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Two New Species of Stone Loaches from Turkey (Teleostei: Nemacheilidae)

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Abstract: *Oxynemacheilus kaynaki* (Goksu River, Firat drainage) and *Oxynemacheilus anatolica* (input of Karamanli Dam, Burdur) are distinguished from other members of *Oxynemacheilus* by number of branched of dorsal, anal and caudal fin rays, colour pattern, lateral line, sexual dimorphism, shape of processus dentiformes and some morphometric characteristics.

Key words: *Oxynemacheilus kaynaki*, *Oxynemacheilus anatolica*, new species, Turkey

INTRODUCTION

Up to date, there are about 21 species occur in Nemacheiline loaches, mentioned by Banarescu and Nalbant (1966), Banarescu (1968), Erk'akan and Kuru (1982a, b), Delmastro (1982), Krupp and Schenider (1991) and Erk'akan *et al*. (2007) in Turkey. According to Kottelat and Freyhof (2007), *Oxynemacheilus bergamensis*, Erk'akan *et al*. (2007) accepted as a synonym of *Oxynemacheilus theophili*, but this species is clearly distinguished from *O. theophili* with presence of sexual dimorphism and different morphometric characteristics as a valid species. In respect of Kottelat and Freyhof (2007), there are two genera, *Oxynemacheilus* and *Barbatula* of Nemacheilidae family occur in European waters and these are wide apart according the caudal fin rays and caudal fin shape (truncated, emarginated, forked), but these characteristics are not valid and acceptable for Turkish Nemacheilids (Erk'akan *et al*., 2007). Nemacheiline loaches in Asia Minor are encompassed rapid genetic differentiation and fast local speciation as Cobitidae (joint research with Anabel Perdices). A study about revision of Turkish nemacheilids has been continued to solve the taxonomic problem.

In this study, two additional new species described from the Asia Minor.

MATERIALS AND METHODS

The materials used in this study were collected from the Goksu River, Nurhak, Elbistan (Firat Basin drainage), input of the karamanli dam lake, Burdur (Mediterranean Basin drainage) by electro-fishing equipment in June and August 2008. Twenty-six morphometric characters such as standard length (SL: till the beginning of caudal fin rays), head length, head depth, maximum body depth, longitudinal eye diameter, interorbital length, snout length, postorbital length, 3rd barbel length, length and depth of dorsal fin, length and depth of anal fin, length of pectoral fin, length of ventral fin, predorsal distance, postdorsal, preanal, preventral and postventral distances, pecto-ventral and ventral-anal distance, length and depth of caudal peduncle, length of upper, lower and middle caudal fin were measured according to Banarescu *et al*. (1978, 1982) and Krupp and Schneider (1991) and 5 meristic characters (unbranched and branched rays in dorsal, anal, ventral, pectoral and caudal fins) were counted in each specimens. Morphometric characters measured with the digital caliper by the same person in order to avoid differences in estimates. All drawings were made by F. Erk'akan. Specimens are preserved in HUIC: The collection of the Ichthyology Museum, Department of Biology, Hacettepe University (Ankara).

RESULTS AND DISCUSSION

***Oxynemacheilus kaynaki*, sp. nov.**

Holotype: HUIC-F-20, male, 60.0 mm SL: Goksu River, Nurhak, Elbistan, Firat Basin, 37°53′22.82″N, 37°22′19.99″E. June, 18, 2008, Erk'akan collec.

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Paratypes: HUIC-F-20, 14 specimens, 49.0-67.0 mm SL,bearing same locality and data as holotype, Erk'akan collec.

Diagnosis: *Oxynemacheilus kaynaki* is distinguished from all other species of *Oxynemacheilus* in the following combination of characters: branched of dorsal fin with (9 and 10), branched rays of caudal fin (15, 16, 17), convex caudal fin, configuration of spots at the caudal base, mouth shape, length of barbels, head shape.

