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Capoeta aydinensis, a new species of scraper from southwestern Anatolia, Turkey (Teleostei: Cyprinidae)

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Abstract: *Capoeta aydinensis* sp. nov. is described from the Büyük Menderes River and the streams Tersakan, Dalaman, and Namnam in southwestern Turkey. It is distinguished from all other Anatolian *Capoeta* species by the following combination of characters: one pair of barbels; a plain brownish body coloration; a well-developed keel in front of the dorsal-fin origin; a slightly arched mouth; a slightly convex lower jaw with a well-developed keratinized edge; a weakly ossified last simple dorsal-fin ray, serrated along about 60%–70% of its length, with 14–20 serrae along its posterior edge; 58–71 total lateral line scales; 11–12 scale rows between lateral line and dorsal-fin origin; 7–9 scale rows between lateral line and anal-fin origin.

Key words: Büyük Menderes, *Capoeta*, new species, Turkey

1. Introduction

Anatolian species of the genus *Capoeta* have been intensively studied in the last decade (Turan et al., 2006a, 2006b, 2008; Özuluğ and Freyhof, 2008; Schöter et al., 2009; Küçük et al., 2009). A few studies have looked at this genus with a larger geographic perspective, such as that of Levin et al. (2012), who provided a phylogenetic framework of the genus. Alwan (2010) intensively studied the *C. damascina* species group, and Geiger et al. (2014) provided additional molecular data on Mediterranean species of *Capoeta*. Alwan (2010) conclusively demonstrated that *C. angorae* from the Mediterranean basin is a synonym of *C. damascina*, a view also supported by Levin et al. (2012) and Geiger et al. (2014).

However, despite all these studies, the species diversity of *Capoeta* in Anatolia has not been fully resolved, and both Levin et al. (2012) and Geiger et al. (2014) found one group of populations in the Büyük Menderes and Dalaman rivers that was well distinguished from its sister species, *C. bergamae*, by the molecular methods applied. Here we study *Capoeta* from the Büyük Menderes River as well as from the streams Dalaman, Tersakan, and Namnam, with the aim of testing whether this molecular lineage might be a species different from *C. bergamae* and other *Capoeta* species of the Mediterranean Basin and adjacent Central Anatolia.

2. Materials and methods

Fish were caught using pulsed DC electrofishing equipment. The material is deposited in the Recep Tayyip Erdoğan University Zoology Museum of the Faculty of Fisheries, Rize (FRR) and İstanbul University, Science Faculty, Hydrobiology Museum, İstanbul (IUSHM). Measurements were made using digital calipers (0.1 mm accuracy). Hubbs and Lagler (1947) were followed in counts and measurements except as follows: head width at anterior eye margin: distance between anterior margins of eyes; head width at posterior eye margin: distance between posterior margins of eyes; head depth: through eye; snout width: at level of nostrils; head depth at snout: at level of nostrils; mouth width: measured between corners of mouth. Lateral line scale count includes scales on the caudal-fin base. The last 2 branched dorsal- and anal-fin rays, which articulate on a single pterygiophore, were counted as 1½. In the descriptions, numbers in parentheses after a count indicate the number of specimens in which this count was observed. To determine the sex of fishes, gonads were checked under a stereomicroscope.

Morphometric and meristic data of *C. damascina*, *C. bergamae*, *C. trutta*, *C. erhani*, *C. barroisi*, *C. pestai*, *C. tinca*, *C. antalyensis*, *C. turani*, *C. caelestis*, and *C. mauricii* are taken from Turan et al. (2006a, 2006b, 2008), Özuluğ

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and Freyhof (2008), Schöter et al. (2009), and Küçük et al. (2009).

