slightly beyond pelvic origin in male / ○ body depth decreasing between dorsal and caudal base / ○ belly with few, small, embedded scales / ○ caudal–peduncle depth 1.5–2.1 times in its length / ○ caudal emarginate, shortest middle caudal ray 76–91 % of longest ray of upper caudal lobe / ○ prepelvic length 48–55 % SL / ○ usually a series of short bars on caudal peduncle / ○ 2–4 dark-brown bands on caudal / ○ suborbital groove present in male. Size up to 78 mm SL.

Distribution. Türkiye: Lakes Akşehir, Eber, Eğirdir and Ilgın basins.

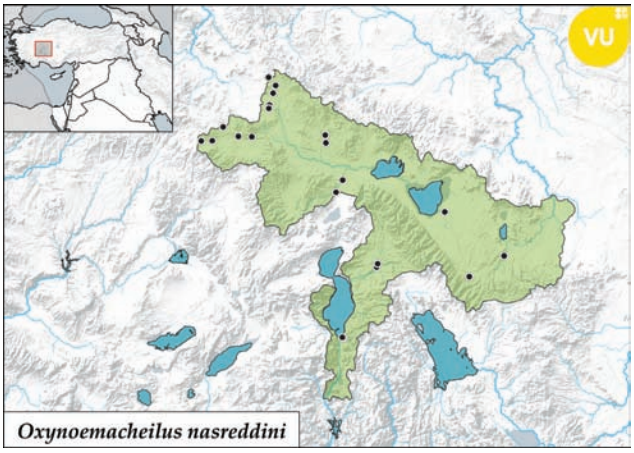
Habitat. Slow-flowing streams with gravel or mud bottom.

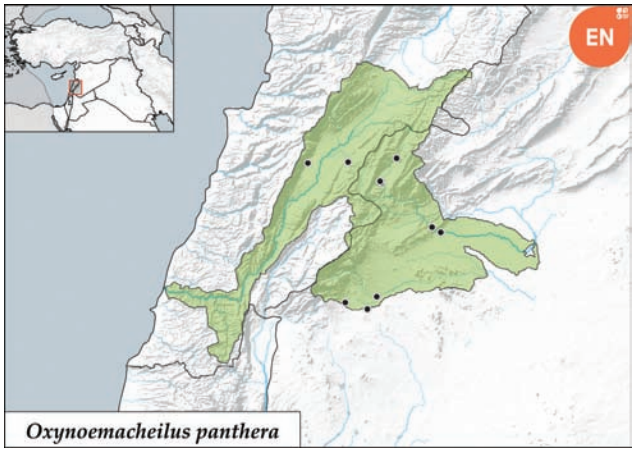
Biology. No data.

Conservation status. VU; appears to be declining within its small range and has lost several habitats in recent years due to desiccation of streams and massive pollution.

Remarks. Populations from Lake Eğirdir basin share the mtDNA with *O. mediterraneus,* indicating a past introgressive hybridisation.

Further reading. Yoğurtçuoğlu et al. 2021a (description).





The use and misuse of DNA barcoding for taxonomy.

"…a classification founded on any single character, however important that may be, has always failed."

—Charles Darwin (1859)

The advent of molecular techniques has provided new tools for species identification, revolutionising the taxonomic methodology within less than two decades. One of the most widely applied methods compares nucleotide sequence similarity among organisms and attributes it to species differences. For this, sequencing a short fragment of the mitochondrial gene, i.e., cytochrome c oxidase subunit 1 (COI or DNA barcode), was hailed as a "magical

tool" or "the taxonomy of the twenty-first century." Since its inception, DNA barcoding has become a widely accepted and standardised protocol for species identification worldwide. However, as with any single-character approach, it must be applied cautiously. Some believe that the barcoding gene was placed in all organisms by a higher entity to allow scientists to recognise species. This viewpoint is not as uncommon as one might suspect.
The arguments against the approach have been consistently presented. The primary criticism is based on the opposition to the assertion of the proponents of the barcoding approach, who have declared that if two organisms show a "considerable" nucleotide difference, they would be considered different species, or vice versa. The assertion is open to serious debate for three reasons. Firstly, the reduction of the complex evolutionary history of organisms to a single character: phylogenetic distance, is employed as a species concept. Secondly, no reasonable distance threshold is provided by which species can be demarcated. Thirdly, the confusion between diagnosis (assigning a fish to an already known species) and definition (deciding if a group of individuals is a species) is evident. In the real world, species are evolving entities, and phylogenetic (or COI) distance can be understood as a measure of proximity to the number of generations (time) that have passed since the last gene flow between populations.
The species concept that DNA barcoding represents ignores the existence of old and young species, where phylogenetic distance is of no consequence. This is because, while speciation does not always require a long period that leads to high phylogenetic distances, genetic divergence does not necessarily lead to speciation. Furthermore, there are several theoretical pitfalls in applying the barcoding approach, in which untrained practitioners (both taxonomists and molecular biologists) have always been prone to being trapped. For instance, at least in the case of fishes, mitochondrial capture through introgressive hybridisation is much more common than previously thought. Consequently, the sole use of COI DNA sequences to identify an individual with mitochondrial DNA introgressed by another species will result in an erroneous identification.

Oxynoemacheilus panthera; Litani drainage, Lebanon; 60 mm SL.

Oxynoemacheilus panthera
Common name. Damascus loach.
Diagnosis. Distinguished from other species of *Oxynoemacheilus* in southern Levant by: ○ caudal very slightly emarginate or truncate / ○ lateral line terminating before vertical of dorsal origin / ○ usually a prominent dorsal crest on caudal peduncle / ○ 8½–9½ branched dorsal rays / ○ anterior flank scaleless or with few isolated scales, caudal peduncle with densely set scales / ○ suborbital groove absent in male / ○ body depth at dorsal origin 20–25 % SL. Size up to 77 mm SL.
Distribution. Syria: Barada and Nahr al Awaj drainages west of Damascus; Lebanon: Litani drainage.
Habitat. Standing and slow-flowing waters of springs and streams with mud or gravel bottoms.
Biology. No data.
Conservation status. EN; appears to be declining within its very small range.
Remarks. This species is usually identified in Litani as *O. leontinae*, a poorly known loach from the Jordan drainage. The few individuals analysed from the Litani drainage host the COI sequences of *O. namiri*.
Further reading. Krupp 1985d (description, distribution).

Oxynoemacheilus panthera; spring of Barada, Syria; ~70 mm SL.

Stream al Tammasiyyar in Syria is a habitat of *Oxynoemacheilus panthera*, *O. insignis*, and *Pseudophoxinus drusensis*.

Oxynoemacheilus pantheroides; upper Jordan drainage, Israel; ~60 mm SL. © M. Ford.

Oxynoemacheilus pantheroides

Common name. Golan loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in southern Levant by: ○ caudal deeply emarginate / ○ no prominent dorsal crest on caudal peduncle / ○ suborbital groove present in male / ○ lateral line usually incomplete, terminating between vertical of dorsal- and anal base / ○ back and flank densely covered by scales. Size up to 60 mm SL, likely to grow larger.

Distribution. Israel: Upper Jordan drainage, possibly also in upper reaches of Jordan in Lebanon.

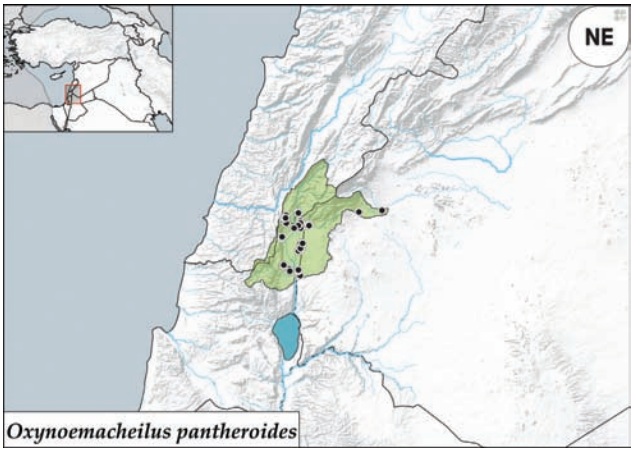
Habitat. Standing and slow-flowing waters of springs and streams with mud or gravel bottoms.

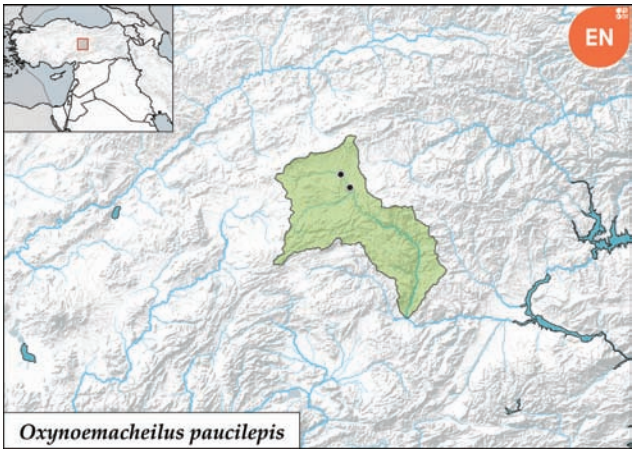
Biology. No data.

Conservation status. NE; due to very limited knowledge of this species.

Remarks. *Oxynoemacheilus doriae* from Israel may be an additional valid species, and further research is needed to test this hypothesis.

Further reading. Bănărescu et al. 1982 (description); Krupp & Schneider 1989 (synonym of *O. insignis*).





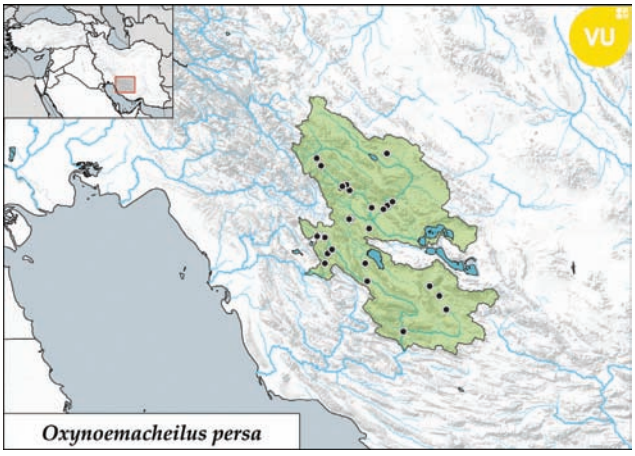
Oxynoemacheilus paucilepis; upper Euphrates drainage, Türkiye; ~35 mm SL.

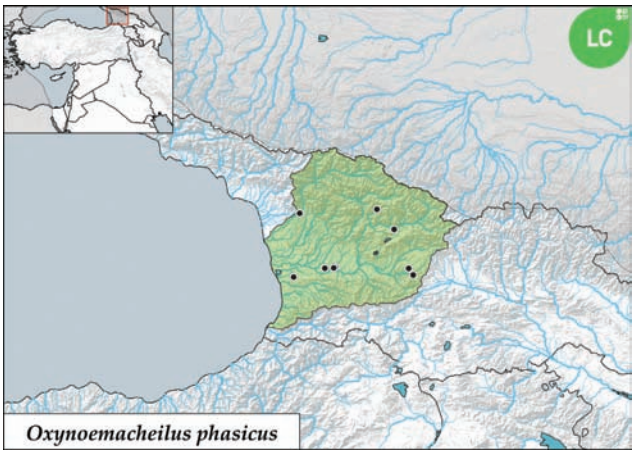
Oxynoemacheilus paucilepis; upper Euphrates drainage, Türkiye; 70 mm SL.

Oxynoemacheilus paucilepis
Common name. Tohma loach.
Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Euphrates drainage by: ● flank with a distinct midlateral series of large, roundish or horizontally elongated brown blotches and a row of small brown blotches between upper pelvic base and lowermost caudal base / ○ lateral line complete / ○ caudal emarginate / ○ no prominent dorsal crest on caudal peduncle / ○ suborbital groove absent in male / ○ caudal peduncle without high adipose crest or ridge / ○ flank covered by scales. Size up to 76 mm SL.
Distribution. Türkiye: Mancınık, Çetinkaya, and Kalkım drainages in upper Euphrates.
Habitat. Moderately or slowly flowing waters in streams with gravel substrate.
Biology. No data.
Conservation status. EN; appears to be declining within its very small range.
Further reading. Erk'akan et al. 2007 (description).

Oxynoemacheilus persa; Kor drainage, Iran; ~60 m SL.

Oxynoemacheilus persa
Common name. Persian loach.
Diagnosis. Distinguished from *Oxynoemacheilus tongiorgii*, it is only other congeneric in Iranian Kor drainages by: ● caudal deeply emarginate / ● no dorsal crest on caudal peduncle. Size up to 78 mm SL.
Distribution. Iran: Kor basin, Helleh, and Mond drainages.
Habitat. Moderately fast-flowing waters in springs, streams, and rivers with gravel substrate.
Biology. Spawns May and June.
Conservation status. VU; appears to be declining within its small range.
Remarks. *Oxynoemacheilus farsicus* is a synonym.
Further reading. Nalbant & Bianco 1998 (*Oxynoemacheilus farsicus*); Mirghiyasi et al. 2016 (spawning time); Esmaeili et al. 2019 (phylogeography).





Oxynoemacheilus phasicus; Rioni drainage, Georgia; 65 mm SL © R. Lennigk.

Oxynoemacheilus phasicus

Common name. Rioni loach.

Diagnosis. Distinguished from other adjacent *Oxynoemacheilus* species by: ○ flank mottled, marbled, or with bars / ○ a moderately emarginate caudal / ○ caudal peduncle deep / ○ no median incision in upper lip / ○ pelvic not reaching to origin of genital papillae / ○ pelvic origin below first branched dorsal ray / ○ a wide, bold band at middle or posterior half of caudal / ○ suborbital groove present in male. Size up to 77 mm SL.

Distribution. Georgia: Rioni and Inguri drainages.

Habitat. Moderate or fast-flowing waters in springs, streams, and rivers with gravel substrate.

Biology. No data.

Conservation status. LC.

Further reading. Freyhof et al. 2021b (description).

Oxynoemacheilus sarus; lower Seyhan drainage, Türkiye; 47 mm SL.

Oxynoemacheilus sarus

Common name. Sarus loach.

Diagnosis. Distinguished from other *Oxynoemacheilus* species in Cilicia (including Göksu, Seyhan, and Ceyhan drainages) by: ○ a series of irregularly shaped midlateral blotches or bars disconnected from saddles on back / ○ a bold, black blotch or spot at upper and lower caudal base / ○ 3–5 dark-brown bands on caudal / ○ lateral line complete, terminating at anterior part of hypural complex / ○ caudal forked (shortest middle caudal ray is 56–70 % of longest ray of upper caudal lobe) / ○ caudal peduncle 1.4–1.8 times longer than deep, without dorsal crest / ○ a suborbital groove in male / ○ pre-dorsal length 45–52 % SL / ○ prepelvic length 48–53 % SL / ○ distance between pectoral- and pelvic origin 25–29 % SL. Size up to 54 mm SL.

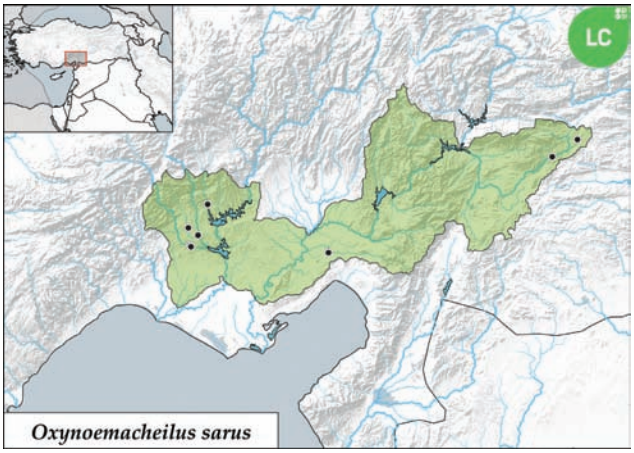
Distribution. Türkiye: Ceyhan, and lower Seyhan drainages.

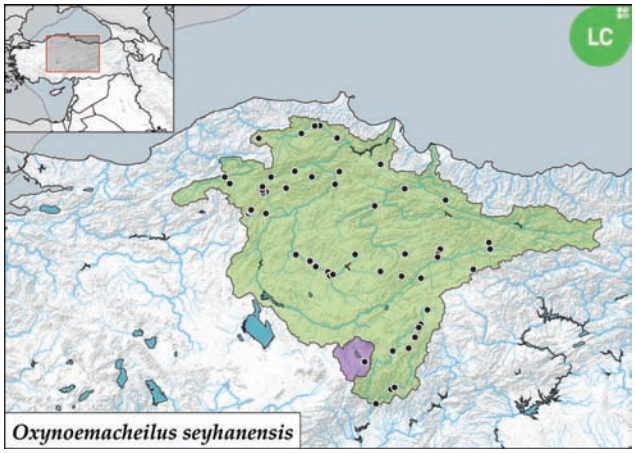
Habitat. Moderately fast-flowing water in streams and rivers with stones and gravel bottoms.

Biology. No data.

Conservation status. LC.

Further reading. Freyhof et al. 2021a (description).





Oxynoemacheilus seyhanensis; Kızılırmak drainage, Türkiye; 68 mm SL.

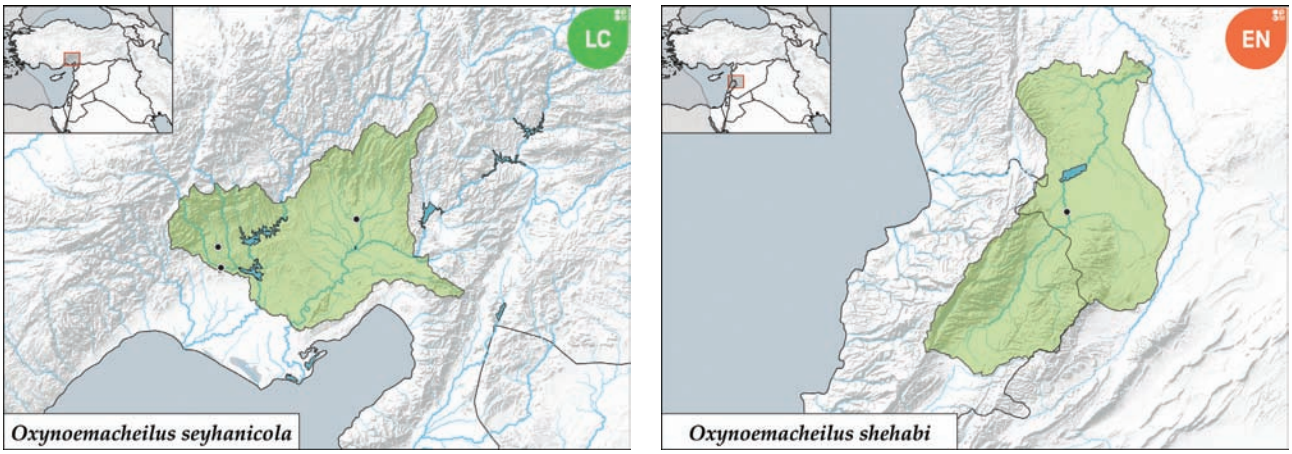
Oxynoemacheilus seyhanensis; Kızılırmak drainage, Türkiye; ~75 mm SL.

Oxynoemacheilus seyhanensis; Zamantı, Seyhan drainage, Türkiye; ~65 mm SL.

Oxynoemacheilus seyhanensis
Common name. Lycaonian loach.
Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Marmara and Black Sea basin as well as in Cilicia and northern Levant by: ● caudal slightly emarginate, almost truncate / ○ lateral line complete / ○ flank behind dorsal base covered by scales / ○ suborbital groove absent in male / ○ no prominent dorsal crest on caudal peduncle. Size up to 84 mm SL.
Distribution. Türkiye: Kızılırmak and Yeşilırmak drainages, also in upper and middle Seyhan, and in Çerkeş, in upper Filyos drainage. Recorded from Sultan marshes, where it entered through Zamantı tunnel.
Habitat. Moderately fast-flowing water in streams with gravel or mud substrate.
Biology. No data.
Conservation status. LC.
Remarks. *Oxynoemacheilus kosswigi* is a synonym.
Further reading. Bănărescu 1968 (description); Erk'akan & Kuru 1986 (description as *O. kosswigi*); Sungur 2020 (synonyms).

Oxynoemacheilus seyhanicola; Seyhan drainage, Türkiye; ~45 mm SL.

Oxynoemacheilus seyhanicola
Common name. Adana loach.
Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Cilicia and northern Levant by: ● caudal pattern indistinct, almost or completely absent / ○ bold black band or blotches on caudal base / ○ lateral line complete, terminating at anterior part of hypural complex / ○ caudal deeply emarginate / ○ caudal peduncle without dorsal crest / ○ suborbital groove present in male / ○ caudal–peduncle depth 1.4–2.2 in its length / ○ pre-dorsal length 51–56 % SL / ○ prepelvic length 50–57 % SL / ○ distance between pectoral- and pelvic origin 27–32 % SL. Size up to 56 mm SL.
Distribution. Türkiye: Seyhan and Ceyhan drainages.
Habitat. Moderately fast-flowing water in streams and rivers with gravel substrate.
Biology. No data.
Conservation status. LC.
Further reading. Erk'akan et al. 2007 (description); Freyhof et al. 2021a (taxonomy, distribution).



