

Two new species of the genus *Cobitis* Linnaeus (Teleostei: Cobitidae) from Turkey

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Abstract

Two new species of the genus *Cobitis* including *C. dorademiri* sp. nov. from the Köyceğiz Basin and *C. sipahilerae* sp. nov. from the Kırkgözler Basin of Turkey are described and illustrated here. *Cobitis dorademiri* differs from other species of Bicanestrinia *Cobitis* species by lack of 5th Gambetta zone; second zone formed by round brown blotches, reduced to few spots behind the dorsal fin; short (9.7-13.5 %SL) and deep (12.7-14.2 %SL) caudal peduncle, and more than one spots at the base of caudal fin. *Cobitis sipahilerae* differs from other species of Bicanestrinia *Cobitis* species by lack of 5th Gambetta zone; third zone similar to the first one but with smaller spots; fourth zone consisting triangular or square-like blotches, in some specimens merged as a stripe; thinner caudal peduncle; mouth arched with lips a little furrowed, and mental lobe moderate marked and covered with papilla.

Keywords: Spined loach, *Cobitis dorademiri*, *Cobitis sipahilerae*, Anatolia, Turkey.

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Introduction

The genus *Cobitis* represents one of the most widely distributed Palearctic primary freshwater fishes with 16 species in Turkey (Çiçek et al. 2015; Jouladeh-Roudbar et al. 2017; Eagderi et al. 2017). The first revision of this genus in Turkey was performed by Erkakan et al. (1999) by recording 10 species viz. *Cobitis fahireae*, *C. varderensis*, *C. splendens*, *C. kellei*, *C. puncticulata*, *C. strumicae*, *C. levantina*, *C. turcica*, *C. simplicispina* and *C. bilseli*. Later *C. elazigensis*, *C. vardarensis*, *C. pontica*, *C. phyrigica*, *C. evreni*, and *C. damlae*, as new cave fish of Turkey, were added to this inventory (Nalbant et al. 2001; Vasil'eva and Vasil'ev 2006; Böhlen et al. 2006; Erkakan et al. 2008; Erkakan and Özdemir, 2014; Çiçek et al. 2015).

A study of the populations of this genus in Turkey found some populations were not identified as any described species (Bohlen et al. 2006). Among them, two populations including Kırkgözler (from Antalya Province) and Köyceğiz (Köyceğiz Basin, Muğla Province) populations belong to the Mediterranean Basin examined and compared with other species of the genus *Cobitis* from Turkey. Consequently, based on differences found, we describe two new species i.e. *Cobitis dorademiri* sp. nov. and *Cobitis sipahilerae* sp. nov.

Material and Methods

The specimens were collected using electrofishing device. After an overdose with anaesthesia, samples were fixed in 10% buffered formaldehyde. Specimens were stored in HUIC: the collection of the Ichthyology Museum, Department of Biology, Hacettepe University (Ankara). A total of 28 morphometric, 8 meristic characters were measured by a digital caliper to the nearest 0.01 mm (Tables 1-4). All measurements are made based on Banarescu et al. (1972). Terminology of the pigmentation pattern follows Banarescu et al. (1972). Length of maxillary barbels were not measured due to changing with geographic and ecological condition. Meristic characters, including unbranched and branched dorsal, anal, pectoral, ventral and caudal fin rays were counted using a binocular dissecting microscope.

Abbreviations used: SL, standard length; HL, lateral head length; HUIC, the collection of the Ichthyology Museum, Department of Biology, Hacettepe University.

Results

Cobitis dorademiri sp. nov.

(Fig. 1, Tables 1-2)

Holotype: HUIC-AKDY1, 1, 64.0 mm SL; Turkey; Muğla prov.: Köyceğiz Basin, Balıklı stream, F. Erkakan & F. Özdemir, 6 Oct 2011.

Paratypes: HUIC- AKDY2-8, 7, 62.0-80.79 mm SL; same data as holotype.

