Journal of Fisheries International 2 (1): 69-85, 2007

Seven New Species of *Barbatula*, Three New Species of *Schistura* and a New Species of *Seminemacheilus* (Ostariophysi: Balitoridae: Nemacheilinae) from Turkey

[1]Füsun Erk'Akan, [2]Theodor T. Nalbant and [1]S. Cevher Özeren
[1]Department of Biology, Faculty of Science, Hydrobiology Section,
Hacettepe University, Beytepe, Ankara, Turkey
[2]Department of Taxonomy and Evolution 31, Institute of Biology,
Furmoasa Str., R-78114, Bucharest, Romania

Abstract: Eleven new species of nemacheilid fishes, included in genera *Barbatula*, *Schistura* and *Seminemacheilus* are described various fershwater basin systems in Turkey. New species are distinguished by following characters: general shape of the body and of head, fin rays formulas, shape of mouth and lips, presence/absence of processus dentiformis on the upper jaw, suborbital flap on the head, adipose crests above and below the caudal peduncle, complete or incomplete of lateral line, swim-bladder bony capsule shape and colour pattern. Besides, some morphometric ratios derived from twenty-seven morphometric characters are used in the study.

Key words: *Barbatula*, *Schistura*, *Seminemacheilus*, new species, Turkey

INTRODUCTION

Noemacheilinae are the largest of the three subfamily of Cobitidae. Sawada (1982), nemacheilines excluded from Cobitidae and ascribed in Homalopteridae, but the name of the family changed as Balitoridae by Menon (1987) and Kottelat (1989, 1990).

Starting with 1839, numerous generical names have been proposed for nemacheline loaches (Banarescu and Nalbant, 1995). According to Banarescu *et al.* (1978), 10 nominal species of Balitoridae from Turkey, Bulgaria and Greece were described and they placed in the genus *Orthrias* Jordan and Fowler (1790), but according to Kottelat (1990), *Barbatula* Licnk (1790) is the earliest name available for the genus (Stoumboudi *et al*., 2006). Besides, Banarescu and Nalbant (1966), accepted *Oxynoemacheilus* as a synonym of *Barbatula*.

Schistura Mc Clelland, 1838, is the largest and most variable genus of Balitoridae and in present acceptance, polyphyletic, since it includes several rather unsimilar groups of species, which can not be clearly delimited (Banarescu and Nalbant, 1995). *Seminemacheilus* genus, which is characterized by short lateral line, initally described as *Heminonemacheilus*.

In the previous studies, *Noemacheilus fasciatus*, *N. angorae*, *N. lendli*, *N. panthera*, *N. frenatus*, *N. malapterurus*, *N. tigris*, *N. argyrogramma*, *N. insignis*, *N. tschaiyssuensis* and *Turcinoemacheilus kosswigi* described (Hanko, 1924; Berg, 1949; Banarescu and Nalbant, 1964; Banarescu, 1968). Later, Banarescu *et al.* (1978), included the *Nemacheilus* species of Turkey into *Orthrias* genus and divided into five species namely *Orthrias angorae*, *O. brandti*, *O. insignis*, *O. tschaiyssuensis* and *O. panthera*. Furthermore, Kuru (1971, 1976, 1980), Balık (1974, 1979), Erk'akan and Kuru (1982, 1986a, b), Delmastro (1982), Krupp and Schneider (1991) have made important and valuable contibutions to the taxonomy of nemacheilinae species from Turkey.

MATERIALS AND METHODS

The materials used in this study were caught from various basin tributaries of Turkey by electro-fishing equipment. The locatilies of the new species are shown in (Fig. 1). Meristic counts and morphometric measurements made by the same person (S.C. Özeren) in order to avoid differences in estimates, follow by Banarescu *et al.* (1978, 1982) and Krupp and Schneider (1991). Twenty-seven morphometric characters as Standart Length (SL), head lenght, head depth, maximum body depth, longitudinal eye diameter, interorbital width, snout lenght, postorbital length, maxillar barbel length, length and depth of dorsal fin, length and depth of anal fin, length of lower and upper lobes of caudal fin, length of middle caudal fin rays, length of pelvic and pectoral fins, length of predorsal, postdorsal, preventral, postventral and preanal,

Corresponding Author: Füsun Erk'Akan, Department of Biology, Faculty of Science, Hydrobiology Section, Hacettepe University, Beytepe, Ankara, Turkey

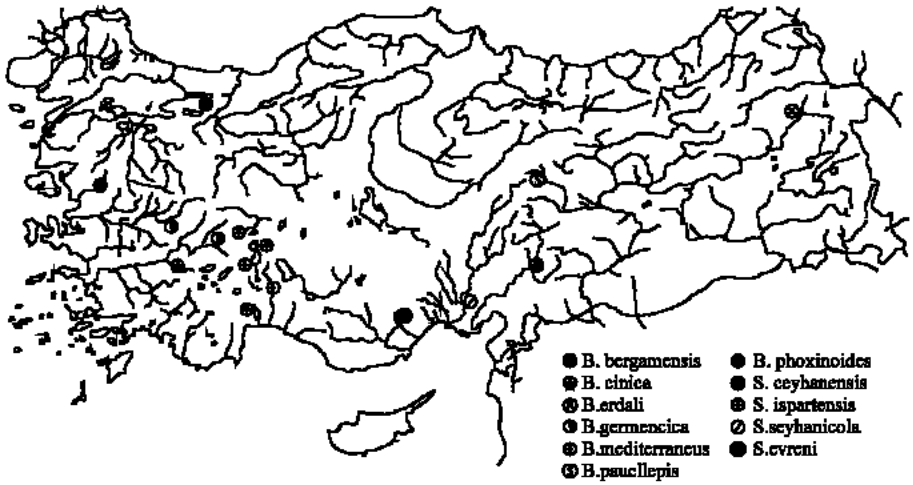

Fig. 1: Map of Turkey, showing localities of the new species

pecto-ventral distance, ventral-anal distance, length and depth of caudal peduncle. Furthermore, some external features such as shape of body and head, shape of mouth, suborbital flap, formation of processus dentiformis, presence or absence of lateral line and colour pattern were compared. Specimens are preserved in HUIC: The collection of the Department of Biology, Hacettepe University (Ankara). All drawings were made by T.T. Nalbant.

RESULTS AND DISCUSSION

***Barbutula germencica*, n. sp.:** Holotype: ♂, HUIC: BM-1, 54.0 mm SL; Turkey: Aydın, Germencik 15th km., 37°38'N 27°28' E; F. Erk'akan, 4 June 1984.

Paratype: 7 examples: HUIC: BM-1; ♂♂: 40.0-63.0 mm SL; ♀♀: 37.0-48.0 mm SL. Same data as holotype.

Comparison materials: *Barbatula simavica*, ISBB 2976: Holotype ♂ 72,5 mm SL; Simav, Kütahya, Turkey; ISBB 2977; 2 paratype ♂♂ 70.0-76.0 mm SL same data as holotype. HUIC: KM-1, 55 paratype, 27.0-37.0 mm SL; Turkey: Aydın, Ödemiş; 38°39´N 27°28´ E; F. Erk'akan, 27 November 1985.

Fin rays formula: D III/7-8; A III/5; P I/9-10; V II/6-7; C 17.

Diagnois: *Barbatula germencica* is differed from *Barbatula simavica*, in western Anatolia by the following characters: head depth is about 1.88 and 2.34 times in its length in *B. germencica* and *B. simavica*, respectively. Processus dentiformis is present upper jaw; caudal peduncle about 1.2 times in its length in *B. germencica* whereas its about 1,6 times in *B. simavica*.

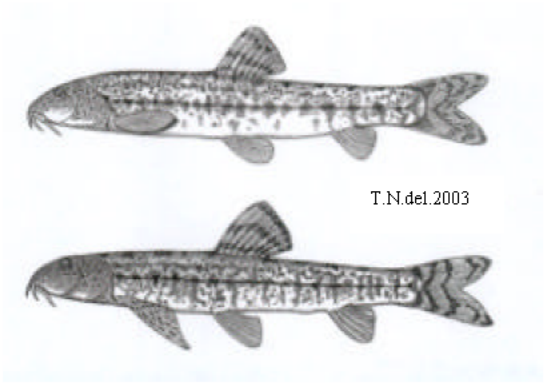

Fig. 2: *Barbatula germencica* n. sp. HUIC: BM-1, 54.0 mm SL (above); 55.2 mm SL (below), paratype, Turkey, Germencik.

Description: Lateral line complete. Body and caudal peduncle are moderately stout. Length of head is much longer than deep. Snout length and postorbital length relatively equal (2.2 and 2.3 mm, respectively). Eyes in upper position and interorbital width narrow. Anterior nare forming two snag; posterior nasal opening rounded. Lips are papillated. Upper jaw unfurrowed; processus dentiformis moderately to well-developed. Lower lips furrowed with moderately wide median slit and small grooves. Maxillary barbel reaches the posterior margin of eye (Fig. 2).

Dorsal fin with 7 or 8 branched rays; distal margin of dorsal and anal fins are straight to slightly concave; length of dorsal fin base is about 1.5 times in its height. Caudal fin deeply forked; upper and lower adipose crest is short and slender. Length of predorsal and postdorsal is almost equal. Distance between pectoral-ventral is longer than ventral-anal.