Oxynoemacheilus shehabi; upper Orontes, Syria; 46 mm SL.

Oxynoemacheilus shehabi

Common name. Syrian sportive loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Cilicia and northern Levant by: ● flank with 5–7 dark-brown bars, much narrower than interspaces, irregularly shaped and set, extending to middorsal saddles and meeting contralateral / ○ a bold, black blotch or spot at upper and lower caudal base / ○ caudal with dark-brown bands of elongated blotches / ○ lateral line complete terminating at caudal base / ○ caudal deeply emarginate / ○ flank covered by scales, sparsely set on anterior, densely set on posterior flank / ○ no dorsal crest on caudal peduncle / ○ no or a very short incision in upper lip / ○ suborbital groove present in male / ○ pelvic axillary lobe well developed, fully attached to body / ○ two, usually indistinct, black blotches or spots at caudal base / ○ caudal–peduncle depth 1.8–2.4 in its length. Size up to 48 mm SL, likely to grow larger.

Oxynoemacheilus simavicus; Susurluk drainage, Türkiye; 65 mm SL.

Oxynoemacheilus simavicus; Bayındır, Sakarya drainage, Türkiye; 64 mm SL.

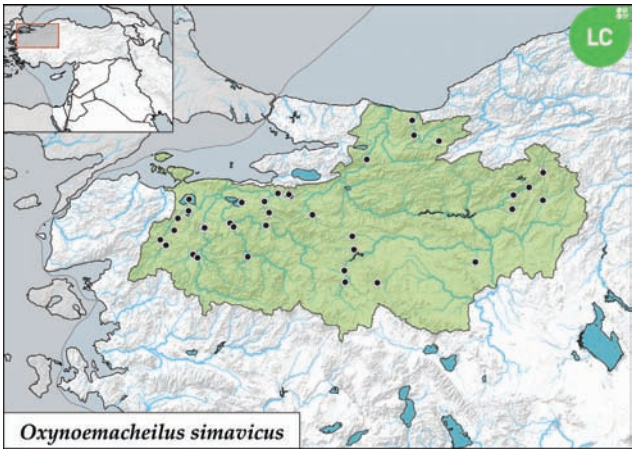
Oxynoemacheilus simavicus; Porsuk subdrainage, Sakarya drainage, Türkiye; 55 mm SL.

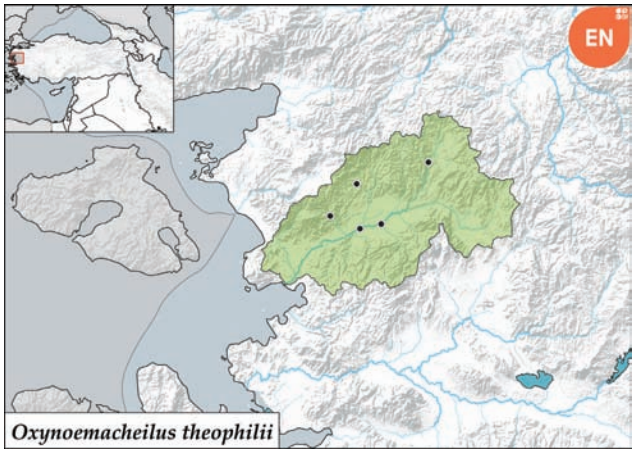
Distribution. Syria: Upper Orontes drainage upriver of Lake Qattinah.
Habitat. From small streams to larger rivers. In fast-flowing stretches.
Biology. No data.
Conservation status. EN; appears to be declining within its very small range.
Further reading. Freyhof & Geiger 2021 (description).

Oxynoemacheilus simavicus
Common name. Mysian loach.
Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Marmara and Black Sea basin by: ○ caudal–peduncle depth 6–10 % SL, usually 2.0–3.0 times in its length, very rarely 1.7–3.3, without high adipose crest or ridge / ○ caudal emarginate, middle caudal ray 70–96 % of length of longest ray in upper caudal lobe / ○ lateral line complete / ○ flank covered by scales / ○ suborbital groove present in male / ○ one central or no black, grey or brown blotch or short bar on caudal base, its colour identical to blotches on caudal peduncle / ○ no yellowish triangles at posteriormost portion of caudal peduncle / ○ pelvic very long, reaching or almost reaching to anus / ○ pectoral in male very long, reaching or almost reaching to pelvic origin / ○ flank mottled or with large irregularly shaped, squarish or vertically elongate blotches, usually as wide or narrower than interspaces / ○ lateral blotches on caudal peduncle usually interrupted in size and/or shape at or above lateral midline. Size up to 74 mm SL.
Distribution. Türkiye: Susurluk, Sakarya and Büyük Melen drainages.
Habitat. Moderately fast-flowing water in streams and rivers with gravel substrate. Usually found in riffles and other fast-flowing habitats.
Biology. No data.
Conservation status. LC.
Remarks. No external characters are known to distinguish this species from *O. banarescui*, *O. bergianus,* and *O. fatsaensis*, all of which are diagnosed by molecular characters. Morphological characters and differences in colour pattern to distinguish this species from the others are based on too small sample sizes or are false. As these four species are allopatric, the range should help in identification. *Oxynoemacheilus sakaryaensis* and *O. melenicus* are synonyms of this species as they are closely related, and none of the characters proposed as diagnostic in their description could be confirmed. The diagnostic characters

distinguishing *O. simavicus*, *O. sakaryaensis*, and *O. melenicus* have been deliberately falsified to allow populations that differ slightly in molecular characters to be described as separate species.

Further reading. Balık & Bănărescu 1978, in Bănărescu, Nalbant & Balık 1978 (description); Erk'akan et al. 2014 (size); Freyhof 2022 (revision of *O. bergianus* group); Turan et al. 2023 (description of O. *sakaryaensis* and *O. melenicus*).





Streams in lower Seyhan drainage are habitats of *Oxynoemacheilus seyhanicola*.

Oxynoemacheilus theophilii; Bakırçay, Türkiye; 65 mm SL.

Oxynoemacheilus theophilii

Common name. Aeolian loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Aegean basin by: ○ caudal deeply emarginate / ○ a shallow dorsal crest on caudal peduncle / ○ suborbital groove present in male; caudal-peduncle depth 12–13 % SL, 1.3–1.6 times in its length / ○ flank mottled / ○ body depth at dorsal origin 17–18 % SL / ○ length of middle caudal ray 19–23 % SL / ○ dorsal and ventral adipose crests present on caudal peduncle behind vertical of posterior anal base / ○ body depth between dorsal and caudal bases almost uniform / ○ caudal emarginate / ○ belly with few, small, embedded scales. Size up to 66 mm SL.

Distribution. Türkiye: Bakırçay drainage. Also, on Greek island of Lesbos.

Habitat. Moderately fast-flowing waters in streams with gravel substrate.

Biology. No data.

Conservation status. EN; appears to be declining within its very small range.

Remarks. *Oxynoemacheilus bergamensis* is a synonym.

Further reading. Stoumboudi et al. 2006 (description); Erk'akan et al. 2007 (description as *Barbatula bergamensis*); Freyhof et al. 2011 (distribution); İlhan et al. 2020 (distribution).

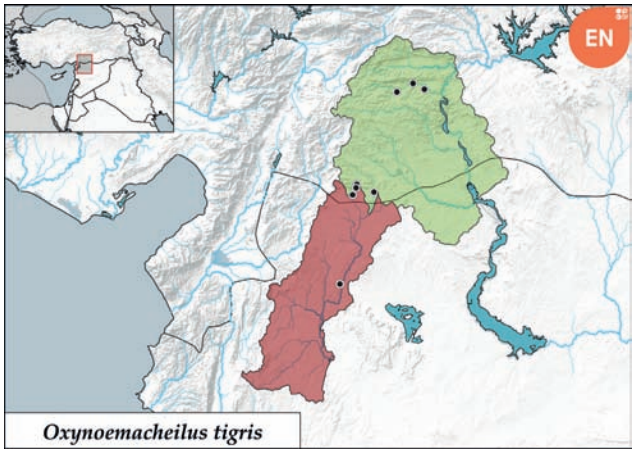
Oxynoemacheilus tigris; Qweiq drainage, Türkiye; ~55 mm SL; individual with mtDNA of *O. namiri*.

Oxynoemacheilus tigris

Common name. Halap loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Euphrates and Qweiq drainages by: ● prominent long and high dorsal adipose crest on caudal peduncle reaching beyond vertical through anal origin, usually below last dorsal rays when folded down / ● dorsal crest usually dark-brown with yellowish or whitish margin in individuals larger than 60 mm SL / ● 10–16 bold, narrow, regularly shaped bars, very prominent on caudal peduncle / ○ caudal slightly emarginate / ○ suborbital groove absent in male / ○ lateral line incomplete / ○ many isolated, deeply embedded scales on flank / ○ two bold, black spots at caudal base in most individuals. Size up to 73 mm SL.

Oxynoemacheilus sarali; Merzimen, Euphrates drainage, Türkiye; 65 mm SL.



Distribution. Qweiq drainage in Türkiye and Syria, and stream Merziman, which joins Euphrates at Birecik reservoir.
Habitat. Moderately fast-flowing to standing waters of streams with gravel or mud bottoms.
Biology. No data.
Conservation status. EN; appears to be declining within its very small range. Extirpated from Syria and has a very small distribution range in Türkiye.
Remarks. A population of *O. tigris* from the upper Qweiq in Türkiye shares mtDNA with *O. namiri* from the Orontes, The population from Merziman was described as *O. sarali* in 2025, too late to be included in this book.
Further reading. Heckel 1843 (description); Freyhof et al. 2019b (diagnosis, distribution); Turan et al. 2025 (*O. sarali*).

Sünnep, a small headwater stream inhabited by *Oxynoemacheilus tigris*, is one of only two remaining tributaries of the Qweiq drainage.

The Choman, making the border between Iraq (left) and Iran (right), is a tributary of the Lesser Zab and the habitat of a diverse and rich fish community, including *Oxynoemacheilus kurdistanicus*.

Oxynoemacheilus tongiorgii; Kor drainage, Iran; female, ~60 m SL.

Oxynoemacheilus tongiorgii

Common name. Kor loach.

Diagnosis. Distinguished from *Oxynoemacheilus persa*, the only other congeneric in Iranian Kor and Mond drainages by: • caudal slightly emarginate or truncate / • shallow dorsal crest on caudal peduncle. Size up to 62 mm SL.

Distribution. Iran: Kor drainage.

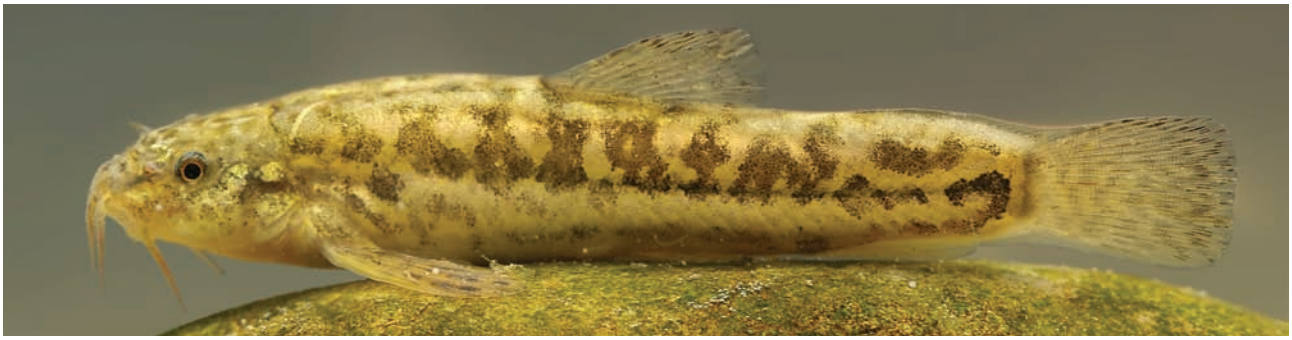
Habitat. Moderately fast-flowing to standing waters of springs and streams with muddy bottoms.

Biology. No data.

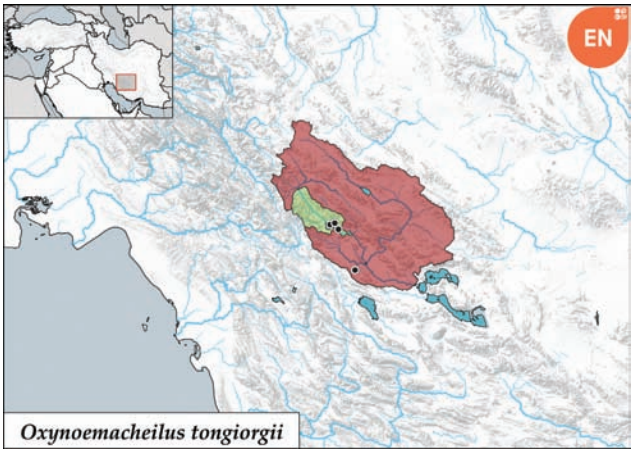
Conservation status. EN; appears to be declining within its very small range.

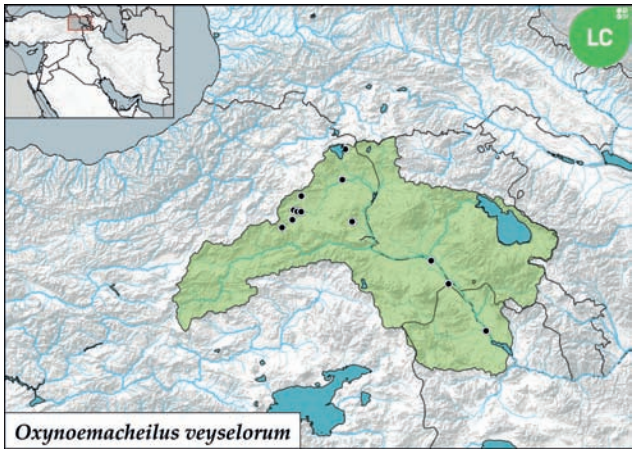
Remarks. Previously thought to be a species of *Seminemacheilus*, but molecular data show that it belongs to *Oxynoemacheilus*. Originally described from Kol drainage, which is a mistake.

Further reading. Nalbant & Bianco 1998 (description); Freyhof et al. 2011 (generic position).



Oxynoemacheilus tongiorgii; Kor drainage, Iran; male, ~50 m SL.





Oxynoemacheilus veyselorum; Aras drainage, Türkiye; ~80 mm SL. © M. Özuluğ.

Oxynoemacheilus veyselorum

Common name. Aras loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Caspian basin by: ● flank mottled, often forming an irregularly shaped midlateral stripe, without distinct bars or large blotches / ○ lateral line complete / ○ caudal slightly emarginate / ○ suborbital groove present in male / ○ caudal–peduncle depth 1.3–1.6 times in its length. Size up to 117 mm SL.

Distribution. Caspian basin: Aras drainage.

Habitat. Rivers and streams with fast-flowing water and gravel or boulder substrate.

Biology. No data.

Conservation status. LC.

Further reading. Çiçek et al. 2018 (description as *Oxynoemacheilus veyseli*); Kaya et al. 2020a; Kuljanishvili et al. 2020 (distribution).

Oxynoemacheilus zagrosensis; Shooei River, Lesser Zab drainage, Iran; ~50 mm SL.

Oxynoemacheilus zagrosensis

Common name. Mottled Choman loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Tigris drainage by: ● posterior process of bony air-bladder capsule directed posteriorly / ○ flank mottled / ○ caudal slightly emarginate / ○ flank completely covered by scales / ○ dorsal profile convex / ○ suborbital groove absent in male / ○ one central pore in supratemporal canal / ○ no median incision in upper lip / ○ lateral line complete, terminating behind vertical of anal base or at caudal base / ○ colour pattern on anterior part of flank not interrupted by unpigmented zone along lateral line. Size up to 61 mm SL.

Distribution. Iran: Choman drainage, a tributary of Lesser Zab.

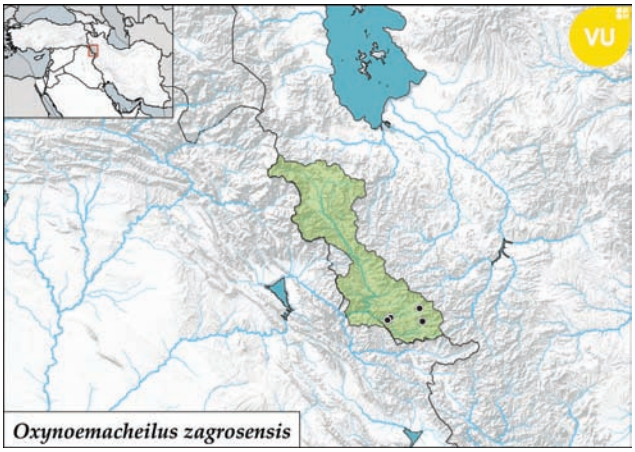
Habitat. Moderately fast-flowing and standing waters of streams, backwaters, and springs with muddy bottoms.

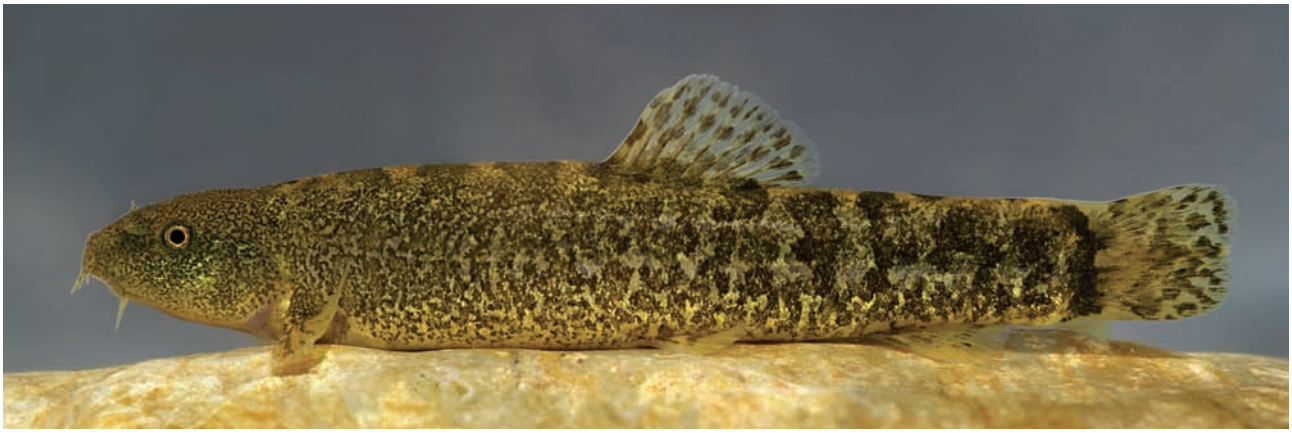
Biology. No data.

Conservation status. VU; appears to be declining within its small range.

Remarks. See remarks at *O. chomanicus*.

Further reading. Kamangar et al. 2014 (description); Sayyadzadeh & Esmaeili 2020 (discussion of Iranian and Anatolian populations of *Oxynoemacheilus frenatus*).





Oxynoemacheilus zarzianus; Lesser Zab drainage, Iraq; 55 mm SL.

Oxynoemacheilus zarzianus; Lesser Zab drainage, Iraq; 62 mm SL.

Oxynoemacheilus zarzianus

Common name. Zarzianian loach.

Diagnosis. Distinguished from other species of *Oxynoemacheilus* in Tigris drainage by: ● 8+8 branched caudal rays / ○ flank completely covered by scales / ○ caudal slightly emarginate / ○ dorsal profile convex / ○ colour pattern on flank behind dorsal base mottled or marmorated, without bars / ○ colour pattern on anterior part of flank not interrupted by unpigmented zone along lateral line / ○ one central and one lateral pore in supratemporal canal / ○ pelvic axillary lobe absent or a very shallow pad / ○ a median incision in upper lip / ○ suborbital groove absent in male / ○ lateral line complete, terminating behind vertical of anal base or at caudal base / ○ caudal–peduncle depth 1.0–1.2 times in caudal–peduncle length / ○ interorbital distance 1.1–1.4 times in snout length / ○ posterior process of bony air-bladder capsule directed laterally. Size up to 75 mm SL.

Distribution. Iran and Iraq: Lesser Zab, Qeshlaq, and upper Sirvan drainages.

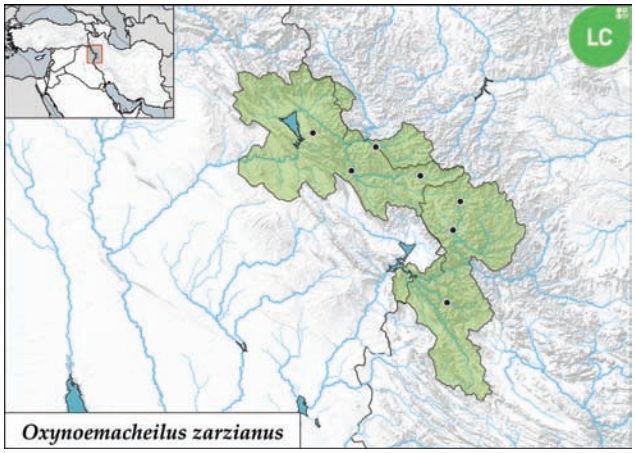
Habitat. Moderately fast-flowing and standing waters of streams, backwaters, and springs with gravel bottoms.