Diagnosis: *Cobitis dorademiri* differs from other species of Bicanestrinia *Cobitis* species by the combination of following characters: lack of 5th Gambetta zone, second zone ormed by round brown blotches, reduced to few spots behind the dorsal fin; short (9.7-13.5 %SL) and deep (12.7-14.2 %SL) caudal peduncle, and more than one spots (mean 3-5) at the base of caudal fin.

Description: See Figure 1 for general appearance. Twenty-eight morphometric and eight meristic characters are given in Tables 1 and 2. Fin ray formula: D, III 6; A, II 5; V, I 5-I 5; P, I 8-I 8; C, n8+8n. Body stout, deep and laterally compressed (Fig. 1a); head and snout blunt with HL 4.7-5.1 (mean=4.9) %SL; mouth inferior and arched with mental lob covered with papilla (Fig. 1e); caudal peduncle deep and short with anal fin reaching up to its base, caudal peduncle length 7.0-7.9 (7.5) %SL; eyes are relatively big and its length 5.0-6.1 (5.6) times in HL, and its diameter half of snout length. Predorsal distance shorter compared with preventral distance, its average lengths 1.91 and 1.72 times in SL, respectively; margin of dorsal, anal and caudal fins slightly convex. In males, pectoral fin with two lamina circularis (Fig. 1d); scales rounded with a large focal zone (Fig. 1c); suborbital spine bicuspid and curved (Fig. 1b).

Colouration: In the preserved material, abdomen yellowish-brown. 4-5 large dark brown blotches present before dorsal fin and 5 (rarely 4) dark one at rear of dorsal fin. Four Gambetta pigmentation zones are present. The first zone of the Gambetta irregular with small spot. The second zone is formed by round brown blotches, reduced to few spots behind the dorsal fin. The third zone similar to the first zone but its colour is lighter brown. The fourth zone formed by relatively big round or square-like blotches, reduced to smaller and irregular blotches posteriorly. The 5th zone is absent. Head covered with small brown spots.

Sexual dimorphism: Males with two lamina circularis at base of first (unbranched) and second (unbranched) pectoral rays. In males, pectoral fin longer than females (19.6-19.7 vs. 14.5-16.9 %SL)

Etymology: The new species is named to Dora Demir Özdemir, the son of Dr. Filiz Özdemir.

Distributions: *Cobitis dorademiri* sp. nov. has only been recorded from the Balıklı Stream, Köyceğiz Basin, South of Turkey.

Remarks: *Cobitis dorademiri* is similar to *C. hellenica* in many morphological features, but can be distinguished from it by lacking 5th Gambetta zone (vs. present), lack of a straight black line between eyes and snout (vs. present), longer pectoral fin in males and mental lob structure with papilla.

Cobitis dorademiri is distinguished from *C. turcica* by lack of 5th Gambetta zone, and deeper (12.7-14.2 vs. 9.7-13.5 %SL) and shorter (8.3-10.0 vs. 15.3-19.3 %SL) caudal peduncle, different colouration pattern, lack of a supplementary row of speckles under the fourth row of Gambetta.

Cobitis dorademiri is distinguished from *C. vardarensis* by different colouration pattern, body shape and lack of a large jet black spot at superior base of caudal fin (vs. present).

Cobitis dorademiri differs from *C. simplicispina* by having stout body (vs. very long body) and different colouration pattern.

Cobitis dorademiri is well-separated from the *C. splendens* by having third Gambetta zone (vs. absent), lack of a large jet black spot at superior base of caudal fin and mental lobes covered with papilla (generally not covered with papilla).

Cobitis dorademiri is easily distinguished from *C. puncticulata* by having well-developed fourth Gambetta

Table 1. Morphometric characters of *Cobitis dorademiri* sp. nov. (HUIC-AKDY1-8, n=8) with holotype.

