

Family Cobitidae

Spined loaches

A family of small, slender fishes found in Morocco, Europe, and Asia. It is most diverse in Southeast and East Asia, with approximately 240 species in 18 genera. Two genera are found in West Asia. They are distinguished by an erectile, movable, usually bifid, suborbital spine, hidden under the skin in some species. Many spined loaches exhibit external sexual dimorphism. In *Cobitis*, the male has a modified pectoral, which is usually much larger than the female's pectoral, and the male is smaller than the female. In *Sabanejewia*, there are no size differences between the sexes, but the male exhibits vertical swellings of the flanks. All Cobitidae are benthic, living on the substrate, and all prey on small invertebrates. The pigmentation of spined loaches is a useful diagnostic feature. Its pattern is organised in one series of blotches on the back and up to four pigmentation zones on the flank, described as Gambetta's longitudinal pigmentation zones. These zones are abbreviated as Z1 to Z4, starting with Z1 as the narrow line immediately below the mid-dorsal row of blotches and Z4 as the midlateral row

of blotches. Furthermore, most species exhibit one or two black spots on the caudal base, which may be fused to form a bar in *Sabanejewia*. In *Sabanejewia* and several *Cobitis* species, the Gambetta zones are either incompletely developed or dissociated.

Three East Asian species of weatherfish (*Misgurnus anguillicaudatus*, *M. bipartitus*, *Paramisgurnus dabryanus*) are non-native in Europe and are anticipated to be found in West Asia in the near future. Their spread is facilitated by the use of non-biosave stocking materials of carp and other aquaculture fishes and through the pond and aquarium trade. East Asian weatherfish are pale-brownish with numerous dark-brown spots and small blotches, forward-directed barbels, and a mental lobe that is prolonged into two long, barbel-like projections (vs. mental lobe absent or with one very short projection in *Cobitis* and *Sabanejewia*).

Further reading. Gambetta 1934 (pigmentation pattern); Nalbant 1963 (genera); Sawada 1982 (morphology); Ludwig et al. 2001 (molecular phylogeny); Kottelat 2012 (diversity); Geiger et al. 2014 (molecular diversity in Mediterranean); Zangl et al. 2020 (*Misgurnus* invasion).

Key to genera of Cobitidae in West Asia

1a - Body pigmentation usually organised in 1 dorsal and 2 lateral longitudinal zones; 12 branched caudal rays.

.....*Sabanejewia*

1b - Body pigmentation usually organised in 1 dorsal and 4 lateral longitudinal zones; 14 branched caudal rays.

.....*Cobitis*



Misgurnus anguillicaudatus; Germany; 150 mm SL.

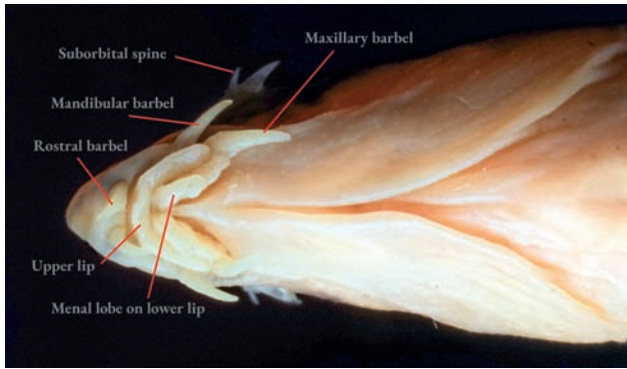


Figure 44: Head of Cobitidae.

Cobitis

Cobitis comprises approximately 126 species, distributed between Portugal and Morocco in the west and Korea and Japan in the east. In West Asia, 31 species have been documented, most of which are found in Anatolia. In conjunction with Greece, this region represents a significant diversity hotspot of the genus. Male *Cobitis* have one or two laminar projections on the dorsal surface of the anterior pectoral rays (lamina circularis, plural: laminae circularis; also known as Canestrini scales). Examining the lamina circularis in *Cobitis* requires preparation, as it is covered by skin. In species with two laminae, these may be very small, particularly the outer lamina, which may be a small lateral enlargement or a lateral crest on the fin ray. It should be noted that the inner lamina is not necessarily scale-shaped.

Cobitis is notable for exhibiting minimal morphological variation. Most species exhibit superficial similarities, share identical meristic characters, and display comparable structural characteristics, including fin position, mouth shape and

structure, nares, lateral-line length, and squamation pattern. Species differentiation is primarily achieved through colour patterns, organised by the Gambetta zones relatively conservatively. Several species have a notable divergence from the typical configuration of the Gambetta zones. This is evidenced by the fragmentation of the blotches within these zones, the blurring of the borders between them, and the gradual convergence of different zones. Notably, this process of dissociating the colour pattern of the Gambetta zones is ontogenetic. In young fish, the colour pattern is often well organised in the Gambetta zones, whereas in adults, particularly in adult females, a pattern of dissociated blotches is observed. The degree to which the Gambetta zones' colour patterns are dissociated depends on the species and particular populations. For instance, considerable individual variation is observed in the colour pattern of *C. battalgilae*, which spans almost the entire spectrum of variation observed in *Cobitis*. Additionally, considerable variation is observed among different populations of *C. strumicae*, *C. phrygica*, *C. simplicispina* and *C. turcica*, with almost every population displaying distinct characteristics. In *C. dorademiri* and *C. sipahilerae*, only a small proportion of individuals exhibit a dissociated colour pattern, with most individuals displaying a highly similar phenotype.

Cobitis are typically associated with fine substrates (sand, mud) from which they feed. They burrow in the substrate to hide. A specialised filter-feeding mechanism enables *Cobitis* to separate fine organic particles and small benthic organisms (e.g., copepods, worms, insect larvae) from the substrate. *Cobitis* can swallow air, with oxygen being absorbed through the gut walls. The spawning behaviour is consistent in the few species of *Cobitis* in which it has been observed. The male follows the female, and after both enter dense vegetation (e.g., filamentous algae), the male

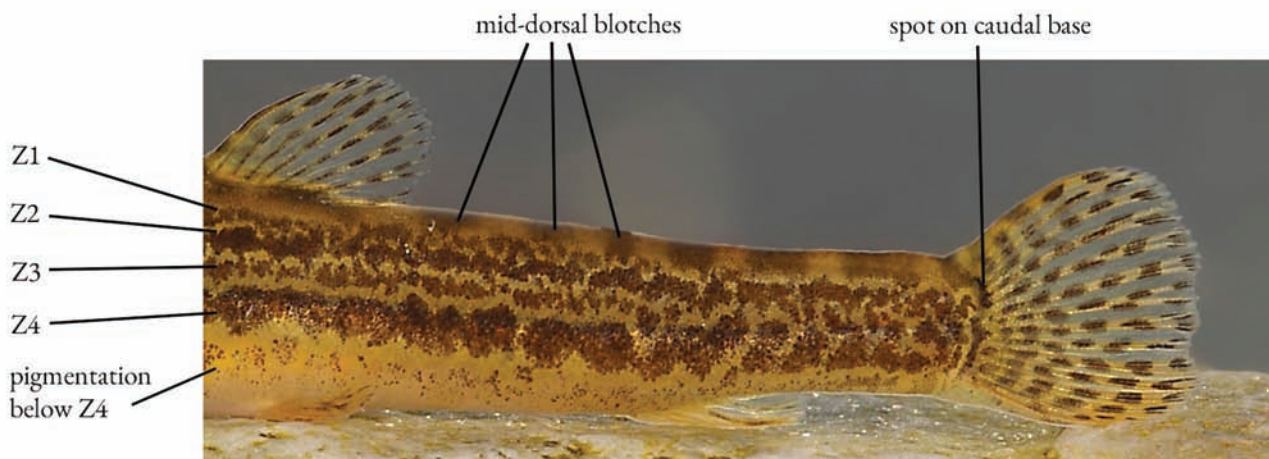


Figure 45: Colour marks on the body of *Cobitis* species. Gambetta's longitudinal pigmentation zones Z1–4.

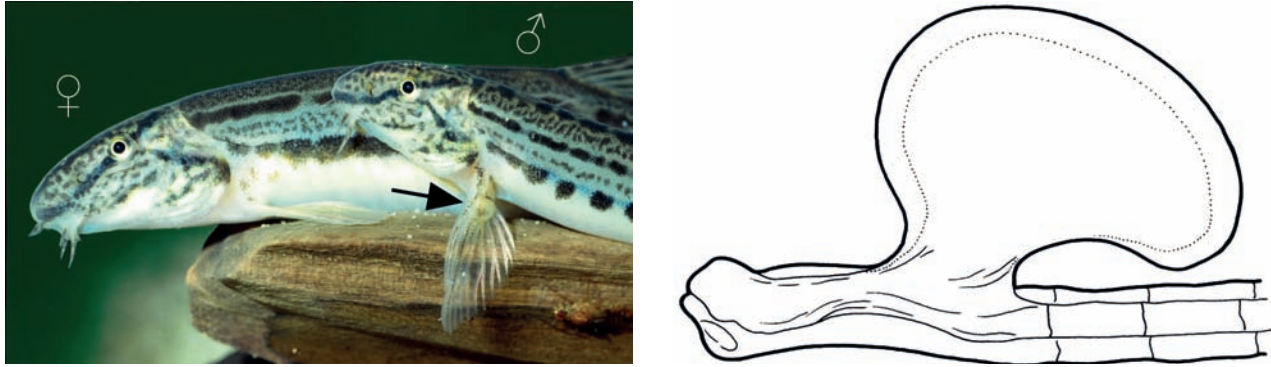


Figure 46: Sexual dimorphism in *Cobitis*; **left**, male and female *Cobitis* showing the position of the lamina circularis (arrow) on the dorsal surface of the anterior pectoral ray of male; **right**, lamina circularis, dorsal view (from Kottelat & Freyhof 2007, a © A. Hartl; b after Nalbant 1963).

forms a complete ring around the female's body behind the dorsal as the female releases the eggs. The eggs of most species are not sticky but swell to 2.5–3.5 mm in diameter and, due to this large size, are retained in the vegetation. The free larvae have large external gill filaments. The biology of almost all *Cobitis* species in West Asia remains unstudied, and there is much work to be done in the future.

Some *Cobitis* species of Central and Eastern Europe occur as a multitude of hybridogenous lineages. These hybrid lineages, made up of nearly only female individuals, reproduce by gynogenesis, often including polyploid individuals. They are described as sperm-parasites, as they

are dependent on males of bisexually reproducing lineages that serve as sperm donors, with the sperm serving only to induce the development of their eggs. Such hybridogenous lineages have yet to be reported from West Asia, but their occurrence cannot be excluded. The presence of highly biased sex ratios may serve as an indicator.

Further reading. Gambetta 1934 (pigmentation pattern); Bohlen 2003a, b (reproduction); Ludwig et al. 2001 (molecular phylogeny); Bohlen et al. 2006 (molecular phylogeny); Geiger et al. 2014 (molecular diversity in the Mediterranean); Perdices et al. 2018 (molecular diversity); Freyhof et al. 2018c (species diversity in West Asia).

Keys to species of *Cobitis* in West Asia

Persian Gulf basin

1a - Male with two laminae circularis.

.....2

1b - Male with one lamina circularis.

.....3

2a - Blotches in Z4 between vertical of pectoral origin and dorsal base squarish, irregularly shaped, roundish, and usually widely separated; blotches in Z4 posterior to dorsal base not fused into stripes, restricted to one row; pelvic axillary lobe present.

.....*C. elazigensis*

2b - Blotches in Z4 between vertical of pectoral origin until caudal–peduncle comma-shaped, densely set, often fused into short stripes or dissociated into a wide band of several rows of blotches; axillary pelvic lobe absent.

.....*C. linea*

3a - Large, usually horizontally elongated, dark-brown blotches in anterior part of Z4, roundish or vertically elongated on caudal–peduncle.

.....*C. avicennae*

3b - Minute, roundish, dark-grey dots in Z4.

.....*C. kellei*

Caspian basin

1a - Subdorsal scales with a large focal zone (about $\frac{1}{2}$ of maximum scale diameter).

.....*C. amphilekta*

1b - Subdorsal scales with a small focal zone (about or less than $\frac{1}{10}$ of maximum scale diameter).

.....2

2a - Plate of lamina circularis not reaching end of third segment of attached pectoral ray; dark-brown spot at upper caudal base poorly developed.

.....*C. derzhavini*

2b - Plate of lamina circularis reaching to or beyond end of third segment of attached pectoral ray; dark-brown spot at upper caudal base well developed.