Biology. No data.

Conservation status. LC.

Remarks. See remarks at *O. chomanicus*.

Further reading. Freyhof & Geiger 2017 (description); Sayyadzadeh & Esmaeili 2020 (discussion of Iranian and Anatolian populations of *O. frenatus*).



River Tajan is located in humid northern Iran and is the habitat of *Paracobitis abrishamchianorum.*

Paracobitis

A slender body and a high dorsal adipose crest on the caudal peduncle distinguish *Paracobitis*. All species lack a suborbital flap or groove, and there is no sexual dimorphism in the length of the pectoral. Additionally, other genera within the family contain crested species with prominent brown bars on the posterior part of the flank (*Paraschistura*) or a stout body with a markedly different general appearance and pronounced sexual dimorphism (male with enlarged pectoral fins in *Oxynoemacheilus* and *Seminemacheilus*), a character state that absent in *Paracobitis*. Twelve species of *Paracobitis* are currently recognised, with eight of them being described after the year 2000. All species of *Paracobitis*, except subterranean, Central Asian *P. starostini*, are found in West Asia. Slender loaches with a high adipose crest, identified as *Paracobitis*, also occur in China. They belong to a very different evolutionary lineage and are placed in the genus *Homatula*. *Paracobitis smithi* from Iran is placed in its own genus (*Eidinemacheilus*). The phylogenetic position of *Paracobitis ghazniensis* from the Afghan Helmand drainage still needs to be studied. However, the species is superficially very similar to *P. rhadinaea*; thus, we treat both as conspecific. The species diversity of *Paracobitis* in West Asia is well understood, and only one additional species might await description. **Further reading.** Bănărescu & Nalbant 1966 (*N. ghazniensis*); Kottelat 2012 (*Homatula*); Freyhof et al. 2014b (revision of *Paracobitis*); Thoni & Hart 2015 (*P. boutanensis*).

Key to species of *Paracobitis* in West Asia

1a - Posterior narial opening slit-shaped.
……2
1b - Posterior narial opening roundish or ovoid.
……3

2a - Back and flank densely covered by scales; flank with many, irregularly set, small blotches or bars not organised in rows.
……*P. longicauda*
2b - Back and flank with few embedded scales or without scales; flank posteriorly with one or two rows of large, irregularly set blotches.
……*P. rhadinaea*

3a - Body completely scaleless; isolated scales on dorsal adipose crest in few individuals.
……4
3b - Body covered by scales; scales present at least on caudal peduncle.
……5

4a - Caudal rays dark-brown or black with a hyaline base and a hyaline posterior margin; caudal clearly emarginate; axillary pelvic lobe well developed with free tip.
……*P. hircanica*
4b - Caudal rays hyaline with an irregular pattern of dark-brown or black spots and elongated blotches often organised in 1–3 wide, irregularly shaped bars; caudal truncate or very slightly emarginate; axillary pelvic lobe absent or fully attached.
……*P. atrakensis*

5a - Dorsal origin situated above, behind, or very slightly in front of vertical of pelvic origin.
……6
5b - Dorsal origin situated clearly in front of vertical of pelvic origin.
……9

6a - Flank cream yellowish with large, irregularly shaped brown blotches; dorsal origin situated about one eye diameter behind pelvic origin.
……*P. basharensis*
6b - Flank brown with a fine or wide, cream-yellowish reticulate or vermiculate pattern; dorsal origin situated above or very slightly in front of vertical of pelvic origin.
……7

7a - Axillary pelvic lobe large and well developed, usually with free tip.
……*P. abrishamchianorum*
7b - Axillary pelvic lobe absent or very small and fully attached to body.
……8

8a - Caudal slightly emarginate; predorsal length 49–56 % SL; prepelvic length 50–53 % DL; outer rostral barbel 16–24 % HL; maxillary barbel 19–27 % HL.
……*P. zabgawraensis*
8b - Caudal truncate; predorsal length 56–57 %; prepelvic length 54 % SL; outer rostral barbel 24–32 % HL; maxillary barbel 27–34 % HL.
……*P. salihae*

9a - Caudal truncate.
……*P. molavii*
9b - Caudal emarginate.
……10

10a - Tube of anterior nostril reaching beyond posterior tip of posterior nostril when folded back; caudal adipose crest deep, its depth at highest point 3.3–3.8 % SL in individuals of 30–50 mm SL.
……*P. malapterura*
10b - Tube of anterior nostril not fully overlapping posterior nostril when folded back; caudal adipose crest shallow, its depth at highest point 2.1–3.2 % SL in individuals of 30–50 mm SL.
……*P. persa*

Paracobitis abrishamchianorum; Kashpel, Iran; 95 mm SL.

Paracobitis abrishamchianorum

Common name. Caspian crested loach.

Diagnosis. Distinguished from other species of *Paracobitis* by: ○ axillary pelvic lobe large and well developed, usually with free tip / ○ scales sparsely set on flank between dorsal origin and anal base, densely set on caudal peduncle / ○ posterior narial opening roundish / ○ caudal emarginate / ○ dorsal origin usually slightly behind a vertical through pelvic origin, rarely above or in front / ○ caudal rays hyaline with an irregular pattern of dark-brown or black spots and elongated blotches often organised in 1–2 wide, irregularly shaped bars. Size up to 110 mm SL.

Distribution. Iran: Tajan, Siyah, Talar, Babol, Haraz, and Kashpal in southern Caspian basin.

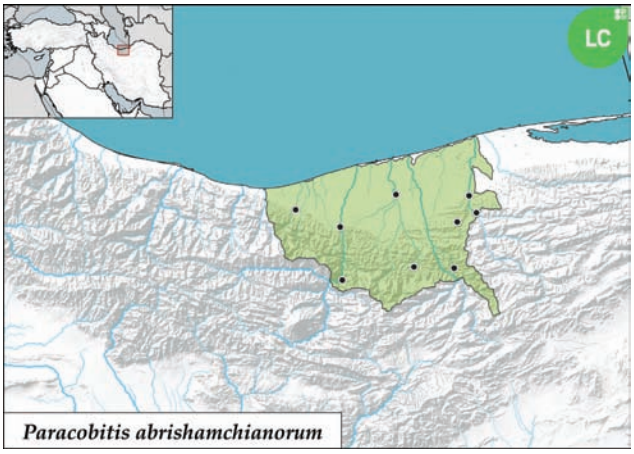
Habitat. Streams and small rivers with clear water, coarse gravel, and fast currents.

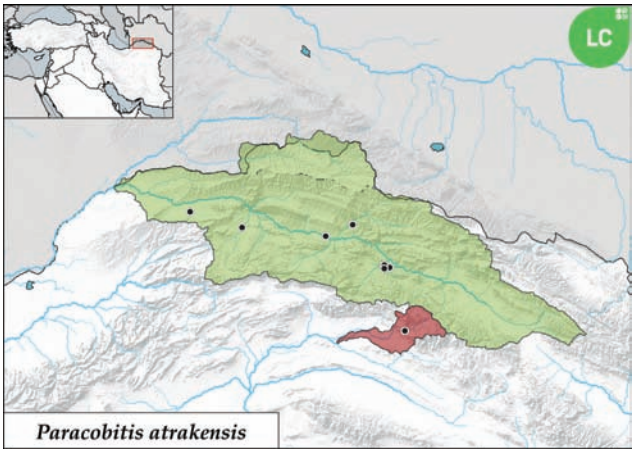
Biology. No data.

Conservation status. LC.

Remarks. Originally described as *P. abrishamchiani*, the name needed to be declined, as the species was described for two persons.

Further reading. Mousavi-Sabet et al. 2019b (description).





Paracobitis atrakensis; Atrak, Iran; ~125 mm SL.

Paracobitis atrakensis

Common name. Atrak crested loach.

Diagnosis. Distinguished from other species of *Paracobitis* by: ○ no scales on body, isolated scales on dorsal, adipose crest in few individuals / ○ caudal truncate or very slightly emarginate / ○ coarse mottled brown pattern on flank / ○ posterior narial opening roundish / ○ pelvic origin below vertical of last unbranched or first branched dorsal ray / ○ caudal rays hyaline with an irregular pattern of dark-brown or black spots and elongated blotches often organised in 1–3 wide, irregularly shaped bars / ○ no pelvic axillary lobe or lobe fully attached. Size up to 125 mm SL.

Distribution. Iran and Turkmenistan: Atrak drainage in southeast Caspian basin and Bidvaz drainage in Eastern Kavir basin.

Habitat. Streams with coarse gravel and moderate to fast-flowing water.

Biology. No data.

Conservation status. LC; extirpated from Bidvaz.

Further reading. Esmaeili et al. 2014d (description).

Paracobitis basharensis; Karun drainage; ~50 mm SL.

Paracobitis basharensis

Common name. Karun crested loach.

Diagnosis. Distinguished from other species of *Paracobitis* by: ● dorsal origin at about one eye diameter behind a vertical of pelvic origin / ○ many brown or yellowish, medium-sized, widely spaces and irregularly shaped blotches forming a mottled pattern on predorsal back and flank / ○ flank behind dorsal origin covered by small scales / ○ caudal almost truncate or slightly emarginate / ○ posterior narial opening roundish / ○ axillary pelvic lobe small. Size up to 61 mm SL, likely to grow larger.

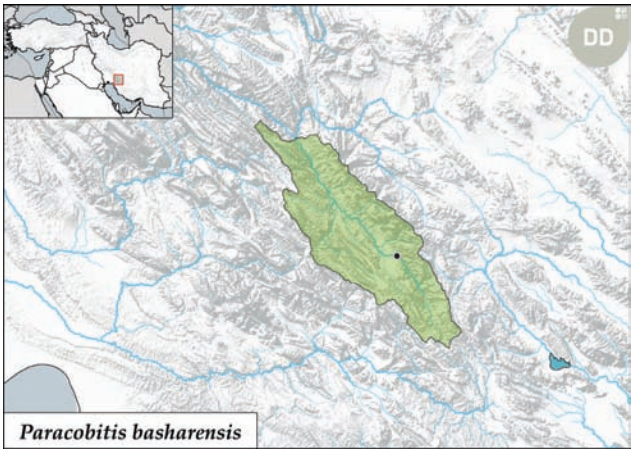
Distribution. Iran: Headwaters of Bashar in upper Karun drainage.

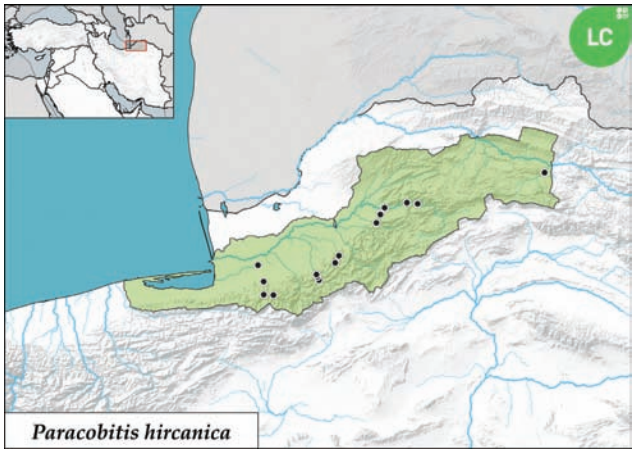
Habitat. Streams with coarse gravel and moderate to fast-flowing water.

Biology. No data. Only four individuals have been found so far.

Conservation status. DD; due to very poor knowledge of this species. May be extinct, as it has never been found again despite intensive searches.

Further reading. Freyhof et al. 2014b (description).





Paracobitis hircanica; Gorgan drainage, Iran; ~65 mm SL. © R. Patimar.

Paracobitis hircanica

Common name. Golestan crested loach.

Diagnosis. Distinguished from other species of *Paracobitis* by: ○ caudal rays dark-brown or black with a hyaline base and a hyaline posterior margin / ○ no scales on body / ○ caudal emarginate / ○ fine marbled or vermiculate brown pattern on flank / ○ posterior narial opening roundish / ○ axillary pelvic lobe well developed with free tip / ○ pelvic origin below vertical of last unbranched or first to second branched dorsal ray. Size up to 95 mm SL.

Distribution. Iran: Ziyarat, Zaringol, Madarsu, and Qarasu in Gorgan drainage and locally in Atrak.

Habitat. Fast to moderately fast-flowing streams.

Biology. Lives for 3 (males) to 4 years (females). Feeds on benthic invertebrates such as chironomids and stoneflies.

Conservation status. LC.

Remarks. *Paracobitis atrakensis* and *P. hircanica* occur in sympatry in Atrak and hybrids should be expected to occur.

Further reading. Patimar et al. 2009 (biology as *P. malapterura*); Mousavi-Sabet et al. 2015a (description).

Paracobitis longicauda; Hari drainage, Iran; ~80 mm SL. © H. Mousavi-Sabet.

Paracobitis longicauda; Hari drainage, Iran; ~120 mm SL.

Paracobitis longicauda

Common name. Central Asian crested loach.

Diagnosis. Distinguished from other species of *Paracobitis* by: ○ posterior narial opening slit-shaped / ○ body fully covered by scales / ○ irregularly set blotches or bars on flank behind dorsal base / ○ caudal deeply emarginate / ○ pelvic origin below second or third branched dorsal ray / ○ axillary pelvic lobe small / ○ caudal rays hyaline with an irregular pattern of dark-brown or black spots and elongated blotches often organised in 1–2 wide, irregularly shaped bars. Size up to 150 mm SL.

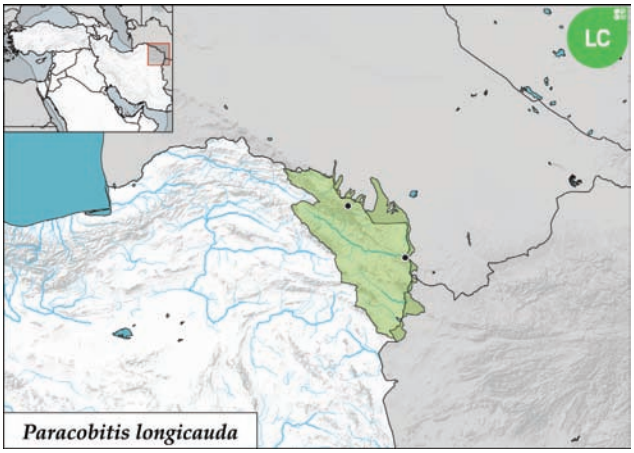
Distribution. Hari and Morghab in Iran, Afghanistan, and Turkmenistan. Amu Darya and Zeravshan in Aral basin.

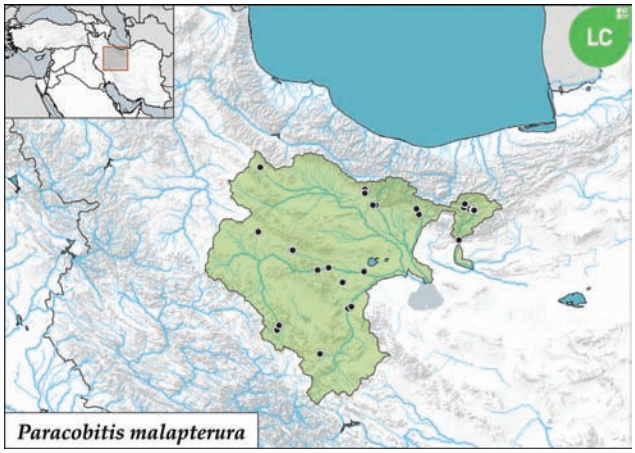
Habitat. Streams and small rivers. From lowland habitats up to high mountain streams.

Biology. Feeds on aquatic invertebrates.

Conservation status. LC; common and widespread, especially in Amu Darya drainage.

Further reading. Freyhof et al. 2014b (diagnosis, discussion of types).





Paracobitis malapterura; Namak basin, Iran, 64 mm SL.

Paracobitis malapterura; Namak basin, Iran; ~90 mm SL.

Paracobitis malapterura

Common name. Namak crested loach.

Diagnosis. Distinguished from other species of *Paracobitis* by: ○ flank behind dorsal origin or slightly anterior to dorsal base covered by scales, anterior flank naked / ○ moderately to slightly emarginate caudal / ○ posterior narial opening roundish / ○ caudal adipose crest high, its depth at highest point 3.3–3.8 SL in individuals between 30–50 mm SL / ○ tube of anterior nostril not fully overlapping posterior nostril when folded back / ○ midlateral stripe connected to blotches and saddles on caudal adipose crest / ○ caudal rays hyaline with an irregular pattern of dark-brown or black spots and elongated blotches often organised in 1–2 wide, irregularly shaped bars / ○ pelvic origin below vertical of last unbranched or first to second branched dorsal ray / ○ axillary pelvic lobe small, often indistinct / ○ tube of anterior nostril reaching beyond posterior tip of posterior nostril when folded back. Size up to 126 mm SL.

Distribution. Iran: Qom, Qara chai, Jaj, and Karaj in Lake Namak basin and Nam and Hable in Western Kavir basin.

Habitat. Fast-flowing stream with gravel bottom.

Biology. Lives up to 5 years and spawns between March and May.

Conservation status. LC.

Remarks. There are doubtful records of this species from the Urmia basin, which need to be confirmed. *Paracobitis iranica* is a synonym.

Further reading. Freyhof et al. 2014b (diagnosis, distribution); Jamali et al. 2016 (biology).

The Hari at the border between Iran and Turkmenistan was the habitat of *Paracobitis longicauda*. Recently, the river falls often dry.

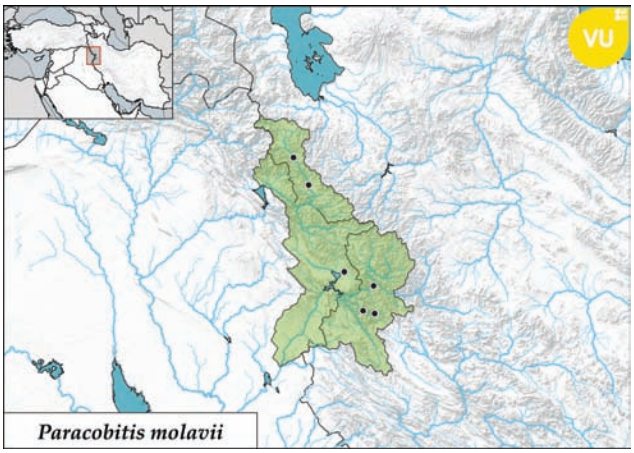
Paracobitis malapterura, MNHN 3962, B.3070, syntypes, 126 and 103 mm SL; probably collected in 1837 and "sent from Syria."

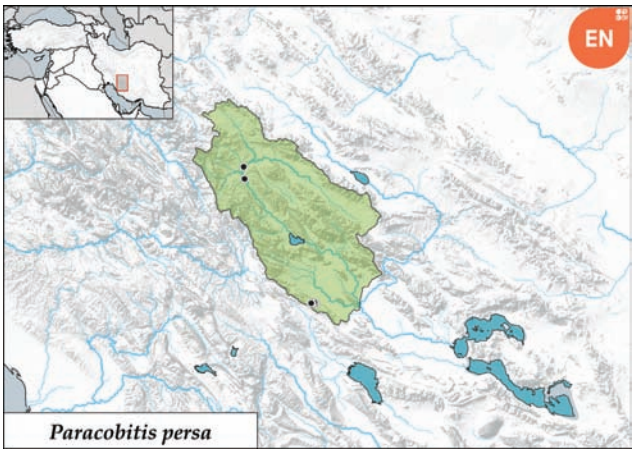
Pierre Martin Rémi Aucher-Éloy and *Paracobitis malapterura.* The provenance of a fish can occasionally be a source of considerable interest. *Cobitis malapterura* was described by Cuvier and Valenciennes (1846) based on two individuals (MNHN 3962 and B-3070) received in 1840 by the Muséum National d'Histoire Naturelle (MNHN) in Paris. Both specimens were dispatched to Paris by Rémi Aucher-Éloy, a French botanist who relocated to Constantinople (now İstanbul) to collect plants in West Asia. Between 1830 and 1838, he undertook extensive travels in West Asia. The two specimens are labelled as originating from Syria, yet Cuvier & Valenciennes (1846) note that "Mr. Aucher-Éloy (1792–1838) has sent, from Syria, a loach." The two fish were probably sent through an agent from what is now

Lebanon, as this was a common practice at the time for agents to receive material and sell it to museums and collections. The fish were obtained by MNHN in 1840, following the death of Aucher-Éloy in 1838. This suggests they were collected in the final years of Aucher-Éloy's travels. In March 1836, a significant portion of Aucher-Éloy's collections were lost in a fire in Constantinople. Consequently, the fish were probably collected after the fire.
In 1836, Aucher-Éloy undertook several expeditions to Greece and Western Anatolia (an area devoid of *Paracobitis*). In 1837, he accompanied the French zoologist M. Dufaud on a survey of northern Anatolia, traversing the shores of the north of Lake Urmia and extending as far as the Caspian Sea in Iran. In August 1837, they surveyed the western Alborz Mountain range, after which they departed the mountains on September 2. Their route took them along the lower Sefid, through Qazvin and Karaj, to Tehran, where they arrived on September 5. Dufaud died of fever in Tehran on October 21. On December 22, 1837, Aucher-Éloy continued his travels south, reaching Qom on December 24. In his account, he noted that the city was based on a small river that always had good water and never dried up. (Aucher-Éloy, 1843: 464). From Qom, he subsequently proceeded to Esfahan, and from there continued his journey southwards to Shiraz, Bandar Abbas, and later to Oman and also to Baluchistan, before returning to Esfahan, where he died.
Aucher-Éloy (1843) did not mention anything about his fish collection in his published work, but he rarely mentioned specific plants in his writings. The two loaches were the only fish sent to Paris. M. Dufaud may have collected them before he died in Tehran, as he was interested in zoological materials. Aucher-Éloy and Dufaud entered the distribution range of *Paracobitis* when they visited the Lake Namak basin after turning east from the Sefid to Tehran. Aucher-Éloy crossed rivers that were potentially inhabited by *Paracobitis* until he left Qom. It seems highly probable that Aucher-Éloy and Dufaud collected their *Paracobitis* specimens in the Namak basin and did so in the northern tributaries of the lake in the present-day Alborz province. This is because Dufaud died before they reached Qom, the next locality where they might have collected *Paracobitis*. The two syntypes, still extant at MNHN, are indistinguishable from the *Paracobitis* species found in the Lake Namak basin.
Further reading. Aucher-Éloy 1843 (travel description); Freyhof et al. 2014b (identification).