In % standard length (mm): maximum body depth 15.71-16.98 (x = 16.45); head length 22.38-24.29 (x = 23.43); head depth 11.90-13.10 (x = 12.50); longitudinal eye diameter 5.23-6.91 (x = 5.93); interobital width 6.04-7.38 (x = 7.02); snout length 10.20-11.19 (x = 10.67); postorbital length 9.50-10.95 (x = 10.24); length of dorsal fin base 14.29-17.92 (x = 15.81); depth of dorsal fin 20.21-24.00 (x = 22.16); length of anal fin base 8.89-10.0 (x = 9.57); depth of anal fin 17.08-19.29 (x = 17.72); length of pelvic fin 14.90-16.83 (x = 15.94); length of pectoral fin 18.75-22.14 (x = 20.59); predorsal length 43.57-46.53 (x = 45.36); postdorsal length 29.17-32.62 (x = 31.62); preventral length 44.29-66.50 (x = 50.05); postventral length 38.96-42.75 (x = 40.82); preanal length 62.86-68.89 (x = 66.58); P-V distane 21.46-23.88 (x = 22.55); V-A distance 12.65-14.29 (x = 13.13); caudal peduncle length 12.04-13.75 (x = 12.73). caudal peduncle depth 9.21-11.46 (x = 10.34); longest caudal fin rays 16.35-20.0 (x = 17.95).

In % head length (mm): head depth 49.58-55.45 (x = 53.39); maximum body depth 65.35-75.89 (70.30); longitudinal eye diameter 23.40-28.71 (x = 25.27); interorbital width 26.36-32.62 (x = 29.99); snout length 42.02-46.81 (x = 45.56); postorbital length 40.43-45.54 (x = 43.70); maxillar barbel length 27.73-43.97 (x = 33.91) (Table 1).

Coloration: Preserved: The ground colour of the body is light ochre with a rather whitish ventral surface. Flanks and dorsal region with an irregular of light brown patches on lateral line and spots on upper part of the line lateral. In some species, light brown small vertical bars between postdorsal to caudal fin base. There is a brown spot at the base of caudal fin and 3-4 irregular light brown crossbars. Dorsal fin with 3 series of brown crossbars.

Sexual dimorphism: Body is slightly slender, pectoral and ventral fin lengths much greater in males; maximum body depth of the body is higher in females than males. Pectoral fins are broadened, thickened and black spots in males. Suborbital flap is present in males.

Remarks: In colour pattern, *B. germencica* n. sp. resembles *B. simavica*, described by Banarescu *et al.* (1978) and other specimens found in HUIC collection, but differs from by the following features: presence of sexual dimorphism and suborbital flap in male; moderately to well-developed processus dentiformis on the upper jaw; more stout caudal peduncle depth and 14 morphometric ratios, derived from twenty-seven morphometric characters given in (Table 1).

Etymology: The name of this species given in locality of Germencik.

Table 1: Comparison the average ratio of morphometric measurements of *B. germencica* and *B. simavica*

	B. evreni n = 7	*B. simavica* n = 55
Standard length (mm)	37.0-49.0 (41.6)	27.0-37.0 (31.6)
(%) Standard length		
Head depth	12.50	10.38
Body depth	16.45	14.23
Postdorsal length	31.62	36.04
Caudal peduncle length	12.73	16.31
Length of middle caudal fin rays	17.95	21.25
Length of upper caudal fin lobe	21.53	27.20
Length of lower caudal fin lobe	20.89	26.05
Length of pelvic fin	15.94	17.42
Length of pectoral fin	20.59	23.22
Interorbital width	7.02	7.59
(%) Head length		
Head depth	53.39	42.72
Body depth	70.30	58.50
Snout length	45.56	39.92
Maxillar barbel	33.91	25.19

***Barbatula bergamensis*, n. sp.**

Holotype: ♂, HUIC: KE-1, 50.0 mm SL; Turkey: Bergama, Kozak (Madra) Creek, 39°40'N 27°28' E; F. Erk'akan, 6 June 1984.

Paratype: 16 examples: HUIC: KE-1; ♂♂: 32.0-54 mm SL; ♀♀: 37.0-46.9. Same data as holotype.

Comparison materials: *Barbatula simavica*, ISBB 2976: Holotype ♂ 72,5 mm SL; Simav, Kütahya, Turkey; Balık, 1978; ISBB 2977; 2 paratype♂♂ 70.0-76.0 mm SL same data as holotype. HUIC: KM-1, 55 paratype, 27.0-37.0 mm SL; Turkey: Aydın, Ödemiş; 38°39´N 27°28´ E; F. Erk'akan, 27 November 1985. HUIC: KE-2b (17 examples): 40.0-50.0 mm SL; Turkey: Cumalıdere-Kınık-Bakırçay; 39°40'N 27°28'; F. Erk'akan, 06 June 1984. HUIC: BM-1, 7 paratype,♂♂: 40.0-63.0 mm SL; ♀♀: 37.0-48.0 mm SL, Turkey: Aydın, Germencik 15th km., 37°38'N 27°28' E; F. Erk'akan, 4 June 1984.

Fin rays formula: D III/8; A III/5; P I/9-11; V II/6-7; C 17-18.

Diagnosis: *Barbatula bergamensis* differs from *B. simavica* (Banarescu *et al.*, 1978) with the presence of sexual dimorphism and well-developed processus dentiformis formation on upper jaw; adipose crests below the caudal peduncle.

This new species also differs from *B. germencica* with eight branched of dorsal fin rays; unfurrowed lips; absence of suborbital flap; head depth and maximum body depth in head length is more less; body and caudal peduncle stout.

Description: Body and caudal peduncle are stout. Lateral line completed. Scales are present. Depth of head contained about 2 times in its length. Depth of caudal

Table 2: Comparison the average ratio of morphometric measurements of *B. Bergamensis, B. germencica* and *B. simavica*

	B. bergamensis n = 16	*B. germencica* n = 7	*B. simavica* n = 55
Standard length (mm)	32.0-48.0 (41.1)	37.0-49.0 (41.6)	27.0-37.0 (31.6)
(%) Standard length			
Postdorsal length	31.31	31.62	36.04
Caudal peduncle length	12.49	12.73	16.31
Length of middle caudal fin rays	21.06	17.95	21.25
Length of upper caudal fin lobe	24.87	21.53	27.20
Length of lower caudal fin lobe	24.04	20.89	26.05
Length of dorsal fin base	16.46	15.81	14.44
Depth of dorsal fin	22.55	22.16	24.32
Depth of anal fin	19.35	9.57	17.80
Snout length	10.93	10.67	9.70
Interorbital width	6.51	7.02	7.59
(%) Head length			
Interorbital width	26.14	29.99	31.28

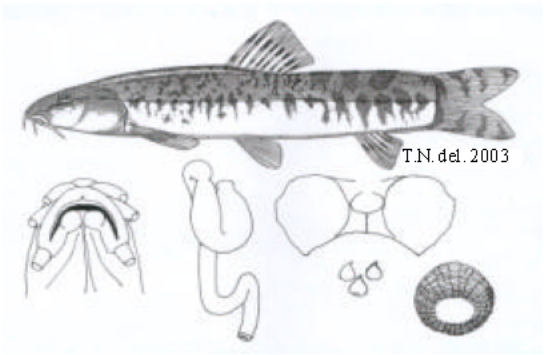

Fig. 3: *Barbatula bergamensis* n. sp. HUIC: KE-1, adult ♂: 45.0 mm SL, Kozak Stream, Bergama

peduncle is almost equal to its length. Eyes are in upper position, relatively large. Anterior nare with a short tube and pointed posterior flap; posterior nasal opening oval. Lips and barbels papillated. Processus dentiformes feebly developed; lower jaw with median slit (Fig. 3).

Dorsal fin with 8 branched of rays; free edge of the dorsal fin straight. Pectoral fins reach ventral fin base in males. Predorsal and preventral distance is almost equal. Caudal fin forked and lobes rounded; upper lobe 1.09-1.25 (x = 1.18) times longer than median rays. Adipose crests, which is below caudal peduncle is markedly.

In % standard length (mm): maximum body depth 14.05-16.92 (x = 15.62); head length 24.32-26.19 (x = 24.90); head depth 10.00-11.80 (x = 10.97); longitudinal eye diameter 5.63-6.67 (x = 6.24); interobital width 6.00-6.91 (x = 6.51); snout length 10.00-11.56 (x = 10.93); postorbital length 10.00-11.52 (x = 10.66); length of dorsal fin base 15.65-17.95 (x = 16.46); depth of dorsal fin 20.54-25.60 (x = 22.55); length of anal fin base 9.58-11.54 (x = 10.46); depth of anal fin 17.62-20.26 (x = 19.35); length of pelvic fin 14.52-18.75 (x = 16.57); length of pectoral fin 18.46-22.92 (x = 20.53); predorsal length 43.20-47.95 (x = 45.23); postdorsal length 26.92-36.46 (x = 31.31); preventral length 40.95-49.73 (x = 46.61); postventral length 37.18-43.80 (x = 40.46); preanal length 62.89-70.22 (x = 66.56); P-V distane 20.00-27.30 (x = 23.52); V-A distance 11.11-15.00 (x = 13.18); caudal peduncle length 10.26-14.58 (x = 12.49); caudal peduncle depth 8.00-11.46 (x = 10.48); longest caudal fin rays 22.92-26.09 (x = 24.87).