.....3

3a - Base of lamina circularis widely connected to pectoral ray; cheek between eye and opercle strongly pigmented.

.....*C. saniae*

3b - Base of lamina circularis with a narrow connection to pectoral ray; cheek between eye and opercle poorly pigmented or unpigmented.

.....*C. faridpaki*

Southern Black Sea basin and endorheic Anatolian basins of Lakes Akşehir, Eber, and Ilgın

1a - Male with 2 laminae circularis.

.....*C. simplicispina*

1b - Male with 1 lamina circularis.

.....2

2a - Pigmentation in Z3 reduced to about head length in male or pigmentation in Z3 as wide as or narrower than pigmentation in Z2.

.....*C. splendens*

2b - Pigmentation in Z3 usually complete, reaching much behind dorsal base and or pigmentation in Z3 wider than pigmentation in Z2.

.....*C. satunini*

Southern Marmara and eastern Aegean basins south to Eşen

1a - Male with 2 laminae circularis.

.....2

1b - Male with 1 lamina circularis.

.....6

2a - Two brown or black spots at upper and lower caudal base.

.....*C. strumicae*

2b - One or no black spot at upper and lower caudal base.

.....3

3a - External part of suborbital spine simple; no black spot at upper caudal base; colour pattern on flank often dissociated, not following Gambetta zones in most, but not all, individuals and populations.

.....*C. phrygica*

3b - External part of suborbital spine bifurcate; back spot at upper caudal base present, often very small, rarely absent; colour pattern on flank following Gambetta zones in all populations except in few individuals.

.....4

4a - Pigmentation below Z4 absent except some small spots at caudal–peduncle, also above anal base in few individuals; caudal–peduncle depth 1.2–1.7 times in caudal–peduncle length.

.....*C. indus*

4b - Pigmentation below Z4 present, if restricted to anal base, then caudal–peduncle depth 1.0–1.2 times in caudal–peduncle length.

.....5

5a - Pigmentation below Z4 restricted to a short line or few dots below pectoral and a second short line on lower caudal–peduncle.

.....*C. dorademiri*

5b - Pigmentation below Z4 usually present along complete flank.

.....*C. afifeae*

6a - Blotches in Z2 and Z4 very small, indistinct or confluent; flank pigmented below zone Z4; body brownish.

.....*C. puncticulata*

6b - Blotches in Z2 and Z4 well separated, fused into a bold stripe in some individuals; flank without pigmentation below zone Z4; body pale-yellowish or whitish.

.....7

7a - Focal zone of subdorsal scale large, about $\frac{1}{3}$ – $\frac{1}{2}$ of vertical scale diameter.

.....*C. satunini*

7b - Focal zone of subdorsal scale small, about $\frac{1}{10}$ – $\frac{1}{3}$ of vertical scale diameter.

.....8

8a - 25–36, small, comma-shaped blotches in Z4 along anterior and middle part of flank blotches squarish or irregularly shaped on posterior part of flank, rarely fused into short stripes.

.....*C. troasensis*

8b - 12–18 roundish, triangular, squarish, or horizontally elongate blotches in Z4, often densely set and fused into short stripes along anterior and middle part of flank, blotches vertically elongate on posterior part of flank.

.....9

9a - Black spot at upper caudal base roundish or ovoid, larger than eye diameter in male; Z3 fully covered by very small spots forming a sand-like pattern, especially in female.

.....*C. emrei*

9b - Black spot at upper caudal base absent or comma-shaped, smaller than eye diameter in male and female; Z3 with a row or a narrow band of small spots not forming a sand-like pattern.

.....*C. fahireae*

Mediterranean basin east of Eşen and endorheic basins in Central Anatolia (excluding basins of Lakes Akşehir, Eber, and Ilgın)

1a - Male with 1 lamina circularis.

.....*C. bilseli*

1b - Male with 2 laminae circularis.

.....2

2a - No black spot at upper caudal base.

.....3

2b - Black spot present at upper caudal base, often very small and best seen in live individuals.

.....4

3a - A bold-brown stripe in Z4 between head and vertical of anal origin; flank below Z4 unpigmented; external part of suborbital spine bifurcate.

.....*C. evreni*

3b - A series of midlateral blotches in Z4 or Gambetta zones dissociated into a pattern of many irregularly shaped small or medium-sized spots and blotches; flank below Z4 usually pigmented; external part of suborbital spine simple.

.....*C. phrygica*

4a - Back plain cream-brown, few individuals with 1–3 narrow, squarish, brown bars.

.....*C. sipahilerae*

4b - Back with 3–8 large, roundish, dark-brown blotches or blotches fused into a dark-brown stripe on back or blotches dissociated into a marbled pattern.

.....5

5a - Flank pattern not organised in Gambetta zones, completely disorganised into a pattern of many small spots and blotches.

.....6

5b - Flank pattern well organised in four Gambetta zones, blotches in Z4 organised in a wide band or two rows of spots, and blotches in some individuals or populations.

.....7

6a - Mental lobe long, reaching to or beyond lower lip; caudal truncate; prepelvic length 53–56 % SL; preanal distance 75–78 % SL in female.

.....*C. turcica*

6b - Mental lobe short, not reaching beyond lower lip; caudal slightly rounded; prepelvic length 58–59 % SL; preanal distance 81–82 % SL in female.

.....*C. joergbohleni*

7a - External part of suborbital spine simple; two distinct rows of small blotches in Z4, one along lateral midline and one distinctly below.

.....*C. piri*

7b - External part of suborbital spine bifurcate, simple in some individuals of *C. battalgilae*, one row of large blotches in Z4 or blotches in Z4 dissociated into a band of spots and blotches or spots and blotches of Z4 completely dissociated, not forming two rows.

.....8

8a - A series of large, horizontally elongate blotches in Z4, adjacent blotches often fused to each other; blotches in Z4 not vertically or horizontally dissociated.

.....*C. erkakanae*

8b - A series of roundish, squarish, comma-shaped, or vertically elongated blotches in Z4, rarely blotches horizontally elongate or fused into short stripes in some individuals (in *C. levantina*); blotches in Z4 often vertically and horizontally dissociated into several rows or a wide band of small blotches and spots.

.....9

9a - Blotches in Z4 usually vertically elongate or squarish, often dissociated into a band of small irregularly shaped blotches and spots; interorbital distance 14–16 % HL in male.

.....*C. battalgilae*

9b - Blotches in Z4 in a single row, roundish, irregularly shaped, horizontally elongate or squarish anterior to dorsal origin, often fused into a stripe, not dissociated into a band of small spots or small blotches; interorbital distance 7–11 % HL in male.

.....10

10a - Blotches in Z2 irregularly shaped, often $\frac{1}{2}$ of size or as large as in Z3, often blotches in Z2 and Z3 about size of eye or pupil diameter; Z2, and Z3 usually forming one marbled pattern; many small, dark-brown spots or blotches on lower part of caudal-peduncle, reaching forward to pectoral base in some individuals.

.....*C. levantina*

10b - Z2 with small brown spots, always much smaller than blotches in Z3, much smaller than eye or pupil diameter; Z2 and Z3 well separated; no pigmentation or very few isolated brown spots below Z4 and on lower caudal-peduncle.

.....11

11a - Anterior to dorsal origin, blotches in Z2 and Z4 almost always well separated from each other; Z1 and Z2 always well distinguished; prepelvic length 56–60 % SL in female; caudal-peduncle length 11–14 % SL in female.

.....*C. aliyeae*

11b - Anterior to dorsal origin, blotches in Z2 usually fused into short, irregularly shaped stripes or forming a mottled band of irregularly shaped, small blotches and spots, Z4 fused into a stripe in few individuals; Z1 and Z2 usually fused into a mottled band; prepelvic length 53–55 % SL in female; caudal-peduncle length 15–19 % SL in female.

.....*C. anabelae*



Cobitis afifeae; Büyük Menderes drainage, Türkiye; male, 71 mm SL.



Cobitis afifeae; stream Karadirek, Türkiye; male, 47 mm SL.

Cobitis afifeae

Common name. Menderes spined loach.

Diagnosis. Distinguished from other species of *Cobitis* in eastern Aegean basin by ○ pigmentation below Z4 usually present along complete flank / ○ colour pattern on flank often dissociated, but following Gambetta zones in all populations except in few individuals / ○ external part of

suborbital spine bifurcate / ○ back spot at upper caudal base present, often very small / ○ caudal-peduncle depth 1.9–1.1 times in caudal-peduncle length / ○ two laminae circularis in male. Size up to 90 mm SL.

Distribution. Türkiye: Büyük Menderes and Küçük Menderes drainages, including Lake Işıklı basin and Karadirek, which flows underground to Lake Işıklı.

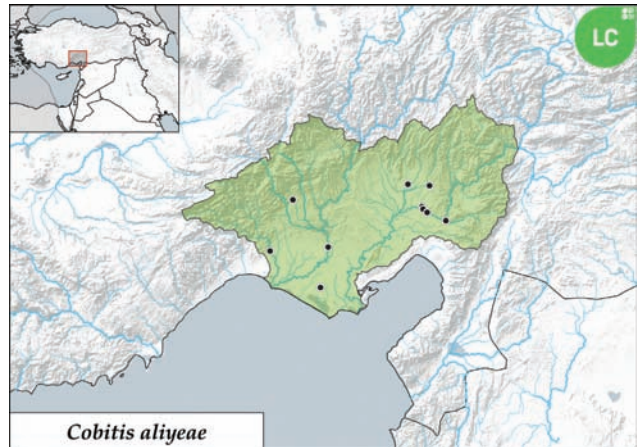
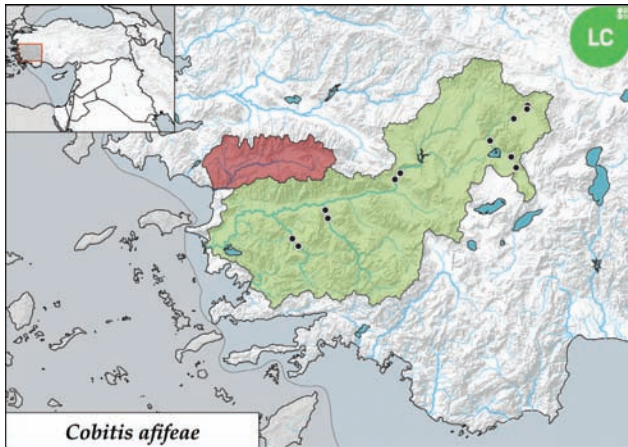
Habitat. Streams, rivers, lakes, and reservoirs, usually on sand or fine gravel in slow or moderate fast-flowing waters.

Biology. No data.

Conservation status. LC; extirpated from Küçük Menderes.

Remarks. Often occurs in sympatry with *C. fahireae*.

Further reading. Freyhof et al. 2018c (description).



Cobitis aliyeae; lower Seyhan drainage, Türkiye; female, 65 mm SL.

Cobitis aliyeae

Common name. Cilician spined loach.

Diagnosis. Distinguished from other species of *Cobitis* in Mediterranean basin east of Eşen by: ○ flank pattern well organised in four Gambetta zones / ○ anterior to dorsal origin, blotches in Z2 and Z4 almost always well separated from each other / ○ Z1 and Z2 always well distinguished / ○ Z2 with small brown spots, always much smaller than blotches in Z3, much smaller than eye or pupil diameter / ○ Z2 and Z3 well separated / ○ Z4 formed by one series of distinct blotches / ○ no pigmentation or very few isolated brown spots below Z4 and on lower caudal-peduncle / ○ mid-dorsal pigmentation consisting in a series of 10–14 dark-brown, roundish blotches / ○ prepelvic length 56–60 % SL in female / ○ interorbital distance 7–11 % HL in male / ○

caudal-peduncle length 11–14 % SL in female. Size up to 65 mm SL.

Distribution. Türkiye: Lower Tarsus, Seyhan and Ceyhan drainages.

Habitat. Streams, rivers, lakes, and reservoirs, usually on sand or fine gravel in slow or moderate fast-flowing waters.

Biology. No data.

Conservation status. LC.

Remarks. *Cobitis aliyeae*, *C. evreni*, and *C. erkakanae* are three *Cobitis* species found in the Ceyhan drainage. All three species occur in allopatry within the drainage, *C. aliyeae* in lower Ceyhan and *C. evreni* in upper reaches of Ceyhan.

Further reading. Freyhof et al. 2018c (description).



Cobitis amphilekta; Caspian Sea near Port Il'icha, Azerbaijan; male, 41 mm SL. © E. Vasil'eva.