Paracobitis molavii; Sirvan drainage, Iraq; 56 mm SL.

Paracobitis molavii
Common name. Kurdistan crested loach.
Diagnosis. Distinguished from other species of *Paracobitis* by: ○ caudal truncate / ○ pelvic origin below first branched dorsal ray / ○ flank behind dorsal origin or slightly anterior to dorsal base covered by scales, anterior flank naked / ○ axillary pelvic lobe small / ○ posterior narial opening roundish. Size up to 66 mm SL, likely to grow larger.
Distribution. Iran and Iraq: Upper Zalem, Sirvan, Leyleh, and Lesser Zab drainages.
Habitat. Streams with coarse gravel and moderate to fast-flowing water.
Biology. No data.
Conservation status. VU; appears to be declining within its small range.
Further reading. Freyhof et al. 2014b (description).





Paracobitis persa; Malsosjan spring, Iran; 75 mm SL.

Paracobitis persa

Common name. Kor crested loach.

Diagnosis. Distinguished from other species of *Paracobitis* by: ○ tube of anterior nostril not fully overlapping posterior nostril when folded back / ○ caudal adipose crest very shallow, its depth at highest point 2.1–3.2 % SL / ○ flank behind dorsal origin or slightly anterior to dorsal base covered by scales, anterior flank naked / ○ pelvic origin below last unbranched dorsal ray / ○ axillary pelvic lobe small, often indistinct / ○ moderately to slightly emarginate caudal / ○ posterior narial opening roundish / ○ midlateral stripe always disconnected from blotches and saddles on caudal adipose crest. Size up to 75 mm SL.

Distribution. Iran: Beyza, Maloosjan, and Ghadamgah springs, as well as headwaters of Kor.

Habitat. Small, slow-flowing streams and springs.

Biology. No data.

Conservation status. EN; appears to be declining within its very small range.

Further reading. Freyhof et al. 2014b (description).

Paracobitis rhadinaea; Sistan basin, Iran; ~250 mm SL.

Paracobitis rhadinaea

Common name. Giant crested loach.

Diagnosis. Distinguished from other species of *Paracobitis* by: ○ posterior narial opening slit-shaped / ○ body naked or with few, usually isolated and embedded scales / ○ usually a midlateral row of irregularly set and shaped large dark-brown blotches on flank posterior to dorsal base / ○ caudal emarginate or truncate / ○ pelvic origin below vertical of first to third branched dorsal ray / ○ axillary pelvic lobe large, well developed. Size up to 250 mm SL.

Distribution. Afghanistan and Iran: Sistan basin, including Helmand drainage, Chahnime reservoirs, and Hamun Lakes.

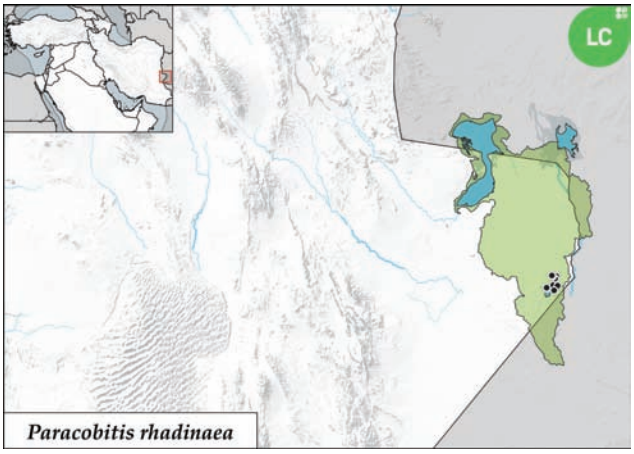
Habitat. Lakes and large rivers, but little-known about habitats.

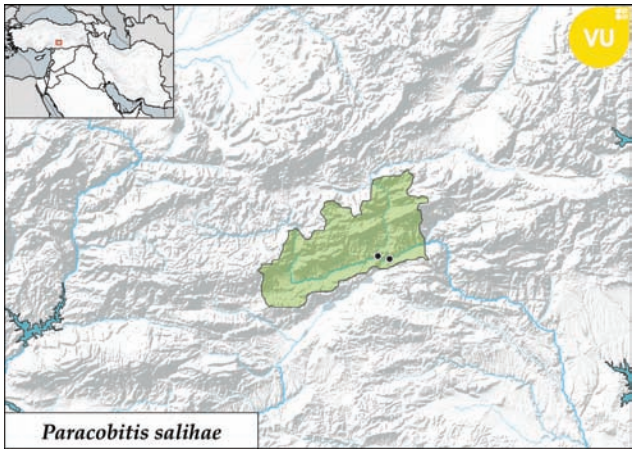
Biology. Feeds on aquatic invertebrates and small fishes.

Remarks. *Paracobitis macmahoni*, *P. ghazniensis*, and *P. vignai* are synonyms for this species. *Paracobitis rhadinaea* shows remarkable variability in colour pattern, from spots to almost patternless, in scale cover, from scales on the caudal peduncle to being completely bare, and from an emarginate to a truncate or slightly rounded caudal.

Conservation status. LC; situation in Helmand is unknown. Strongly declined in Iran due to loss of wetlands.

Further reading. Regan 1906 (description); Bănărescu & Nalbant 1966 (diagnosis); Freyhof et al. 2014b (diagnosis); Mousavi-Sabet et al. 2014 (description); Mousavi-Sabet et al. 2016b (conservation); Sayyadzadeh et al. 2019a (variability, *P. vignai*).





Paracobitis salihae; Euphrates drainage, Türkiye; 66 mm SL.

Paracobitis salihae

Common name. Euphrates crested loach.

Diagnosis. Distinguished from other species of *Paracobitis* by: ○ pelvic origin below or very slightly in front of dorsal origin / ○ caudal truncate / ○ no pelvic axillary lobe / ○ flank with a dark-brown vermiculate or marbled pattern / ○ flank behind vertical through adipose-crest origin covered with small, deeply embedded scales / ○ posterior narial opening roundish / ○ predorsal length 56–57 % / ○ prepelvic length 54 % SL / ○ outer rostral barbel 24–32 % HL / ○ maxillary barbel 27–34 % HL. Size up to 66 mm SL.

Distribution. Türkiye: Upper Göksu drainage.

Habitat. Streams with coarse gravel and moderate to fast-flowing water.

Biology. No data.

Conservation status. VU; appears to be declining within its small range. Its distribution is very small, and only two individuals have been found so far.

Further reading. Kaya et al. 2020c (description).

Paracobitis zabgawraensis

Common name. Greater Zab crested loach.

Diagnosis. Distinguished from other species of *Paracobitis* by: ● body almost plain brown with narrow reticulate yellowish pattern / ○ pelvic origin below or very slightly in front of dorsal origin / ○ caudal slightly emarginate / ○ no or a very small pelvic axillary lobe / ○ flank behind dorsal origin covered with small, deeply embedded scales / ○ posterior narial opening roundish. / ○ predorsal length 49–56 % SL / ○ prepelvic length 50–53 % SL / ○ outer rostral barbel 16–24 % HL / ○ maxillary barbel 19–27 % HL. Size up to 77 mm SL.

Distribution. Türkiye: Upper Yanarsu, Botan, and Nerduş drainages; Greater Zab drainage in Türkiye and Iraq.

Habitat. Streams with coarse gravel and moderate to fast-flowing water.

Biology. No data.

Conservation status. LC.

Further reading. Freyhof et al. 2014b (description); Kaya et al. 2020c (distribution).

Paracobitis zabgawraensis; headwater of Great Zab, Iraq; 73 mm SL.

The Nerduş in Türkiye is the habitat of *Paracobitis zabgawraensis*, *Turcinoemacheilus ekmekciae*, *Glyptothorax daemon*, *Oxynoemacheilus kentritensis*, *O. marunensis* and many other stream fishes.

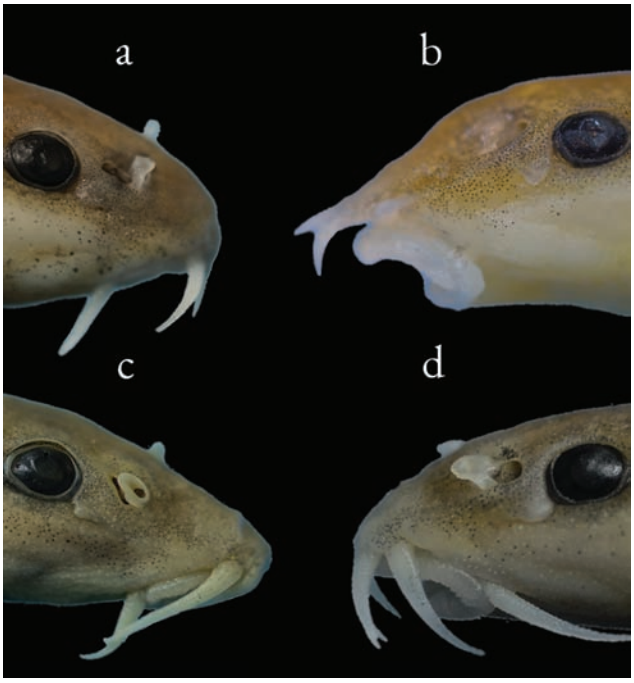
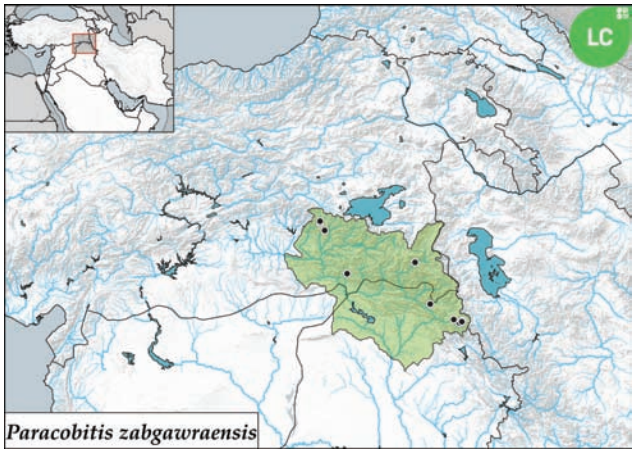


Figure 54. Suborbital flap and groove in some *Paraschistura*: a, *P. nielseni*, 46 mm SL; b, *P. ilamensis*, 38 mm SL; c, *P. hormuzensis*, 45 mm SL; b, *P. susiani*, 34 mm SL.

Paraschistura

Paraschistura is a poorly known group of medium-sized or small loaches, distributed from the Karkheh in Iran throughout southern Iran and Pakistan to the Indus and the Hari, Morghab, and Helmand in Afghanistan, Iran, Pakistan, and Turkmenistan. It is anticipated that some species of India's large loach diversity may belong to this genus. The genus *Paraschistura* was first described in 2009, and 24 species are currently recognised, 16 of which are found in West Asia. The genus *Metaschistura* is a synonym. Several osteological characters diagnose *Paraschistura*. In Iran, all species except *P. aredvii*, *P. nielseni*, *P. ilamensis,* and *P. susiani* can be readily identified by a prominent black spot at the base of the first dorsal rays. The diversity of *Paraschistura* species in Iran has been well-studied, but knowledge of diversity in Afghanistan, Pakistan, and Turkmenistan is very poor. It is anticipated that further unidentified species will be discovered in these regions. **Further reading.** Mirza et al. 1981 (Pakistan); Prokofiev 2009 (description); Freyhof et al. 2015 (revision in West Asia, *Metaschistura* synonym, phylogeny).



Key to species of *Paraschistura* in Iran

1a - Body completely scaleless.
……2
1b - Scales present at least on caudal peduncle; scales on flank and caudal peduncle often isolated and deeply embedded.
……4

2a - Flank with marbled colour pattern without distinct bars or with bars dissociated in a row of midlateral blotches and saddles on back or with 11–14 irregularly shaped and set dark-brown bars on flank, usually dissociated into two adjacent narrow bars or individual bars with a central open space.
……*P. turcmenica*
2b - Flank with 10–12 regularly shaped and set, dark-brown bars.
……3

3a - Body depth 11–15 % SL; pelvic origin below vertical of first branched dorsal ray; no dorsal adipose crest.
……*P. kessleri*
3b - Body depth 14–17 % SL; pelvic origin shortly before vertical of first branched dorsal ray; a short dorsal adipose crest.
……*P. lindbergi*

4a - Lateral line complete or almost complete, reaching to caudal base.
……5
4b - Lateral line incomplete, reaching a point before caudal base.
……7

5a - Caudal peduncle with a prominent dorsal adipose crest supported by 22–25 procurrent caudal rays; snout blunt.
……*P. cristata*
5b - Caudal peduncle without dorsal, adipose crest, if with crest, then without procurrent caudal rays; snout long and pointed.
……6

6a - Processus dentiformis absent in upper jaw.
……*P. alta*
6b - Processus dentiformis in upper jaw small and pointed.
……*P. makranensis*

7a - Predorsal flank scaleless, scales present on caudal peduncle, also on back in populations from Sirjan and Jazmurian.
……8
7b - Predorsal flank and back covered by scales.
……9

8a - Pelvic origin situated behind vertical of dorsal origin.
……*P. abdolii*
8b - Pelvic origin situated in front of or below vertical of dorsal origin.
……*P. kermanensis*

9a - Suborbital flap or groove absent in male.
……10
9b - Suborbital flap or groove present in male.
……13

10a - Dorsal origin situated in front of vertical of pelvic origin.
……*P. aredvii*
10b - Dorsal origin situated above or very slightly behind of vertical of pelvic origin.
……11

11a - Distance between anus and tip of pelvic 4–7 % SL.
……*P. naumanni*
11b - Distance between anus and tip of pelvic 7–10 % SL.
……*P. delvarii*

12a - Suborbital groove present in male.
……*P. nielseni*
12b –Suborbital flap present in male.
……13

13a - Suborbital flap, triangular, not overlapping horizontal slit below flap; lateral line usually reaching beyond dorsal base; bold black spot at base of first dorsal rays; snout pointed.
……14

13b - Suborbital flap roundish or elongate, overlapping slit below flap; lateral line not reaching or reaching to dorsal base; very faint black spot at base of first dorsal rays or spot absent; snout blunt.
……15

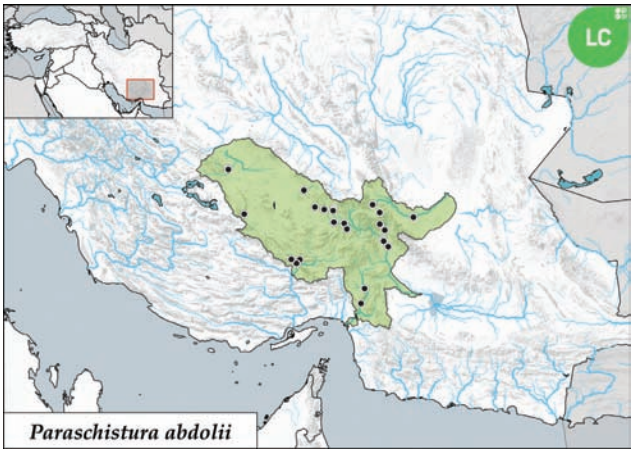
14a - Flank with 11–18 dark-brown bars; pelvic reaching to about 1–2 eye diameter in front of anus.
……*P. bampurensis*
14b - Flank with 7–8 dark-brown bars; pelvic reaching to or beyond anus, to anal origin in some individuals.
……*P. hormuzensis*

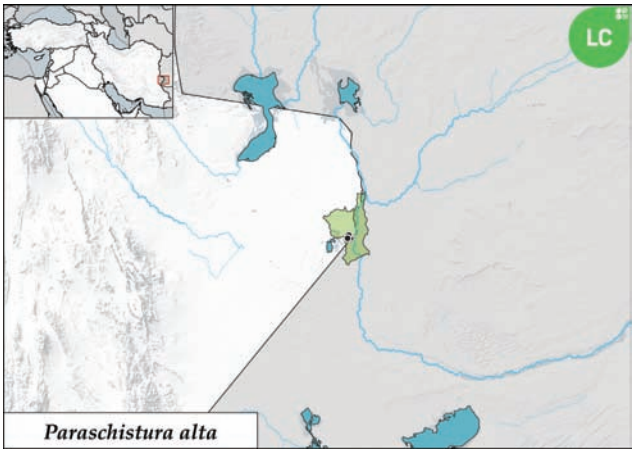
15a - Male with an elongated suborbital flap pointed downward; caudal–peduncle depth 1.6–1.8 times longer than deep.
……*P. ilamensis*
15b - Male with a short, blunt, and roundish suborbital flap; caudal–peduncle depth 1.4–1.6 times longer than deep.
……*P. susiani*

Paraschistura abdolii; Baft, Iran; ~65 mm SL.

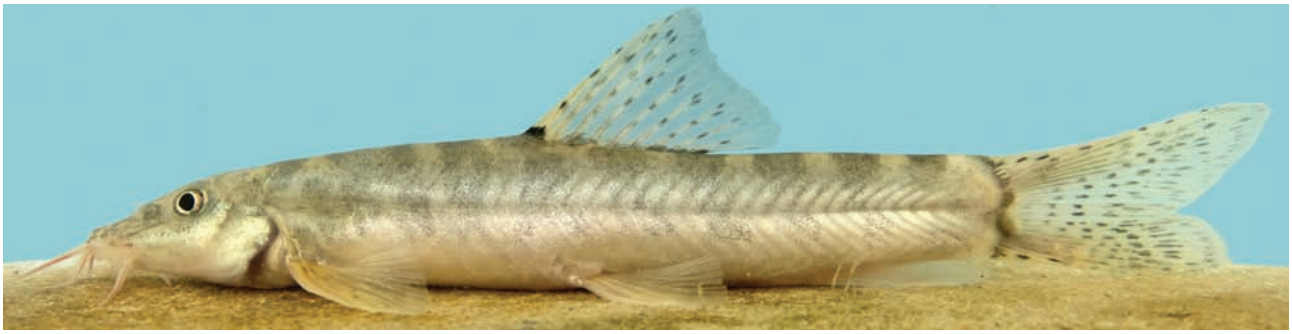
Paraschistura abdolii
Common name. Sirjan loach.
Diagnosis. Distinguished from other species of *Paraschistura* in West Asia by: ○ caudal peduncle covered by deeply embedded, often isolated scales, in some populations, scales also present immediately in front of dorsal origin / ○ pelvic origin below first or second branched dorsal ray / ○ lateral line incomplete / ○ caudal emarginate / ○ 7½ branched dorsal rays / ○ 11–19 regularly or irregularly shaped pale- or dark-brown bars on flank, often dissociated into a marmorate pattern / ○ suborbital flap or groove absent in male / ○ dorsal adipose keel usually absent, if present, then without procurrent rays / ○ predorsal distance 49–53 % SL / ○ body depth at dorsal origin 10–14 % SL. Size up to 65 mm SL.
Distribution. Iran: Haji Abad and upper Minhab in Persian Gulf basin, Baft in Sirjan basin, and western tributaries of Jazmurian and Lut basins.
Habitat. Fast to slow-flowing streams with gravel substrate.
Biology. No data.
Conservation status. LC.
Remarks. Individuals from the Jazmurian and Sirjan basins lack dorsal scales, as do most individuals from the Kol drainage. In Kol drainage, there are some individuals that have scales on the dorsum, just in front of dorsal origin.
Further reading. Freyhof et al. 2015 (description).

Paraschistura abdolii; Kol drainage, Iran; ~40 mm SL. © K. Borkenhagen.





Stream Baft in Sirjan basin is the habitat of *Paraschistura abdolii* and *Capoeta saadii*.



Paraschistura alta; Sistan basin, Iran; ~80 mm SL.

Paraschistura alta

Common name. Helmand banded loach.