In % head length (mm): head depth 40.91-47.97 (x = 44.09); maximum body depth 57.78-67.35 (x = 62.69); longitudinal eye diameter 23.08-26.55 (x = 25.06); interorbital width 24.39-27.43 (x = 26.14); snout length 38.18-47.27 (x = 43.92); postorbital length 38.18-44.72 (x = 42.84); maxillar barbel length 21.85-35.04 (x = 30.67).

Coloration: The ground colour of the body is whitish ventrally and light ochre laterally and dorsally. There are irregular spots on the body; spots are more bigger in postdorsal region. Caudal fin base with brownish vertical bar; caudal fin with 3-4 brown crossbars. Dorsal fin with 1-2 series of irregular spots.

Sexual dimorphism: Body is slightly slender, pectoral and ventral fin lengths much greater in males than females. Maximum body depth of the body is higher in females than males.

Remarks: *B. bergamensis* distinguish from *B. simavica*, identified by Banaresu *et al*. (1978) with more stout body and caudal peduncle depth; presence of sexual dimorphism; snout length is longer and interorbital width is shorter than *B. simavica*; Maxillar barbels reach to the end of eyes. This new species differs from another new species, *B. germencica*, inhabit in the same basin with the absence of suborbital flap; markedly adipose crest below caudal peduncle, more stout body; colour pattern (Fig. 1 and 2); furrowed lips. Other distinctive characters in these three species are given in (Table 2).

Etymology: The name is given in connection with the locality of this species.

***Barbatula cinica*, n. sp.**

Holotype: ♂, HUIC: BM-3; 44.0 mm SL; Turkey: Road of Kütahya to Denizli, Cin Stream, 39°40'N 29°30' E; F. Erk'akan, 28. October 2002.

Paratype: 23 examples: HUIC: BM-3; ♂♂: 44.0-49.0 mm SL; ♂♂: 25.0-59.0 mm SL, same data as holotype.

Comparison materials: *Barbatula simavica*, ISBB 2976: Holotype ♂ 72,5 mm SL; Simav, Kütahya, Turkey; Balık, 1978; ISBB 2977; 2 paratype♂♂ 70.0-76.0 mm SL same data as holotype. HUIC: KM-1, 55 paratype, 27.0-37.0 mm SL; Turkey: Aydın, Ödemiş; 38°39´N 27°28´ E; F. Erk'akan, 27 November 1985. HUIC: KE-2b (17 examples): 40.0-50.0 mm SL; Turkey: Cumalıdere-Kınık-Bakırçay; 39°40'N 27°28'; F. Erk'akan, 06 June 1984. HUIC: BM-1, 7 paratype,♂♂: 40.0-63.0 mm SL; ♀♀: 37.0-48.0 mm SL, Turkey: Aydın, Germencik 15th km., 37°38'N 27°28' E; F. Erk'akan, 4 June 1984. 16 examples: HUIC: KE-1; ♂♂: 32.0-54 mm SL; ♀♀: 37.0-46.9. Same data as holotype.

Fin rays formula: D III/7-8; A III/ (4) 5 (6); P I/9-10; V II/6-7; C 16-17.

Diagnosis: *Barbatula cinica* differs from the other species, *B. germencica* and *B. bergamensis*, described in this study by following characters: absence of sexual dimorphism and suborbital flap, maximum depth of the body and caudal peduncle; caudal fork is less forked and colour pattern. *B. cinica* differs from *B. simavica* with eight branched of rays on dorsal fin, rarely 7; snout moderately stubby; of caudal peduncle included approximately 1.3 times in caudal peduncle length.

Description: Body elongated and slender of almost uniform depth; lateral line completed; scales are hidden underneath; head moderately pointed in lateral and dorsal view; snout rather stubby (Fig. 4). Mouth arched; upper jaw with moderately processus dentiformis; lips and barbels papillated; upper lip relatively furrowed; lower lips furrowed with a small front notch. Maxillar barbels reach to back of eyes; anterior nare forming a small tube with roundish posterior flap; posterior nasal opening round. Pectoral and pelvic fins long and pointed. Caudal fin forked; upper and lower lobes are pointed and almost at same length. Adipose crests present both above and below caudal peduncle. Dorsal fin with eight branched rays, rarely 7; distal margin of the dorsal fin straight;

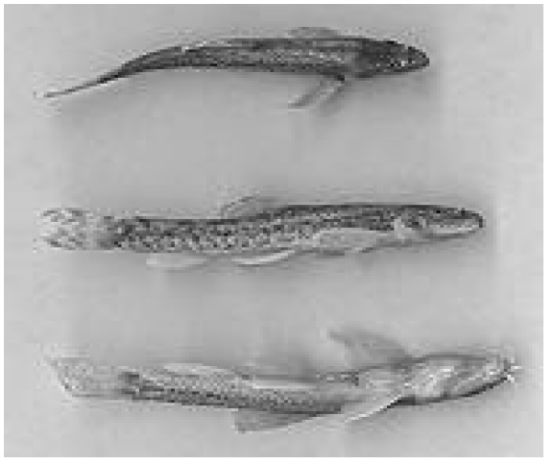

Fig. 4: *Barbatula cinica*. Turkey: Road of Kütahya to Denizli, Cin Stream, F. Erk'akan, 28. October 2002

pectoral fin with usually nine, rarely 10 branched rays, reaching about to pelvic fin base. Pelvic fins reach through anus opening.

In % standard length (mm): maximum body depth 11.82-13.26 (x = 12.72); head length 24.07-27.60 (x = 26.04); head depth 11.36-12.80 (x = 12.10); interobital width 6.12-7.27 (x = 6.62); snout length 9.84-10.77 (x = 10.25); postorbital length 10.33-11.85 (x = 11.07); length of dorsal fin base 14.00-16.25 (x = 14.92); depth of dorsal fin 20.31-24.29 (x = 22.51); length of anal fin base 8.66-9.84 (x = 9.41); depth of anal fin 17.91-20.33 (x = 19.13); length of pelvic fin 16.42-19.46 (x = 18.20); length of pectoral fin 16.42-22.00 (x = 19.91); predorsal length 44.34-46.94 (x = 45.72); postdorsal length 32.68-35.38 (x = 33.92); preventral length 44.34-48.21 (x = 46.38); postventral length 37.50-42.73 (x = 40.66); preanal length 65.09-70.00 (x = 68.12); P-V distane 22.10-25.19 (x = 23.85); V-A distance 11.89-14.33 (x = 13.20); caudal peduncle length 12.90-16.15 (x = 15.01); caudal peduncle depth 10.57-12.50 (x = 11.68); longest caudal fin rays 16.36-17.86 (x = 16.90). In % head length (mm): head depth 46.36-52.34 (x = 49.64); maximum body depth 56.80-74.17 (x = 64.22); interorbital width 26.98-31.25 (x = 28.56); snout length 42.54-45.70 (x = 44.19); postorbital length 45.26-50.00 (x = 47.74); maxillar barbel length 24.22-33.12 (x = 27.76).

Coloration: Colour of the body is light ochre with brown irregular dots on flanks and moderately big brown saddles dorsal view. There are several irregular dark brown spots on dorsal fin and 3-4 series of bands on caudal fin.

Sexual dimorphism: Sexual dimorphism not observed.

Table 3: Comparison the average ratio of morphometric measurements of *B. cinica* and *B. simavica*

	B. cinica n = 23	*B. simavica* n = 55
Standard length (mm)	44.0-49.0 (47.1)	27.0-37.0 (31.6)
(%) Standard length		
Head length	26.04	24.34
Head depth	12.10	10.38
Body depth	12.72	14.23
Predorsal lenght	46.19	43.20
Postdorsal length	30.61	36.04
Preanal lenght	66.44	62.51
Caudal peduncle length	12.50	16.31
Length of anal fin base	10.80	9.35
Depth of anal fin	21.59	17.80
Length of pectoral fin	22.51	23.22
Snout length	11.29	9.70
Postorbital length	12.28	10.84
(%) Head length		
Head depth	46.50	42.72
Body depth	48.93	58.50
Eye diameter	23.61	25.46
Snout length	43.38	39.92
Interorbital width	27.75	31.28
Maxillar barbel length	31.01	25.19

Remarks: *B. cinica* is closely related to *B. simavica* (Banarescu *et al*., 1978), but differs from this species with presence of processus dentiformes upper jaw; head depth contained about 2.2 times in its length; depth of caudal peduncle more stout. Besides, 22 morphometric ratios, derived from twenty-seven morphometric characters shown in (Table 3).

Ethymology: The name is given in connection with stream which new species caught.

***Barbatula mediterraneus*, n. sp.**

Holotype: ♂, HUIC: AKD-2a; 54.0 mm SL; Turkey: Eğirdir, Çandır, Aksu Stream, 37°38'N 30°31' E; F. Erk'akan, 4 June 1998.