3. Results

Key to the species of *Capoeta* of the Central Anatolia, Mediterranean, Aegean, and Marmara Sea basins

1.a Two pairs of barbels…….....2

1.b One pair of barbels.…….....…….3

2.a Lateral line with 51–57 scales…….....…*C. antalyensis*

2.b Lateral line with 69–80 scales…….....…….. *C. tinca*

3.a Numerous irregularly shaped black spots on body…...4

3.b No black spots on body in fishes larger than 150 mm SL…….....…….…8

4.a 25–30 gill rakers on outer side of first gill arch…….....5

4.b 16–18 gill rakers on outer side of first gill arch.....…7

5.a Body depth at dorsal-fin origin 25%–30% SL.…...….6

5.b Body depth at dorsal-fin origin 22%–25% SL..…...…...….....…..*C. barroisi*

6.a Lateral line with 64–70 scales.…….....…...*C. turani*

6.b Lateral line with 69–77 scales.…….....…...….*C. erhani*

7.a Postorbital distance 1.4–1.6 times snout length……...….....….*C. mauricii*

7.b Postorbital distance 1.3–1.4 times snout length.…….....*C. pestai*

8.a Serrae along the posterior margin of the last unbranched dorsal-fin ray absent…..…..….*C. caelestis*

8.b Serrae along the posterior margin of the last unbranched dorsal-fin ray present……..……9

9.a Dorsal fin with 9½ branched rays…...…..*C. damascina*

9.b Dorsal fin with 8½ branched rays.…….....10

10.a 21–27 serrae along the posterior margin of last unbranched dorsal-fin ray; mouth width 25%–33% HL…….....……*C. bergamae*

10.b 14–20 serrae along the posterior margin of last unbranched dorsal-fin ray; mouth width 32%–39% HL…….....……...*C. aydinensis* **sp. nov.**

Holotype. FFR 01926, 171 mm SL; Turkey: Aydın Province: Çine Stream, Büyük Menderes drainage, 37°25′N, 28°08′E; D. Turan, C. Kaya & E. Bayçelebi, 25 August 2014.

Paratypes. FFR 01897, 21, 106–234 mm SL; same data as holotype. FFR 00742, 22, 80–210 mm SL; Turkey: Aydın Province, Karacasu District: Dandalas Stream, Büyük Menderes River drainage, 37°43′N, 28°38′E; D. Turan; 06 April 2005. FFR 01924, 5, 127–162, Turkey: Muğla Province, Dalaman District: Tersakan Stream, 36°43′N, 28°48′E; S.S. Güçlü & Z. Güçlü; 9 October 2010. FFR 01423, 6, 140–160, Turkey: Muğla Province, Köyceğiz District: Namnam Stream, 36°56′N, 28°36′E; S.S. Güçlü & Z. Güçlü; 9 October 2010. IUSHM 2016-1170, 15, 38–60, Turkey: Muğla Province, Dalaman District: Dalaman River, 36°48′N, 28°47′E; M. Özuluğ; 03 November 2007.

Diagnosis. *Capoeta aydinensis* is distinguished from the other species of the genus in the Mediterranean Basin and in Central Anatolia by a combination of characters, none of them unique. *Capoeta aydinensis* is closely related to and occurs geographically adjacent to *C. bergamae*, which is found from the Gediz River north to the rivers of the Biga Peninsula. *Capoeta aydinensis* is distinguished from *C. bergamae* by having fewer serrae along the posterior margin of the last simple dorsal-fin ray (14–20 vs. 21–26; Figure 1), a wider mouth (mouth width 32%–39% HL, mean 34% vs. 25%–33%, mean 30%), and a concave outer margin of the dorsal fin (vs. straight). *Capoeta aydinensis* is distinguished from *C. caelestis* from the Göksu River by the presence of serrae along the posterior margin of the last unbranched dorsal-fin ray (vs. absence) and a shorter head (HL 22%–25% SL, mean 24% vs. 24%–27%, mean 25%). *Capoeta aydinensis* is further distinguished from *C. caelestis* and *C. bergamae* by the shape of the head and mouth. In *C. aydinensis*, the dorsal profile of the head is strongly convex (vs. slightly convex), the mouth is slightly arched (vs. moderately arched in *C. bergamae*), the mouth of the female is more arched than that of the male in *C. caelestis* (Figure 2), and the lower jaw is straight or slightly convex (vs. convex in *C. bergamae*; slightly convex in male, markedly convex in female of *C. caelestis*). See Section 4 to distinguish *C. aydinensis* from the other species of the genus found in the Marmara and Mediterranean basins, as well as in Central Anatolia.