Characters	Holotype	female		male	
		range	mean±SD	range	mean±SD
Standard length (mm)	64	64.0-80.79		57.0-62.0	
In percent of standard length					
Body depth at dorsal fin origin	16.4	16.7-18.5	17.4±0.5	16.4-17.1	16.7±0.4
Caudal peduncle depth	12.5	12.7-14.2	13.4±0.5	12.5-12.5	12.5±0.0
Predorsal length	50.2	50.5-54.6	52.3±1.5	50.2-52.1	51.2±1.3
Postdorsal length	35.1	34.6-37.9	36.3±1.1	35.1-35.2	35.2±0.0
Prepelvic length	56.7	51.6-55.2	53.9±1.3	56.7-57.6	57.2±0.6
Preanal length	78.2	77.0-81.7	79.5±1.8	78.2-78.6	78.4±0.2
Caudal peduncle length	12.3	9.7-13.5	11.9±1.2	12.3-12.1	12.2±0.1
Dorsal-fin base length	11.8	10.5-12.0	11.3±0.6	11.8-11.8	11.8±0.0
Dorsal-fin depth	21.0	17.6-20.8	19.2±1.2	21.0-21.1	21.0±0.0
Anal-fin base length	8.6	8.0-9.0	8.4±0.3	8.6-9.1	8.9±0.3
Anal-fin depth	16.6	15.4-16.7	16.3±0.4	16.6-17.8	17.2±0.8
Pectoral fin length	19.6	14.5-16.9	15.2±0.8	19.6-19.7	19.6±0.0
Pelvic fin length	10.8	12.2-13.0	12.6±0.2	10.8-12.8	11.6±1.0
Distance between pectoral and pelvic-fin origins	31.5	35.0-37.6	36.1±0.7	31.5-33.1	32.3±1.1
Distance between pelvic and anal-fin origins	22.8	19.8-23.0	21.5±0.9	22.8-24.0	23.4±0.8
Body width at dorsal fin origin	8.9	9.5-9.9	9.8±0.1	8.9-9.4	9.2±0.3
Caudal peduncle width	2.6	2.7-3.4	3.1±0.2	2.6-2.7	2.6±0.0
Head length (HL)	19.7	19.5-21.1	20.2±0.5	19.7-20.8	20.2±0.7
In percent of head length					
Snout length	32.4	33.2-37.3	35.1±1.4	32.4-33.0	32.7±0.4
Horizontal eye diameter	18.1	16.3-19.8	17.4±1.1	18.1-19.6	18.8±1.1
Postorbital distance	48.3	47.0-53.3	49.4±2.1	48.3-56.0	51.6±3.9
Head depth at nape	66.9	67.7-71.3	69.9±1.1	66.9-68.1	67.5±0.8
Head depth at eye	57.6	59.6-64.1	61.6±1.5	57.6-58.0	57.8±0.2
Dorsal head length	85.3	87.2-91.8	88.7±1.5	85.3-85.8	85.6±0.3
Head width at nape	38.7	40.0-45.3	42.3±1.8	38.7-43.3	41.0±3.2
Interorbital distance	20.8	19.4-22.7	20.9±1.1	20.8-22.1	21.5±0.8
Internasal distance	10.1	13.6-16.4	15.0±0.9	10.1-10.6	10.3±0.3
Mouth width	16.8	16.9-20.7	19.2±1.5	16.8-17.9	17.4±0.8

Table 1. Meristic data of *Cobitis dorademiri* (HUIC-AKDY1-8, n=8) with holotype.

Characters	female		male	
	range	mode	range	mode
Blotches in Z4	20-23	21	19-22	20
Predorsal blotches	4-5	5	4-5	5
Postdorsal blotches	5-6	5	5-6	5
Branched dorsal-fin rays	6-7	6	6-7	6
Branched anal-fin rays	5-5	5	5-5	5
Pectoral-fin rays	7-8	8	7-8	8
Pelvic-fin rays	5-5	5	5-5	5
Caudal-fin rays	14-17	16	15-16	16

zone (vs. lack of fourth Gambetta zone), different colouration pattern, and body shape.

Cobitis dorademiri differs from *C. evreni* by having well-developed third Gambetta zone (vs. reduced third Gambetta zone), fourth zone with relatively large round or square-like blotches (vs. fourth zone of *C. evreni*'s forming a continuous black stripe ending with big black spot at the caudal peduncle).