Paratype: 7 examples: HUIC: AKD-2a; ♀♀: 53.0-67.0 mm SL, same data as holotype. 27 examples: HUIC-AKD-3: ♂♂: 49.0-58.0 mm SL; ♀♀: 30.0-63.0 mm SL, Turkey: Madenli-Aksu Stream, Eğirdir; F. Erk'akan, 2 October 1982.

Comparison materials: *Barbatula simavica*, ISBB 2976: Holotype ♂ 72,5 mm SL; Simav, Kütahya, Turkey; Balık, 1978; ISBB 2977; 2 paratype♂♂70.0-76.0 mm SL same data as holotype. HUIC: KM-1, 55 paratype, 27.0-37.0 mm SL; Turkey: Aydın, Ödemiş; 38°39´N 27°28´E; F. Erk'akan, 27 November 1985. HUIC: KE-2b (17 examples): 40.0-50.0 mm SL; Turkey: Cumalıdere-Kınık-Bakırçay; 39°40'N 27°28'; F. Erk'akan, 06 June 1984. *Barbatula eregliensis*. 4 examples: 49.0-57.8 mm SL, Beyşehir Lake; C. Kosswig, 19 August 1957.

Fig. 5: *Barbatula mediterraneus*. Adult +Paratype: 55 mm SL; Aksu Stream, Çandır

Fin rays formula: D III/7; A III/5; P I/10-11; V II/7; C 17;19.

Diagnosis: *Barbatula mediterraneus* is differed from other species, *B. simavica* and *B. eregliensis* in western and central Anatolia according to 19 and 18 morphometric characters respectively such as length and depth of head, maximum body depth, interorbital length, preorbital length, predorsal length, postdorsal length, preventral length, postventral length, caudal peduncle depth, caudal fin length. Besides, mouth shape and coloration of the body are different.

Description: Body elongated and moderately slender from anterior to posterior. Lateral line completed. Scales are hidden underneath. Depth of caudal peduncle is almost equal to its length (Fig. 5). Eyes are in upper position, relatively large. Anterior nare with a short tube with a small rounded posterior flap; posterior nasal opening round. Lips and barbels papillated. Upper lip with small frontal incision; lower lip with well-defined median slit and furrowed. Pectoral and ventral fins long and pointed. Caudal fin deeply forked and upper and lower lobes are roundish and same length. Adipose crests weakly present. Upper margin of the dorsal fin straight or slightly concave. Pelvic fins reach anus opening. Length of pelvic fin nearly the same depth of anal fin. Length of the anal fin contained approximately 2 times in its depth. Predorsal and preventral distance is almost equal.

In % standard length (mm): maximum body depth 13.40-16.79 (x = 14.89); head length 22.42-23.93 (x = 23.20); head depth 10.45-12.32 (x = 11.52); longitudinal eye diameter 5.33-5 (x = 6.15); interobital width 6.52-7.78 (x = 7.22); snout length 10.64-12.05 (x = 11.29); postorbital length 10.51-13.04 (x = 12.28); length of dorsal fin base

Table 4: Comparison the average ratio of morphometric measurements of *B. mediterraneus, B. simavica* and *B. eregliensis* (average ratios)

	B. mediterraneus n = 8	*B. simavica* n = 55	*B. eregliensis* n = 26
Standard length (mm)	53.0-67.0 (59.0)	27.0-37.0 (31.6)	25.0-61.0 (42.7)
(%) Standard length			
Head length	23.20	24.34	25.42
Head depth	11.52	10.38	10.57
Body depth	14.89	14.23	12.56
Predorsal lenght	45.72	43.20	44.98
Postdorsal length	33.92	36.04	35.19
Preventral lenght	46.38	42.76	43.30
Preanal lenght	68.12	62.51	68.04
Caudal peduncle depth	11.68	9.95	8.35
Length of middle caudal fin rays	16.90	21.25	17.84
Length of upper caudal fin lobe	22.88	27.20	20.47
Length of lower caudal fin lobe	23.56	26.05	20.47
Depth of anal fin	19.13	17.80	16.54
Length of pelvic fin	18.20	17.42	14.87
Length of pectoral fin	19.91	23.22	19.82
Snout length	10.25	9.70	9.88
Interorbital width	6.62	7.59	5.96
(%) Head length			
Head depth	49.64	42.72	41.62
Body depth	64.22	58.50	49.37
Eye diameter	29.68	25.46	22.55
Snout length	44.19	39.92	38.80
Interorbital width	28.56	31.28	23.49
Postorbital length	47.74	44.52	46.30

12.73-17.61 (x = 15.60); depth of dorsal fin 23.41-26.53 (x = 24.66); length of anal fin base 10.00-11.70 (x = 10.80); depth of anal fin 18.64-23.40 (x = 21.59); length of pelvic fin 15.76-24.08 (x = 19.14); length of pectoral fin 20.43-23.78 (x = 22.51); predorsal length 44.07-48.00 (x = 46.19); postdorsal length 28.94-33.00 (x = 30.61); preventral length 43.18-46.59 (x = 44.86); postventral length 37.96-45.45 (x = 40.13); preanal length 63.64-68.18 (x = 66.44); P-V distane 19.40-23.83 (x = 21.87); V-A distance 10.20-14.57 (x = 12.92); caudal peduncle length 10.87-15.76 (x = 12.50); caudal peduncle depth 9.32-10.68 (x = 9.79); longest caudal fin rays 20.34-26.14 (x = 22.51).

In % head length (mm): head depth 42.02-49.30 (x = 46.50); maximum body depth 43.70-54.23 (x = 48.93); longitudinal eye diameter 22.13-26.32 (x = 23.61); interorbital width 25.86-30.17 (x = 27.75); snout length 40.98-45.69 (x = 43.38); postorbital length 43.66-49.18 (x = 47.14); maxillar barbel length 26.05-34.48 (x = 31.01).

Coloration: The ground colour of the body is ochre laterally and dorsally. There are irregular vertical bars and spots on the body; vertical bars are more bigger in postdorsal region. Caudal fin base with brownish spot; 3-4 irregular bands on the caudal fin.

Sexual dimorphism: Sexual dimorphism is not observed in males and females.

Remarks: *B. mediterraneus* differed from *B. simavica* (Banarescu *et al*., 1978) with head length; head depth; interorbital width; depth of anal fin; length of pelvic and pectoral fins; predorsal and postdorsal length; preventral and preanal length; the size of caudal peduncle, colour pattern and other features given in (Table 4).

This new species separated from *B. eregliensis* (Banarescu *et al*., 1978) with 7 branched rays in dorsal fin; dorsal fin with *B. eregliensis* the beginning of the pelvic fins; maxillar barbels reach origin of the postopercular region in *B. eregliensis* whereas its reach midway of the eyes in *B. mediterraneus*. Coloration of the body, caudal fin, dorsal fin and anal fin are different from in both species. Besides, *B. mediterraneus* differentiated to *B. eregliensis* by the 18 characters given in (Table 4).

Ethymology: The new species name is given in connection with mediterrenien basin.

***Barbatula phoxinoides*, n. sp.**

Holotype: ♂, HUIC: MAR-7g, 52.0 mm SL; Turkey: Iznik; 40°41'N 29°30'; S. C. Özeren, 28.4.2000.

Paratype: 10 examples: HUIC: F12; ♂♂: 32.0-52.0 mm SL; ♀♀: 28.0-53.0 mm SL. Same data as holotype.

Comparison materials: *Barbatula angorae*, 5 examples: 33.0-44.0 mm SL, Çubuk stream, Ankara, Gadeu and Kerville collection, 1927. 23 examples: 40.0-70.5 mm SL, Izmir, S. Balık collection, 1978. HUIC: SA-19 (50 examples); 34.0-63.0 mm SL; Turkey: Gicik Village, Ankara; F. Erk'akan, 11 April 1980.

Fin rays formula: D III/7-8; A III/5; P I/9-10 (11); V II/(6)-7; C 16.

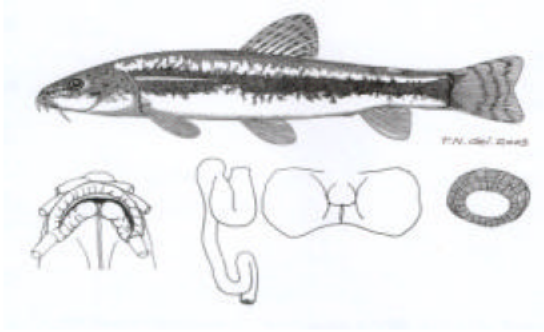

Fig. 6: *Barbatula phoxinoides*. Adult +: 51.5 mm SL., Iznik Lake, 7 July 2000;S. C. Özeren

Diagnosis: *Barbatula phoxinoides* distinguish from closely related species, *Barbatula angorae*, found in Sakarya Basin, with eight branched of dorsal fin rays; five branched of anal fin; depth of head; longitudinal eye diameter; shape of mouth; processus dentiformis; length of lower jaw barbels and coloration of body, dorsal and caudal fin rays; adipose crests well-defined.