Description: General appearance is shown in Fig. 1 and morphometric characters of holotype and 14 paratypes are given in Table 1. Body elongated and stout. Body depth 5.7-7.1 times in the standard length. Lateral line completed. Head is moderately flattened with wide well-rounded cheek. Head depth is 2.0-2.6 (2.3) times in the head length. Eyes in upper lateral position, not visible from below. Interorbital width narrow. Eye diameter is 4.0-5.2 (4.5) times in the head length. Anterior nare with a short tube and pointed posterior flap. Posterior nasal opening oval and rounded.

Mouth is small and semicircular (Fig. 2). Upper jaw with moderately to well-developed proccessus dentiformes. Lips are unfurrowed, small grooves are present on both sides of lower jaw. Shape of the digestive system, bony swim-bladder capsule and ellipsoid scales are shown in Fig. 3.

Dorsal fin with 3 simple and eight, nine and ten branched rays (rarely seven and eleven), anal fin with 2 and 3 simple and five branched rays. Distal margin of dorsal and anal fins convex, length and height of dorsal fin is almost equal. Pectoral fins with one simple, nine or 10 branched rays (rarely eight), ventral fin with one simple and 5 or 6 branched rays. Dorsal and ventral fin base nearly the same alignment, distance of predorsal and prevantral is almost equal (0.9). Distance between pecto-ventral is longer than ventral-anal. Scales are small and reduced in the anterior part of the body.

Caudal fin truncated and convex with 15, 16 or 17 branched rays, caudal peduncle height is 1.2-1.5 (1.4)

Table 1: Morphometric characters of *Oxynemacheilus kaynaki*

Morphometric characters	Holotype (Male)	Paratypes Minimum-Maximum (x±SE) n = 14
Standard length (mm)	60.0	49.0-67.0
Standard lenght (%)		
Head length	23.3	22.6-25.2 (24.0±0.2)
Head depth	11.0	9.7-11.9 (10.5±0.2)
Body depth	15.5	14.1-17.5 (15.5±0.3)
Predorsal distance	48.3	46.1-50.2 (47.7±0.3)
Postdorsal distance	35.5	30.6-36.4 (33.8±0.4)
Preventral distance	47.5	45.5-50.0 (48.2±0.4)
Postventral distance	45.3	40.8-45.3 (42.9±0.3)
Preanal distance	71.0	67.2-72.3 (70.2±0.4)
Dorsal fin length	13.8	13.5-17.1 (14.6±0.2)
Dorsal fin height	15.0	12.1-20.2 (16.0±0.5)
Anal fin length	9.0	8.1-10.8 (9.0±0.2)
Anal fin height	15.3	12.2-17.0 (15.5±0.3)
Ventral fin length	15.0	12.2-15.8 (14.5±0.2)
Pectoral fin length	18.3	14.3-20.2 (18.0±0.4)
Pecto-ventral distance	25.5	23.8-27.5 (26.1±0.3)
Ventral-anal distance	18.5	14.7-18.5 (16.6±0.3)
Caudal peduncle length	17.0	13.2-17.0 (15.3±0.3)
Caudal peduncle height	11.0	9.7-11.2 (10.6±0.1)
Head length (%)		
Head depth	47.1	39.2-50.0 (43.9±0.8)
Body depth	66.4	57.3-74.2 (64.8 ±1.3)
Snout length	46.4	42.2-48.0 (45.2±0.5)
Eye diameter	23.6	19.5-24.8 (22.2±0.4)
Postorbital length	50.7	43.9-50.7 (47.0±0.5)
Interorbital length	33.6	26.8-37.2 (30.8±0.7)
3rd barbel length	15.7	13.4-22.1 (15.6±0.5)

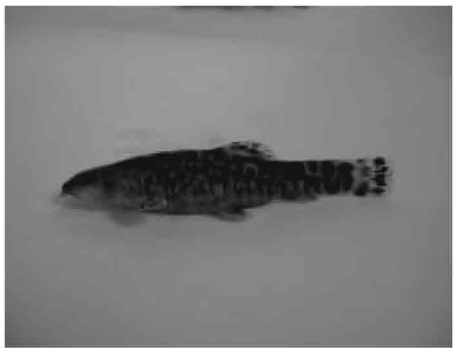

Fig. 1: *Oxynemacheilus kaynaki* HUIC: F-20, holotype, 60 mm SL, Goksu River, Nurhak, Elbistan