Diagnosis. Distinguished from other species of *Paraschistura* in West Asia by: ● processus dentiformis in upper jaw absent / ○ lateral line complete or almost complete (incomplete in Iranian fish), reaching to caudal base / ○ flank and caudal peduncle covered by scales / ○ snout long and pointed / ○ caudal forked / ○ 7½ or 8½ branched dorsal rays / ○ pelvic origin below second or third branched dorsal ray / ○ no dorsal adipose crest / ○ suborbital flap or groove absent in male / ○ a small, bold black spot at base of first dorsal rays / ○ black bar at caudal base faint / ○ 9–10 regularly set and shaped pale-brown or grey bars, absent or very faint on flank in front of dorsal origin / ○ caudal–peduncle depth 0.9–1.2 times longer than deep / ○ body depth at dorsal origin 12–20 % SL. Size up to 112 mm SL.

Distribution. Afghanistan and Iran: Sistan basin, including Helmand drainage, Chahnime reservoirs, Hamun Lakes, and Zehak.

Habitat. Large and medium-sized rivers.

Biology. No data.

Conservation status. LC; situation in Helmand unknown.

Remarks. This species was originally described as having a complete or almost complete lateral line, which is incomplete in fish recorded from Iran. Whether this species has a suborbital groove or flap in males remains unknown; it is absent in the few individuals examined.

Further reading. Nalbant & Bianco 1998 (description); Jouladeh-Roudbar et al. 2015c (record from Iran).

The Hamoun: From wetlands to wastelands. The Helmand rises in the Hindu Kush mountain range, situated west of Kabul in Afghanistan. It crosses the Dashti Margo desert before reaching the Hamoun or Sistan Lake region, located at the border between Afghanistan and Iran. The Hamoun wetlands, which form a true oasis in the middle of hundreds of kilometers of arid plains, are a testament to the river's influence. The marshes and lakes of the Hamoun wetlands supported a diverse range of wildlife and were an important stopover for migrating birds. Furthermore, the wetlands were the source of livelihood for thousands of people who depended on agriculture and fishing in the area. However, many factors, including improved irrigation practice, urban development, dams, and drought, led to a gradual decline in the wetlands since the 1970s. Since the 1990s, the Hamoun wetlands have deteriorated rapidly due to the expansion of irrigation, coupled with one of the worst droughts ever recorded. One of the major dams blocking water to the Hamoun wetlands is the Kajaki dam, located in central Afghanistan. The Taliban government closed the sluices of the dam in 1998 after a dispute with Iran. At the same time, severe droughts massively decreased the precipitation in the Hindu Kush. Until 2001, the Hamoun wetlands had completely dried out. The post-Taliban government in Kabul agreed to open the sluices again in late October, allowing water to reach the Hamoun wetlands again. The new Taliban government allows surplus water to flow during high floods. Much work still needs to be done to restore the wetlands, including ensuring adequate water flow to sustain the ecosystem. When the dam is opened, fish from Afghanistan, including the loach *Paraschistura alta*, are washed downriver. **Further reading.** Rashki et al. 2013 (Sistan Oasis)

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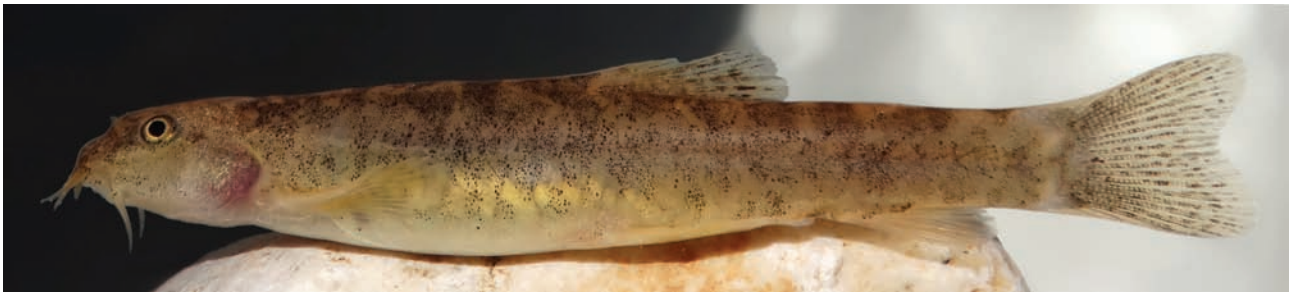


Paraschistura aredvii; Sarab-e Bahram spring, Iran; 39 mm SL.

Paraschistura aredvii

Common name. Zohreh loach.

Diagnosis. Distinguished from other species of *Paraschistura* in West Asia by: ○ pelvic origin below first or second branched dorsal ray / ○ lateral line incomplete / ○ suborbital groove absent in male / ○ back and flank behind dorsal origin covered by scales / ○ 7–9 irregularly shaped blotches or bars on flank, wider than interspaces / ○ dorsal adipose crest absent / ○ snout blunt / ○ caudal emarginate / ○ 7½ branched dorsal rays / ○ caudal–peduncle depth 1.4–1.7 times longer than deep / ○ body depth at dorsal origin 14–17 % SL. Size up to 56 mm SL.

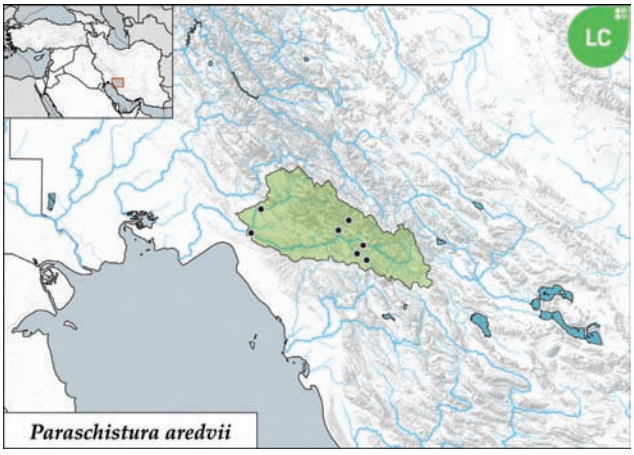
Distribution. Iran: Fahlian, Shiv and Zohreh drainages.

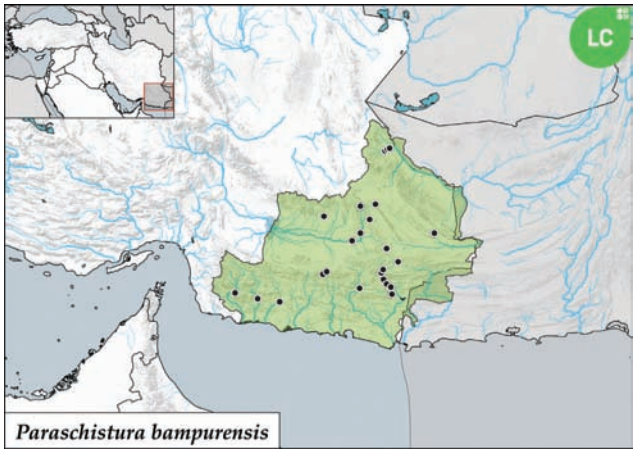
Habitat. Fast to slow-flowing streams with gravel substrate.

Biology. No data.

Conservation status. LC.

Further reading. Freyhof et al. 2015 (description).





Paraschistura bampurensis; Sarbaz, Iran; ~45 mm SL.

Paraschistura bampurensis

Common name. Bampur loach.

Diagnosis. Distinguished from other species of *Paraschistura* in West Asia by: ○ snout pointed / ○ flank and back covered by scales / ○ 11–18 dark-brown bars on flank usually narrower than interspaces, especially on caudal peduncle / ○ lateral line incomplete, usually reaching beyond dorsal base, beyond anal origin in some individuals / ○ caudal forked or deeply emarginate / ○ suborbital flap present in male, triangular, not overlapping horizontal slit below flap / ○ a bold black spot at base of first dorsal rays / ○ dorsal adipose crest absent / ○ usually 8½ branched dorsal rays / ○ pelvic reaching to about 1–2 eye diameter in front of anus / ○ pelvic origin below first or second branched dorsal ray. Size up to 60 mm SL.

Distribution. Iran and Pakistan: Mashkid and Khash drainages, eastern tributaries of Jazmurian basin, Sarhe, Sarbaz, and Bahukalat drainages in Makran region.

Habitat. Moderately to rapidly flowing freshwater streams in mountain and desert landscapes.

Biology. No data.

Conservation status. LC.

Further reading. Freyhof et al. 2015 (diagnosis).

Paraschistura cristata; Hari drainage, Iran; 59 mm SL. © H. Mousavi-Sabet.

Paraschistura cristata

Common name. Khorasan loach.

Diagnosis. Distinguished from other species of *Paraschistura* in West Asia by: ● prominent dorsal adipose crest supported by 22–25 procurrent caudal rays / ○ lateral line complete or almost complete, reaching to caudal base / ○ snout blunt / ○ flank completely covered by scales / ○ pelvic reaching to or slightly in front of anus / ○ a bold black spot at base of first dorsal rays / ○ 9–13 brown bars usually faded or absent on flank in front of dorsal origin, regularly shaped and wider than interspaces or dissociated into blotches and irregularly shaped bars; rarely without bars / ○ body with 4–8 wide dark-brown bars behind dorsal origin / ○ usually a complete black bar at caudal base / ○ pelvic origin below vertical of second or third branched dorsal ray / ○ suborbital groove or flap absent in male / ○ caudal emarginate / ○ usually 8½, rarely 7½ branched dorsal rays. Size up to 70 mm SL.

Distribution. Eastern Kavir basin (Iran), Hari drainage in Afghanistan, Iran, Turkmenistan, Morghab, and Kopetdag in Karakum Desert basin (Turkmenistan). Probably more widespread in Turkmenistan.

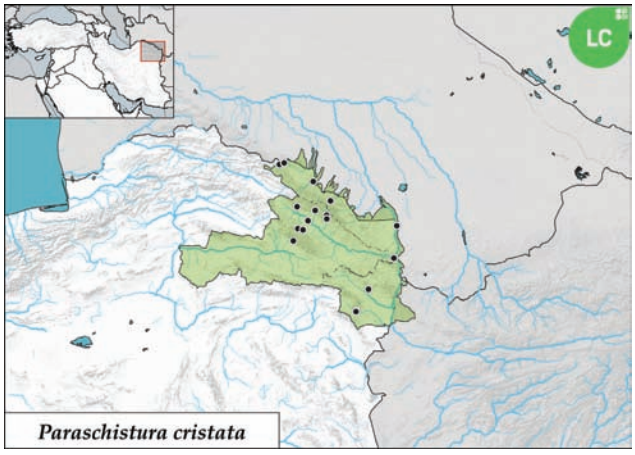
Habitat. Fast to slow-flowing streams with gravel substrate.

Biology. Lives up to 4 years, and spawns March–June.

Conservation status. LC.

Remarks. Previously placed in the monotypic genus *Metaschistura*.

Further reading. Prokofiev 2009 (placement in *Metaschistura*); Freyhof et al. 2015 (diagnosis).



Paraschistura delvarii; Mond drainage, Iran; ~45 mm SL.

Paraschistura delvarii

Common name. Qareh Aqaj loach.

Diagnosis. Distinguished from other species of *Paraschistura* in West Asia by: ○ dorsal origin situated above, or very slightly behind vertical of pelvic origin / ○ suborbital flap or groove absent in male / ○ flank and back completely covered by scales / ○ lateral line incomplete / ○ no dorsal adipose crest / ○ caudal emarginate / ○ caudal–peduncle depth 1.2–1.9 times longer than deep / ○ snout blunt / ○ 7½ branched dorsal rays / ○ very variable colour pattern of irregularly shaped and set, often faded bars and blotches on flank / ○ a bold black or brown spot at base of first dorsal rays / ○ an irregularly shaped black bar at caudal base in some populations / ○ predorsal distance 52–56 % SL / ○ distance between tip of pelvic and anus 7–11 % SL. Size up to 51 mm SL.

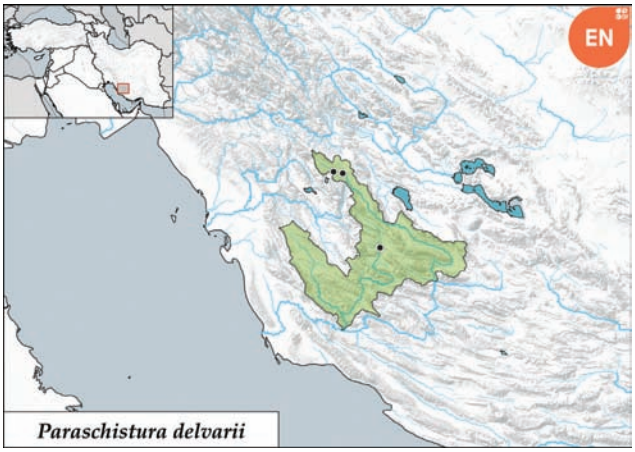
Distribution. Iran: Qareh Aqaj and Firozabad in Mond drainage.

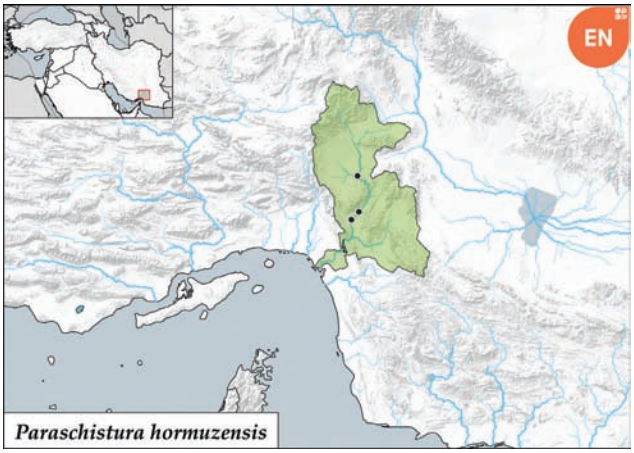
Habitat. Fast to slow-flowing streams with gravel substrate.

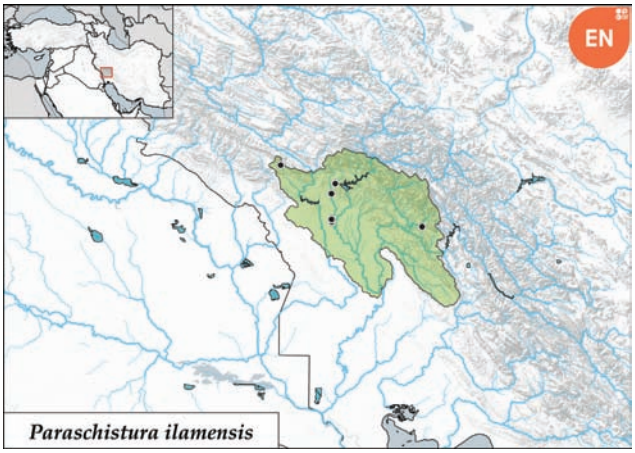
Biology. No data.

Conservation status. EN; appears to be declining within its very small range.

Further reading. Mousavi-Sabet & Eagderi 2015 (description); Sayyadzadeh et al. 2018b (description).







Paraschistura hormuzensis; Minhab drainage, Iran; ~45 mm SL.

Paraschistura hormuzensis
Common name. Minab loach.
Diagnosis. Distinguished from other species of *Paraschistura* in West Asia by: ○ snout pointed / ○ suborbital flap present in male, triangular, not overlapping horizontal slit below flap / ○ caudal forked / ○ lateral line incomplete / ○ 7–8 dark-brown bars on flank / ○ pelvic reaching to or beyond anus, to anal origin in some individuals / ○ body fully covered by scales / ○ body depth at dorsal origin 13–18 % SL / ○ no dorsal adipose crest / ○ a bold black spot at base of first dorsal rays / ○ usually a complete black bar at caudal base / ○ pelvic origin below first or second branched dorsal ray / ○ 7½ branched dorsal rays. Size up to 52 mm SL.
Distribution. Iran: Minab drainage.
Habitat. Fast to slow-flowing streams. Usually in shallow areas and on gravel substrate.
Biology. No data.
Conservation status. EN; appears to be declining within its very small range.
Further reading. Freyhof et al. 2015 (description).

Paraschistura ilamensis; Karkheh drainage, Iran; ~55 mm SL. © S. Vatandoust.

Paraschistura ilamensis
Common name. Ilam banded loach.
Diagnosis. Distinguished from other species of *Paraschistura* in West Asia by: ○ suborbital flap roundish or elongate, pointed downward, overlapping slit below flap / ○ snout blunt / ○ back and flank fully covered by scales / ○ pelvic origin below first branched dorsal ray / ○ 7–13 dark-brown, irregularly shaped and set, often faded bars on flank / ○ pelvic reaching to a point about 1.0–2.0 eye diameter in front of anus / ○ no dorsal adipose crest / ○ lateral line incomplete / ○ caudal emarginate / ○ caudal–peduncle depth 1.6–1.8 times longer than deep / ○ a bold or very faint black spot at base of first dorsal rays / ○ usually a complete black bar at caudal base / ○ 7½ branched dorsal rays / ○ body depth at dorsal origin 14–15 % SL. Size up to 55 mm SL.
Distribution. Iran: Bala and Cholvar are two tributaries of Dez in Karun drainage and Siah Gav in Karkheh drainage.
Habitat. Fast to slow-flowing streams with gravel substrate.
Biology. No data.
Conservation status. EN; seems to be declining within its very small range.
Remarks. *Paraschistura pasatigris* is a synonym.
Further reading. Freyhof et al. 2015 (description as *P. pasatigris*); Vatandoust & Eagderi 2015 (description); Eagderi et al. 2019b (priority).

River Rodan in Iran is the habitat of *Paraschistura hormuzensis*, *Capoeta anamisensis*, *Garra persica* and *Cyprinion microphthalmum.*

Paraschistura kermanensis; Bidkhoon drainage, Iran; 65 mm SL.

Paraschistura kermanensis

Common name. Kerman loach.

Diagnosis. Distinguished from other species of *Paraschistura* in West Asia by: ○ dorsal origin situated above, or very slightly behind vertical of pelvic origin / ○ lateral line incomplete / ○ caudal peduncle covered by scales, no scales on predorsal back and middle and anterior part of flank / ○ suborbital flap or groove absent in male / ○ very variable colour pattern of 4–21 irregularly shaped and set, often faded bars and blotches on flank / ○ a bold black spot at base of first dorsal rays / ○ an irregularly shaped black bar at caudal base in some populations / ○ no dorsal adipose crest / ○ caudal emarginate / ○ 7½ branched dorsal rays / ○ snout blunt / ○ predorsal distance 53–56 % SL / ○ caudal–peduncle depth 1.1–1.4 times longer than deep. Size up to 68 mm SL.

Distribution. Iran: Bidkhoon in Kerman basin.

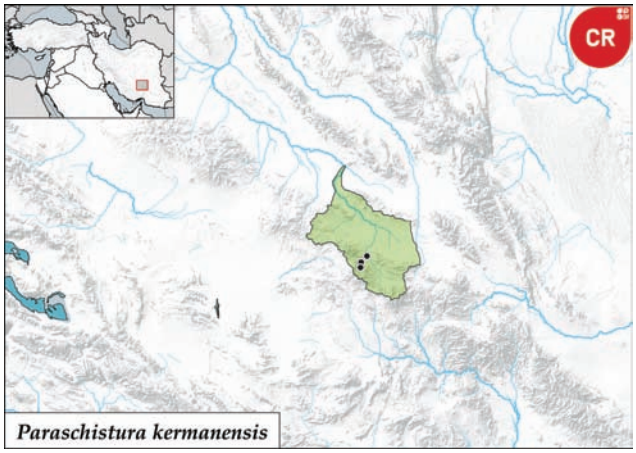
Habitat. High altitude (about 2400 m), clear, fast to slow-flowing streams with gravel substrate.

Biology. No data.

Conservation status. CR; known only from a small population in a very small area. Desiccation of rivers is a major threat, and it may be at the edge of extinction.

Remarks. This species is superficially similar to *P. abdolii,* and both occur nearby.

Further reading. Sayyadzadeh et al. 2019b (description).



Paraschistura kessleri; Mashkid basin, Iran; ~35 mm SL. © H. Mousavi-Sabet.

Paraschistura kessleri

Common name. Pishin Lora loach.

Diagnosis. Distinguished from other species of *Paraschistura* in West Asia by: ○ 10–12 regularly shaped and set dark-brown bars on flank, as wide as interspaces / ○ scales completely absent / ○ body depth 11–15 % SL / ○ pelvic reaching to about 1–2 eye diameter in front of anus / ○ suborbital flap or groove absent in male / ○ a bold black spot at base of first dorsal rays / ○ caudal emarginate / ○ snout blunt / ○ no dorsal adipose crest / ○ pelvic origin below first branched dorsal ray / ○ usually 7½ branched dorsal rays. Size up to 45 mm SL.

Distribution. Pishin Lora drainage in Pakistan and Afghanistan and Mashkid basin in Iran and Pakistan.