Cobitis amphilekta

Common name. Azerbaijani spined loach.

Diagnosis. Distinguished from other species of *Cobitis* in Caspian basin by: ● subdorsal scales with a large focal zone, about $\frac{1}{2}$ of maximum scale diameter / ○ Z4 consisting of distinct, large dark-brown blotches, usually horizontally elongated on anterior part of flank, roundish or vertically elongated on caudal-peduncle / ○ spot in upper part of caudal base very small and faint. Size up to 65 mm SL.

Distribution. Kyzylagach Bay, south of Kura estuary, lower Kumbashi, about 150 m from Azerbaijan's coast, desalinated

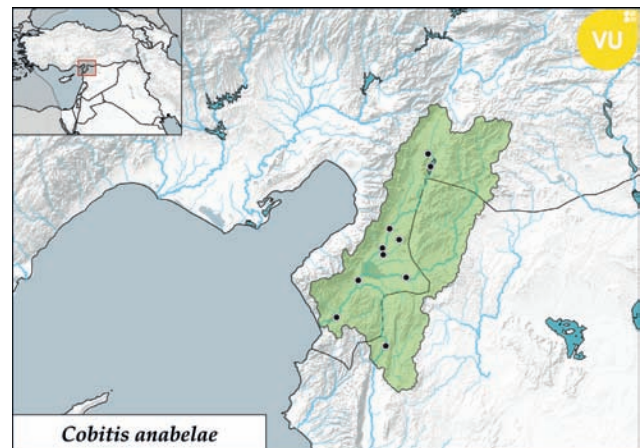
Caspian Sea area off Durnev Islands and Prorva in Kazakhstan. Expected to occur elsewhere in lower parts of rivers, coastal lagoons, and freshened parts of sea.

Habitat. Coastal lagoons, lower parts of rivers, and freshwater parts of sea with gravel, sand, or mud bottoms.

Biology. No data.

Conservation status. Extinct; not recorded since 1937. Intensive fieldwork in southern Azerbaijan revealed only *C. saniae*, even in stream sections very close to the sea.

Further reading. Vasil'eva & Vasil'ev 2012 (description).



Cobitis anabelae; Karasu in Orontes drainage, Türkiye; male, 53 mm SL.



Cobitis anabelae; Gölbaşı lake in Orontes drainage, Türkiye; female, 70 mm SL.

Cobitis anabelae

Common name. Hatay spined loach.

Diagnosis. Distinguished from other species of *Cobitis* in Mediterranean basin east of Eşen by: ○ flank pattern well organised in four Gambetta zones / ○ anterior to dorsal origin, blotches in Z2 usually fused into short, irregularly shaped stripes, or forming a mottled band of irregularly shaped, small blotches and spots / ○ Z1 and Z2 usually fused into a mottled band / ○ Z2 with small brown spots, always much smaller than blotches in Z3, much smaller than eye or pupil diameter / ○ Z2 and Z3 well separated / ○ Z4 formed by one series of distinct blotches, fused into a stripe in few individuals / ○ mid-dorsal pigmentation consisting in a series of 7–11 dark-brown, roundish blotches / ○ no pigmentation or very few isolated brown spots below Z4 and on lower caudal–peduncle / ○ interorbital

distance 7–11 % HL in male / ○ prepelvic length 53–55 % SL in female / ○ caudal–peduncle length 15–19 % SL in female. Size up to 82 mm SL.

Distribution. Türkiye and Syria: Lower Orontes drainage.

Habitat. Streams, rivers, lakes, and reservoirs, usually on sand or fine gravel in slow or moderate fast-flowing waters.

Biology. No data.

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

Remarks. While *C. anabelae* is found in northern, lower part of Orontes drainage, the upper Orontes is inhabited by the closely related *C. levantina*. The exact distribution of both species is unknown, and it cannot be excluded that they might form a hybrid zone at the border of their ranges.

Further reading. Freyhof et al. 2018c (description).



Cobitis avicennae; Karkheh drainage, Iran; ~90 mm SL.

Cobitis avicennae

Common name. Zagros spined loach.

Diagnosis. Distinguished from other species of *Cobitis* in Persian Gulf basin by: ○ one lamina circularis in male / ○ 12–17 distinct, large, dark-brown blotches in Z4, usually horizontally elongated along anterior part of flank, roundish or vertically elongated on caudal–peduncle. Size up to 98 mm SL.

Distribution. Iran: Dinevar, Raazavar, and Gamasiab in upper Karkheh drainage.

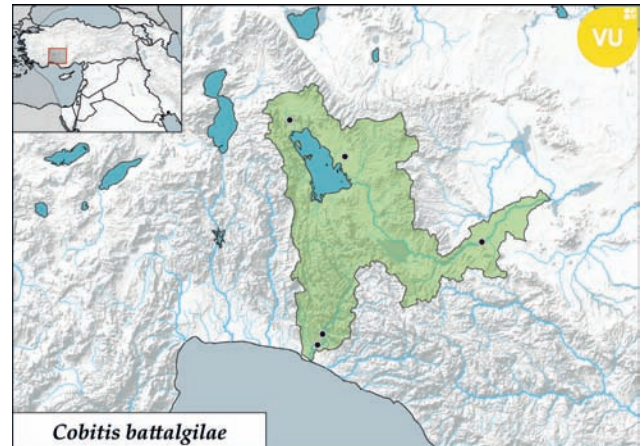
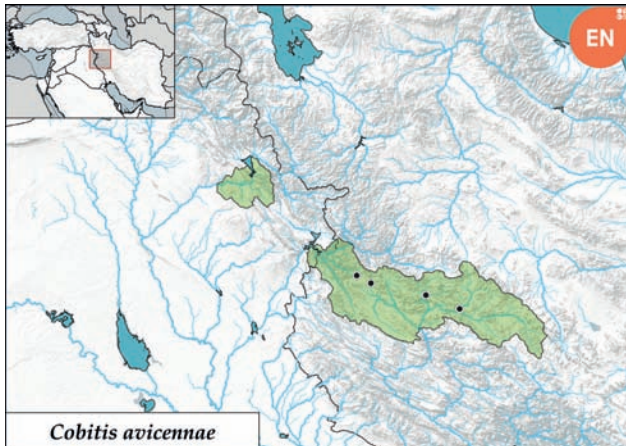
Habitat. Streams with sandy or muddy bottoms.

Biology. No data.

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

Remarks. Records from Sirvan (Iran) and Dukan reservoir in Lesser Zab drainage (Iraq) might be identified as this species, but these identifications must be confirmed.

Further reading. Coad 2010a (record from Iraq); Mousavi-Sabet et al. 2015e (description).



Cobitis battalgilae; spring Eflatun Pınarı, Türkiye; male, 68 mm SL.

Cobitis battalgilae

Common name. Beyşehir spined loach.

Diagnosis. Distinguished from other species of *Cobitis* in Mediterranean basin east of Eşen and endorheic basins in Central Anatolia by: / ◦ two laminae circularis in male / ◦ pigmentation organised in Gambetta zones / ◦ blotches in Z4 being usually dissociated, usually vertically elongate, often forming a band or an open field of small, irregularly shaped blotches and spots in female larger than 90 mm SL / ◦ blotches in Z4 often vertically and horizontally dissociated into several rows or a wide band of small blotches and spots / ◦ blotches in Z4 in not forming stripes, usually much larger than in Z2 / ◦ mid-dorsal pigmentation consisting in a series of blotches, often very closely set or slightly fused / ◦ a black spot at upper caudal base, often very small and comma-shaped / ◦ anterior nare reaching to hint margin of posterior nare when folded down

/ ◦ external part of suborbital spine bifurcate / ◦ snout as long or shorter than distance between tip of anal and end of hypural complex / ◦ caudal peduncle 14–16 % SL / ◦ interorbital distance 14–16 % HL in male / ◦ eye diameter in male 16–20 % HL. Size up to 137 mm SL.

Distribution. Türkiye: Lake Beyşehir basin in Çeltekin very north and in spring Eflatunpınarı in east of lake (and maybe elsewhere). Also, in Apa reservoir and in river that flows out of Lake Suğla and ends in Konya plains, as well as in Manavgat that flows to Gulf of Antalya.

Habitat. Running waters with gravel, sand, or silt bottoms, often with dense submerged vegetation.

Biology. No data.

Conservation status. VU; less than 10 populations are known; some declining but may be more widespread.

Remarks. Closely related to *C. turcica*, and few individuals might be difficult to distinguish. *Cobitis battalgilae* grows



Cobitis battalgilae; spring Eflatun Pınarı, Türkiye; female, 135 mm SL.

much larger than *C. turcica*. The distribution area of *C. battalgilae* reflects the hydrological connections of Lake Beyşehir, which seasonally flows over to Lake Suğla, from which some parts of water flow to the Konya plain, and other parts of water flow into the karstic rock masses supporting springs in Manavgat drainage through underground connections.

The colour pattern in *C. battalgilae* is especially variable within and between populations. Some individuals, usually males smaller than 70 mm SL, lack the pigmentation in Z3, and there is one series of squarish blotches in Z4. Other individuals have the Z3 partly or fully pigmented, and the blotches in Z4 are vertically elongate,

often small and densely set, or some or all blotches in Z4 are divided into 2 or more elements, resulting in a colour pattern of two rows of blotches (similar to *C. pirii*, see below). In other individuals, Z4 is dissociated into a band of small, irregularly shaped blotches and spots, or the spots and blotches are dispersed on the flank, forming an open field of blotches and spots. This large variability in colour pattern in *C. battalgilae* makes it very difficult to identify this species, especially if only few individuals are available.

Further reading. Băcescu 1962 (description); Freyhof et al. 2018c (description).



Cobitis bilseli; Beyşehir canal, Türkiye; ~190 mm SL.

Cobitis bilseli

Common name. Great Beyşehir spined loach.

Diagnosis. Distinguished from other species of *Cobitis* in Mediterranean basin east of Eşen and endorheic basins in Central Anatolia by: ● one lamina circularis on pectoral in male, base of pectoral ray adjacent to lamina circularis swollen / ● a short skin-flap before genital papilla. Size up to 195 mm SL.

Distribution. Türkiye: Lake Beyşehir basin, in streams Sarıöz (Eylikler) and Sarıçay north of Beyşehir (and possibly others). Also, in river flowing from Lake Beyşehir to Lake Suğla and seasonally in outflow of Lake Beyşehir, possibly more widespread.

Habitat. Running waters with gravel or sand bottoms, often with dense submerged vegetation.

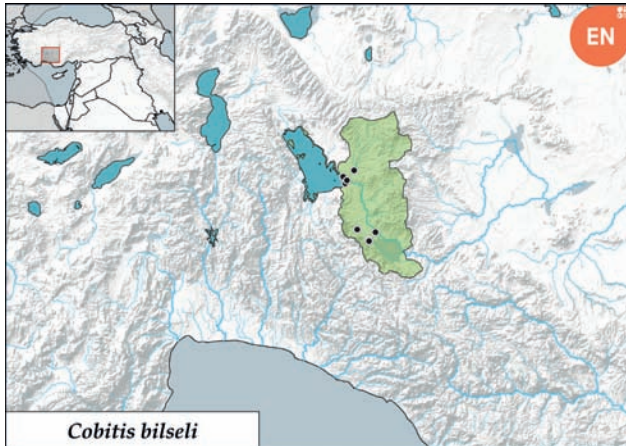
Biology. No data.

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

Remarks. This is the largest spined loach in the world. It was placed in a separate subgenus, *Beyshehiria*, but belongs to a group of species around *C. simplicispina*. It is related

to the geographically adjacent *C. pirii* from Lake Eğirdir basin. It is the only species of this species group having one lamina circularis, while all other species have two.

Further reading. Battalgil 1942 (description); Freyhof et al. 2018c (description).



Doors regulating the water level of Lake Beyşehir, a seasonal habitat of *Cobitis bilseli*.



Cobitis derzhavini; Kara-Su in Kura drainage, Azerbaijan; female, 73 mm SL.



Cobitis derzhavini; Kara-Su in Kura drainage, Azerbaijan; male, 66 mm SL.

Cobitis derzhavini

Common name. Kura spined loach.

Diagnosis. Distinguished from other species of *Cobitis* in southern Caspian basin by: ● plate of lamina circularis not reaching end of third segment of attached pectoral ray / ● dark-brown spot at upper caudal base absent or poorly developed / ○ subdorsal scales with a small focal zone (about or less than $\frac{1}{10}$ of maximum scale diameter) / ○ one lamina circularis in male. Size up to 80 mm SL.