Description: Lateral line complete, but more dense anterior part of the body. Scales very minute scattered on the body. Body are moderately stout; depth of caudal peduncle contained around 1.4 times in caudal peduncle length (Fig. 6). Head moderately pointed in dorsal and lateral view. Eyes relatively large and contained about 2.3 times in head length; Anterior Depth of head contained about 1.90 times in its length. Snout length and postorbital length relatively equal (0.91 mm). Eyes in upper position; relatively big; longitudinal eye diameter and interorbital distance almost same (1.2 mm). Mouth is arched; lips and barbels papillated; processus dentiformis feebly to moderately developed; lower jaw smooth; lower lips with small incision and groove. Anterior nare forming tube with a short rounded posterior flap; posterior nasal cavity circular. Maxillary barbels reaching through midway of eyes. Upper margin of dorsal and anal fins are concave. Caudal fin forked; lobes rounded; adipose crest well-developed. Predorsal and preventral length is nearly equal.

In % standard length (mm): maximum body depth 14.36-19.81 (x = 16.32); head length 23.59-26.19 (x = 25.18); head depth 10.77-13.57 (x = 12.65); longitudinal eye diameter 5.68-7.50 (x = 6.18); interobital width 6.81-9.38 (x = 7.64); snout length 9.76-11.73 (x = 10.96); postorbital length 10.47-12.12 (x = 11.46); length of dorsal fin base 13.81-16.73 (x = 15.19); depth of dorsal fin 20.50-25.00 (x = 22.59); length of anal fin base 9.38-11.67 (x = 10.40); depth of anal fin 17.19-20.45 (x = 18.58); length of pelvic fin 14.65-18.33 (x = 16.11); length of pectoral fin 18.00-24.29 (x = 20.25); predorsal length 40.91-46.60 (x = 44.11); postdorsal length 31.67-36.19 (x = 34.36); preventral length 41.43-49.04 (x = 44.53); postventral length 40.26-45.35 (x = 42.66); preanal length 63.64-71.35 (x = 67.57); P-V distane 19.69-23.81 (x = 21.74); V-A distance 15.24-17.45 (x = 16.20); caudal peduncle length 12.56-15.63 (x = 13.88); caudal peduncle depth 9.36-10.48 (x = 9.80); longest caudal fin rays 16.67-24.04 (x = 20.23).

In % head length (mm): head depth 45.65-57.00 (x = 50.23); maximum body depth 57.50-77.21 (x = 64.76); longitudinal eye diameter 22.50-30.00 (x = 24.57); interorbital width 26.67-37.50 (x = 30.37); snout length 39.22-45.45 (x = 43.52); postorbital length 40.91-47.83 (x = 45.51); maxillar barbel length 28.68-36.36 (x = 32.55).

Coloration: Color of head and upper part of the body is brown; irregular light brown dots above lateral line; regular horizontal dark brownish band along lateral line. Caudal fin with 3 series of dark brown bars; caudal fin base with deep brown lunate form; dorsal fin with irregular brown spots.

Sexual Dimorphism: Pectoral rays are wider and thicker in male than in female. During the reproductive period pectoral fins carry cone-shaped breeding tubercules in male whereas pectoral and pelvic fins are short body is stout and high in females. Suborbital flap is absent.

Remarks: *B. phoxinoides* is closely related to *B. angorae* Banarescu *et al.* (1978), but differs it according to the number of branched rays in dorsal and anal fins; lacking of suborbital flap; processus dentiformis on the upper jaw; maxillary barbels position; coloring more darkly. Besides, nine morphometric ratio, derived from twenty-seven morphometric characters such as depth of head, longitudinal eye diameter; interorbital length, snout length, postdorsal length in standat length and head depth, snout length in head length; postdorsal length in predorsal (Table 5).

Ethymology: The new species name given in colour pattern similarity of *Phoxinus* genus.

***Seminemacheilus ispartensis*, n. sp.**

Holotype: ♂, HUIC: AKD-1; 54.0 mm SL; Turkey: Isparta Creek, Eğirdir-Isparta Road, 1st. Railway Pass; 37°38'N 30°31'E; F. Erk'akan and F. G. Ekmekçi; 4 June 1998.

Paratype: 16 examples: HUIC: AKD-1; ♂♂: 41.0-57.0 mm SL; ♀♀: 54.0-83.0 mm SL; Same data as holotype.

Table 5: Comparison the average ratio of morphometric measurements of *B. phoxinoides and B. angorae*

	B. phoxinoides n = 14	*B. angorae* n = 50
Standard Length (mm)		
(%) Standard length		
Head depth	12.65	11.44
Postdorsal length	34.36	37.12
Eye diameter	6.18	5.37
Snout length	10.96	9.95
Interorbital width	7.64	6.91
(%) Head length		
Head depth	50.23	46.95
Snout length	43.52	40.80

Comparison materials: *Seminemacheilus lendli*: Sml. 1901; 9 examples: 34.0-64.0 mm SL, Cihanbeyli, 6. July 1955, Banarescu and Nalbant collec.; Sml. 1897: 4example: 41.0-43.9 mm SL, Çavuşcu Lake, 10 May 1959, Banarescu and Nalbant collec.; HUIC: KKB-7 (5 examples): 44.0-62.0 mm SL; Turkey: Güldürhacı-Beyşehir, 37°38'N 31°32 E';; F. Erk'akan, S.C. Özeren and A.C. Hoş, 22 July 1998.

Fin rays formula: D III/8; A III/5-6; P I/10 (11) (13); V II/6-7; C 16 (17).

Diagnosis: *S. ispartensis* is different from the other species, *S. lendli*, in central Anatolia with external morphological view; head shape is long and pointed whereas its small and stubby in *S. lendli*. Caudal peduncle is flat; scales are oval structure; bony swim-bladder capsule with pointed through posterior part; upper and lower lips furrowed; colour pattern of the body like leopard.

Description: The shape of the body is moderately elongated; lateral line incompleted (Fig. 7). Head pointed in upper and in side view. Upper and lower lips with densely furrowed; lower lips with small incision with two rounded lobes; barbels with papillated. Eyes are relatively big. Anterior nasal openning with a short tube and pointed posterior flap; posterior nare forming a small round hole. There are very rare ovoid scales on the caudal peduncle. Caudal fin with straight structure; depth of caudal peduncle is about 1.2 times in its length. Adipose crest moderately defined above the caudal peduncle. Distance between pecto-ventral is about 1.6 times longer than distance between ventral-anal. Upper margin part of the dorsal and anal fins are straight to moderately concave. Depth of dorsal fin is about 1.2 times in its length.

In % standard length (mm): maximum body depth 17.86-21.52 (x = 19.46); head length 21.32-23.60 (x = 22.47); head depth 11.17-12.96 (x = 12.15); longitudinal eye diameter 3.80-5.00 (x = 4.41); interobital width 6.67-7.65 (x = 6.98); snout length 8.45-10.00 (x = 9.42); postorbital length 10.00-12.15 (x = 10.97); length of dorsal fin base 11.90-15.22 (x = 13.23); depth of dorsal fin 21.11-23.04 (x = 21.67); length of anal fin base 7.47-11.11 (x = 9.15); depth of anal fin 16.34-19.75 (x = 18.18); length of pelvic fin 11.59-13.24 (x = 12.45); length of pectoral fin 16.67-22.22 (x = 18.91); predorsal length 44.20-48.97 (x = 46.72); postdorsal length 28.73-38.04 (x = 33.19); preventral length 41.60-52.39 (x = 46.42); postventral length 36.48-46.96 (x = 40.52); preanal length 68.33-73.29 (x = 71.30); P-V distane 24.40-29.29 (x = 26.70); V-A distance 15.37-17.65 (x = 16.97); caudal peduncle length 9.85-14.29 (x = 11.76); caudal peduncle depth 19.12-25.89 (x = 21.74); longest caudal fin rays 19.12-25.36 (x = 21.26).

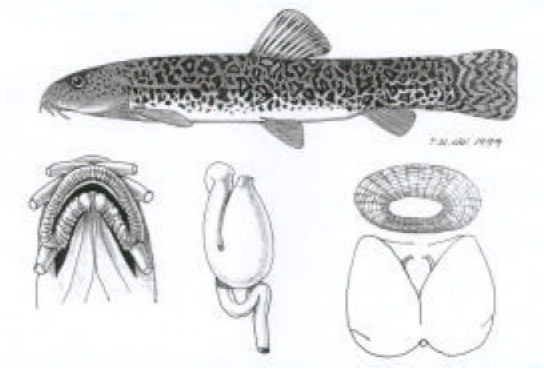

Fig. 7: *Seminemacheilus ispartensis*.♂ Adult: 56.0 mm SL, Isparta creek, June 1998

In % head length (mm): head depth 50.85-60.13 (x = 54.14); maximum body depth 76.27-98.04 (x = 86.81); longitudinal eye diameter 16.67-21.19 (x = 19.60); interorbital width 28.80-35.86 (x = 31.12); snout length 37.60-45.80 (x = 41.97); postorbital length 43.20-56.55 (x = 48.88); maxillar barbel length 35.59-43.89 (x = 39.69).

Coloration: Ventral region of the body is yellowish; flanks are brown with leopard figures. Head with densely small brown dots; barbells with brownish dots. Caudal fin base with brownish band; caudal fin with 4-5 irregular mousy bands; there are vertical mousy spots on dorsal fin.

Sexual dimorphism: Pectoral rays are longer, pointed and reach to pelvic fin base in male than in female. Body is moderately stout in females. Suborbital flap is absent.