Fig. 2: Mouth shape of *Oxynemacheilus kaynaki*

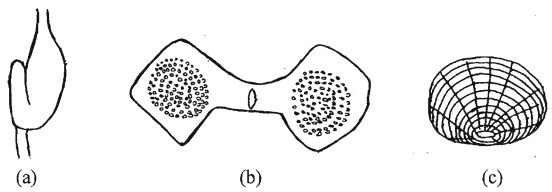

Fig. 3: The shape of the digestive system (a), bony swim-bladder capsule (b), scale (c) of *O. kaynaki*

in its length, caudal peduncle length is about 6.5 times in the standard length. Lower adipose crest is well-defined. Anus opening close to anal fin origin.

Colour pattern: The ground colour of the body is primnase yellow with irregular black platcehs laterally and dorsally. Generally, caudal fin base with two irregular black bands, but this band forming black dash in some specimens. Dorsal fin with black irregular spots lengthways. Caudal fin with two big irregular dark dash.

Sexual dimorphism: Pectoral rays are widened in males and carry cone shape tubercules on breeding season. Ventral fins are longer in males than females.

Remarks: *Oxynemacheilus kaynaki* is distinguished from all other species of Anatolian *Oxynemacheilus* in the following combination of characters: dorsal fin with commonly 8, 9 and 10 (rarely 7 or 11) branched rays, small ventral mouth, shorter barbels, irregular black band at the caudal base, flattened head with well-rounded cheek, truncated and convex caudal fin.

Etymology: This new species is named after Hüseyin Kaynak, father of Füsun Erk'akan.

Distribution: Up to date, *B. kaynaki* is known only from the Goksu River, located in Nurhak, Elbistan, Firat basin drainage.

***Oxynemacheilus anatolica* sp. nova**

Holotype: HUIC-AKD-13, male, 49.0 mm SL: Input of Karamanli Dam Lake, Burdur, southwest Turkey, 37°24' 34.33" N, 29°49' 54.94" E. August, 10, 2008, Erk'akan collec.

Paratypes: HUIC-AKD, 14 specimens, 38.0-52.0 mm SL, bearing same locality and data as holotype, Erk'akan collec.

Compartion material: *Barbatula cinica* HUIC: BM-3, 23 paratypes, 25.0-59.0 mm SL, Cin Stream, Denizli, 37°40'41.07" N, 29°30' 13.08" E, October, 28, 2002, Erk'akan collec.

***Oxynemacheilus eregliensis* HUIC:** KKK-7b: 26 paratypes: 25.0-61.0 mm SL, Saz Lake drainage, Haymana, Ankara, 39°01'00.33" N 32°49'48.32" E, July, 27, 2002, Erk'akan collec.

Diagnosis: *Oxynemacheilus anatolica* differs from other species of the genus *Oxynemacheilus* by dorsal fin with 5 and 7 branched rays, pectoral fin with 8 branched rays, length of pectoral fin, caudal fin with 18 branched rays, body and head shape, depth of the head, body and caudal peduncle, colouration of the body with very small irregular spots furnished by rings in the fresh material.

Description: Body form of *Oxynemacheilus anatolica* illustrated in Fig. 4 and morphometric data of holotype and 14 paratypes are given in Table 2. Body elongated and moderately stout. Body depth 5.8-6.9 (6.3) times in the standard length. Lateral line continuous but in some specimens it is discontinuos on the caudal peduncle. Scales are hidden underneath. Head moderately pointed in dorsal and lateral view. Depth of head is 2.3-2.7 (2.5) times in its length. Eyes in upper position and contained 3.5-4.2 (3.8) times in head length. Eye diameter and interorbital width almost same (1.2). Snout slightly longer than postorbital distance. Nostrils much nearer to eye than tip of snout. Anterior nare prolonged in a short tube, posterior nasal opening oval to circular. Mouth arched, lips and barbels papillated, lips unfurrowed, lower lip with a small incision (Fig. 5). Processus dentiformes weakly developed, 3rd barbel reached the posterior margin of eye. The shape of the digestive system, bony swim-bladder capsule and scale is given in Fig. 6.