Distribution. Azerbaijan and Georgia: Lower Kura drainage: Kara-Su and its tributaries, Agstafa, Mingechaur reservoir basin, and Katekh in Balaken region.

Habitat. Wetlands, streams, rivers, and reservoirs, usually on sand or fine gravel in slow or moderate fast-flowing waters.

Biology. No data.

Conservation status. LC.

Remarks. Sympatric with *C. saniae* in Agstafa drainage and potentially in other areas. Both species are very closely related, and their mode of reproductive isolation is interesting to research.

Further reading. Vasil'eva et al. 2020 (description); Vasil'eva & Vasil'ev. 2020 (osteology).



Cobitis dorademiri; Lake Köyceğiz basin, Türkiye; male, 87 mm SL.

Cobitis dorademiri

Common name. Köyceğiz spined loach.

Diagnosis. Distinguished from other *Cobitis* species in eastern Aegean basin by: ○ very deep caudal-peduncle, depth 1.0–1.2 times in its length / ○ two laminae circularis in male / ○ back spot at upper caudal base present, often very small / ○ usually, a very regular colour pattern organised in four Gambetta zones / ○ Z4 often dissociated into a wide

band or field of small blotches and spots / ○ blotches in Z4 much larger than in Z2 / ○ pigmentation below Z4 present, often restricted to anal base / ○ external part of suborbital spine bifurcate. Size up to 90 mm SL.

Distribution. Türkiye: Lake Köyceğiz basin, lower Dalaman drainage, and some small coastal streams in between.

Habitat. Streams and rivers with sandy or gravelly bottoms.

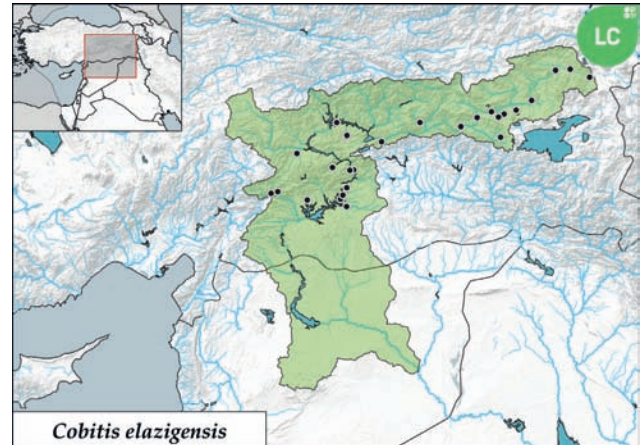
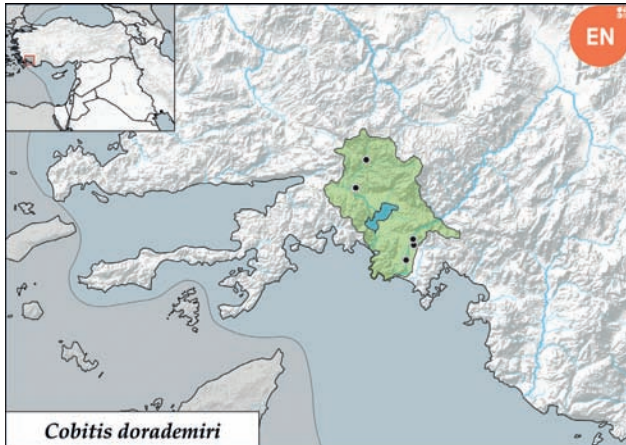
Biology. No data.

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

Remarks. Four different *Cobitis* species in Dalaman drainage make this small river a hotspot in *Cobitis* species diversity. *Cobitis dorademiri*, *C. phrygica*, and *C. indus* have two laminae circularis. These three species seem not to occur in sympatry as *C. dorademiri* is only known from the lower, *C. indus* from the middle, and *C. phrygica* from

upper Dalaman drainage, where it occurs adjacent to and potentially sympatric with *C. fahireae*. The distribution of different species in Dalaman should be better explored. It is expected that *C. dorademiri* and *C. indus*, but potentially all species, might occur in sympatry.

Further reading. Erk'akan et al. 2017 (description); Freyhof et al. 2018c (description).



Cobitis elazigensis; upper Euphrates drainage, Türkiye; female, 122 mm SL.

Cobitis elazigensis

Common name. Euphrates spined loach.

Diagnosis. Distinguished from other species of *Cobitis* in Persian Gulf basin by: ○ two laminae circularis in male / ○ Z4 between vertical of pectoral origin and dorsal base squarish, irregularly shaped, roundish, and usually widely separated / ○ pelvic axillary lobe present. Size up to 143 mm SL.

Distribution. Türkiye: Upper Euphrates south to Atatürk reservoir. Expected to be more widespread in Euphrates,

and records of *Cobitis* from Syrian Euphrates may belong to this species.

Habitat. Streams, rivers, lakes, and reservoirs, usually on sand or fine gravel in slow or moderate fast-flowing waters.

Biology. No data.

Conservation status. LC.

Further reading. Coad & Sarieyyüpoğlu 1988 (description); Erk'akan et al. 1998 (discussion); Bohlen et al. 2006 (phylogeny); Freyhof et al. 2018c (description).



Cobitis emrei; Lake Sapanca basin, Türkiye; male, 55 mm SL.

Cobitis emrei

Common name. Sapanca spined loach.

Diagnosis. Distinguished from other species of *Cobitis* in Marmara and Black Sea basins by: ● Z3 fully covered by very small spots forming a sand-like pattern, especially in female / ● black spot at upper caudal base roundish or ovoid, larger than eye diameter in male / ○ blotches in Z2 and Z4 well separated, fused into a bold stripe in some individuals / ○ flank without pigmentation below Z4 / ○ 12–18 roundish, triangular, squarish or horizontally elongate blotches in Z4, blotches vertically elongate on posterior part of flank / ○ one lamina circularis in male / ○ focal

zone of subdorsal scale small, about $\frac{1}{3}$ – $\frac{1}{4}$ of vertical scale diameter. Size up to 77 mm SL.

Distribution. Türkiye: Lake Sapanca basin. *Cobitis* in lower Sakarya drainage are expected to belong to this species.

Habitat. Lakeshores with fine sediments such as sand and silt, and inflowing streams.

Biology. No data.

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

Further reading. Erk'akan et al. 1998 (distribution as *C. vardarensis*); Freyhof et al. 2018c (description).



Cobitis erkakanae; River connecting Lakes Gölbaşı and Azaplı, Türkiye; female, ~65 mm SL.

Cobitis erkakanae

Common name. Gölbaşı spined loach.

Diagnosis. Distinguished from other species of *Cobitis* in Mediterranean basin east of Eşen and endorheic basins in Central Anatolia by: ○ flank pattern well organised in four Gambetta zones / ○ a series of large, horizontally elongate blotches in Z4, adjacent blotches often fused / ○ blotches in Z4 not vertically or horizontally dissociated / ○ external part of suborbital spine bifurcate / ○ black spot present at upper caudal base / ○ two laminae circularis in male / ○ mid-dorsal

pigmentation consisting in a series of 9–12, elongate blotches, often very closely set or slightly fused. Size up to 65 mm SL.

Distribution. Türkiye: Lakes Gölbaşı (Adıyaman) basin in Ceyhan drainage.

Habitat. Streams and lakes, usually on sand or fine gravel.

Biology. No data.

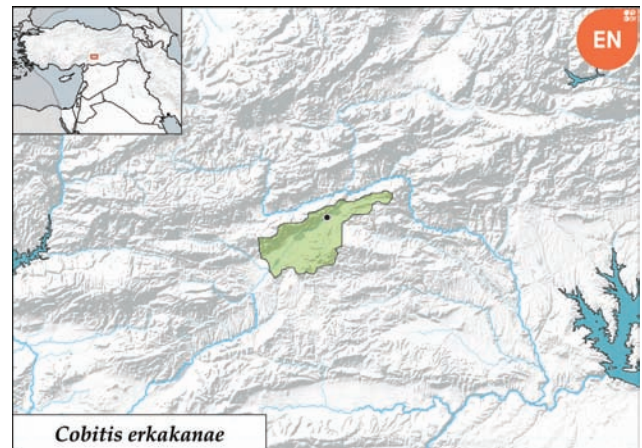
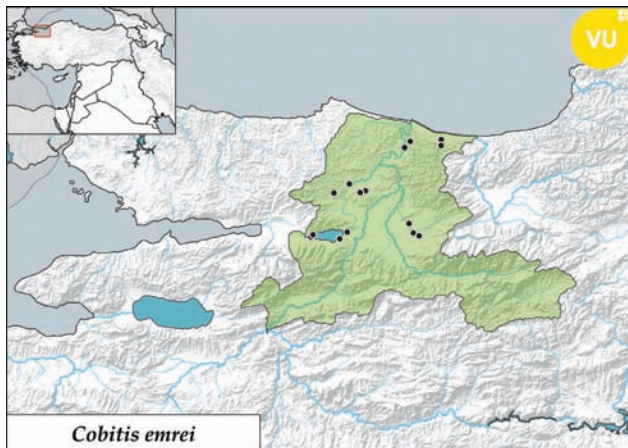
Conservation status. EN; appears to be declining within its very small range.

Remarks. Together with *C. aliyeae* and *C. evreni*, *C. erkakanae* is the third *Cobitis* species found in Ceyhan

drainage. All three species occur in allopatry within drainage, but we are unaware of any biogeographical background explaining why the Gölbaşı lakes have their own fish fauna isolated from the Ceyhan. Not only is *C. erkakanae* endemic to the Gölbaşı lakes, but molecular data indicates that the populations of *Paraphanius* (*P. boulengeri*) and

Pseudophoxinus zekayi are isolated from those in Ceyhan. While the water from the Gölbaşı lakes flows to the Ceyhan today, we postulate that this was an endorheic basin connected only recently to the Ceyhan.

Further reading. Freyhof et al. 2018c (description).



Cobitis evreni; Ceyhan drainage, Türkiye; upper: 78 mm SL; lower: 75 mm SL.

Cobitis evreni

Common name. Ceyhan spined loach.

Diagnosis. Distinguished from other species of *Cobitis* in Mediterranean basin east of Eşen and endorheic basins in Central Anatolia by: ● a bold-brown stripe in Z4 between head and vertical of anal origin / ○ flank below Z4 unpigmented / ○ external part of suborbital spine bifurcate / ○ no black spot at upper caudal base / ○ two laminae circularis in male. Size up to 80 mm SL.

Distribution. Türkiye: Göksun and Savrun in middle Ceyhan drainage.

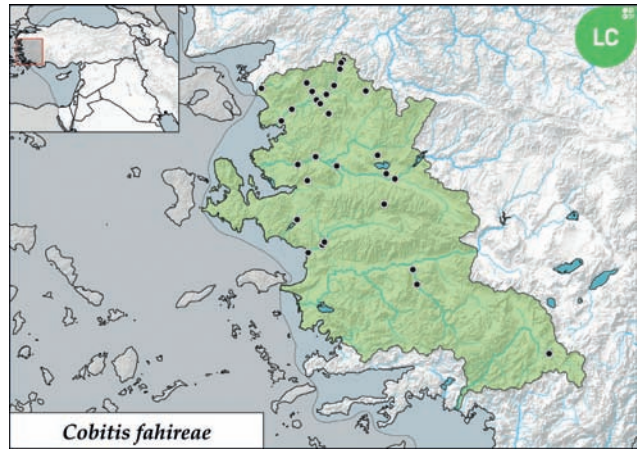
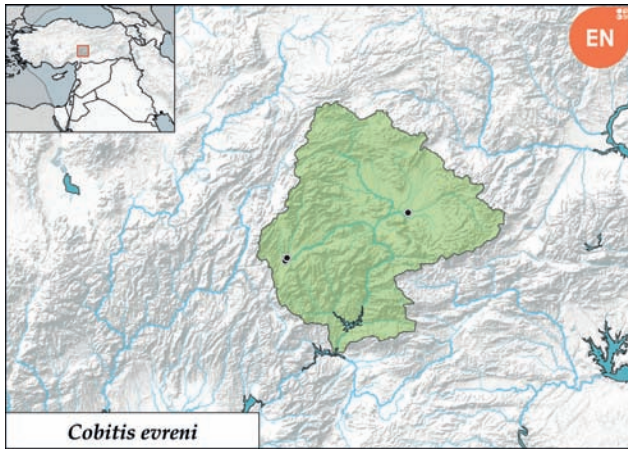
Habitat. Running waters with gravel or sand bottoms, also on lakeshores.