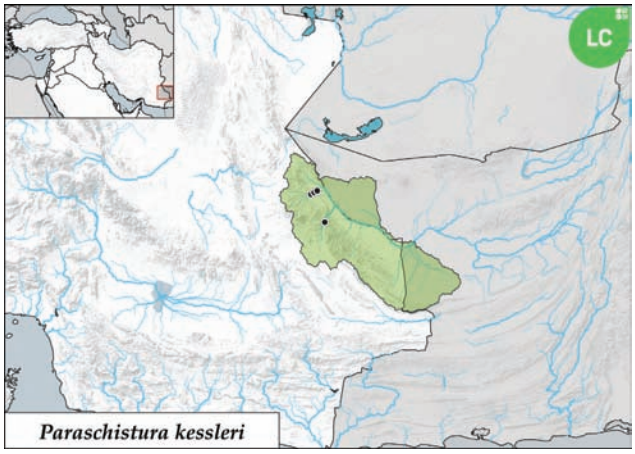
Habitat. Moderately to rapidly flowing freshwater streams in mountain and desert landscapes.

Biology. No data.

Conservation status. LC.

Remarks. The records from Bodo in Pakistan probably refer to *P. lindbergi*, and both occur in sympatry in Mashkid basin. *Nemacheilus sargadensis* is a synonym of *P. kessleri*. *Paraschistura turcomana* is another species without scales. It has been described from the Kushka in Morghab drainage in Turkmenistan. Like the Hari, Morghab is an endorheic basin that originates in Afghanistan and ends in Karakum Desert, not far from the inner estuary of Hari.

Further reading. Freyhof et al. 2015 (diagnosis).



Paraschistura lindbergi; Mashkid basin, Iran; ~40 mm SL.

Paraschistura lindbergi

Common name. Farah banded loach.

Diagnosis. Distinguished from other species of *Paraschistura* in West Asia by: ○ 10–12 regularly shaped and set dark-brown bars on flank, wider or as wide as interspaces / ○ scales completely absent / ○ body depth 14–17 % SL / ○ suborbital flap or groove absent in male / ○ a bold black spot at base of first dorsal rays / ○ caudal emarginate / ○ snout blunt / ○ a short dorsal adipose crest / ○ pelvic origin shortly in front of first branched dorsal ray / ○ usually 7½ branched dorsal rays. Size up to 58 mm SL.

Distribution. Afghanistan: Farah drainage in Sistan basin; Iran and Pakistan: Mashkid basin; Pakistan: Unar and Loralai in Indus drainage.

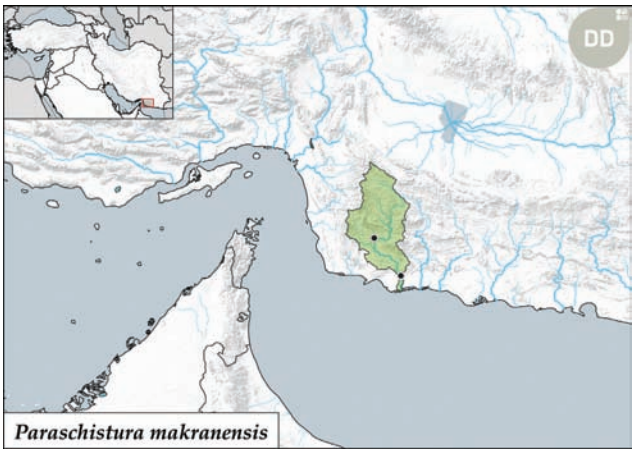
Habitat. Streams with moderate to fast-flowing freshwater in mountainous desert landscapes.

Biology. No data.

Conservation status. NE; due to the very poor knowledge about this species.

Remarks. This species is poorly known and has not been studied since its description in 1965. The Farah, Mashkid, and Indus populations seem unlikely to be conspecific. *Paraschistura lindbergi* and *P. kessleri* occur in sympatry in Mashkid basin.

Further reading. Bănărescu & Mirza 1965 (description); Mirza et al. 1981 (distribution in Pakistan).



Paraschistura makranensis; Jegin drainage, Iran; 35 mm SL. © H. Mousavi-Sabet.

Paraschistura makranensis

Common name. Jegin loach.

Diagnosis. Distinguished from other species of *Paraschistura* in West Asia by: ● flank plain brown or slightly mottled / ○ lateral line complete or almost complete, reaching to caudal base / ○ caudal emarginate / ○ 7½ branched dorsal rays / ○ processus dentiformis in upper jaw small and pointed / ○ pelvic origin situated below second or third branched dorsal ray / ○ no dorsal adipose crest on caudal peduncle without procurrent rays / ○ suborbital flap present in male / ○ small, isolated, deeply embedded scales restricted to caudal peduncle and flank below and behind dorsal origin, no scales on predorsal back and flank / ○ snout pointed / ○ a bold black spot at base of first dorsal rays / ○ 2–3 black blotches at caudal base / ○ caudal–peduncle depth 1.2–1.4 times longer than deep. Size up to 40 mm SL.

Distribution. Iran: Upper Jegin drainage.

Habitat. Fast to slow-flowing streams with gravel substrate.

Biology. No data.

Conservation status. DD; due to the very poor knowledge of this species.

Further reading. Eagderi et al. 2019b (description).

Paraschistura naumanni; Kol drainage, Iran; ~40 mm SL.

Paraschistura naumanni; Golabi spring, Iran; ~45 mm SL.

Paraschistura naumanni

Common name. Persian banded loach.

Diagnosis. Distinguished from other species of *Paraschistura* in West Asia by: ○ dorsal origin situated above, or very slightly behind vertical of pelvic origin / ○ suborbital flap or groove absent in male / ○ back and flank fully covered by scales / ○ snout blunt / ○ absence of a long dorsal adipose crest / ○ lateral line incomplete / ○ caudal emarginate / ○ 7½ branched dorsal rays / ○ very variable colour pattern of irregularly shaped and set, often faded bars and blotches on flank / ○ pelvic reaching to a point about 1.0–2.0 eye diameter in front of anus / ○ no dorsal adipose crest / ○ caudal–peduncle depth 1.7–2.0 times longer than deep / ○ a bold or faint black spot at base of first dorsal rays in some populations / ○ a complete black bar at caudal base in some populations / ○ distance between anus and tip of pelvic 4–7 % SL. Size up to 51 mm SL.

Distribution. Iran: Kor basin and Kol and Mond drainages.

Habitat. Fast to slow-flowing streams and springs with gravel substrate.

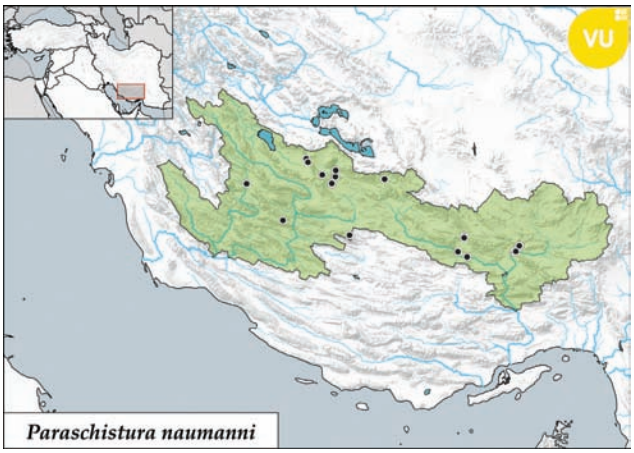
Biology. No data.

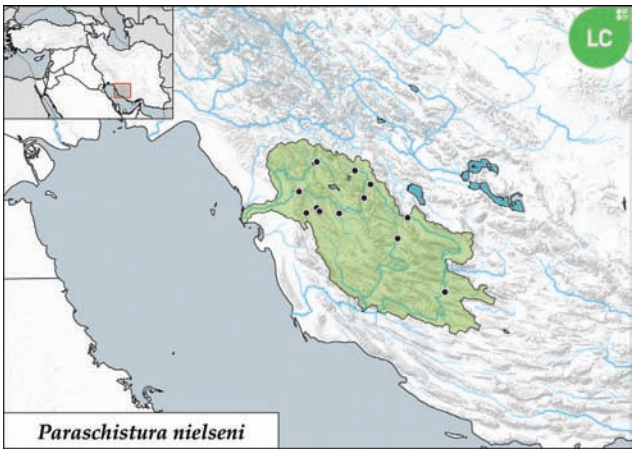
Conservation status. VU; appears to be declining in its small range, where stream desiccation is a major challenge.

Remarks. In the Kol drainage, *P. naumanni* occurs in sympatry with *P. abdolii* and *P. delvarii*. Whether all three species occur in syntopy or are geographically separated within Kol drainage remains unclear. *Oxynoemacheilus persa* is another loach species found in Mond. *Paraschistura naumanni* shows a large variability in colour patterns within and between different populations, and fish from other sites may look very different.

Further reading. Freyhof et al. 2015 (description).

Spring Golabi in Iran is the habitat of *Paraschistura naumanni*, *Esmaeilius darabensis*, *Mystus cyrusi*, and other regional endemic species.





Paraschistura nielseni; Helleh drainage, Iran; ~45 mm SL.

Paraschistura nielseni

Common name. Helleh loach.

Diagnosis. Distinguished from other species of *Paraschistura* in West Asia by: ○ 6–11 regularly set and shaped dark-or pale-brown or grey bars, wider than interspaces, absent or very faint on flank in front of dorsal origin / ○ suborbital groove present in male / ○ a faint dark-grey spot at base of first dorsal rays / ○ black bar at caudal base faint or dissociated o two blotches, rarely complete / ○ snout blunt / ○ no dorsal adipose crest / ○ lateral line incomplete / ○ caudal deeply emarginate / ○ back and flank fully covered by scales / ○ body depth at dorsal origin 15–17 % SL / ○ pelvic reaching to about 1–2 eye diameters in front of anus / ○ pelvic origin below first or second branched dorsal ray / ○ 7½ branched dorsal rays. Size up to 52 mm SL.

Distribution. Iran: Helleh and Mond drainages.

Habitat. Fast to slow-flowing streams and springs with gravel substrate.

Biology. No data.

Conservation status. LC.

Further reading. Nalbant & Bianco 1998 (description); Freyhof et al. 2015 (diagnosis).

Paraschistura susiani; Marun drainage, Iran; ~50 mm SL.

Paraschistura susiani

Common name. Khuzestan banded loach.

Diagnosis. Distinguished from other species of *Paraschistura* in West Asia by: ○ suborbital present in male, short, blunt, and roundish / ○ back and flank fully covered by scales / ○ snout blunt / ○ no dorsal adipose crest / ○ lateral line incomplete / ○ caudal emarginate / ○ pelvic origin below first or second branched dorsal ray / ○ pelvic reaching to about 0.5–1 eye diameters in front of anus / ○ 7½ branched dorsal rays / ○ body depth at dorsal origin 14–16 % SL / ○ 7–10, usually regularly set and shaped, dark-or pale- brown or grey bars, wider than interspaces, absent or very faint on flank in front of dorsal origin / ○ black or brown bar at caudal base / ○ a bold or very faint dark-grey spot at base of first dorsal rays / ○ caudal peduncle 1.4–1.6 times longer than deep. Size up to 50 mm SL.

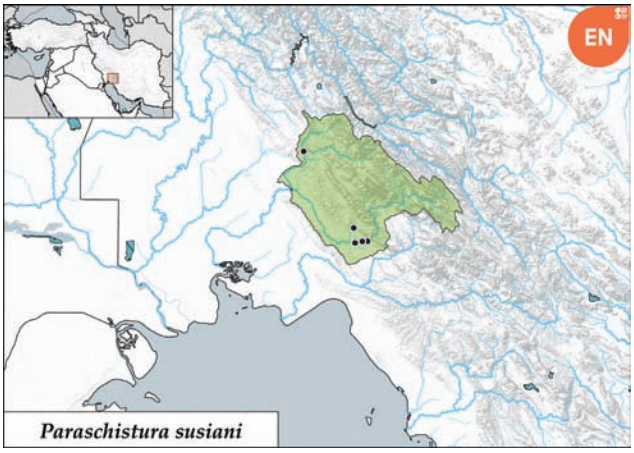
Distribution. Iran: Ab-e Ala and Zard in Jarahi drainage and Shur in Karun drainage.

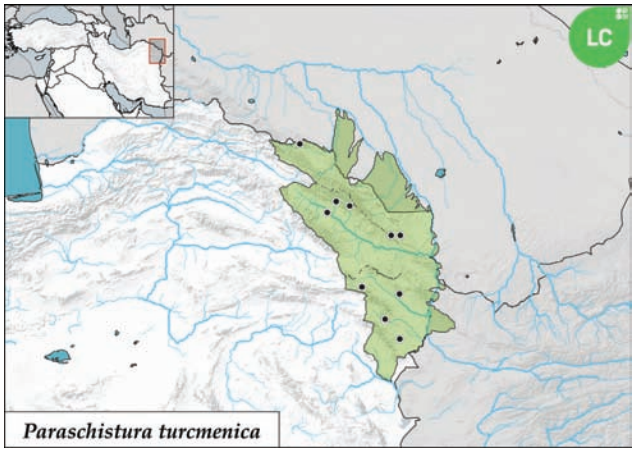
Habitat. Fast to slow-flowing streams and springs with gravel substrate.

Biology. No data.

Conservation status. EN; appears to be declining within its very small range.

Further reading. Freyhof et al. 2015 (description).





Paraschistura turcmenica; Hari drainage, Iran, ~45 mm SL.

Paraschistura turcmenica

Common name. Turkmenian loach.

Diagnosis. Distinguished from other species of *Paraschistura* in West Asia by: ○ scales completely absent / ○ flank with marbled colour pattern, or with bars dissociated in a row of midlateral blotches and saddles on back, or with 11–14 irregularly shaped and set, dark-brown bars on flank, usually dissociated into two adjacent narrow bars or individual bars with a central open space / ○ suborbital flap or groove absent in male / ○ no dorsal adipose crest / ○ caudal emarginate / ○ a bold black spot at base of first dorsal rays / ○ snout blunt / ○ usually 7½ branched dorsal rays / ○ body depth at dorsal origin 13–15 % SL / ○ pelvic reaching to about 1–2 eye diameter in front of anus / ○ pelvic origin below first or third branched dorsal ray. Size up to 53 mm SL.

Distribution. Eastern Kavir basin, Atrak drainage, western Karakum Desert, Hari in Afghanistan, Iran and Turkmenistan, Morghab in Afghanistan and Turkmenistan, and northern slope of Kopetdag in Turkmenistan.

Habitat. Streams and springs with moderate to fast-flowing freshwater in mountain and desert landscapes.
Biology. No data.
Conservation status. LC.
Remarks. *Nemacheilus kessleri turcomanus* is likely a synonym for this species. *Paraschistura turcomanus* has recently been re-validated, but while syntypes of *P. turcomana* examined for that study are typical of *P. turcmenica*, the species identified as *P. turcmenica* may be juvenile *P. cristata.*
Further reading. Freyhof et al. 2015 (diagnosis); Mousavi-Sabet et al. 2015d (*P. turcomana*).

Sasanidus

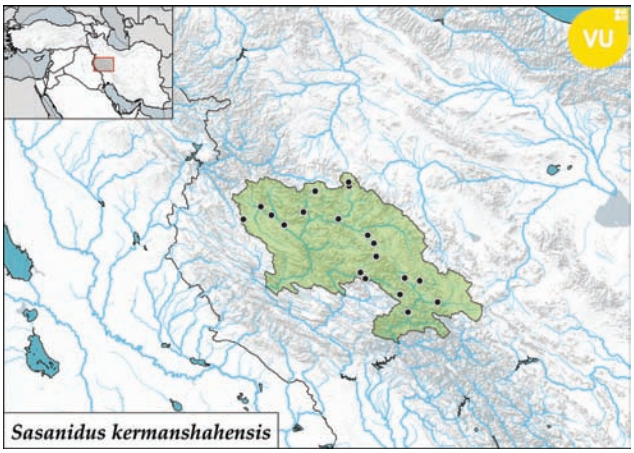
Sasanidus and *Eidinemacheilus* are two loach genera endemic to the Persian Gulf basin. Only one species of *Sasanidus* is known, and no superficially similar species have been reported from Pakistan or India. *Sasanidus* is distantly related to *Paraschistura,* and it cannot be excluded that other species of *Sasanidus* might exist on the Indian subcontinent, where a large diversity of nemacheilid loaches exist, usually identified as *Paraschistura* or *Schistura.* Furthermore, an understanding of the phylogeny of loaches is virtually lacking in this region. **Further reading.** Freyhof et al. 2016a (description, phylogeny).

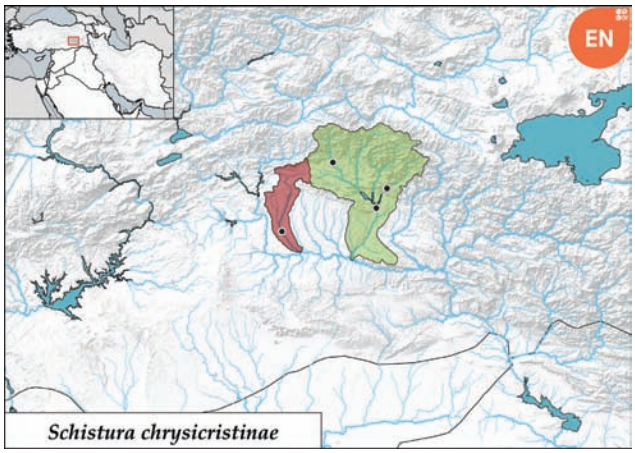
Sasanidus kermanshahensis

Common name. Kermanshah loach.
Diagnosis. Distinguished from superficially similar species of *Oxynoemacheilus* in Tigris drainage by: ○ body cylindrical / ● a prominent, irregular lateral stripe along lateral midline / ● no dark-brown or black bar or blotch at caudal base / ● a prominent whitish or yellowish triangular patch on posteriormost upper and lower caudal peduncle / ● no sexual dimorphism in pectoral length / ○ caudal peduncle deep, without adipose crest / ○ caudal moderately deep emarginate / ○ lateral line incomplete, reaching to vertical between middle dorsal base and middle anal base / ○ suborbital groove present in male. Size up to 70 mm SL.

Sasanidus kermanshahensis; Karkheh drainage, Iran, ~70 mm SL.

Sasanidus kermanshahensis; Karkheh drainage, Iran, ~65 mm SL.





Distribution. Iran: Gamasiab, Dinevar, Razavar, and Kahman in Karkheh drainage and Sezar in Karun drainage.
Habitat. Moderately fast-flowing to standing waters of gravel-bed streams.
Biology. No data.
Conservation status. VU; appears to be declining within its small range.
Further reading. Bănărescu & Nalbant 1966 (description); Freyhof et al. 2016a (phylogeny).

Schistura

Schistura is a highly polyphyletic genus that encompasses approximately 250 species. The type species of *Schistura* is *S. rupecula*, found in northern India. The genus is thought to be widely distributed and speciose in the southern Himalayas, extending from Pakistan to China. Loaches identified as *Schistura* are widespread in India and Sri Lanka and occur all over tropical Asia and Indonesia. They are especially speciose in Indochina. Most loaches placed in *Schistura* will be recognised in different genera in the future, and the genus needs a fundamental revision. In West Asia, several loaches had been described in *Schistura*, including *S. ceyhanensis*, *S. chrysicristinae*, *S. evreni*, and *S. seyhanicola*, all from Türkiye. Except for *S. chrysicristinae*, these were later placed in *Oxynoemacheilus*. *Schistura chrysicristinae* was placed in *Paraschistura* based on the characters provided in its original description. Upon rediscovery in 2021, mitochondrial DNA data indicated a close relationship between *S. chrysicristinae* and *S. rupecula*. Consequently, *S. chrysicristinae* was reclassified within the genus *Schistura*. *Schistura chrysicristinae* is found approximately 3,000 km northeast of the genus's known range.

Schistura chrysicristinae

Common name. Batman loach.
Diagnosis. Distinguished from other species of *Nemacheilidae* in upper Tigris drainage by: ○ flank with wide, pale-brown bars or large, irregularly shaped and set blotches / ○ no black bar or bold black blotches at caudal base / ○ no suborbital flap or groove in male / pectoral in male as large as in female / ○ lateral line incomplete, reaching above anal base / ○ body covered by scales, scales densely set on caudal

Schistura chrysicristinae; Batman drainage, Türkiye; ~35 mm SL.

peduncle and flank behind dorsal origin, absent on anterior flank / ○ caudal emarginate / ○ 7–8½ branched dorsal rays. Size up to 36 mm SL, likely to grow larger.
Distribution. Türkiye: Ambar and Batman drainages.
Habitat. Fast-flowing river sections.
Biology. No data.
Conservation status. EN; appears to be declining within its very small range. Not found in Ambar in recent years.
Further reading. Nalbant 1998 (description); Kaya et al. 2025b (description, generic position).