Remarks: *S. ispartensis* differs from *S. lendli* (Banarescu and Nalbant, 1964), which is closed to this new species, with less deeper and moderately elongate body. Snout rather pointed whereas its blunt in *S. lendli*. Upper and lower lips densely furrowed; bony swim-bladder capsule with pointed through posterior part; coloration of the

Table 6: Comparison the average ratio of morphometric measurements of *S. ispartensis* and *S. lendli*

	S. ispartensis n = 16	*S. lendli* n = 5
Standard length (mm)	41.0-83.0 (55.2)	44.0-62.0 (53.2)
(%) Standard length		
Head length	22.47	24.36
Pelvic-Ventral Distance	26.70	23.98
Ventral-Anal Distance	16.97	12.78
Caudal peduncle length	11.76	15.25
Caudal peduncle depth	9.65	11.42
Length of dorsal fin base	13.23	11.71
Length of pectoral fin	18.91	21.98
Longitudinal eye diameter	4.41	5.96
Interorbital width	6.98	8.48
(%) Head length		
Body depth	86.81	71.16
Longitudinal eye diameter	19.60	24.47
Snout length	41.97	38.77

body is similar to leopard pattern. Maxillar barbels reach end of the preopercular region. Besides, *S. ispartensis* is different to *S. lendli* by the twelve morphological ratios given in (Table 6).

Ethymology: The specific name is taken from the creek which the species inhabit.

***Barbatula erdali*, n. sp.**

Holotype: ♂, HUIC: F12, 44.0 mm SL; Turkey: Murat River-Ağrı; 39°40′N 43°44′E; F. Erk'akan, 29 May 1971.

Paratype: 7 examples: HUIC: F12; ♂♂: 33.5-45 mm SL; ♀♀: 34.0-47 mm SL. Same data as holotype.

Comparison materials: *Barbatula araxensis*: ZMH-5951: 5 examples: 45.0-65.2 mm SL,; Karasu, Kandilli. ISBB-2617: 2 examples: 51.2-59.3 mm SL, Karasu, Kandilli, C. Kosswig. HUIC: F-7a (4 examples): 54.0-75.0 mm SL; Turkey: Hazar Lake; F. Erk'akan, 6 June 1971. *A. brandti*: HUIC: F-11a (4 examples): 45.0-56.0 mm SL; Turkey: Patnos Creek, Murat River, Ağrı; F. Erk'akan, 7 July 1974.

Fin rays formula: D III/9; A III/6; P I/9; V II/6-7; C 16.

Diagnosis: *B. erdali* varies from other species, *B. araxensis* and *B. brandti*, in East Anatolia with depth of caudal peduncle; 9 and 6 branched rays in dorsal and anal fin, respectively; caudal fin rays; colour pattern; length of lower jaw barbels, shape of mouth and proccesus dentiformis.

Description: Lateral line complete. Body is moderately stout and become slender through caudal fin; caudal peduncle are moderately slim (Fig. 8). Depth of head contained about 1,90 times in its length. Snout length and postorbital length relatively equal (0.91 mm). Eyes in upper position; relatively big; longitudinal eye diameter

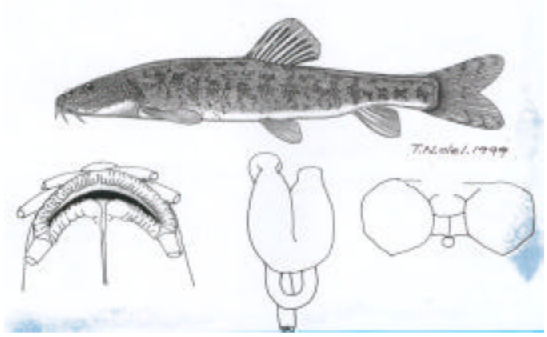

Fig. 8: *Barbatula erdali*, Holotype. Murat river, Ağrı, 9 May 1971

and interorbital distance almost same (1.2 mm). Posterior nare forming very small round hole. Anterior nare with a short tube and pointed posterior flap. Lips and barbels covered with papillae. Processus dentiformis is absent. Lips are furrowed; lower lip with a small notch. Maxillary barbel reaches the posterior margin of eye. Distal margin of dorsal and anal fins are slightly concave. Caudal fin deeply forked; lobes rounded; adipose crest in upper part is slender. Predorsal and preventral length is almost equal. Length of predorsal and postdorsal is almost equal. Pectoral-ventral distance is about 2.23 times longer than ventral-anal length.

In % standard length (mm): maximum body depth 13.53-19.07 (x = 15.78); head length 23.40-26.18 (x = 25.22); head depth 12.29-14.65 (x = 13.33); longitudinal eye diameter 5.75-6.86 (x = 6.35); interobital width 7.76-8.29 (x = 7.88); snout length 9.30-10.51 (x = 9.97); postorbital length 10.29-11.76 (x = 10.95); length of dorsal fin base 13.71-15.64 (x = 14.95); depth of dorsal fin 22.34-25.35 (x = 23.54); length of anal fin base 9.36-12.57 (x = 11.21); depth of anal fin 18.46-20.00 (x = 19.31); length of pelvic fin 15.71-18.09 (x = 16.62); length of pectoral fin 16.67-22.29 (x = 19.13); predorsal length 41.14-45.96 (x = 43.59); postdorsal length 29.14-35.13 (x = 30.88); preventral length 42.00-46.51 (x = 44.81); postventral length 35.71-40.23 (x = 37.86); preanal length 64.62-67.67 (x = 66.05); P-V distane 22.65-26.81 (x = 25.17); V-A distance 8.86-13.72 (x = 11.59); caudal peduncle length 10.21-13.64 (x = 11.94); caudal peduncle depth 8.37-9.55 (x = 8.77); longest caudal fin rays 17.95-21.43 (x = 19.22).

In % head length (mm): head depth 47.19-59.43 (x = 52.95); maximum body depth 51.69-77.36 (x = 62.75); longitudinal eye diameter 23.60-26.67 (x = 25.16); interorbital width 30.00-32.73 (x = 31.29); snout length 37.75-42.73 (x = 39.55); postorbital length 40.45-46.36 (x = 43.43); maxillar barbel length 25.45-29.41 (x = 27.36).

Table 7: Comparison the average ratio of morphometric measurements of *B. erdali*, *B. araxensis* and *B. brandti*

	B. erdali n = 7	*B. araxensis* n = 4	*B. brandti* n = 4
Standard length (mm)	34.0-47.0 (39.6)	54.0-75.0 (65.3)	45.0-56.0 (48.8)
(%) Standard length			
Head depth	13.33	10.90	10.89
Preventral lenght	44.81	48.40	45.34
Postventral length	37.86	41.27	41.76
Caudal peduncle depth	8.77	11.0	5.77
Caudal peduncle length	11.94	15.54	20.23
Length of dorsal fin	14.95	15.50	16.84
Length of anal fin	11.21	9.53	8.82
Length of pelvic fin	16.62	18.14	18.70
Length of pectoral fin	19.13	23.34	21.98
Longitudinal eye diameter	6.35	4.87	7.03
Postorbital length	10.95	10.10	9.51
Interorbital width	7.88	6.38	6.07
(%) Head length			
Head depth	52.95	45.71	45.89
Snout length	39.55	43.42	44.09
Interorbital width	31.29	26.75	25.60
Maxillar barbels length	27.36	30.39	32.38

Coloration: Colour pattern is extremely variable. The ground colour of the body is light ochre with a whitish ventral surface. Flanks and dorsal region with an irregular light brown spots and vertical bands throughout the body. Caudal fin with 3 series of brown bars; dorsal fin with 2-3 series of brown horizontal line.

Sexual dimorphism: Sexual dimorphism is absent.

Remarks: *B. erdali* is related to *B. araxensis* (Banarescu *et al*., 1978) in appearance, but differs from *B. araxensis* with 12 morphometric characters such as depth of head, interorbital length, postorbital length, length of pelvic and anal fins, postventral distance, length and depth of caudal peduncle in standart length and branched rays of dorsal and anal fin. (Table 7). Besides, sexual dimorphism and suborbital flap is present in *B. araxensis* whereas they are absent in *B.* erdali.

This new species distinguished from *A. brandti* (Banarescu *et al*., 1978) with the rays of dorsal and anal fin branched rays; thinner caudal peduncle depth and 15 morphometric characters given in (Table 6).

Ethymology: The name of this species given in Erdal Erk'akan.

***Barbatula paucilepis*, n. sp.**

Holotype: ♂, HUIC: F2, 70.0 mm SL; Turkey: Sivas, Mancılık Stream, Gürün; 38°39'N 37°38'E; B. Ünver, 7 July, 1989.

Paratype: 7 examples: HUIC: F2; ♂♂: 41.0-70.0 mm SL; ♀♀: 59.0-66.0 mm SL. Same data as holotype.

Comparison materials: *Paracobitis tigris*: H. Z. Sml. 1927: 4 examples: 56.2-73.0 mm SL, Hakkari; Banarescu and Nalbant, 1964. HUIC: F-18 (5 examples): 27-30 mm SL; Turkey: Zapsuyu, Hakkari; F. Erk'akan, 1985.

Fin rays formula: D III/8-9; A III/6; P I/10-11; V II/6-7; C 16-17.