Biology. No data.

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

Remarks. *Cobitis evreni*, *C. aliyeeae*, and *C. erkakanae* are the three *Cobitis* species found in Ceyhan drainage. All three species occur in allopatry within Ceyhan drainage, *C. evreni* inhabiting hillstream habitats in middle and upper Ceyhan drainage.

Further reading. Erk'akan et al. 2008a (description); Freyhof et al. 2018c (description).



Cobitis fahireae; Büyük Menderes drainage, Türkiye; 51 mm SL.



Cobitis fahireae; Bakırçay drainage, Türkiye; male, 46 mm SL.

Cobitis fahireae

Common name. Aegean spined loach.

Diagnosis. Distinguished from other species of *Cobitis* in eastern Aegean basin by: ● 12–18 roundish, triangular, squarish, or horizontally elongate blotches in Z4, often densely set and fused into short stripes along anterior and middle part of flank / ● blotches vertically elongate on posterior part of flank / ○ black spot at upper caudal base absent or comma-shaped,

smaller than eye diameter / ○ Z3 with a row or a narrow band of small spots not forming a sand-like pattern / ○ focal zone of subdorsal scale small / ○ blotches in Z2 and Z4 well separated, fused into a bold stripe in some individuals / ○ flank without pigmentation below zone Z4 / ○ one lamina circularis in male. Size up to 89 mm SL.

Distribution. Türkiye: Upper Dalaman drainage (around Gölhisar) north to Madra drainage in Aegean basin.

Habitat. Streams, rivers, lakes, and reservoirs, usually on sand or fine gravel in slow or moderate fast-flowing waters.

Biology. No data.

Conservation status. LC.

Remarks. *Cobitis kurui*, described from the Küçük Menderes, and *C. damlae* from the upper Dalaman are synonyms. *Cobitis damlae* was described for an albinotic individual miss-perceived as a cave fish. Molecular data indicate a

moderate diversity of different populations identified as *C. fahireae* within its large range, and we cannot fully exclude that more than one species is involved. Initial examination of several populations did not reveal any characters allowing to distinguish different populations as distinct species.

Further reading. Erk'akan et al. 1998 (description); Erk'akan & Özdemir 2014 (*Cobitis damlae*); Freyhof et al. 2018c (diagnosis, synonyms).



Cobitis faridpaki; Tajan, Iran; male, 50 mm SL.

Cobitis faridpaki

Common name. Siahrud spined loach.

Diagnosis. Distinguished from other species of *Cobitis* in Caspian and Lake Namak basins by: ○ one lamina circularis in male / ○ base of lamina circularis with a narrow connection to pectoral ray / ○ cheek between eye and opercle poorly pigmented or unpigmented / ○ plate of lamina circularis reaching to or beyond end of third segment of attached pectoral ray / ○ dark-brown spot at upper caudal base well developed / ○ subdorsal scales with a small focal zone, about or less than $\frac{1}{10}$ of maximum scale diameter. Size up to 90 mm SL.

Distribution. Iran: Eastern Caspian basin from Khey east to Gorgan, Karaj in Lake Namak basin, and Taar and Havar in upper Nam drainage in Western Kavir basin.

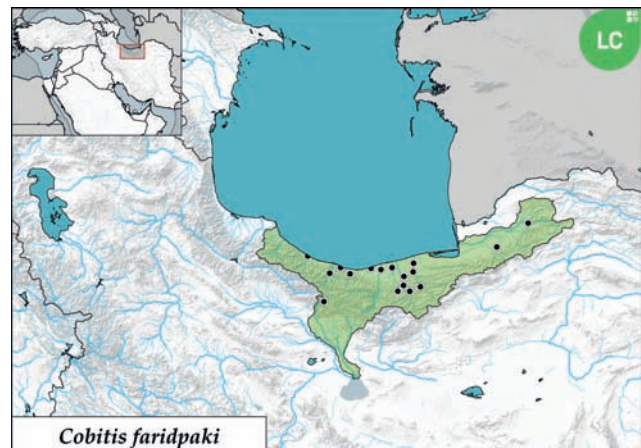
Habitat. Running and stagnant waters with sandy bottoms, often with dense submerged vegetation.

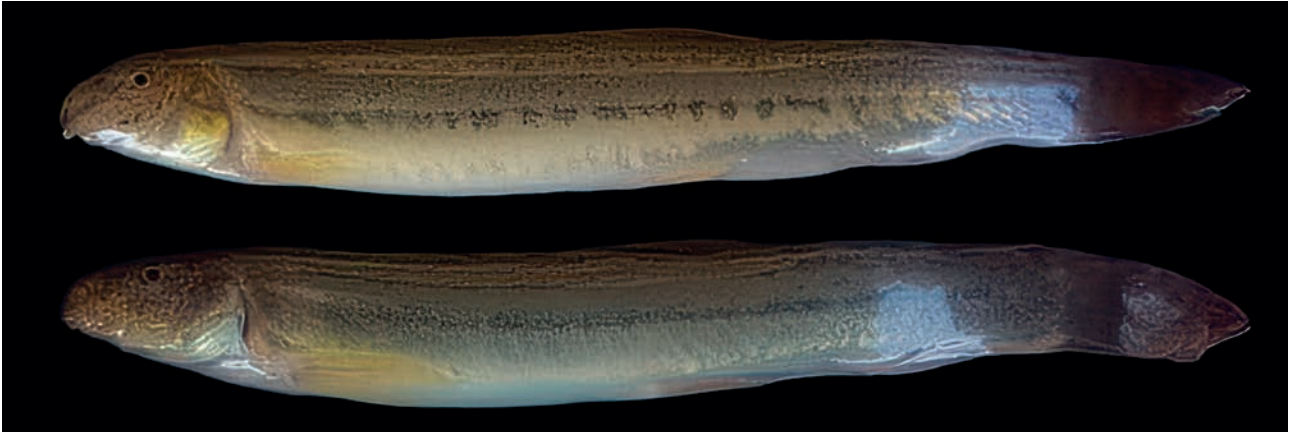
Biology. No data.

Conservation status. LC.

Remarks. *Cobitis keyvani* from eastern Caspian basin is a synonym. Most probably Western Kavir population was translocated to upper Nam drainage.

Further reading. Mousavi-Sabet et al. 2011 (description); Mousavi-Sabet et al. 2012 (description of *C. keyvani*); Eagderi et al. 2017a (Lake Namak); Jouladeh-Roudbar et al. 2017a (*C. keyvani* as a synonym of *C. faridpaki*).





Cobitis indus; Dalaman, Türkiye; female (upper) and male (lower), ~50 mm SL. © S. Aksu.

Cobitis indus

Common name. Dalaman spined loach.

Diagnosis. Distinguished from other *Cobitis* species in eastern Aegean basin by: ○ caudal–peduncle depth 1.2–1.7 times in caudal–peduncle length / ○ two laminae circularis in male / ○ back spot at upper caudal base present, often very small / ○ usually a very regular colour pattern organised in four Gambetta zones / ○ Z4 rarely dissociated into a wide band or field of small blotches and spots / ○ blotches in Z4 slightly larger than in Z2 / ○ pigmentation below Z4 absent or restricted to a short line or few dots on caudal–peduncle / ○ external part of suborbital spine bifurcate. Size up to 69 mm SL.

Distribution. Türkiye: Middle Dalaman drainage.

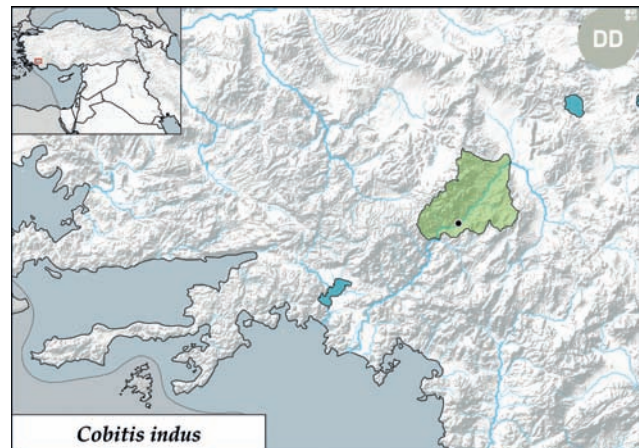
Habitat. Rivers, usually on sand or fine gravel in slow or moderate fast-flowing waters.

Biology. No data.

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

Remarks. See remarks under *C. dorademiri*.

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



Cobitis joergbohleni; spring Soysallı, Türkiye; female, 70 mm SL.

Cobitis joergbohleni

Common name. Sultan spined loach.

Diagnosis. Distinguished from other species of *Cobitis* in Mediterranean basin east of Eşen and endorheic basins in Central Anatolia by: ○ flank pattern not organised in Gambetta zones, completely disorganised into a pattern of many small spots and blotches / ○ two laminae circularis in male / ○ black spot present at upper caudal base, often very small and best seen in life individuals / ○ 5–8 dark-brown, large and roundish blotches on back anterior to dorsal origin / ○ mental lobe short, not reaching beyond lower lip; caudal

slightly rounded / ○ prepelvic length 58–59 % SL / ○ preanal distance 81–82 % SL in female. Size up to 70 mm SL.

Distribution. Türkiye: Sultan marshes in Develi depression.

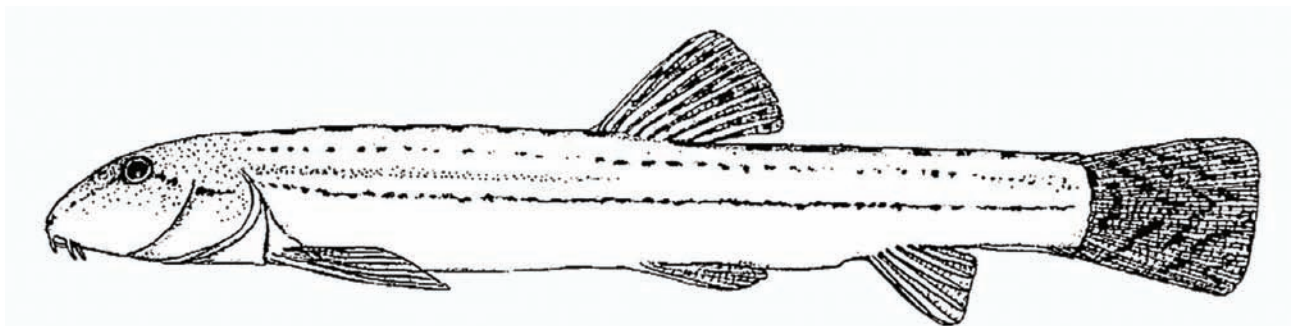
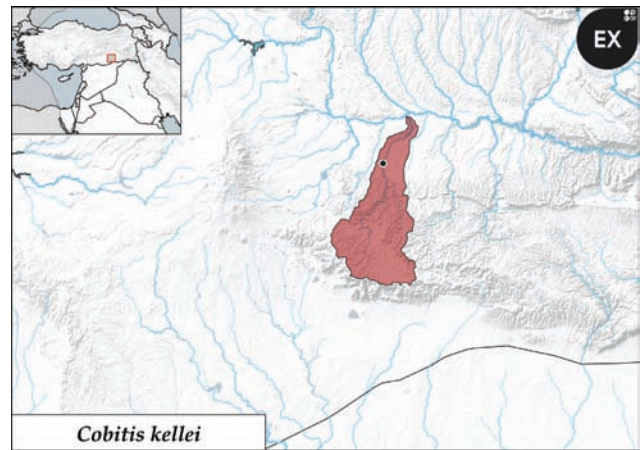
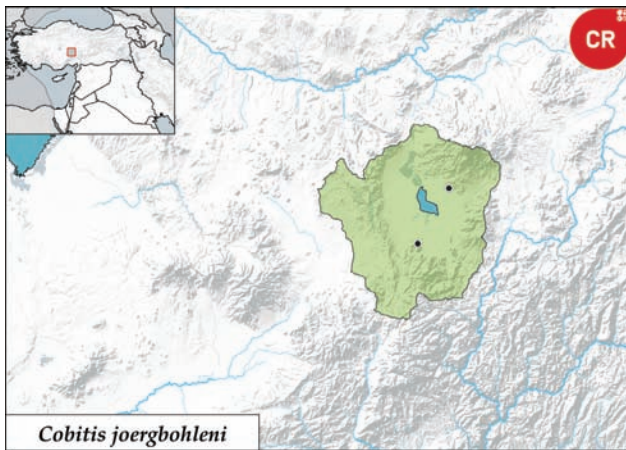
Habitat. Springs, streams, and canals, usually on sand or fine gravel in slow or moderate fast-flowing waters.