Description. See Figure 3 for the general appearance of body and Tables 1 and 2 for morphometric and meristic data. Body moderately deep and slightly compressed laterally, upper profile markedly convex in predorsal area, with a well-developed keel in front of the dorsal-fin origin. Ventral profile straight or slightly convex. Head short, its length smaller than body depth, upper profile conspicuously convex. Mouth moderately wide, slightly arched. Free margin of lower jaw slightly arched, with a well-developed keratinized edge in both sexes (Figure 2a-d). Lower lip poorly developed and slightly distinct only at corner of mouth. Maxillary barbel present, its length smaller than eye diameter.

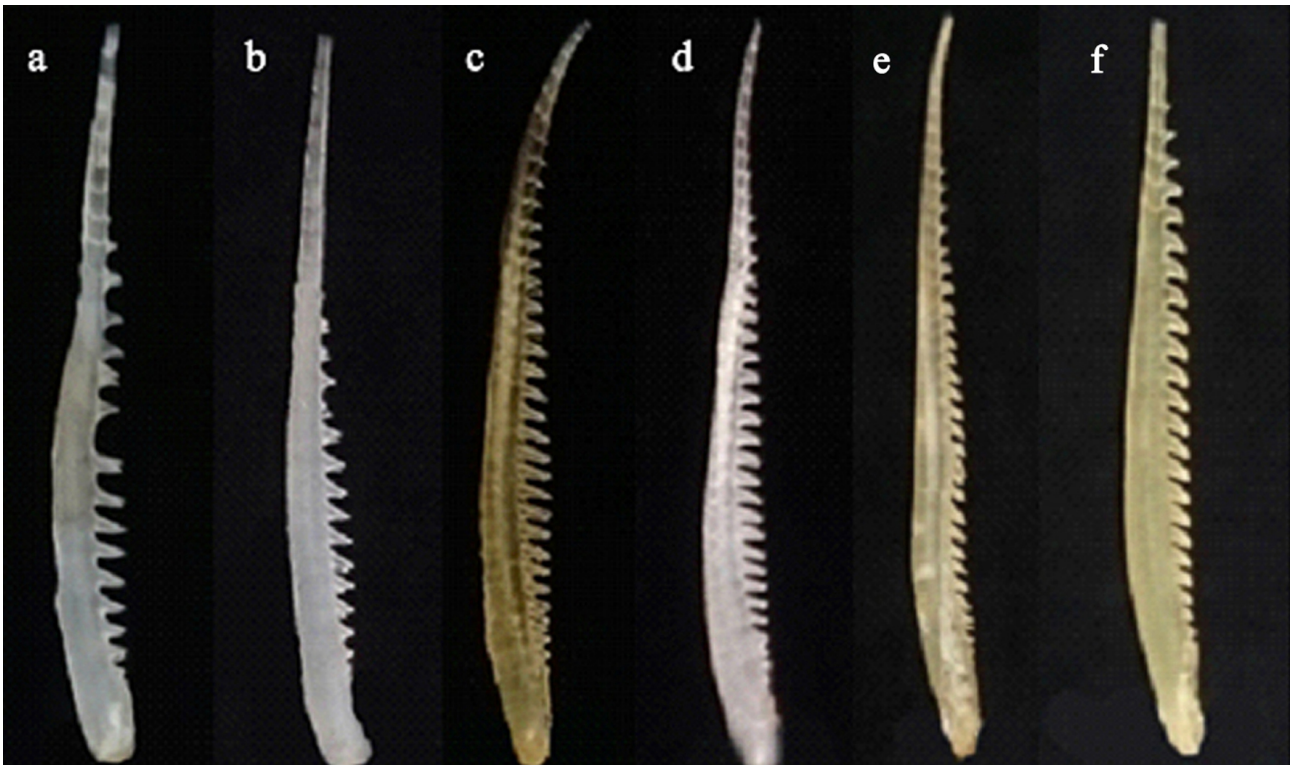

Figure 1. Last simple dorsal-fin rays of: *Capoeta aydinensis*, paratype, FFR 01897, 120 mm SL (a), 130 mm SL (b), Büyük Menderes River; *C. bergamae*, FFR 00741, 132 mm SL (c), 125 mm SL (d), Gediz River; *C. damascina*, FFR 00731, 150 mm SL (e), 120 mm SL (f), Orontes River.