Diagnosis: *B. paucilepis* differs from *Paracobitis tigris* in east Anatolia, by the following combination characters: five branched anal fin rays; 14-16 principal caudal fin rays; mouth shape; adipose crest structure and 19 morphometric characters such as depth of head, maximum body depth, longitudinal eye diameter, length and depth of caudal peduncle, length of upper and lower caudal fin lobes. Besides, mouth shape and coloration is different.

Description: Body moderately elongated, with body depth increasing up to predorsal region Behind dorsal fin, body depth almost constant to caudal fin base. Lateral line completed (Fig. 9). Depth of caudal peduncle contained about 1.25 in its length. Head rounded in upper and in side view. Eyes are relatively large and in upper position. Postorbital length is much longer than snout length. Anterior nare with a short tube with rounded posterior flap; posterior nasal opening round. Barbels papillated. Lips are furrowed; upper lip with well-defined median slit.

Distal margin of dorsal fin slightly concave or straight. Pectoral fin with 10-11 branched rays, reach almost midway to pecto-ventral distance. Caudal fin moderately forked and upper and lower lobes are roundish and nearly same length. Adipose crests weakly present. Preventral distance is 1.20 times longer than postventral length. Predorsal and preventral length is almost equal.

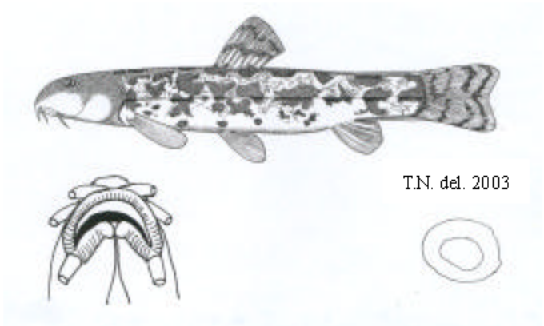

Fig. 9: *Barbatula paucilepis*. Gömek, Mancılık stream, Gürün, 7 July 1989, F. Erk'akan

In % standard length (mm): maximum body depth 15.45-15.86 (x = 15.63); head length 22.71-24.57 (x = 23.56); head depth 11.86-12.86 (x = 12.51); longitudinal eye diameter 4.39-4.55 (x = 4.49); interobital width 5.76-6.14 (x = 6.27); snout length 9.57-10.00 (x = 9.97); postorbital length 10.76-11.43 (x = 11.14); length of dorsal fin base 12.29-12.42 (x = 12.79); depth of dorsal fin 21.06-21.97 (x = 21.58); length of anal fin base 8.86-9.39 (x = 9.41); depth of anal fin 16.67-18.29 (x = 17.53); length of pelvic fin 14.07-16.86 (x = 15.53); length of pectoral fin 18.79-20.00 (x = 19.15); predorsal length 43.39-44.86 (x = 44.03); postdorsal length 31.19-37.29 (x = 33.86); preventral length 48.18-49.57 (x = 48.77); postventral length 38.48-41.43 (x = 40.75); preanal length 68.47-69.24 (x = 69.22); P-V distane 26.36-26.97 (x = 26.66); V-A distance 14.29-16.82 (x = 15.49); caudal peduncle length 11.06-13.29 (x = 12.72); caudal peduncle depth 9.70-10.57 (x = 10.19); longest caudal fin rays 15.76-16.67 (x = 16.26).

In % head length (mm): head depth 52.24-53.55 (x = 53.08); maximum body depth 64.53-65.81 (x = 66.39); longitudinal eye diameter 18.02-19.35 (x = 19.06); interorbital width 24.52-25.00 (x = 26.67); snout length 38.95-42.58 (x = 42.38); postorbital length 45.81-48.39 (x = 47.30); maxillar barbel length 32.26-37.21 (x = 34.36).

Coloration: Specimens with light ochre laterally and dorsally, whitish ventrally; irregular dark brown spots throughout flank; spots under the lateral line narrower. Dorsal fin with 2 series of horizontal dark brown bands; caudal fin with 3-4 irregular dark strips.

Sexual dimorphism: Sexual dimorphism is present; pectoral and ventral fin lengths much greater in males; maximum body depth of the body is higher in females than males. Tubercules are present on head in males.

Remarks: *B. paucilepis* is closed species to *P. tigris*, but differs from it by the size of caudal peduncle; mouth shape; colour pattern. Dorsally adipose crests in *P. tigris* is well developed and thick whereas it is very slim in *B. paucilepis*. Sexual dimorphism is absent in *P.tigris*. Besides, 19 morphometric ratios, derived from twenty-seven morphometric features are distinguishing marks, shown in (Table 8).

Table 8: Comparison the average ratio of morphometric measurements of *B. paucilepis* and *P. tigris*

	B. paucilepis n = 7	*P. tigris* n = 5
Standard Length (mm)	47.0-66.0 (59.8)	27.0-30.0(28.5)
(%) Standard length		
Head depth	12.51	11.28
Body depth	15.63	12.20
Preventral lenght	48.77	40.93
Ventral-Anal Distance	15.49	10.84
Caudal peduncle length	12.72	18.23
Caudal peduncle depth	10.19	6.80
Length of middle caudal fin rays	16.26	19.51
Length of upper caudal fin lobe	18.63	24.69
Length of lower caudal fin lobe	19.38	24.07
Length of dorsal fin base	12.79	18.79
Longitudinal eye diameter	4.49	7.61
(%) Head length		
Head depth	53.08	47.70
Body depth	66.39	51.57

Ethmology: New species name is given in distrubition of the scales on its body.

***Schistura ceyhanensis*, n. sp.**

Holotype: ♂, HUIC: CEY-1, 42.0 mm SL; Turkey: Yalak Village-Elbistan-Kahramanmaraş; 38°39'N 36°37'E; F. Erk'akan, 23 May 1983.

Paratype: 2 examples: HUIC: CEY-1; ♂♂: 30.0-42.0 mm SL; ♀♀: 35.0-43.0 mmSL. Same data as holotype.

Comparison materials: *Schistura namiri*: SMF 23448: 6 examples: 27.0-52.0 MM SL, Syria, Orontes atJisr ash-Shughur, 35°48'N 36°19'E; Krupp, 21 March 1979. HUIC: AS-3 (6 examples): 49.0-70.0 mm SL; Turkey: Entrance of Gölbaşı Lake, Asi Basin, 37°38'N 37°38'E; ; Ş. Yalçın, 20 February 1996.

Fin rays formula: D III/8; A III/5; P I/10 (11); V II/ (6) 7; C 16-17.

Diagnosis: *Schistura ceyhanensis* is different from other species, *S. namiri* in southeast Anatolia according to 13 morphometric characters such as longitudinal eye diameter, length of interorbital, length of predorsal, postdorsal, preventral, postventral and the following combination characters: eight branched of dorsal fin rays; the length of maxillar jaw barbel; shape of body; depth of caudal peduncle and coloration.

Fig. 10: *Shistura ceyhanensis*. Yalak Village-Elbistan-Kahramanmaraş; F. Erk'akan, 23 May 1983

Description: Body elongate, become thin posteriorly; head pointed dorsally and laterally view (Fig. 10); eyes are moderately large; snout length is longer than postorbital length; snout pointed and rostrum covered upper lip; processus dentiformis feebly to moderately developed; lips and barbels papillated; upper lip thinner than upper lip and furrowed; lower lip with a median slit and furrowed; maxillar jaw barbels reach to midway of the eyes; anterior nare forming a short tube with rounded posterior flap; posterior nasal opening rounded. Lateral line complete; dept of caudal peduncle thin and almost 2 times in its length; caudal fin forked and lobes are pointed; dorsal fin with eight branched rays and free edge of the fin is slightly concave to straight. Predorsal and preventral distance is almost equal; adipose crests are usually absent.

In % standard length (mm): maximum body depth 12.86-15.35 (x = 13.94); head length 23.10-26.67 (x = 24.68); head depth 10.47-12.00 (x = 11.04); longitudinal eye diameter 5.81-7.00 (x = 6.33); interobital width 6.28-7.67 (x = 6.81); snout length 11.19-12.00 (x = 11.56); postorbital length 10.00-11.14 (x = 10.59); length of dorsal fin base 14.86-16.90 (x = 16.18); depth of dorsal fin 22.00-24.67 (x = 23.13); length of anal fin base 8.67-11.14 (x = 9.66); depth of anal fin 17.21-19.00 (x = 18.06); length of pelvic fin 16.05-20.00 (x = 17.59); length of pectoral fin 22.33-25.24 (x = 23.49); predorsal length 43.33-45.71 (x = 44.79); postdorsal length 30.00-33.71 (x = 30.99); preventral length 44.05-45.43 (x = 44.73); postventral length 37.44-40.00 (x = 39.18); preanal length 64.76-67.43 (x = 66.06); P-V distane 22.00-24.76 (x = 23.58); V-A distance 11.63-13.57 (x = 12.69); caudal peduncle length 13.95-15.67 (x = 14.55); caudal peduncle depth 6.67-7.71 (x = 7.41); longest caudal fin rays 18.60-23.33 (x = 21.14).