Biology. No data.

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

Remarks. *Cobitis fusunae* is a synonym.

Further reading. Freyhof et al. 2018c (description); Özdemir 2019 (*C. fusunae*).



Cobitis kellei; Tigris drainage; Türkiye; male, 46 mm SL. © T.N. Nalbant.

Cobitis kellei

Common name. Diyarbakır spined loach.

Diagnosis. Distinguished from other species of *Cobitis* in Persian Gulf basin by: ○ one lamina circularis in male / ○ Z4 consisting of indistinct minute, dark-grey, roundish dots. Size up to 58 mm SL, likely to grow larger.

Distribution. Türkiye: Göksu in upper Tigris drainage.

Habitat. Described from a small lowland stream.

Biology. No data.

Conservation status. Extinct; only known occurrence of this species was in lower Göksu. It has not been found again in the region despite intensive fieldwork. Habitat conditions in Göksu had been good and it remains unclear why it might have disappeared. In recent years, however, Göksu has almost completely dried out.

Further reading. Erk'akan et al. 1998 (description); Freyhof et al. 2018c (identification, extinction).



Cobitis levantina; Litani drainage; Lebanon; female, 65 mm SL. © M. Bariche.

Cobitis levantina

Common name. Orontes spined loach.

Diagnosis. Distinguished from other species of *Cobitis* in Mediterranean basin east of Eşen by: ◦ flank pattern well organised in four Gambetta zones / ◦ Z4 formed by one series of distinct blotches, partly or completely fused into a stripe in some individuals / ◦ black spot present at upper caudal base / ◦ blotches in Z2 irregularly shaped, often ½ of size or as large as in Z3 / ◦ often blotches in Z2 and Z3 about size of eye or pupil diameter / ◦ Z2 and Z3 usually forming one marbled pattern / ◦ many small, dark-brown spots or blotches on lower part of caudal-peduncle, reaching forward to pectoral base in some individuals / ◦ interorbital distance 7–11 % HL in male / ◦ external part of suborbital spine bifurcate / ◦ mid-dorsal pigmentation consisting in a series of 7–12 dark-brown, roundish blotches / ◦ two laminae circularis in male. Size up to 82 mm SL.

Distribution. Upper Orontes drainage in Syria and Lebanon, and Litani drainage in Lebanon.

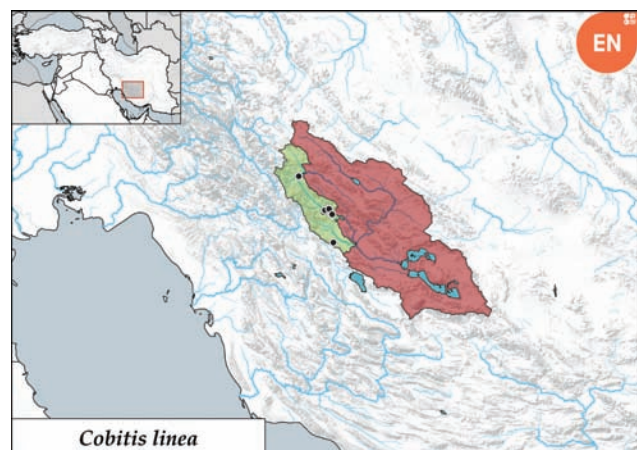
Habitat. Running and standing waters with sandy or muddy bottoms, often with dense submerged vegetation.

Biology. No data.

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

Remarks. *Cobitis levantina* is found in southern, upper Orontes, but closely related *C. anabelae* inhabits the northern, lower part of Orontes drainage. The exact distribution of both species is unknown, and it cannot be excluded that they might form a hybrid zone at the border of their ranges.

Further reading. Krupp & Moubayed 1992 (description); Freyhof et al. 2018c (diagnosis, distribution).





Cobitis linea; Kor, Iran; female, 89 mm SL.

Cobitis linea

Common name. Shiraz spined loach.

Diagnosis. Distinguished from species of *Cobitis* in Persian Gulf basin by: ○ two laminae circularis in male / ○ blotches in Z4 between vertical of pectoral origin until caudal-peduncle comma-shaped, densely set, often fused into short stripes or dissociated into a wide band of several rows of blotches / ○ axillary pelvic lobe absent. Size up to 100 mm SL.

Distribution. Iran: Kor drainage.

Habitat. Slow-flowing and stagnant waters with muddy or sandy bottoms.

Biology. Spawns June–July.

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

Remarks. Occasionally recorded from upper Kol, but this must be incorrect. Superficially similar loaches also occur in Iranian Karun drainage, and it cannot be excluded that these might be identified as *C. linea* in the future.

Further reading. Bianco & Nalbant 1980 (redescription); Esmaeili et al. 2008 (conservation status); Freyhof et al. 2018c (diagnosis, distribution).



Spring Ghadamgah in Kor drainage, Iran, is one of the few habitats of *Cobitis linea*.



Cobitis phrygica; spring east of Gemiş, Türkiye; female, 82 mm SL.



Cobitis phrygica; spring Kirkpınar, Türkiye; female, 79 mm SL.

Cobitis phrygica

Common name. Phrygian spined loach.

Diagnosis. Distinguished from other species of *Cobitis* in Central Anatolia and southern Aegean basin by: ○ a series of midlateral blotches in Z4 or Gambetta zones dissociated into a pattern of many irregularly shaped small or medium-sized spots and blotches / ○ flank below Z4, usually pigmented / ○ external part of suborbital spine simple / ○ no black spot at upper caudal base / ○ two laminae circularis in male. Size up to 120 mm SL.

Distribution. Türkiye: Salda basin, upper Eşen, and Dalaman drainages. In Aksu, north of Bucak, and in one spring area east of Gemiş in Acıgöl basin.

Habitat. Flowing and standing waters of springs and streams with sandy or muddy bottoms, often with dense submerged vegetation.

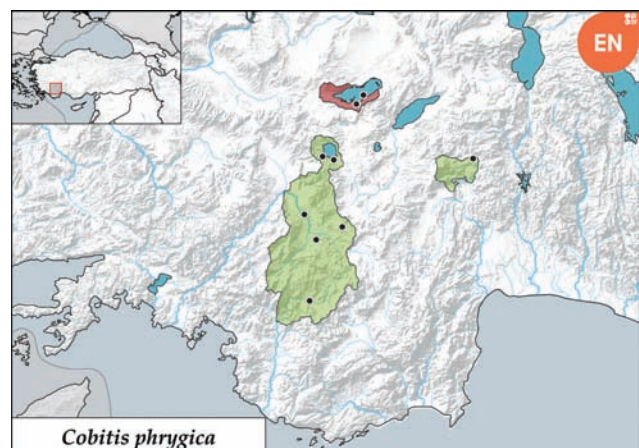
Biology. No data.

Conservation status. EN; largest populations in Dalaman and Eşen. Extirpated from Acıgöl basin. Other populations are confined to small areas.

Remarks. Often treated as a synonym of *C. simpliscispina*, but both species are not closely related. The colour pattern in *C. phrygica* is very variable within and

between populations, making it very difficult to identify. Some individuals have the flank pattern well organised in Gambetta zones; in others, the flank is covered by small spots. Also, all kinds of intermediate colour patterns are found, ranging from individuals with well-organised Gambetta zones to others with Gambetta zones completely dissociated.

Further reading. Battalgazi 1944 (description); Erk'akan et al. 1999 (diagnosis); Bohlen et al. 2006 (molecular phylogeny); Freyhof et al. 2018c (diagnosis, distribution).





Cobitis piri; Lake Eğirdir basin, Türkiye; female, 74 mm SL.

Cobitis piri

Common name. Pisidian spined loach.

Diagnosis. Distinguished from other species of *Cobitis* in Mediterranean basin east of Eşen and endorheic basins in Central Anatolia by: ○ flank pattern well organised in four Gambetta zones, blotches in Z4 organised in a wide band or two rows of spots, and blotches in some individuals or populations / ○ external part of suborbital spine simple / ○ black spot present at upper caudal base / ○ back with 13–20 dark-brown, roundish blotches, often irregularly shaped or fused to each other / ○ two laminae circularis in male. Size up to 97 mm SL.

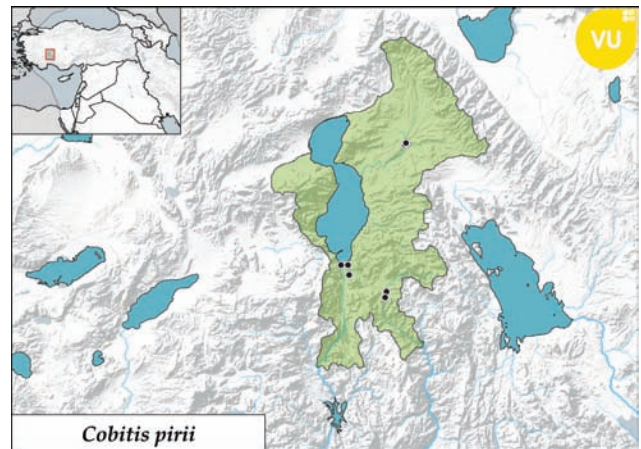
Distribution. Türkiye: Lake Eğirdir basin, upper Aksu and Köprüçay drainages.

Habitat. Streams, rivers, lakes, and reservoirs, usually on sand or fine gravel in slow or moderate fast-flowing waters.

Biology. No data.

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

Further reading. Freyhof et al. 2018c (description).



Cobitis punctulata; Lake Ulubat basin, Türkiye; male, 64 mm SL.

Cobitis punctulata

Common name. Brown spined loach.

Diagnosis. Distinguished from other species of *Cobitis* in Marmara basin by: ● body brownish / ● blotches of zone Z2 and Z4 very small, indistinct, or confluent / ○ flank pigmented below zone Z4 / ○ one lamina circularis in male. Size up to 78 mm SL.

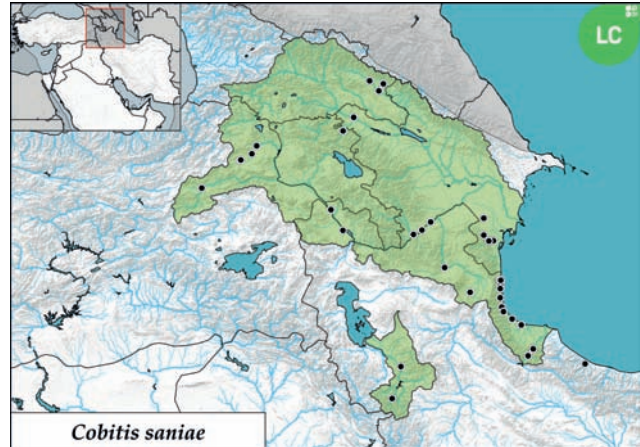
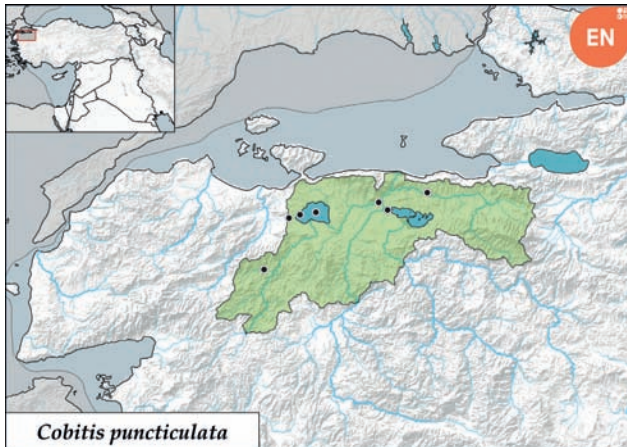
Distribution. Türkiye: Lakes Manyas and Ulubat basins; Greece and Türkiye: lower Maritza drainage.

Habitat. Still to moderately flowing streams with muddy bottoms.

Biology. No data.

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

Further reading. Erk'akan et al. 1998 (description); Freyhof et al. 2008 (record from Greece); Freyhof et al. 2018c (description, distribution).



Cobitis saniae; Sefid drainage, Iran; female, 85 mm SL.



Cobitis saniae; Lenkoran, Azerbaijan; female, 80 mm SL.

Cobitis saniae

Common name. Western Caspian spined loach.