Seminemacheilus
Seminemacheilus comprises six species endemic to Central and southern Anatolia. It is distinguished by a roundish or slightly emarginate caudal, a very stout body, a very long pectoral in male, and no or very few scales. *Seminemacheilus* is related to *Oxynoemacheilus*, and some phylogenetic studies place *Seminemacheilus* as a sister genus to *Oxynoemacheilus* or nested within the basal clades of that genus. However, the phylogenetic relationships between these taxa remain uncertain, and we treat *Seminemacheilus* as a distinct genus. *Seminemacheilus* can be distinguished from similar stout and deep-bodied *Oxynoemacheilus* species, including *O. panthera*, *O. seyhanensis*, and *O. frenatus*, by the presence of a very long pectoral fin in males that extends beyond the pelvic origin when folded back. *Seminemacheilus* are stagnophilic loaches that are rarely found in flowing waters. They typically inhabit densely vegetated backwaters, springs, or slow-flowing streams. They exhibit pronounced sexual dimorphism, with males being smaller, more slender, and having a longer pectoral fin than females.
Further reading. Yoğurtçuoğlu et al. 2020b (revision).

Key to species of *Seminemacheilus*
1a - A few deeply embedded scales on caudal peduncle; caudal–peduncle depth 1.3–1.6 times in its length; head length 21–24 % SL.
……*S. ispartensis*
1b - Body scaleless; caudal–peduncle depth 0.9–1.3 times in its length; head length 24–28 % SL.
……2

2a - Caudal usually slightly emarginate; one central pore in supratemporal head canal.
……*S. attalicus*
2b - Caudal truncate or roundish; no central pore in supratemporal head canal.
……3

3a - Belly usually with many small black or brown blotches; posterior naris reaching to anterior eye margin when folded backwards.
……*S. ahmeti*
3b - Belly plain white or yellowish without small black or brown blotches; posterior naris not reaching to anterior eye margin when folded backwards.
……4

4a - Caudal roundish; caudal–peduncle depth 0.9–1.1 times in its length.
……*S. ekmekciae*
4b - Caudal truncate; caudal–peduncle depth 1.1–1.3 times in its length.
……5

5a - 5–7 supraorbital head pores; eye diameter 13–14 % HL; snout length 38–40 % HL; prepelvic length 57–59 % SL.
……*S. lendlii*
5b - 2–5 (6) supraorbital pores; eye diameter 14–17 % HL; snout length 35–37 % HL; prepelvic length 53–56 % SL.
……*S. tubae*

Seminemacheilus ahmeti; spring Soysallı, Türkiye; female, 53 mm SL.

Seminemacheilus ahmeti; spring Soysallı, Türkiye; male; 51 mm SL.

Seminemacheilus ahmeti

Common name. Sultan pond loach.

Diagnosis. Distinguished from other species of *Seminemacheilus* by: ● many small black or brown dots or blotches on belly / ● posterior naris reaching to anterior eye margin when folded backwards / ○ body scaleless / ○ caudal truncate / ○ no central pore in supratemporal head canal / ○ 2–5 supraorbital head pores / ○ caudal–peduncle depth 1.0–1.1 times in its length / ○ head length 25–28 % SL / ○ eye diameter 13–14 % HL / ○ snout length 38–40 % HL / ○ prepelvic length 57–59 % SL / ○ flank pattern mottled, vermiculated, or with large isolated blotches. Size up to 57 mm SL.

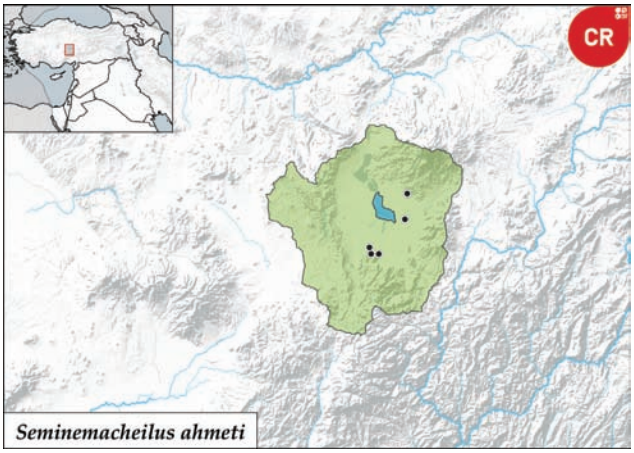
Distribution. Türkiye: Sultan marshes.

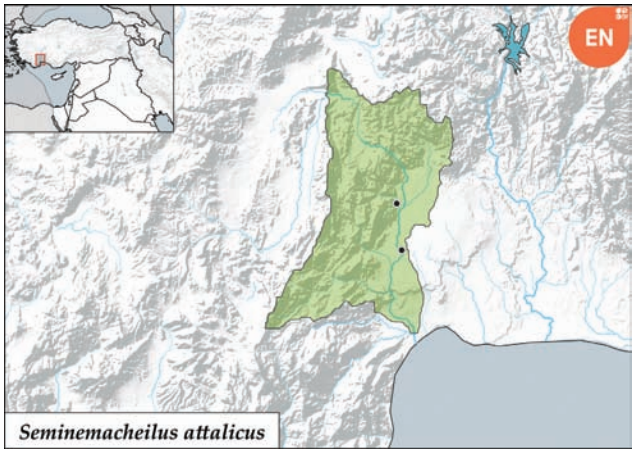
Habitat. Springs and streams with standing or slow-flowing water and dense submerged vegetation.

Biology. No data.

Conservation status. CR; see comments under *Pseudophoxinus elizavetae*.

Further reading. Sungur et al. 2018b (description); Yoğurtçuoğlu et al. 2020b (revision).





Seminemacheilus attalicus; spring Kırkgöz, Türkiye; male, 64 mm SL.

Seminemacheilus attalicus

Common name. Kırkgöz pond loach.

Diagnosis. Distinguished from other species of *Seminemacheilus* by: ● caudal usually slightly emarginate / ○ flank mottled or marbled / ● one central pore in supratemporal head / ● 7–13 supraorbital head pores / ○ body scaleless / ○ caudal–peduncle depth 0.9–1.2 times in its length / ○ head length 24–28 % SL / ○ belly without or very rarely with black or brown blotches / ○ posterior naris not reaching to anterior eye margin when folded backwards. Size up to 86 mm SL.

Distribution. Türkiye: Spring Kırkgöz and outflowing stream Yediarıklar.

Habitat. Springs and streams with stagnant or slow-flowing water and dense submerged vegetation.

Biology. No data.

Conservation status. EN; appears to be declining within its very small range.

Further reading. Yoğurtçuoğlu et al. 2020b (description).

Seminemacheilus ekmekciae; Gölyazı, Türkiye; female, ~50 mm SL.

Seminemacheilus ekmekciae; Lake Büget, Türkiye; male, 34 mm SL.

Seminemacheilus ekmekciae

Common name. Central Anatolian pond loach.

Diagnosis. Distinguished from other species of *Seminemacheilus* by: ○ caudal rounded / ○ no central pore in supratemporal head canal / ○ 2–4 supraorbital head pores / ○ body scaleless / ○ no black or brown dots or blotches on belly / ○ posterior naris not reaching to anterior eye margin when folded backwards / ○ flank pattern mottled, vermiculated, or with large isolated blotches / ○ caudal–peduncle depth 0.9–1.1 times in its length / ○ head length 23–26 % SL. Size up to 73 mm SL.

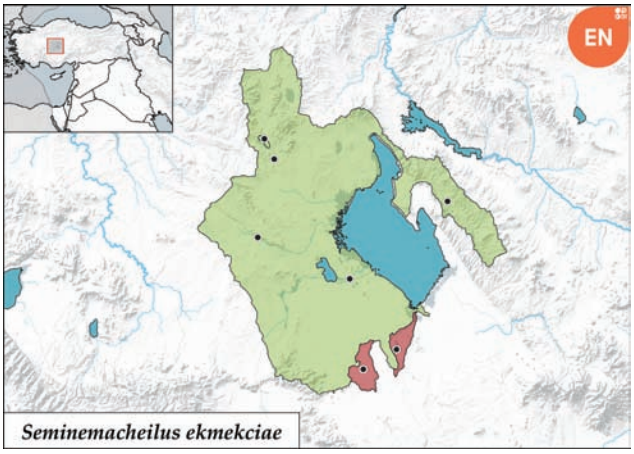
Distribution. Türkiye: Lake Tuz basin and Ereğli marshes.

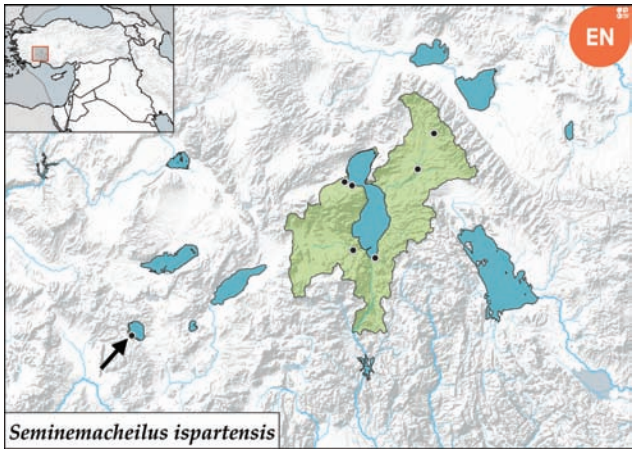
Habitat. Springs and streams with stagnant or slow-flowing water and dense submerged vegetation.

Biology. No data.

Conservation status. EN; appears to be declining within its very small range. Disappeared from Ereğli marshes as these dried up.

Further reading. Yoğurtçuoğlu et al. 2020b (description).





Seminemacheilus ispartensis; Lake Eğirdir basin, Türkiye; female, 72 mm SL.

Seminemacheilus ispartensis; Lake Eğirdir basin, Türkiye; male, 74 mm SL.

Seminemacheilus ispartensis

Common name. Southern pond loach.

Diagnosis. Distinguished from other species of *Seminemacheilus* by: ● a few deeply embedded scales on caudal peduncle / ● caudal–peduncle depth 1.3–1.6 times in its length / ● head length 21–24 % SL / ○ caudal truncate / ○ no black or brown dots or blotches on belly / ○ posterior naris not reaching to anterior eye margin when folded backward / ○ no central pore in supratemporal head canal / ○ 6–10 supraorbital head pores / ○ flank pattern mottled, vermiculated, or with large isolated blotches. Size up to 91 mm SL.

Distribution. Türkiye: Lake Eğirdir and Salda basins.

Habitat. Springs, streams, and lakeshores. Usually in habitats with standing water and dense submerged vegetation. Spawning begins in March.

Biology. Lives up to 4 years.

Conservation status. EN; appears to be declining within its very small range.

Remarks. Although *Seminemacheilus ispartensis* and *S. lendlii* are almost identical in their COI sequences, *S. ispartensis* is recognised as a valid species based on clear morphological differences, with recent introgressive hybridisation suspected. *Seminemacheilus* recorded from Karapınar (Lake Yarışlı basin) may belong to this species. This population has disappeared as Karapınar has dried up.

Further reading. Bănărescu & Nalbant 1964 (distribution as *Nemacheilus lendlii*); Erk'akan et al. 2007 (description); Yoğurtçuoğlu et al. 2020b (revision).

Kırkgöz is a micro-hotspot of fish biodiversity in the Mediterranean basin inhabited by *Seminemacheilus attalicus* and three other locally endemic species.

Seminemacheilus lendlii; stream Eymir, Sakarya drainage, Türkiye; female, 68 mm SL.

Seminemacheilus lendlii; stream Eymir, Sakarya drainage, Türkiye; male, 53 mm SL.

Seminemacheilus lendlii

Common name. Northern pond loach

Diagnosis. Distinguished from other species of *Seminemacheilus* by: ○ caudal truncate / ○ posterior naris not reaching to anterior eye margin when folded backward / ○ no black or brown dots or blotches on belly / ○ flank pattern fine mottled / ○ no central pore in supratemporal canal / ○ 5–7 supraorbital head pores / ○ caudal–peduncle depth 1.1–1.2 times in caudal–peduncle length / ○ head length 25–28 % SL / ○ snout length 38–40 % HL / ○ prepelvic length 57–59 % SL / ○ eye diameter 13–14 % HL. Size up to 77 mm SL.

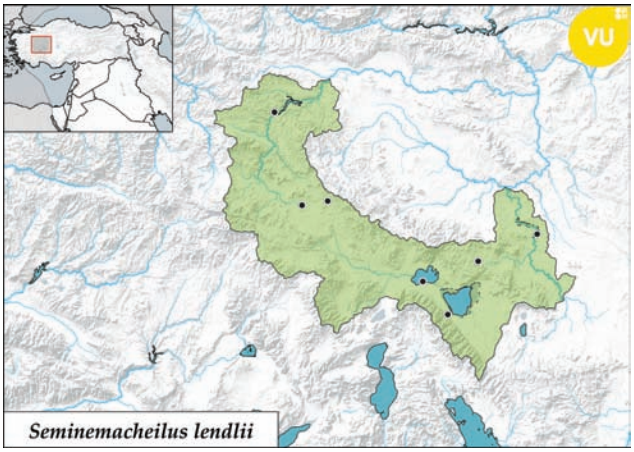
Distribution. Türkiye: Lake Eymir-Mogan basins (Ankara), Porsuk drainage, a tributary of upper Sakarya, and Lakes Akşehir, Eber, and Ilgın basins.

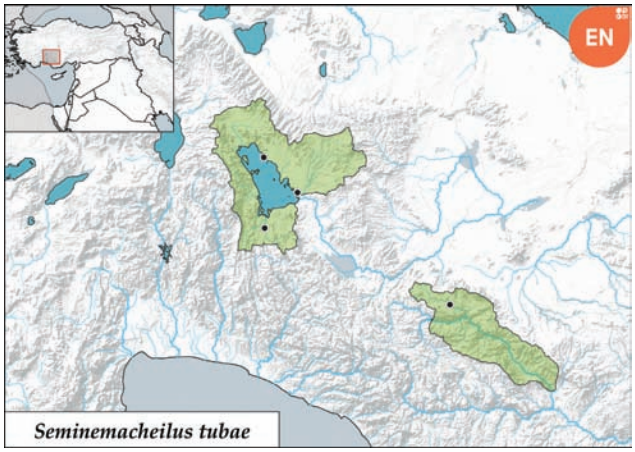
Habitat. Springs and streams with standing or slow-flowing water and dense vegetation.

Biology. No data.

Conservation status. VU; potentially vanished from Lakes Ilgin and Eymir-Mogan basins.

Further reading. Hankó 1925 (description); Yoğurtçuoğlu et al. 2020b (revision).





Seminemacheilus tubae; Lake Beyşehir basin, Türkiye; female, 65 mm SL.

Seminemacheilus tubae; Lake Beyşehir basin, Türkiye; male; 54 mm.

Seminemacheilus tubae

Common name. Beyşehir pond loach.

Diagnosis. Distinguished from other species of *Seminemacheilus* by: ○ caudal truncate / ○ no black or brown dots or blotches on belly / ○ flank pattern mottled, vermiculated or with large isolated blotches / ○ body scaleless / ○ posterior naris not reaching to anterior eye margin when folded backwards / ○ no central pore in supratemporal head canal / ○ 2–5, rarely 6, supraorbital head pores / ○ caudal–peduncle depth 1.1–1.3 times in its length / ○ head length 24–28 % SL / ○ eye diameter 14–17 % HL / ○ snout length 35–37 % HL / ○ prepelvic length 53–56 % SL. Size up to 66 mm SL.

Distribution. Türkiye: Lake Beyşehir basin and Göksu drainage (Mediterranean basin).

Habitat. Stream sections with stagnant or slow-flowing water and dense vegetation.

Biology. No data.

Conservation status. EN; appears to be declining within its very small range.

Remarks. *Seminemacheilus dursunavsari* is a synonym. It was first published as a *nomen nudum*, which did not meet the criteria for a species description. The description was re-published, and now *S. dursunavsari* is an available name but published after the description of *S. tubae*, rendering it a synonym.

Further reading. Çiçek 2020 (description as *S. dursunavsari*); Yoğurtçuoğlu et al. 2020b (description).

Ulupınar, a small spring in Lake Akşehir basin, is the habitat of *Seminemacheilus lendlii*.

Turcinoemacheilus

Turcinoemacheilus are small fishes that can be readily distinguished from all other nemacheilids in West Asia by their very slender body and the position of the anus, which is notably situated in front of the anal origin. Before 2013, only one species was known in the genus, but subsequent research revealed 11 species. *Turcinoemacheilus* are commonly found in the headwater streams and small rivers of the Euphrates, Tigris, and Zayandeh drainage, an endorheic basin in Iran. One species was described from the Himalayas, suggesting a much wider distribution range for the genus. Several small South Asian loaches exhibit superficial similarities to *Turcinoemacheilus*, and their phylogenetic relationships require further investigation. *Turcinoemacheilus* may represent a relatively common genus in the Himalayas, or these fishes may belong to different genera.

Further reading. Conway et al. 2011 (*T. himalaya*); Esmaeili et al. 2014c (revision); Jouladeh-Roudbar et al. 2023c (revision Iran, phylogeny).

Key to species of *Turcinoemacheilus* in West Asia

1a - Anus situated behind middle between pelvic and anal origins.
……2

1b - Anus situated at middle or in front of middle between pelvic and anal origins.
……5

2a - Lateral line complete, reaching to anterior part of caudal.
……*T. christofferi*

2b - Lateral line incomplete, reaching to midway between tip of pectoral and dorsal origin or midway between dorsal and anal origins.
……3

3a - Usually an elongated, irregularly shaped dark-brown blotch on side of anal base.
……*T. bahaii*

3b - No dark blotch-brown on side of anal base.
……4

4a - Body depth at dorsal origin 10–13 % SL.
……*T. ansari*

4b - Body depth at dorsal origin 13–15 % SL.
……*T. hafezi*

5a - No dark-brown stripe along lateral midline; 7–9 distinct dark-brown blotches on flank not forming a row.
……*T. saadii*

5b - Prominent row of dark-brown blotches along lateral midline, usually fused into a stripe.
……6

6a - Caudal–peduncle length 6–7 % SL; 4–5 mandibular pores.
……*T. minimus*

6b - Caudal–peduncle length 7–10 % SL; 5–7 mandibular pores.
……7

7a - Midlateral stripe narrower than eye diameter; prepelvic distance 47–50 % SL.
……*T. kosswigi*

7b - Midlateral stripe broader than eye diameter; prepelvic distance 50–55 % SL.
……8

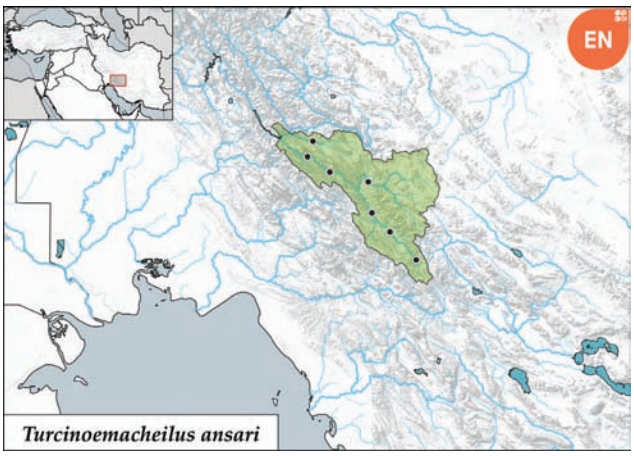
8a - A dark-brown blotch at anal base.
……*T. moghbeli*

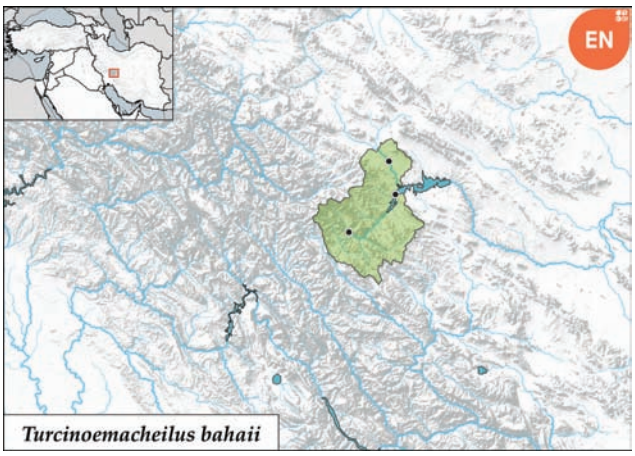
8b - No dark-brown blotch at anal base.
……9

9a - Interorbital distance 31–37 % HL.
……*T. inexpectatus*

9b - Interorbital distance 23–31 % HL.
……*T. ekmekciae*

Turcinoemacheilus ansari; Beshar, Iran; 50 mm SL.





Turcinoemacheilus ansari

Common name. Beshar dwarf loach.

Diagnosis. Distinguished from other species of *Turcinoemacheilus* in West Asia by: body depth 10–13 % SL / ○ no dark-brown blotch on side of anal base / ○ anus situated behind middle between pelvic and anal origins / ○ mottled colour pattern or a prominent irregular-shaped dark-brown stripe along lateral midline disconnected from dark-brown blotches on back. Size up to 50 mm SL.

Distribution. Iran: Merian, Beshar, and Khersan in upper Karun drainage.

Habitat. Fast-flowing sections of small rivers and streams, usually in rapids and riffles with coarse gravel or rocks. Inhabits interspaces in gravel.

Biology. No data.

Conservation status. EN; restricted to a small area where it is in decline.

Remarks. Syntopic with *T. saadii* in Beshar.

Further reading. Jouladeh-Roudbar et al. 2023c (description).

Turcinoemacheilus bahaii; Zayandeh drainage, Iran; ~45 mm SL.