Total lateral line with 58 (1), 59 (2), 60 (3), 61 (6), 62 (4), 63 (2), 64 (4), 65 (1), 66 (2), 67 (2), 68 (1), 69 (1), and 71 (1) scales; 11 (17) and 12 (13) scale rows between dorsal-fin origin and lateral line; 7 (5), 8 (14), and 9 (11) scale rows between anal-fin origin and lateral line. Dorsal fin with 4 simple and 8½ branched rays, outer margin concave, origin in front of vertical through pelvic-fin origin; last simple dorsal-fin ray weakly ossified, flexible, and serrated along 60%–70% of its length. Pectoral fin with 17–19 rays. Pelvic fin with 9–10 rays. Anal fin with 3 simple and 5½ branched rays, outer margin convex anteriorly, straight or slightly concave posteriorly. Caudal fin long and deeply forked, lobes pointed. Gill rakers 6–7 + 12–17 = 18–24 on outer side of first gill arch. Pharyngeal teeth arranged in 3 rows 4.3.2–2.3.4.

Sexual dimorphism. There are tubercles on head, anal-fin rays, and flank scales in male, absent in female. Anal fin of male is shorter than that of female.

Coloration. Body color brownish in life. Formalin-preserved specimens: dark brown on back and upper part of flank, light brownish or yellowish on lower flank and belly. There are 3–5 small rows of minute black spots on posterior margin of flank scales. Dorsal and caudal fins grayish; pectoral, anal, and pelvic fins yellowish. Dorsal- and caudal-fin rays and membranes with small black spots.

Habitat and biology. *Capoeta aydinensis* is presently known from the Büyük Menderes River drainages as well as from the streams Dalaman, Namnam, and Tersakan (Figure 4). It was found in clear and moderately flowing water, with a stone and pebble substrate.

Etymology. The name of the species is derived from the name of the city and eponymous province of Aydın, where we first observed it. An adjective.

4. Discussion

Capoeta aydinensis is distinguished from *C. damascina* by having fewer lateral line scales (58–71, mean 61 vs. 69–78, mean 73) and fewer scale rows between the dorsal-fin origin and the lateral line (11–12 vs. 13–16). *Capoeta aydinensis* is immediately distinguished from *C. trutta*, *C. barroisi*, *C. turani*, *C. erhani*, *C. pestai*, and *C. mauricii* by having a plain brown body (vs. numerous irregular black spots on the dorsal half of the body) and weakly ossified last simple dorsal-fin ray (vs. strongly ossified). Along with

Figure 2. Ventral view of head: *Capoeta aydinensis*, paratype, FFR 01897, 178 mm SL, male (a); 160 mm SL, male (b), 149 mm SL, female (c), 136 mm SL, female (d), Büyük Menderes River; *Capoeta bergamae*, FFR 00741, 117 mm SL, male (e), 120 mm SL, male (f), 158 mm SL, female (g), 145 mm SL, female (h), Gediz River; *Capoeta caelestis*, FFR 01922, 132 mm SL, male (i), 134 mm SL, male (j), 147 mm SL, female (k), 151 mm SL, female (l), Göksu River.

Figure 3. *Capoeta aydinensis*, holotype, FFR 01926, 171 mm SL, female (a); FFR 01897, 158 mm SL, female (b), 133 mm SL, male (c), Büyük Menderes River.

Table 1. Morphometry of the species of the *Capoeta aydinensis*.