Diagnosis. Distinguished from other species of *Cobitis* in Caspian and Black Sea basin by: ○ subdorsal scales with a small focal zone, about or less than $\frac{1}{10}$ of maximum scale diameter / ○ blotches in Z4 horizontally elongate, often very densely set and fused into short or longer stripes

anterior to dorsal origin / ○ dark-brown spot at upper caudal base well developed / ○ one lamina circularis in male / ○ plate of lamina circularis reaching to or beyond end of third segment of attached pectoral ray / ○ base of lamina circularis widely connected to pectoral ray / ○ cheek between eye and opercle strongly pigmented. Size up to 85 mm SL.



Cobitis saniae; Lenkoran, Azerbaijan; male, 55 mm SL.

Distribution. Sefid (Iran) north-west to Kura and Aras in Azerbaijan, Armenia, and Türkiye and Zarrineh drainage in Lake Urmia basin.

Habitat. Streams, rivers, lakes, and reservoirs, usually on sand or fine gravel in slow or moderate fast-flowing waters.

Biology. No data.

Conservation status. LC.

Remarks. A record from middle Rioni in Georgian Black Sea basin may be a lapsus.

Further reading. Eagderi et al. 2017b (description); Vasil'eva et al. 2020 (distribution in Caucasus).



Cobitis satunini; Kintrishi, Georgia; female, ~90 mm SL. © M. Geiger.



Cobitis satunini; Tuzla drainage, Türkiye; male, ~50 mm SL.

Cobitis satunini

Common name. Colchic spined loach.

Diagnosis. Distinguished from other species of *Cobitis* in Black Sea basin by: ○ pigmentation in Z3 usually complete, reaching much behind dorsal base / ○ pigmentation in Z3 usually wider than pigmentation in Z2 / ○ blotches in Z4 irregularly roundish or squarish anterior to dorsal origin / ○ focal zone of subdorsal scale small, about $\frac{1}{3}$ – $\frac{1}{10}$ of vertical scale diameter / ○ one lamina circularis in male / ○ base of lamina circularis with a narrow connection to pectoral ray. Size up to 90 mm SL.

Distribution. From Kintrich in Georgia [entering Black Sea at 41.80388, 41.76916] clockwise to İyidere, Filyos and Bartın drainages in southwestern Black Sea basin and from Tuzla (northernmost Aegean) east to Lake İznik basin, including Sursuluk drainage.

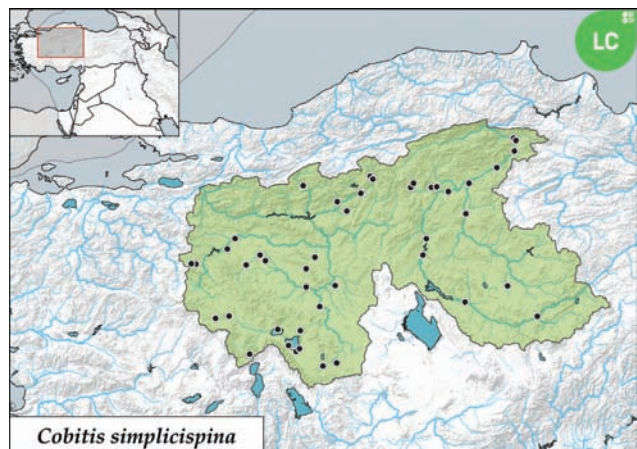
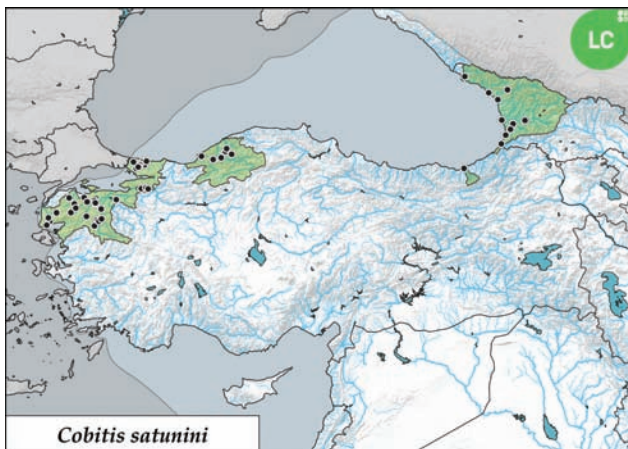
Habitat. Still to moderately flowing clear water streams with mud or sand bottoms.

Biology. No data.

Conservation status. LC.

Remarks. *Cobitis satunini* is closely related to European *C. taenia*. *Cobitis taenia* is distinguished by having 48 chromosomes (vs. 50). Records of *Cobitis* along the southern Black Sea coast are very sparse, and we are not aware of findings of *Cobitis* (except *C. simplicispina*) between Trabzon in east and Bartın in west. *Cobitis* from Western Black Sea basin, Marmara and northern Aegean had been identified as *C. taenia*. But these fish have 50 chromosomes and are also close to *C. satunini* by morphological and molecular characters. *Cobitis osurgeticus* has recently been treated as a valid species for most of the populations identified here as *C. satunini*. It is distinguished from *C. satunini* by very small differences in chromosomes and morphometric characters (both populations are probably conspecific). *Cobitis osurgeticus* is a *numen nudum*, as its description is not valid, despite later indications, and the name is not available.

Further reading. Gladkov 1935 (description); Freyhof et al. 2018c (description, distribution); Vasil'eva et al. 2024 (*C. osurgeticus*)



Cobitis simplicispina; Sakarya drainage, Türkiye; male, 73 mm SL.



Cobitis simplicispina; Sakarya drainage, Türkiye; female, ~100 mm SL.



Cobitis simplicispina; Lake Akşehir drainage, Türkiye; male, 65 mm SL.



Cobitis simplicispina; Lake Akşehir drainage, Türkiye; female, 129 mm SL.

Cobitis simplicispina

Common name. Galatian spined loach.

Diagnosis. Distinguished from other species of *Cobitis* in Black Sea basin and endorheic Anatolian basins of Lakes Akşehir, Eber, and Ilgın by: ● two laminae circularis in male. Size up to 130 mm SL.

Distribution. Türkiye: Sakarya and Kızılırmak drainages and endorheic basins of Lakes Eber, Akşehir and Ilgın.

Habitat. Streams, rivers, lakes, and reservoirs, usually on sand or fine gravel in slow or moderate fast-flowing waters.

Biology. No data.

Conservation status. LC.

Remarks. There is a doubtful record of *C. simplicispina* from Lake İznik, which has not been validated yet. Only *C. satunini* was so far found in Lake İznik. *Cobitis simplicispina* is the only species of *Cobitis* found in Black Sea basin having two laminae circularis, and it is immediately distinguished by its large size and the blotches in Z4 organised in one series, often fused into short or longer stripes (vs. blotches in Z4 well separated in other species). Molecular data place

C. simplicispina in a group of species from Central Anatolia and the Mediterranean basin, indicating a past biogeographic connection between these regions.

Further reading. Erk'akan et al. 1999 (diagnosis, synonyms); Bohlen et al. 2006 (molecular phylogeny); Freyhof et al. 2018c (description, distribution).



Cobitis sipahilerae; stream at Döşemealtı, Türkiye; female, 69 mm SL.

Cobitis sipahilerae

Common name. Kırkgöz spined loach.

Diagnosis. Distinguished from other species of *Cobitis* in Mediterranean basin east of Eşen and endorheic basins in Central Anatolia by: ● back plain cream-brown, few individuals with 1–3 narrow, squarish, brown bars / ○ two laminae circularis in male / ○ black spot present at upper caudal base, often very small and best seen in life individuals. Size up to 90 mm SL.

Distribution. Türkiye: Düden and Kırkgöz springs and out-flowing stream Yediarıklar.

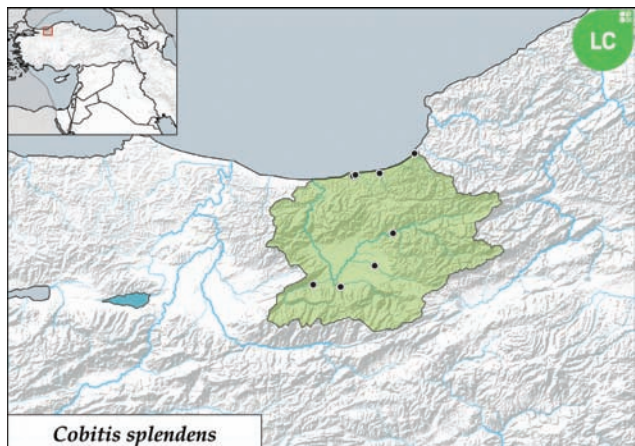
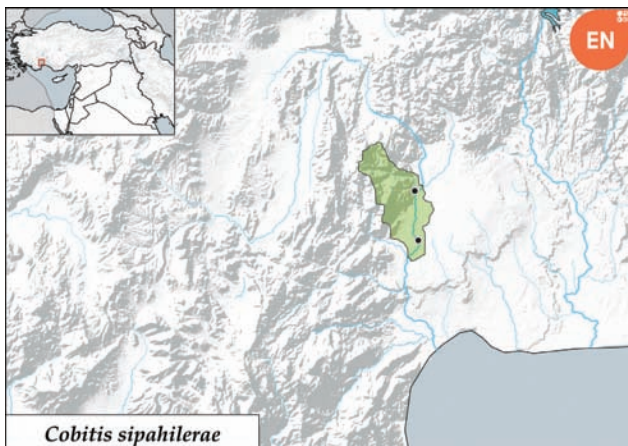
Habitat. Springs and spring-fed streams, usually on sand or fine gravel in slow or moderate fast-flowing waters.

Biology. No data.

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

Remarks. *Cobitis sipahilerae* is one of four freshwater fish species native to the Kırkgöz-Yediarıklar drainage and the adjacent Düden spring in Antalya. Others are *Pseudophoxinus antalyae*, *Paraphanius mentoides*, and *Seminemacheilus attalicus*. All four species are endemic to this small drainage system. The occurrence of four endemic species (the native fish fauna is comprised exclusively of strict endemic species) makes the Düden-Kırkgöz-Yediarıklar drainage a site of major importance for conservation.

Further reading. Erk'akan et al. 2017 (description); Freyhof et al. 2018c (description).





Cobitis splendens; stream Kovukkavla, Türkiye; male, ~49 mm SL.

Cobitis splendens

Common name. Bithynian spined loach.

Diagnosis. Distinguished from other species of *Cobitis* in Black Sea basin and endorheic Anatolian basins of Lakes Akşehir, Eber and Ilgın by: ○ pigmentation in Z3 reduced to about head length in male or pigmentation in Z3 as wide as or narrower than pigmentation in Z2 / ○ blotches in Z4 irregularly roundish or squarish anterior to dorsal origin / ○ focal zone of subdorsal scale small, about $\frac{1}{3}$ – $\frac{1}{10}$ of vertical scale diameter / ○ one lamina circularis in male / ○ base of lamina circularis with a narrow connection to pectoral ray. Size up to 86 mm SL.

Distribution. Türkiye: Small coastal streams around Akçakoca and Büyük Melen (Black Sea).

Habitat. Lower and middle reaches of still to moderately fast-flowing, clear streams with mud or sand bottoms.

Biology. No data.

Conservation status. LC; Population may be stable, but more data is needed.

Remarks. Doubtful records of this species from Aegean and southern Marmara basins could not be confirmed and seem to be based on misidentifications of *C. satunini* and *C. fahireae*. A reduced pigmentation in Z3 in male is very characteristic to *C. splendens*. Still, this character state is not unique to *C. splendens*, and individual males with very much reduced or even no pigmentation in Z3 are found in many other *Cobitis* species. *Cobitis* from the Büyük Melen [entering Black Sea at 41.073, 30.967] are identified as *C. splendens* based on molecular characters. Still, in this population, the pigmentation in Z3 is not reduced, distinguishing it from *C. splendens*. The *Cobitis* of Anatolian Black Sea basin needs an in-depth revision.

Further reading. Erk'akan et al. 1998 (description); Erk'akan et al. 1999 (distribution); Freyhof et al. 2018c (description, distribution, Büyük Melen).



Cobitis strumicae; Provadiskaya, Bulgaria; ~70 mm SL.



Cobitis strumicae; stream Koca, Türkiye; female, 85 mm SL.

Cobitis strumicae

Common name. Struma spined loach.

Diagnosis. Distinguished from other species of *Cobitis* in Marmara basin by: ● two laminae circularis in male / ○ usually two small spots at caudal base, often very small or absent / ○ zone Z4 with 12–21 roundish or squarish blotches, sometimes indistinct or fused two by two / ○ flank not pigmented below zone Z4. Size up to 110 mm SL.