Turcinoemacheilus bahaii

Common name. Zayandeh dwarf loach.

Diagnosis. Distinguished from other species of *Turcinoemacheilus* in West Asia by: ● usually a dark-brown blotch on side of anal base / ○ anus situated behind middle between pelvic and anal origins / ○ mottled colour pattern or an irregular-shaped dark-brown stripe along lateral midline disconnected from dark-brown blotches on back. Size up to 54 mm SL.

Distribution. Iran: Headwaters in Zayandeh drainage.

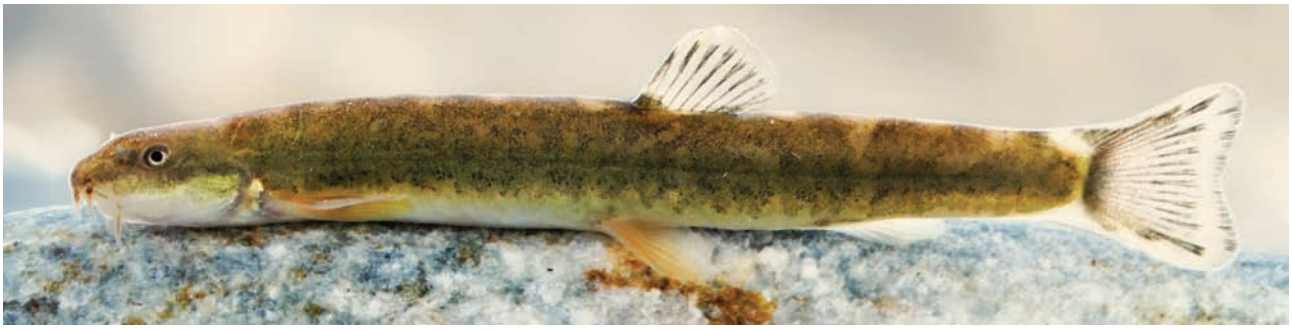
Habitat. Fast-flowing sections of small rivers and streams, usually in rapids and riffles with coarse gravel or rocks.

Biology. Mature at 1 year and lives up to 4 (males) and 5 (females) years. Feeds on invertebrates.

Conservation status. EN; appears to be declining within its very small range.

Remarks. This species was described based on individuals with a dark-brown blotch on side of anal base. New data show that this condition is not present in all individuals and that morphological characters may need to be revised. It is well distinguished from other species by molecular characters.

Further reading. Esmaeili et al. 2014c (description); Borhani et al. 2017 (biology); Ebrahimi et al. 2017 (biology); Jouladeh-Roudbar et al. 2023c (phylogeny).



Turcinoemacheilus christofferi; Gholiyan, Iran; 54 mm SL.

Turcinoemacheilus christofferi

Common name. Sezar dwarf loach.

Diagnosis. Distinguished from other species of *Turcinoemacheilus* in West Asia by: ● lateral line complete, reaching to anterior part of caudal / ○ caudal–peduncle depth 1.6–1.8 times in its length / ○ caudal slightly emarginate / ○ anus situated behind middle between pelvic and anal origins / ○ no dark-brown blotch on side of anal base. Size up to 54 mm SL.

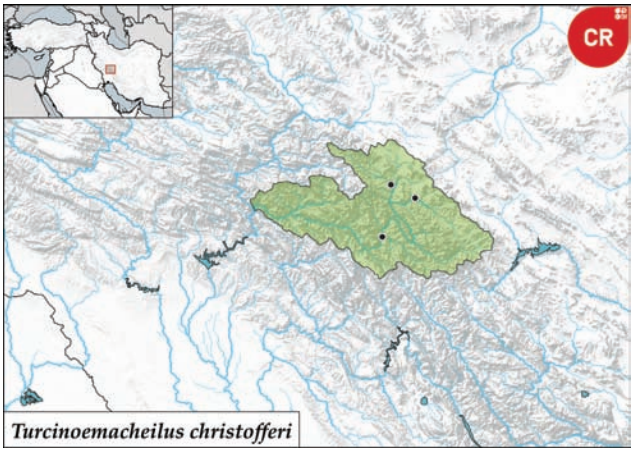
Distribution. Iran: Gholiyan, a headwater tributary of Bakhtiyari in Karun drainage.

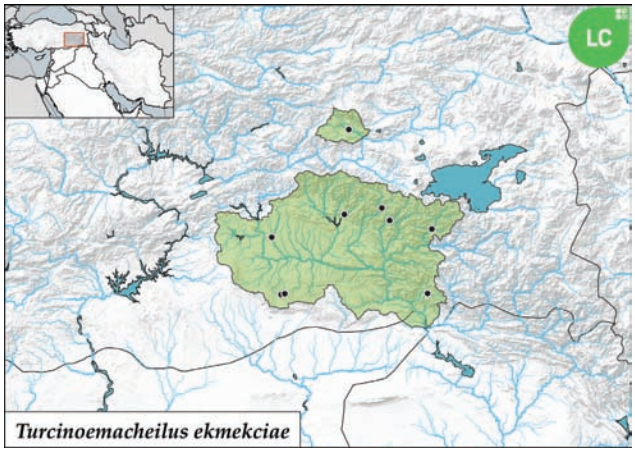
Habitat. Fast-flowing sections of small rivers and streams, usually in rapids and riffles with coarse gravel or rocks. Inhabits interspaces in gravel.

Biology. No data.

Conservation status. CR; restricted to one site where it is in decline. Potentially at the edge of extinction.

Further reading. Jouladeh-Roudbar et al. 2023c (description).





Turcinoemacheilus ekmekciae; Kaynarca in upper Euphrates drainage, Türkiye; 45 mm SL.

Turcinoemacheilus ekmekciae

Common name. Anatolian dwarf loach.

Diagnosis. Distinguished from other species of *Turcinoemacheilus* in West Asia by: ○ roundish blotches or a stripe thicker than eye diameter along lateral midline / ○ 5–7 mandibular pores in mandibular canal / ○ caudal–peduncle length 7–9 % SL / ○ caudal–peduncle depth 1.8–2.7 times in its length / ○ body depth 1.3–1.7 times in head length / ○ prepelvic distance 50–53 % SL / ○ upper caudal lobe 15–18 % SL / ○ interorbital distance 23–31 % HL / ○ maxillary barbel 15–21 % HL / ○ anus situated at middle or in front of middle between pelvic and anal origins / ○ no dark-brown blotch on side of anal base / ○ caudal slightly emarginate. Size up to 55 mm SL.

Distribution. Türkiye: stream Kaynarca in Euphrates, Yanarsu, Botan, Nerduş, Batman in upper Tigris drainages.

Habitat. Fast-flowing sections of small rivers and streams, usually in rapids and riffles with coarse gravel or rocks.

Biology. No data.

Conservation status. LC.

Further reading. Kaya et al. 2024d (description).

Turcinoemacheilus hafezi; Karun drainage, Iran; ~45 mm SL.

Turcinoemacheilus hafezi

Common name. Persian dwarf loach.

Diagnosis. Distinguished from other species of *Turcinoemacheilus* in West Asia by: ○ body depth 13–15 % SL / ○ no dark-brown blotch on side of anal base / ○ anus situated behind middle between pelvic and anal origins / ○ mottled colour pattern or a prominent irregular-shaped dark-brown midlateral stripe disconnected from dark-brown blotches on back. Size up to 67 mm SL.

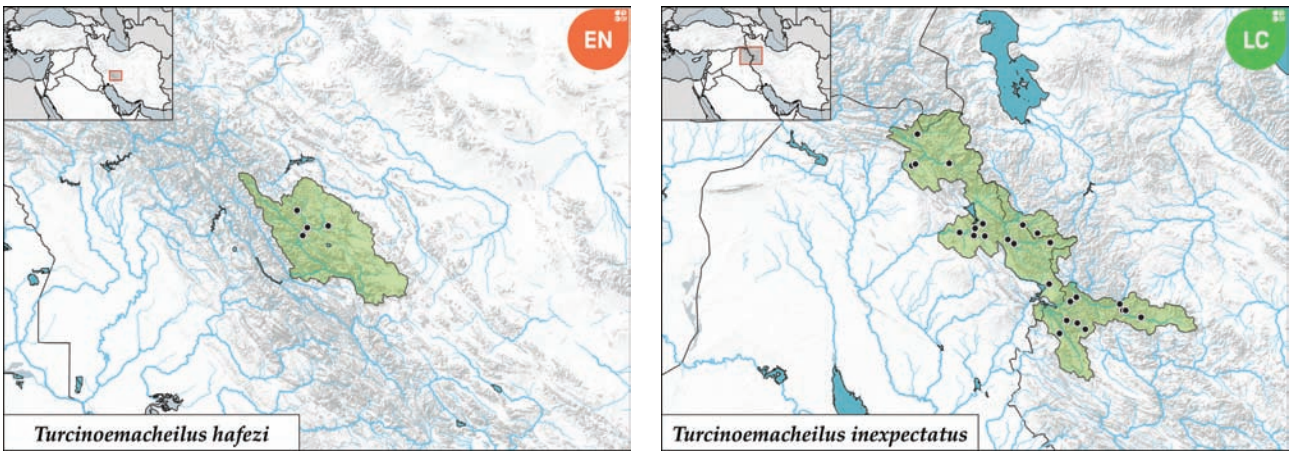
Distribution. Iran: Behesht Abad in Karun drainage.

Habitat. Fast-flowing sections of small rivers and streams, usually in rapids and riffles with coarse gravel or rocks.

Biology. No data.

Conservation status. EN; restricted to a small area where it is in decline.

Further reading. Golzarianpour et al. 2013 (description); Esmaeili et al. 2014c (revision); Jouladeh-Roudbar et al. 2023c (phylogeny).



Turcinoemacheilus inexpectatus; Lesser Zab drainage, Iraq; 50 mm SL.

Turcinoemacheilus inexpectatus

Common name. Zab dwarf loach.

Diagnosis. Distinguished from other species of *Turcinoemacheilus* in West Asia by: ○ a dark midlateral stripe broader than eye diameter / ○ 5–6 mandibular pores in mandibular canal / ○ caudal–peduncle length 8–10 % SL / ○ body depth 1.3–2.0 times in head length / ○ caudal–peduncle depth 1.5–2.3 times in its length / ○ interorbital distance 31–37 % HL / ○ prepelvic distance 50–53 % SL / ○ anus situated at middle or in front of middle between pelvic and anal origins / ○ no dark-brown blotch on side of anal base. Size up to 52 mm SL.

Distribution. Iraq and Iran: Sirvan, Greater and Lesser Zab drainages.

Habitat. Fast-flowing sections of small rivers and streams, usually in rapids and riffles with coarse gravel or rocks. Inhabits interspaces in gravel.

Biology. No data.

Conservation status. LC.

Further reading. Esmaeili et al. 2014c (description as *T. kosswigi*); Kaya et al. 2024d (molecular phylogeny); Freyhof & Jouladeh-Roudbar 2024 (description).

Turcinoemacheilus kosswigi; upper Greater Zab, Türkiye; 60 mm SL.

Turcinoemacheilus kosswigi

Common name. Hakkari dwarf loach.

Diagnosis. Distinguished from other species of *Turcinoemacheilus* in West Asia by: ○ a dark midlateral stripe narrower than eye diameter / ○ 5–7 mandibular pores in mandibular canal / ○ caudal–peduncle length 7–9 % SL / ○ body depth 1.3–1.7 times in head length / ○ caudal–peduncle depth 1.9–2.2 times in its length / ○ large, brown saddles on back connected to lateral stripe / ○ caudal slightly emarginate / ○ upper caudal lobe 18–21 % SL / ○ prepelvic distance 47–50 % SL / ○ maxillary barbel 21–26 % HL / ○ anus situated at middle or in front of middle between pelvic and anal origins / ○ no dark-brown blotch on side of anal base. Size up to 60 mm SL.

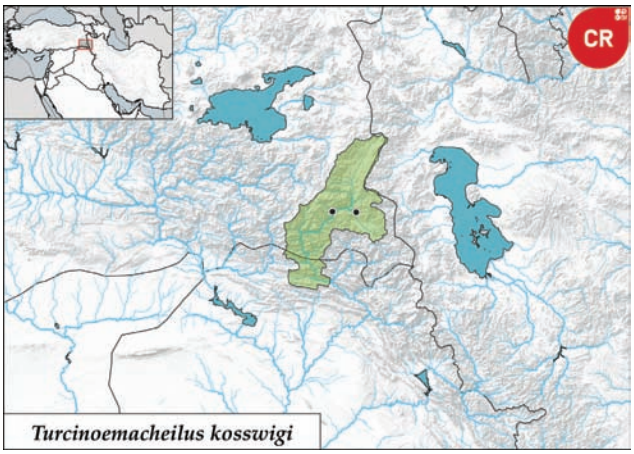
Distribution. Türkiye: Upper Greater Zab drainage.

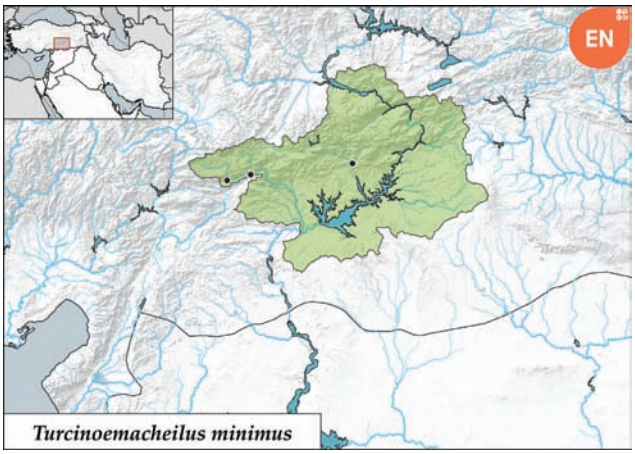
Habitat. Fast-flowing sections of small rivers and streams, usually in rapids and riffles with coarse gravel or rocks. Inhabits interspaces in gravel.

Biology. Lives for 1 or 2 years. Feeds on benthic invertebrates.

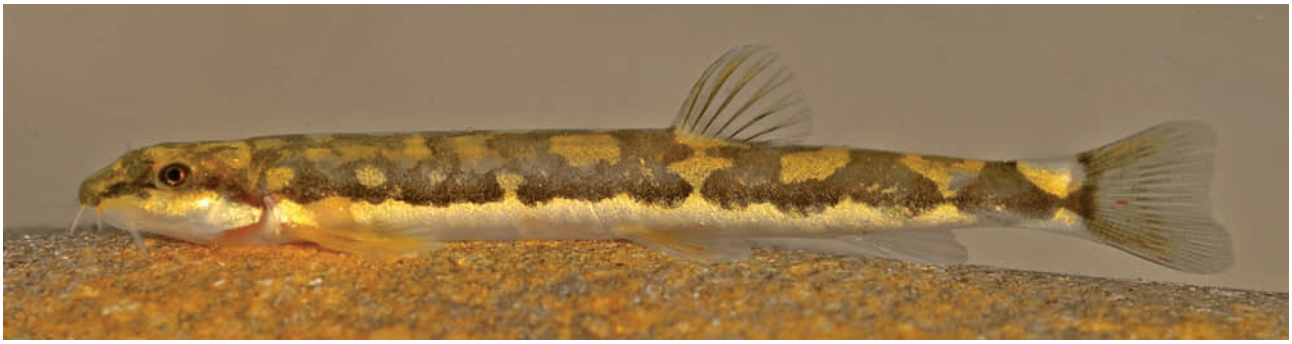
Conservation status. CR; limited to a small area that is and will be heavily impacted by mining.

Further reading. Esmaeili et al. 2014c (revision); Kaya et al. 2024d (re-diagnosis, distribution).





Nalparez in Lesser Zab drainage in Iraq is the habitat of *Turcinoemacheilus inexpectatus*.



Turcinoemacheilus minimus; Euphrates drainage, Türkiye; 35 mm SL.

Turcinoemacheilus minimus

Common name. Euphrates dwarf loach.

Diagnosis. Distinguished from other species of *Turcinoemacheilus* in West Asia by: ● caudal–peduncle length 6–7 % SL / ● body depth 1.6–1.9 times in head length / ● 4–5 mandibular pores in mandibular canal / ○ a row of large irregular, brown, longitudinally elongated blotches along lateral midline, often fused into an irregular-shaped lateral stripe / ○ large, brown saddles on back connected to lateral blotches / ○ caudal slightly emarginate / ○ anus situated at middle or in front of middle between pelvic and anal origins / ○ no dark-brown blotch on side of anal base. Size up to 50 mm SL.

Distribution. Türkiye: Göksu and Kahta in Euphrates drainage.

Habitat. Fast-flowing sections of small rivers and streams, usually in rapids and riffles with coarse gravel or rocks. Inhabits interspaces in gravel.

Biology. No data.

Conservation status. EN; restricted to a small area where it is in decline.

Further reading. Esmaeili et al. 2014c (description); Kaya et al. 2024d (re-diagnosis, distribution).

Turcinoemacheilus moghbeli; Leyleh, Iran; 54 mm SL.

Turcinoemacheilus moghbeli

Common name. Kermanshah dwarf loach.

Diagnosis. Distinguished from other species of *Turcinoemacheilus* in West Asia by: ● caudal–peduncle length 14–20 % SL / ○ 5–6 mandibular pores in mandibular canal / ○ body depth 1.2–1.8 times in head length / ○ caudal–peduncle depth 1.5–2.3 times in its length / ○ prepelvic distance 50–55 % SL / ○ no dark-brown blotch on side of anal base / ○ anus situated at middle or in front of middle between pelvic and anal origins. Size up to 54 mm SL.

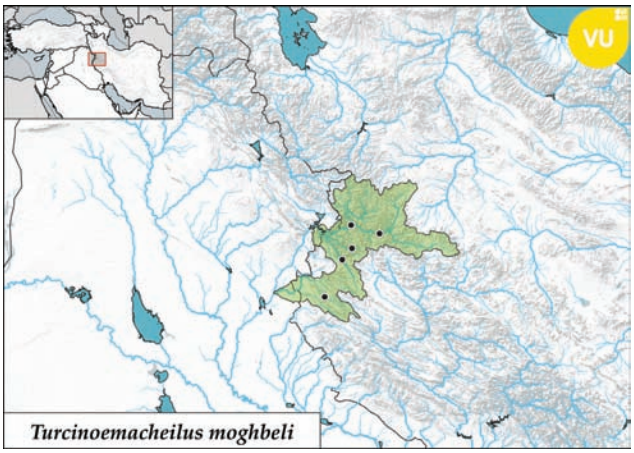
Distribution. Iran: Sirvan, Zemkan, Leyleh, Alvand, and Goleyn in Tigris drainage.

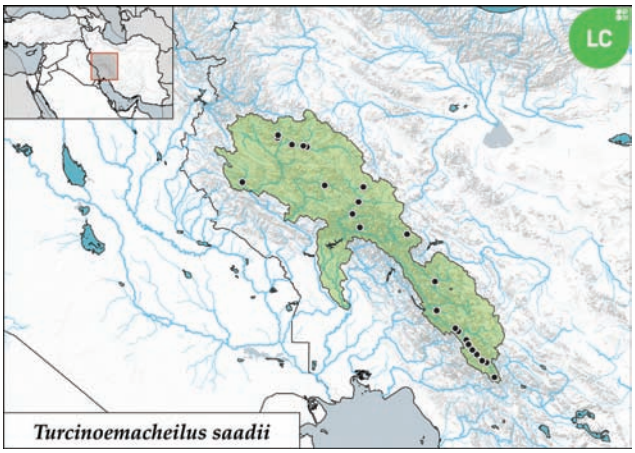
Habitat. Fast-flowing sections of small rivers and streams, usually in rapids and riffles with coarse gravel or rocks. Inhabits interspaces in gravel.

Biology. No data.

Conservation status. VU; restricted to a small area where it is in decline.

Further reading. Jouladeh-Roudbar et al. 2023c (description).





Turcinoemacheilus saadii; Beshar, Karun drainage, Iran; 45 mm SL.

Turcinoemacheilus saadii

Common name. Large spot dwarf loach.

Diagnosis. Distinguished from other species of *Turcinoemacheilus* in West Asia by: ● colour pattern organised in 7–9 distinct dark-brown or grey saddles never forming a lateral stripe / ○ caudal deeply emarginate / ○ anus situated at middle or in front of middle between pelvic and anal origins / ○ no dark-brown blotch on side of anal base. Size up to 64 mm SL.

Distribution. Iran: Bashar, Bakhtiyari, and Sezar in Karun, Gamasiab, Dinevar, and Kahman in Karkheh drainages.

Habitat. Fast-flowing sections of small rivers and streams, usually in rapids and riffles with coarse gravel or rocks. Inhabits interspaces in gravel.

Biology. No data.

Conservation status. LC.

Remarks. In the upper Karun, usually syntopic with *T. hafezi* and *Sasanidus kermanshahensis*.

Further reading. Esmaeili et al. 2014c (description).

The stream Eziki in Türkiye is a tributary of the Greater Zab, a major Tigris tributary. It is the habitat of *Turcinoemacheilus kosswigi*.

Oxynoemacheilus eliasi inhabits streams with a Mediterranean water regime and often survives only in small pools during summer.