	Holotype	Paratypes (n = 30)			
		Min.	Max.	Mean	SD
Standard length (mm) SL	171	117.4	178.8	139.7	
In percentage of standard length					
Head length	23.9	21.7	24.8	23.7	0.9
Body depth of dorsal-fin origin	27.4	21.5	27.8	25.7	1.2
Predorsal length	54.3	50.5	55.2	52.4	1.2
Postdorsal length	35.8	34.9	40.9	38.0	1.3
Prepelvic length	53.7	51.3	55.9	53.1	1.2
Preanal length	76.1	74.5	78.5	76.1	1.1
Dist. from pectoral-fin origin to anal fin	55.5	52.6	57.6	55.1	1.4
Dist. from pectoral-fin origin to pelvic fin	32.8	29.5	33.8	31.8	1.1
Dist. from pelvic-fin origin to anal fin	23.6	22.3	25.9	24.0	0.9
Dorsal-fin height	21.3	17.0	22.9	19.5	1.6
Anal-fin height	19.3	15.0	19.6	16.9	1.2
Pectoral-fin length	19.6	17.2	20.3	18.5	0.8
Pelvic-fin length	17.1	15.3	17.4	16.3	0.5
Upper caudal-fin lobe	24.7	20.0	25.8	23.7	1.4
Middle caudal-fin lobe	14.4	11.7	14.7	13.3	0.8
Length of caudal peduncle	17.9	16.2	22.8	18.4	1.5
Depth of caudal peduncle	11.0	10.5	12.3	11.5	0.5
In percentage of head length					
Snout length	38.8	34.2	41.2	38.0	1.6
Eye diameter	16.5	15.1	19.2	17.4	1.1
Interorbital distance	43.1	38.9	44.6	42.0	1.3
Head width at anterior eye margin	50.6	43.5	51.9	46.7	2.1
Head width at posterior eye margin	65.2	56.6	68.0	60.7	2.4
Head depth through eye	60.2	49.3	61.8	55.7	3.7
Snout width at nostrils	45.3	38.4	45.3	41.9	1.7
Head depth at snout	35.8	32.9	42.1	37.3	2.4
Mouth width	34.2	31.9	38.9	33.9	1.6

Table 2. Frequency distribution of meristic features of *Capoeta* species from the Mediterranean Basin in Anatolia.

	N	Lateral line scales																
		58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	X
C. aydinensis	30	1	2	3	6	4	2	4	1	2	2	1	1		1			63.0
C. bergamae	33			2	2	7	3	4	3	3	3	2	2	1	1			63.8
C. caelestis	15				2	2	2	2	1	2	2	1	1					64.5
C. damascina	30								2	2	2	7	2	4	9		2	69.2
	N	Scale rows between dorsal-fin origin and lat. line							Scale rows between anal-fin origin and lat. line					Unbranched dorsal-fin rays				
		11	12	13	14	15	16	X	7	8	9	10	X	7	8	9	10	X
C. aydinensis	30	17	13					11.2	5	14	11		8.1		30			8.0
C. bergamae	33	5	17	9	2			12.2	16	15	2		7.6	2	31			7.9
C. caelestis	15	4	9	2				11.9	3	9	3		7.5		8	7		8.5
C. damascina	30			21	6	3		13.4		15	15		8.5			30		9.0
	N	Serrae along posterior margin of last simple dorsal-fin ray																		
		14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	X
C. aydinensis	20	1	3	3	5	3	2	3												17.2
C. bergamae	20								1	1	5	2	4	7						24.4
C. damascina	25	1	1	1	1	2	1	1	2		2	1	3	1	4	2		1	1	23.0