Dorsal fin with 3 simple and 8 branched rays (rarely 5 and 7), anal fin with three simple and 5 branched rays, upper margin of dorsal and anal fins are straight to slightly convex. Distal margin of dorsal and anal fins convex, length and height of dorsal fin is almost equal. Pectoral fins with one simple, nine or ten branched rays (rarely 8), ventral fin with one simple and five branched rays. Pair fins relatively longer and pointed. Pectoral fin reached the anterior part of the dorsal fin base and ventral fin came up to anal opening. Predorsal distance is 2.0-2.2 (2.1) times in the standard length, predorsal and

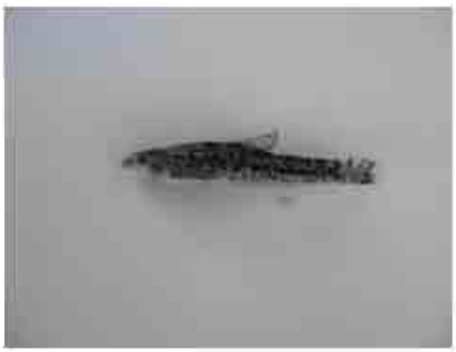

Fig. 4: *Oxynemacheilus anatolica* HUIC: AKD-13, holotype, 49.0 mm SL, input of karamanli dam lake

Table 2: Comparison of morphometric characters of *O. anatolica, B. cinica and O. eregliensis*

Morphometric characters	Holotype (Male)	Paratypes *O. anatolica* Min.-Max. (x±SE) (n = 14)	Paratypes *B. cinica* Min.-Max. (x±SE) (n = 23)	Paratypes *O. eregliensis* Min.-Max. (x±SE) (n = 26)
Standard length (mm)	49.0	38.0-52.0	44.0-49.0	25.0-61.0
SL (%)				
Head length	26.9	25.0-26.9 (25.9±0.2)	24.1-27.6 (26.0±0.3)	22.5-26.7 (25.4±0.3)
Head depth	10.0	10.0-11.2 (10.6±0.1)	11.4-12.8 (12.1±0.1)	9.8-11.1 (10.6±0.1)
Body depth	16.9	14.4-17.4 (15.9±0.3)	11.8-13.3 (12.7±0.2)	10.7-14.1 (12.6±0.3)
Predorsal distance	49.6	45.0-50.6 (48.3±0.4)	44.1-48.0 (46.2±0.4)	41.8-47.9 (45.0±0.4)
Postdorsal distance	33.3	32.1-38.2 (34.6±0.4)	28.9-33.0 (30.6±0.3)	34.2-37.4 (35.2±0.2)
Preventral distance	48.8	47.4-52.6 (49.3±0.4)	43.2-46.6 (44.9±0.4)	40.0-45.7 (43.3±0.4)
Postventral distance	40.2	38.7-43.8 (41.0±0.4)	38.0-45.5 (40.1±0.7)	39.3-44.3 (42.2±0.4)
Preanal distance	69.8	65.7-72.4 (68.9±0.5)	63.6-68.2 (66.4±0.4)	60.0-71.6 (68.0±0.8)
Dorsal fin length	13.3	12.3-14.2 (13.3±0.2)	12.7-17.6 (15.6±0.5)	12.4-14.8 (13.5±0.2)
Dorsal fin height	24.1	21.7-25.8 (23.4±0.3)	23.4-26.5 (24.7±0.3)	17.7-22.9 (20.4±0.4)
Anal fin length	9.0	8.2-10.8 (9.3±0.2)	10.0-11.7 (10.8±0.2)	8.6-10.8 (9.7±0.2)
Anal fin height	18.4	16.7-20.2 (18.7±0.3)	18.6-23.4 (21.6±0.5)	16.0-18.0 (16.5±0.1)
Ventral fin length	18.2	15.7-18.6 (17.2±0.3)	15.8-24.1 (19.1±0.7)	10.0-17.6 (14.9±0.5)
Pectoral fin length	27.8	21.0-28.2 (24.9±0.6)	20.4-23.8 (22.5±0.3)	16.4-21.6 (19.8±0.3)
Pecto-ventral distance	23.7	21.4-25.7 (23.7±0.4)	19.4-23.8 (21.9±0.4)	18.3-25.9 (23.0±0.5)
Ventral-anal distance	14.3	11.5-16.9 (14.3±0.4)	10.2-14.6 (12.9±0.4)	12.7-15.6 (14.9±0.2)
Caudal peduncle length	15.3	14.5-17.4 (16.2±0.2)	10.9-15.8 (12.5±0.5)	12.8-14.9 (14.1±0.2)
Caudal peduncle height	10.6	9.6-11.3 (10.4±0.1)	9.3-10.7 (9.8±0.1)	7.3-9.3 (8.3±0.1)
Head length (%)				
Head depth	37.1	37.1-44.2 (40.9±0.4)	42.0-49.3 (46.5±0.7)	40.0-43.8 (41.6±0.3)
Body depth	62.9	54.4-68.2 (61.4±1.0)	43.7-54.2 (48.9±0.9)	46.4-51.7 (49.4±0.6)
Snout length	46.2	41.1-50.4 (45.3±0.7)	41.0-45.7 (43.4±0.5)	36.5-41.8 (38.8±0.4)
Eye diameter	26.5	23.9-28.4 (26.3±0.3)	22.1-26.3 (23.6±0.4)	20.0-25.0 (22.6±0.3)
Postorbital length	47.0	45.6-52.1 (48.6±0.5)	43.7-49.2 (47.1±0.5)	42.7-48.2 (46.3±0.4)
Interorbital length	31.1	28.5-34.7 (31.1±0.5)	25.9-30.2 (27.8±0.4)	20.0-25.6 (23.5±0.4)
3rd barbel length	30.3	25.2-34.6 (30.5±0.7)	26.1-34.5 (31.0±0.9)	25.0-36.7 (28.4±0.8)