Cobitis dorademiri is easily distinguished from *C. levantina* by different colouration pattern and body shape.

Cobitis dorademiri is distinguished from *C. battalgili* by deeper (12.7-14.2 vs. 9.7-13.5 %SL) and shorter (8.2-10.0 vs. 16.2-19.6 %SL) caudal peduncle and different colouration pattern.

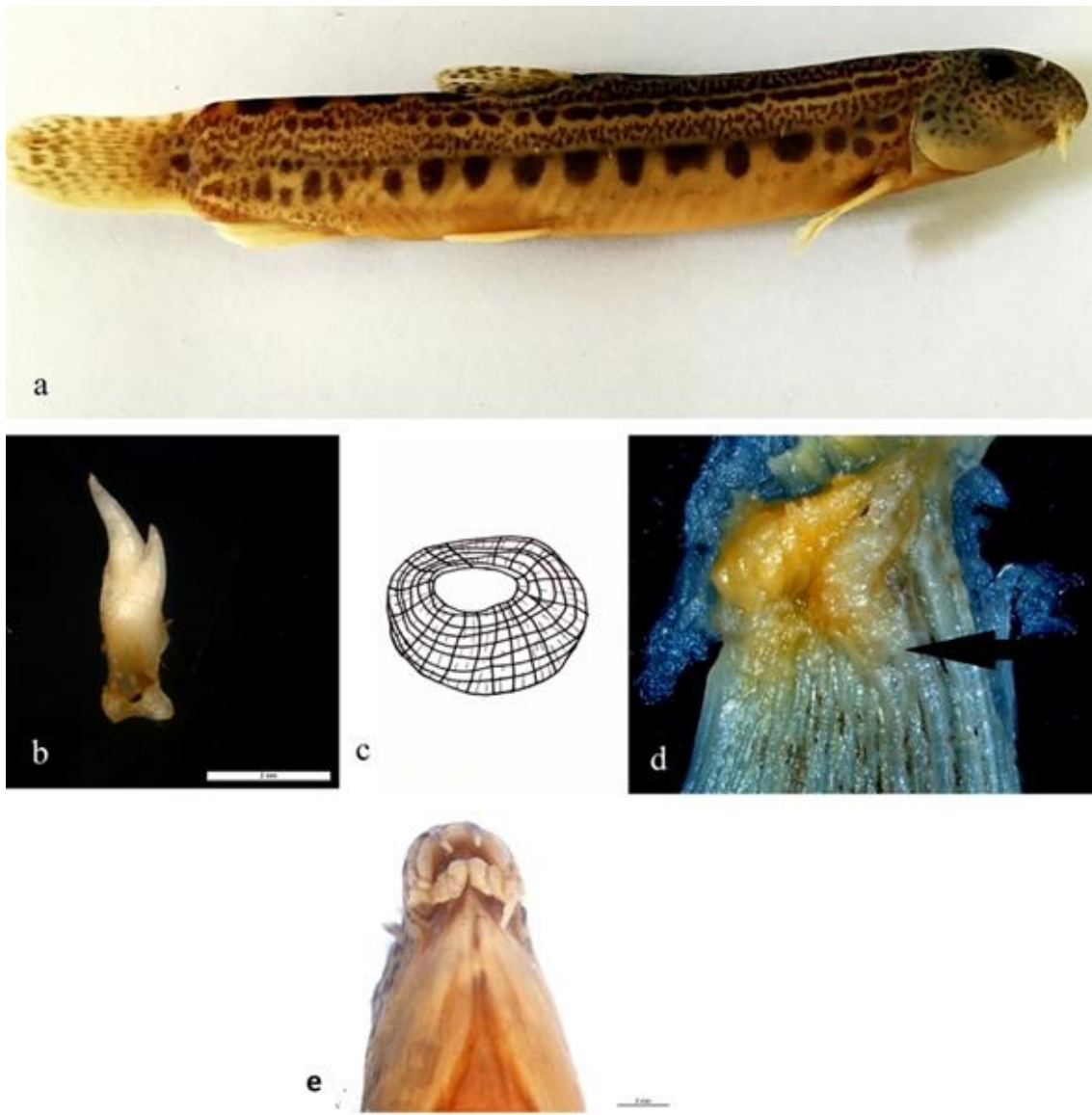


Figure 1. *Cobitis dorademiri* sp. nov. (a) lateral view, 64 mm SL, (b) suborbital spine, (c) scale (diameter: 0,7 mm), (d) laminae circularis, and (e) mouth.