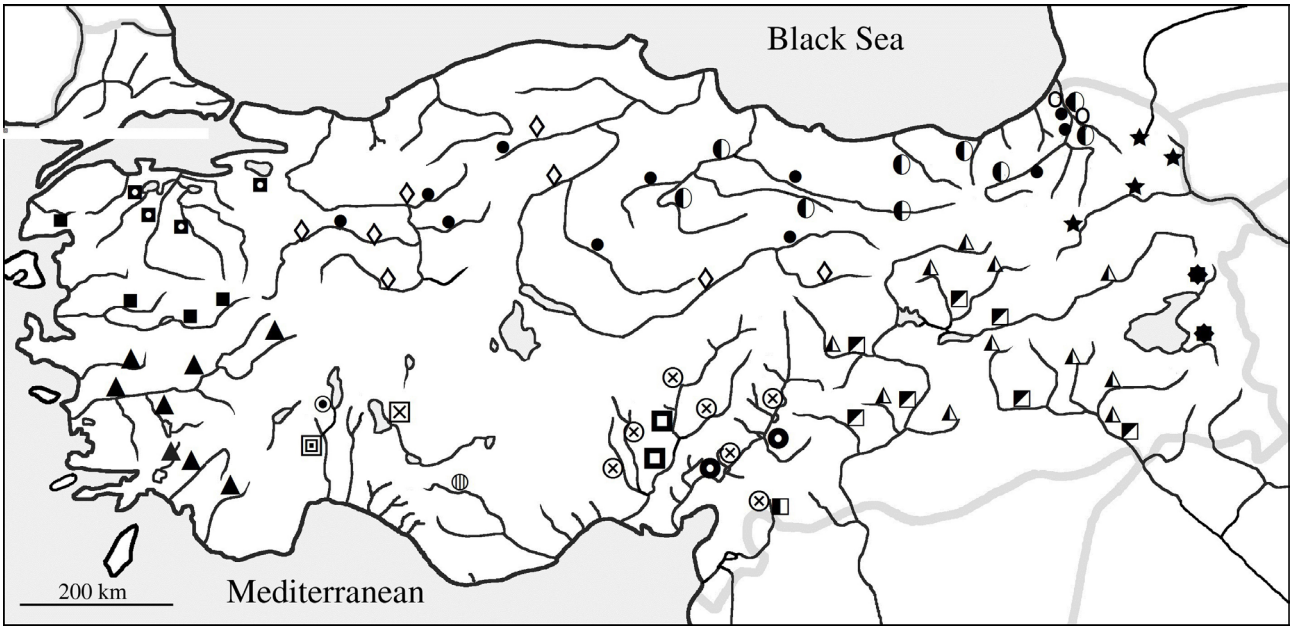

Figure 4. Distribution of some species of *Capoeta* in Anatolia: *Capoeta trutta* (◩), *C. barroisi* (◧), *C. turani* (◘), *C. erhani* (⊙), *C. pestai* (◉), *C. mauricii* (⊠), *C. tinca* (□), *C. banarescui* (◐), *C. baliki* (◇), *C. antalyensis* (▣), *C. ekmekciae* (o), *C. capoeta* (★), *C. umbla* (◭), *C. kosswigi* (✹), *C. damascina* (⊗), *C. caelestis* (◍), *C. bergamae* (■), *C. aydinensis* (▲), and *C. sieboldii* (●).

the differences given above, the new species has fewer scale rows between the dorsal-fin origin and the lateral line than *C. trutta*, *C. barroisi*, *C. turani*, *C. erhani*, *C. pestai*, and *C. mauricii* (11–12 vs. 13–18); fewer scales in the lateral line than *C. erhani*, *C. trutta*, *C. barroisi*, *C. pestai*, and *C. mauricii* (58–71, mean 63.0 vs. 69–77, mean 73.8 in *C. erhani*; 77–83 in *C. trutta*; 76–83 in *C. barroisi*; 85–89 in *C. pestai*; 80–86 in *C. mauricii*); and fewer gill rakers on the first gill arch than *C. trutta*, *C. barroisi*, *C. turani*, and *C. erhani* (18–24 vs. 24–30) and more gill rakers on the first gill arch than *C. pestai* and *C. maurici*; (18–24 vs. 16–18).

The presence of a single pair of barbels distinguishes *Capoeta aydinensis* from *C. tinca* and *C. antalyensis*, which have two pairs. *Capoeta aydinensis* is also distinguished from *C. tinca* by having fewer scale rows between the dorsal-fin origin and the lateral line (11–12 vs. 12–17). *Capoeta aydinensis* further differs from *C. tinca* by having fewer lateral line scales (58–71, mean 61.2 vs. 69–80, mean 75 in *C. tinca*). *Capoeta aydinensis* has more gill rakers on the first gill arch than *C. antalyensis* (18–24 vs. 15–17).

For comparative material, see Turan et al. (2006a, 2006b, 2008) and Küçük et al. (2009). *Capoeta bergamae*: 10, 69–132 mm SL; Turkey: İzmir Province, Dikili District, Çandarlı Village: Bakırçay Stream. *Capoeta caelestis*: 15, 101–148 mm SL; Turkey: Konya Province, Hadim District, Yağcı Village: Göksu River.

Nomenclatural acts: This work and the nomenclatural acts it contains have been registered in ZooBank. The ZooBank Life Science Identifier (LSID) for this publication is: http://zoobank.org/urn:lsid:zoobank.org:pub:71AD8808-FD41-4D18-8A4C-D91ACA4B0AA8

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