Fig. 5: Mouth shape of *Oxynemacheilus anatolica*

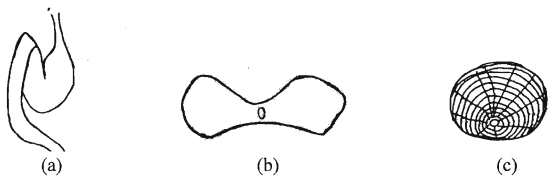

Fig. 6: The shape of the digestive system (a), bony swim-bladder capsule (b), scale (c) of *O. anatolica*

preventral distance is equal. Pecto-ventral distance is about 1.7 times longer than ventral-anal distance. Caudal fin feebly forked with 18 branched rays. Adipose crest weakly developed below the caudal peduncle. Depth of the caudal peduncle is about 1.6 times in its length.

Colour pattern: In fresh material colouration of the body is very small irregular spots furnished with rings. Moderately big black saddles on dorsal view. Dorsal and pectoral fins with irregular black spots. Black band markedly on the caudal fin base and caudal fin with 2-3 series of irregular black bars.

Sexual dimorphism: Suborbital flap is present in males, pectoral and ventral fins rays more longer in males than females.

Etymology: Name is taken from the geographic region of Turkey.

Remarks: *Oxynemacheilus anatolica* differs from *Barbatula cinica*, (Erk'akan *et al*., 2007), which is geographically close by presence of sexual dimorphism, shape of the mouth, caudal fin with eighteen branched rays, pectoral fin with commonly eight branched rays, moderately stout body and caudal peduncle, processus dentiformes feebly developed and 16 morphometric data given in Table 2.

Oxynemacheilus anatolica is distinguished from *Oxynemacheilus eregliensis* with seven branched rays on dorsal fin, eighteen rays on caudal fin, caudal fin forked, mouth shape, completed lateral line and 15 body proportion, which is given in Table 2.

Distribution: Up to date, *O. anatolica* is known only from the input of karamanli dam lake, located in burdur.

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