Distribution. Türkiye: Kocaçay in Çanakkale province and a doubtful record from Terme (Samsun, Black Sea basin). European Aegean and Black Sea basins: from Struma

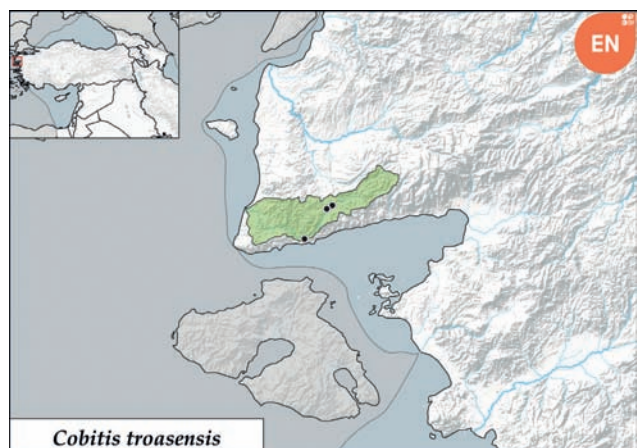
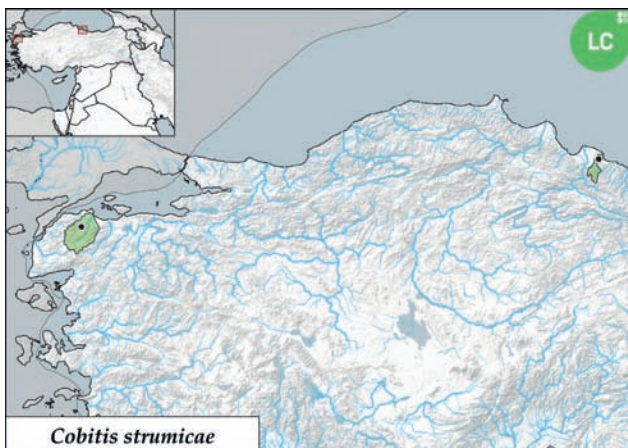
drainage to Varna area (Greece, Bulgaria, Türkiye), Lakes Volvi and Koronia (Greece); Danube basin in Bulgaria. Expected to be more widespread.

Habitat. Still to flowing waters with sandy or muddy bottoms.

Biology. No data.

Conservation status. LC.

Further reading. Economidis & Nalbant 1997 (description); Freyhof et al. 2018c (record from Anatolia); Özpiçak et al. 2023 (record from Samsun).



Cobitis troasensis; stream Tuzla, Türkiye; male, 60 mm SL.

Cobitis troasensis

Common name. Dardanelles spined loach.

Diagnosis. Distinguished from other species of *Cobitis* in eastern Aegean basin by: ● 25–36, small, comma-shaped blotches in Z4 along anterior and middle part of flank / ○ focal zone of subdorsal scale small, about $\frac{1}{3}$ – $\frac{1}{10}$ of vertical scale diameter / ○ flank without pigmentation below zone Z4 / ○ body pale-yellowish or whitish / ○ blotches squarish or irregular shaped on posterior part of flank, rarely fused into short stripes / ○ one lamina circularis in male. Size up to 76 mm SL.

Distribution. Türkiye: Tuzla drainage.

Habitat. Streams and rivers, usually on sand or fine gravel in slow or moderate fast-flowing waters.

Biology. No data.

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

Remarks. *Cobitis troasensis* is found in sympatry with *C. satunini*, making it one of very few cases in which two species of *Cobitis* with one lamina circularis occur together. Hybridisation between both should be expected.

Further reading. Freyhof et al. 2018c (description).



Cobitis turcica; Lake Tuz basin, Türkiye; female, 76 mm SL.



Cobitis turcica; Lake Tuz basin, Türkiye; female, ~70 mm SL.

Cobitis turcica

Common name. Central Anatolian spined loach.

Diagnosis. Distinguished from other species of *Cobitis* in Mediterranean basin east of Eşen and endorheic basins in Central Anatolia by: ○ flank pattern not organised in Gambetta zones, completely disorganised into a pattern of many small spots and blotches / ○ back with dark-brown, large, and roundish blotches / ○ black spot present at upper

caudal base, often very small and best seen in life individuals / ○ mental lobe long, reaching to or beyond lower lip / ○ caudal truncate / ○ prepelvic length 53–56 % SL / ○ preanal distance 75–78 % SL in female / ○ two laminae circularis in male. Size up to 100 mm SL.

Distribution. Türkiye: Wider Lake Tuz basin: Ereğli, Melendiz (Ihlara Valley), springs in Sultanhanı north of Sarı Yayla and Gölyazı.

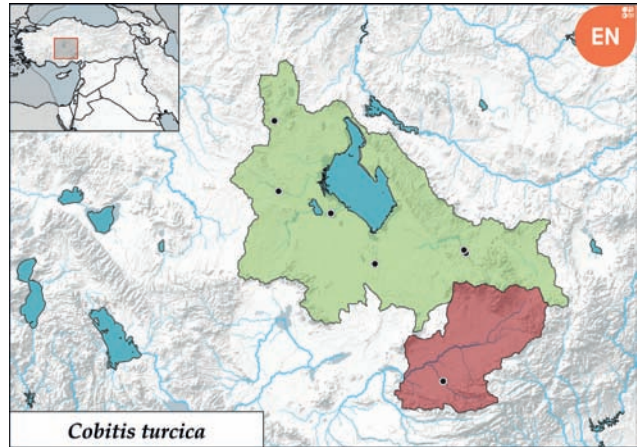
Habitat. Springs and streams with still to moderately flowing clear water and muddy or sandy bottoms. Also, lakes and reservoirs.

Biology. No data.

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

Remarks. *Cobitis turcica* and *C. battalgilae* are closely related, but almost all individuals can be well distinguished, and therefore they are treated as two species.

Further reading. Hankó 1925 (description); Erk'akan et al. 1998 (description, synonyms); Bohlen et al. 2006 (molecular phylogeny); Freyhof et al. 2018c (description, distribution).



Upper Aras in Türkiye is the habitat of *Sabanejewia aurata* and many other rheophilic species.

Sabanejewia

Golden loaches are widely distributed in the northern Aegean, Black, Baltic, Caspian, and Aral basins. There are approximately 10 species of *Sabanejewia*. *Sabanejewia aralensis* from the Aral Sea basin has been occasionally reported from the Hari drainage, although its presence here has yet to be confirmed. While superficially similar to *Cobitis*, *Sabanejewia* exhibits a markedly different sexual dimorphism. Male *Sabanejewia* reach the same size as females, lack modifications of the pectoral fins, but exhibit vertical swellings of the flanks in males. The biogeography

of *Sabanejewia* needs to be better understood. They are related to *Cobitis*, *Misgurnus*, *Microcobitis*, and *Bibarba*, all found in East Asia. Only *Sabanejewia* is absent from East Asia, reaching no further east than the Aral basin. The family Cobitidae probably originated in East and Southeast Asia. Consequently, it is anticipated that *Sabanejewia* may have colonised western Eurasia at an early stage, potentially during the Oligocene, in conjunction with the first Cyprinids. The genus subsequently disappeared from East Asia. **Further reading.** Sayyadzadeh et al. 2018a (phylogeny); Bohlen et al. 2020 (phylogeny).

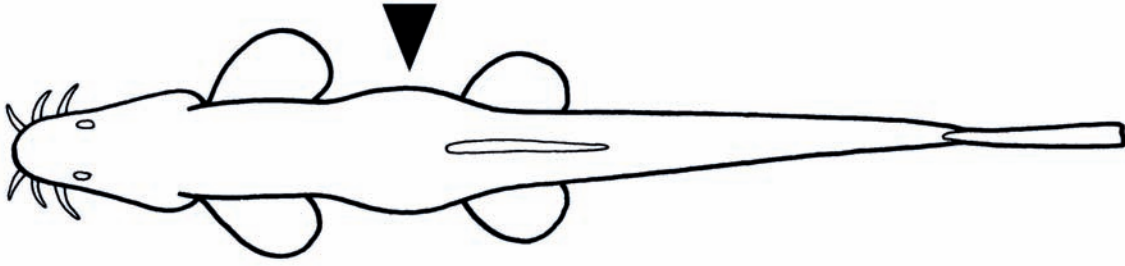


Figure 47: Vertical swelling (arrow) of male *Sabanejewia*.



Sabanejewia aurata; Kura drainage, Türkiye; ~70 mm SL. © M. Özuluğ.

Sabanejewia aurata

Common name. Caspian golden loach.

Diagnosis. Distinguished from *Sabanejewia caspia* by:
 • 10–15 large, distinct blotches along lateral midline • no irregularly shaped band of brown pigments below lateral blotches. Size up to 100 mm SL.

Distribution. Southern Caspian basin: Kura and Aras drainages east to Sefid.

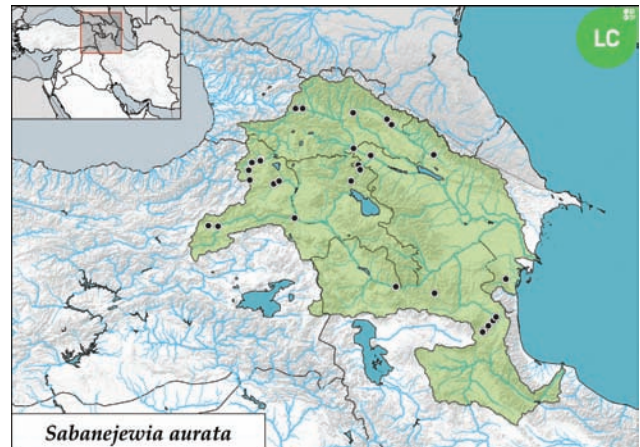
Habitat. Hill streams with clear water and sandy or gravelly bottoms. In moderate current.

Biology. No data.

Conservation status. LC.

Remarks. Occasionally, reported to occur in all rivers of Iranian Caspian basin, but no records east of Sefid was confirmed in last decades. The identity of Hari and Morghab populations is questionable, and these fishes might belong to *S. aralensis*, a species widespread in Zeravshan, Amu, and Syr Darya in Central Asia.

Further reading. Berg 1949b (description); Sayyadzadeh et al. 2018a (description).





Sabanejewia caspia; Sefid drainage, Iran; ~50 mm SL.

Sabanejewia caspia

Common name. Liman golden loach.

Diagnosis. Distinguished from *Sabanejewia aurata* by: ● a narrow, irregularly shaped stripe along lateral midline often overlaid by small blotches or short bars / ● an irregularly shaped band of brown pigments below lateral stripe. Size up to 92 mm SL.

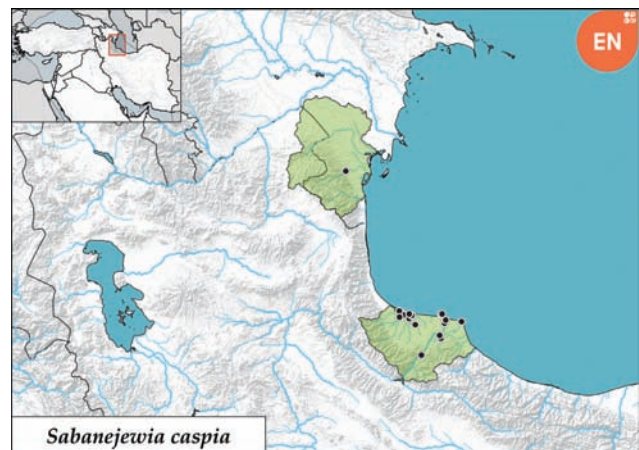
Distribution. Caspian basin: Lowermost Kura in Azerbaijan, Kyzylagach Bay south of Kura estuary, brackish lagoons in Lenkoran region, Anzali wetland, and lowermost Sefid in Iran. Caspian Sea at Durnev Islands and estuaries of Ural and Emba in Kazakhstan.

Habitat. Lowermost part of rivers and coastal waters. In still or very slow-flowing, often brackish waters.

Biology. Spawns in April in brackish lagoons of Lenkoran. Feeds on detritus and benthic invertebrates.

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

Further reading. Berg 1949b (description); Vasil'eva & Vasil'ev 2012 (distribution); Sayyadzadeh et al. 2018a (description).



Kırkgöz is an endemism hotspot in Türkiye. Yediarıklar, the stream flowing out of Kırkgöz, is the habitat of *Cobitis sipahilerae*, *Pseudophoxinus antalyae*, *Paraphanius mentoides*, and *Seminemacheilus attalicus*.