***Cobitis sipahilerae* sp. nov.**

(Fig. 2, Tables 3-4)

Holotype: HUIC–AKD1, 1, 55.0 mm SL; Turkey; Antalya prov.: Topçular District, Yediarıklar stream, F. Erkakan & S.C. Özeren, 1 May 2009.

Paratypes: HUIC–AKD2-8, 6, 55.0-76.0 mm SL, same data as holotype.

Diagnosis: *Cobitis sipahilerae* differs from other species of Bicanestrinia *Cobitis* species by lack of 5th Gambetta zone, third zone similar to the first zone but with smaller spots, fourth zone consisting triangular or square-like blotches, in some specimens the blotches merged as a stripe; mouth arched with lips a little furrowed, mental lobe moderate marked and covered with papilla and thinner caudal peduncle.

Description: See Figure 2 for general appearance. Morphometric and meristic characters are given in Tables 3-4. Fin ray formula: D, III 6; A, II 6; V, I 5-I 5; P, I 8-I 8; C, n7+7n, in a few specimens the number of anal branched rays is 5 and pectoral rays 7. Body elongate, laterally compressed with long head (Fig. 2a); mouth arched with lips a little furrowed, mental lobe moderate marked and covered with papilla (Fig. 2e); head length

Table 3. Morphometric characters of *Cobitis sipahilerae* (HUIC–AKD1-8, n=7) with holotype.

Characters	Holotype	female		male	
		range	mean±SD	range	mean±SD
Standard length (mm)	55	70.0-88.0		53.0-55.0	
In percent of standard length					
Body depth at dorsal fin origin	16.1	15.9-17.5	16.7±0.6	15.1-16.1	15.6±0.7
Caudal peduncle depth	10.5	9.1-10.1	9.5±0.3	9.9-10.5	10.2±0.3
Predorsal length	52.3	50.0-54.7	53.2±1.8	50.9-52.3	51.6±1.0
Postdorsal length	37.4	34.2-36.8	35.9±1.0	35.8-37.4	36.6±1.1
Prepelvic length	54.7	53.1-58.1	56.7±1.8	54.2-54.7	54.5±0.3
Preanal length	76.0	74.7-79.7	78.0±2.0	75.9-76.0	75.9±0.0
Caudal peduncle length	12.8	11.8-14.3	12.7±1.0	12.5-12.8	12.7±0.2
Dorsal-fin base length	11.9	9.9-11.2	10.6±0.4	11.1-11.9	11.5±0.5
Dorsal-fin depth	21.8	16.9-19.3	18.6±1.0	20.5-21.8	21.1±0.9
Anal-fin base length	7.1	6.1-7.7	6.8±0.6	6.9-7.1	7.0±0.1
Anal-fin depth	16.0	12.0-14.4	13.3±0.9	15.9-16.0	15.9±0.0
Pectoral fin length	16.7	11.0-13.3	11.9±0.8	16.7-16.7	16.7±0.0
Pelvic fin length	12.5	9.9-10.9	10.4±0.3	11.6-12.5	12.1±0.6
Distance between pectoral and pelvic-fin origins	30.4	33.0-37.5	35.1±1.8	30.1-30.4	30.3±0.1
Distance between pelvic and anal-fin origins	20.7	19.2-21.9	20.8±1.1	19.8-20.7	20.2±0.6
Body width at dorsal fin origin	9.0	8.6-10.4	9.5±0.8	8.8-9.0	8.93±0.1
Caudal peduncle width	2.5	2.4-2.9	2.7±0.1	1.9-2.5	2.2±0.3
Head length (HL)	20.6	18.8-21.4	19.7±1.0	19.2-20.6	19.9±0.9
In percent of head length					
Snout length	30.4	33.3-35.3	34.2±0.8	29.8-30.4	30.1±0.4
Horizontal eye diameter	16.2	11.6-14.9	13.6±1.3	15.3-16.2	15.8±0.5
Postorbital distance	50.9	50.0-57.3	53.2±3.1	48.0-50.9	49.5±2.0
Head depth at nape	57.5	57.4-62.4	60.0±1.8	54.9-57.5	56.2±1.8
Head depth at eye	50.0	44.7-51.9	49.5±2.8	46.7-50.0	48.3±2.3
Dorsal head length	92.4	84.0-89.6	86.5±2.1	88.8-92.4	90.6±2.5
Head width at nape	37.7	40.1-45.7	43.4±2.6	34.7-37.7	36.2±2.0
Interorbital distance	19.3	15.7-22.2	18.3±2.4	16.4-19.3	17.9±2.0
Internasal distance	13.6	9.7-12.1	10.7±0.9	10.5-13.6	12.1±2.2
Mouth width	16.0	16.1-22.7	19.0±2.3	15.5-16.0	15.8±0.3

Table 4. Meristic data of *Cobitis sipahilerae* (HUIC–AKD1-8, n=7) with holotype.

Characters	female		male	
	range	mode	range	mode
Blotches in Z4	18-21	20	19-22	21
Predorsal blotches	5-6	5	5-6	5
Postdorsal blotches	4-5	4	4-5	4
Branched dorsal-fin rays	6	6	6	6
Branched anal-fin rays	5-6	5	5-6	5
Pectoral-fin rays	7-8	8	7-8	8
Pelvic-fin rays	5-5	5	5-5	5
Caudal-fin rays	14-14	14	13-14	14

4.6-5.3 (5.04) times in SL. Caudal peduncle length 6.9-8.4 (7.8) times in SL, eyes relatively small and its length 6.1-8.6 (7.0) times in HL, placed in the middle of head or a little behind; dorsal fin base placed in the middle of the body and in the front of pelvic fin base; predorsal distance shorter compared with preventral distance with average lengths of 1.89 and 1.78 times in SL, respectively; margin of dorsal, anal and caudal fins slightly convex. In males, the pectoral fin with two lamina circularis (Fig. 2b); scales rounded with a small focal zone (Fig. 2c); suborbital spine bicuspid and curved (Fig. 2d).

Colouration: In preserved material, abdomen yellowish-brown. There are 5-6 large dark brown spots before the



Figure 1. *Cobitis sipahilerae* sp. nov. (a) lateral view, 55 mm SL, (b) laminae circularis, (c) scale (diameter: 0,7 mm), (d) suborbital spine and (e) mouth.

dorsal fin and 4-5 large dark one at the rear of dorsal fin. Head covered by brown small speckles. Four Gambetta pigmentation zones are present. The first Gambetta's zone consists of small spots. The second zone is formed by merged spots reducing posteriorly. The third zone is similar to the first zone but with smaller spots. The fourth zone consisting triangular or square-like blotches. In some specimens, the blotches merged as a stripe.

Sexual dimorphism: Males with two laminae circulares, at base of first (unbranched) and second (unbranched) pectoral rays. In males pectoral (16.7-16.7 vs. 11.0-13.3 %SL) and ventral fins (11.6-12.5 vs. 9.9-10.9 %SL), are longer than females.

Etymology: The new species is named to Prof. Dr. Füsün Sipahiler, the friend of Prof. Dr. Füsün Erkakan.

Distributions: To date, *Cobitis sipahilerae* is found only in the Yediarıklar Stream, Aksu River, Kırk gözler-Topçular, Antalya Province, South of Turkey.

Remarks: *Cobitis sipahilerae* is related to *C. turcica*, *C. evreni* and *C. levantina* but is distinguished from *C. turcica* by lacking 5th Gambetta zone (vs. presence), different colour pattern and mouth structure. It differs from *C. evreni* by having 3rd Gambetta zone (vs. reduced), 4th Gambetta zone forming a continuous black stripe, mouth arched with lips a little furrowed (vs. upper lip unfurrowed) and thinner caudal peduncle. It is distinguished from *C. levantina* by the fourth zone consisting triangular or square-like blotches in some specimens, the blotches merged as a stripe (vs. blotches not merged), lacking black spot on the base of caudal

fin.

Cobitis sipahilerae is distinguished from *C. puncticulata* by having a well-developed fourth Gambetta zone (vs. lack fourth Gambetta zone).

Cobitis sipahilerae is well separated from the *C. splendens* by a well-developed third Gambetta zone, lack of a large jet black spot at superior base of caudal fin.

Cobitis sipahilerae differs from *C. fahireae* by having a well-developed third Gambetta zone (vs. reduced third Gambetta zone), mouth structure, and lack of a jet-shepaed black spot in the upper part of caudal fin base.

Key to species of *Cobitis* in Turkey

- 1(13) Males with single lamina circularis at the base of second pectoral ray (subgenus *Cobitis* s. str.) 2
- 2(11) All Gambetta's pigmentary zones present 3
- 3(12) Body normal in length (generally under 100 mm SL) 4
- 4(9) Body relatively high and compressed. Third Gambetta's pigmentary zone normal..... 5
- 5(6) Anterior part of second Gambetta's pigmentary zone represented by blotches. The jet black spot at the upper part of caudal base small and rounded. West of Turkey..... *fahireae*
- 6(5) Anterior part of second Gambetta's pigmentary zone generally formed by lines. Jet black spot at caudal base large to nearly absent..... 7
- 7(8) Caudal spot large and black. North-west Anatolia (Marmara and Black seas slopes) *vardarensis*
- 8(7) Caudal spot reduced and brownish. Western Anatolia (Aegean slops) *kurui*
- 9(4, 10) Body relatively long. Third Gambetta's pigmentary zone reduced. Black spot at caudal base. In Black and Marmara seas slopes..... *splendens*
- 10(9) Body relatively long but third Gambetta's pigmentary zone normally developed. Southern Anatolia, Tigris basin *kellei*
- 11(2) Four Gambetta's zones absent, substituted by small blotches catered across the whole body. Kuş (Manyas) Lake..... *puncticulata*
- 12(3) Body extremely long (till 200 mm SL) and stout. Endemic to Beyshehir Lake (subgenus Beyshehiria *bilseli*
- 13(1) Males with two laminae circulares at base of first two pectoral rays (subgenus Bicanestrinia)..... 14
- 14(15) Body without pigment and vestigial eyes, adapted to live in the cave..... *damlae*
- 15(16) Body extremely long (till 200 mm SL) and stout. There is a spot at the upper caudal fin base..... *elazigensis*
- 16 (17) Total length up to 100 mm. Acıgöl, Salda and Burdur Lake basins..... *phyrigica*
- 17 (18) Third Gambetta zone is reduced and lack of a black spot on caudal base..... *evreni*
- 18(27) Four Gambetta's pigmentary zones normally developed..... 22
- 22 (23) Lack of 5th Gambetta zone, 2nd zone is formed by round brown dots, might be reduced to few spots behind the dorsal fin, body high with short and high caudal peduncle, West Mediterranean Sea slop..... *dorademiri* sp. nov.
- 23(24) Lack of 5th Gambetta zone, third zone is similar to the first zone but formed by smaller spots, thinner caudal peduncle. Mediterranean basin..... *sipahilerae* sp. nov.
- 24(25) Fourth Gambetta zone is formed blotches on line, Gölhisar, Dalaman River basin..... *battalgili*
- 25(26) Body long enough. European part of Turkey..... *strumicae*
- 26(27) Body relatively high. Antiochia..... *levantina*
- 27(18) Four Gambetta's pigmentary zones not well-defined..... 20
- 20(21) Body relatively high and compressed. There is a row of dots under the lateral spots. South central Anatolia..... *turcica*
- 21(20) Body long to very long. No supplementary row of dots under lateral spots. From Sakarya to Kızılırmak River basins..... *simplicispina*

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