In % head length (mm): head depth 41.25-46.67 (x = 44.83); maximum body depth 50.00-66.00 (x = 56.82); longitudinal eye diameter 25.00-26.25 (x = 25.64); interorbital width 26.67-28.75 (x = 27.56); snout length 44.44-50.00 (x = 46.97); postorbital length 41.25-44.00 (x = 42.97); maxillar barbel length 24.44-32.00 (x = 28.35).

Table 9: Comparison the average ratio of morphometric measurements of *S. ceyhanensis* and *S. namiri*

	S. ceyhanensis n = 4	*S. namiri* n = 6
Standard Length (mm)	30.0-43.0 (37.5)	49.0-70.0(59.8)
(%) Standard length		
Head length	24.68	21.76
Preanal lenght	66.06	69.17
Ventral-Anal Distance	12.69	16.91
Caudal peduncle depth	7.42	10.78
Length of middle caudal fin rays	21.14	16.99
Length of upper caudal fin lobe	24.33	21.13
Length of lower caudal fin lobe	26.35	21.13
Length of pectoral fin	23.49	16.97
Snout length	11.56	9.63
(%) Head length		
Body depth	56.82	87.64
Postorbital length	42.97	46.97

Coloration: The ground colour of the body is whitish ventrally and brownish laterally and dorsally. There are regular vertical brown crossbars on the body; dorsal fin with 1-2 series of tawny horizontal bands; caudal fin with 2-3 series of brownish vertical bars.

Sexual dimorphism: Body is slightly slender, pectoral and ventral fin lengths much greater in males than females. Maximum body depth of the body is higher in females than males. Suborbital flap is absent.

Remarks: *S. ceyhanensis* distinguishes from *S. namiri* (Krupp and Schneider, 1991) with pointed head structure; elongated body shape; more slender caudal peduncle; colour pattern. Besides, thirteen morphometric ratios derived from 27 morphometric characters such as head depth, snout length; pectoral fin length; preanal length, ventral-anal length; caudal peduncle depth; length of lower caudal fin lobes in standart length; maximum body depth in head length. The distinctive characters between two species are given in (Table 9).

Ethymology: The specific name is taken from the Ceyhan basin.

***S. seyhanicola*, n.sp.**

Holotype: ♀, HUIC: SEY-1, 43.2 mm SL; Turkey: Dam Bridge, near Adana, Seyhan Basin; 38°39'N 36°37'E; F. Erk'akan coll., 16 May, 1999;

Comparison materials: *Schistura samantica*: ZMH. 3633; 8 examples: 34.0-51.2 mm SL, Kayseri, Pınarbaşı, Zamantı river. HUIC: SEY-2a, (5 examples): 24.0-47.0 mm SL; Turkey: Kayseri; Pınarbaşı,Samanti River. 38°39'N 36°37'E; F. Erk'akan, 20 May 1983.

Fin rays formula: D III/8; A III/5; P I/8 ;V II/6.

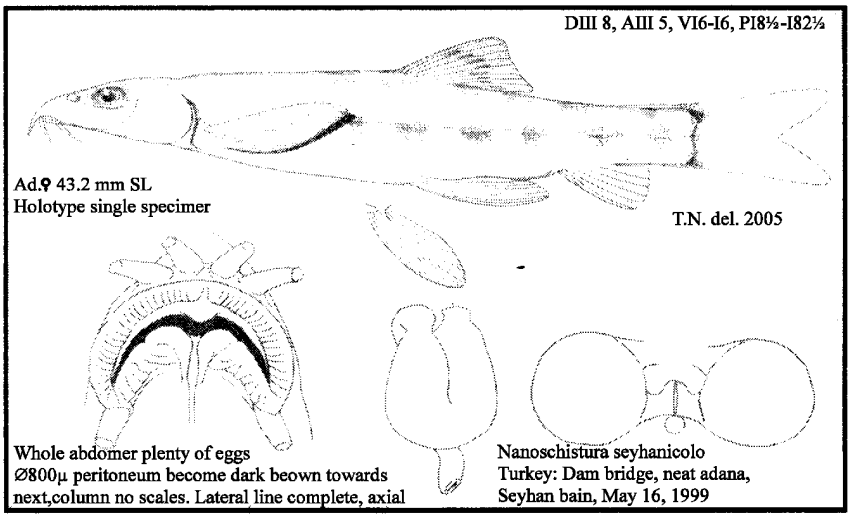

Fig. 11: *Schistura seyhanicola*, Adult ♂: 43.2 mm SL, dam bridge, seyhan basin

Diagnosis: *Schistura seyhanicola* differs from, *Schistura samantica*, found in Seyhan Basin, with reduced of processus dentiformis; intestine formation; mouth shape; caudal peduncle depth; posterior nasal opening with elliptical and colour formation.

Description: Lateral line incomplete; scales absent; body elongate; head markedly pointed in dorsal and lateral view (Fig. 11); depth of head contained about 2,4 times in its length; snout usually long and spindle-shaped; processus dentiformis moderately; upper lip fleshy with slightly furrowed and reach to lower lips; lower lip with distinctly a median incision and furrowed; rostrum covered upper lip; eyes are relatively large; anterior nare forming a tube with roundish posterior flap; posterior nasal opening with elliptical shape.

Dorsal fin with eight branched rays and slightly convex to straight; pelvic fins relatively reach anus opening. Free edge of anal fin straight; dorsal and anal fins are concave. Caudal fin forked; lobes rounded; adipose crest well-developed. Predorsal and preventral length is almost equal.

In % standard length (mm): maximum body depth 17.07; head length 24.88; head depth 10.24; longitudinal eye diameter 5.61; interobital width 5.37; snout length 10.49; postorbital length 12.44; length of dorsal fin base 16.34; depth of dorsal fin 23.90; length of anal fin base 7.81; depth of anal fin 21.95; length of pelvic fin 19.76; length of pectoral fin 21.46; predorsal length 44.39; postdorsal length 26.10; preventral length 49.51; postventral length 40.73; preanal length 68.29; P-V distane 26.10; V-A distance 13.66; caudal peduncle length 13.90; caudal peduncle depth 6.59.

Table 10: Comparison the average ratio of morphometric measurements of *S. seyhanicola* and *S. samantica*

	S. seyhanicola n = 1	*S. samantica* n = 5
Standard length (mm)	43.5	24.0-47.0 (30.6)
(%) Standard length		
Head length	24.88	23.30
Head depth	10.24	10.95
Depth of dorsal fin	23.90	22.27
Length of anal fin	7.81	9.69
Lenght of pelvic fin	19.76	15.03

In % head length (mm): head depth 41.18; maximum body depth 68.63; longitudinal eye diameter 22.55; interorbital width 21.57; snout length 42.16; postorbital length 50.00; maxillar barbel length 25.49.

Coloration: Body background yellowish with light brown regular spots; spots are big on lateral line; dorsal fin with one series of brown dots. Peritoneum is dark brown towards vertical column.

Remarks: *Schistura seyhanicola* is similar to *Schistura samantica* (Banarescu *et al*., 1978) with the shape of swim-bladder bony capsule; complete lateral line; absence of scales; but differs with more slender body depth; caudal peduncle depth; mouth formation; present of processus dentiformis, colour pattern and some morphometric measurements given in (Table 10).

Etymology: Name is taken from the Seyhan River Basin.

***Schistura evreni*, n. sp.**

Holotype: ♀, HUIC: SEY-3, 60.0 mm SL; Turkey: Tekir Stream, Göksu Basin; 38°39'N 36°37'E; F. Erk'akan, 1983.

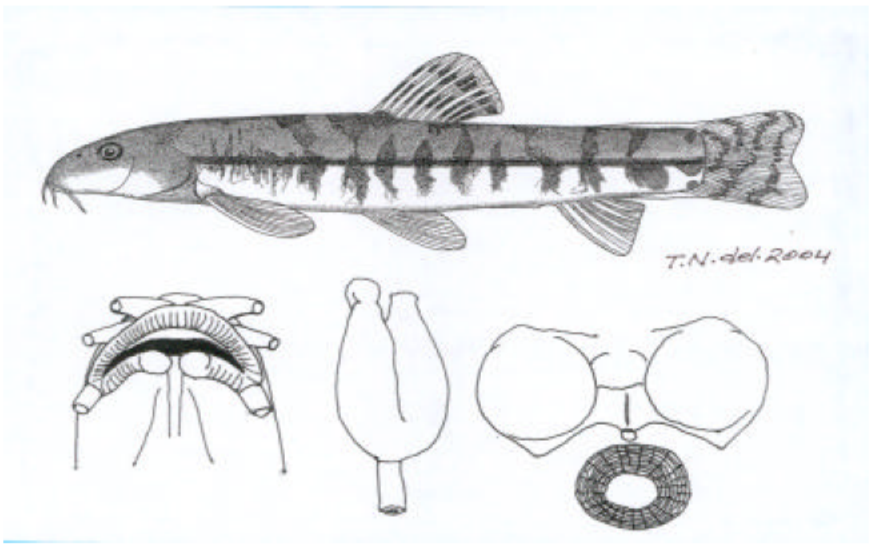

Fig. 12: *Schistura evreni*. Tekir stream, Göksu Basin. Adult ♂: 68.5 mm SL; F. Erk'akan

Paratype: 3 examples: HUIC: CEY-1; ♀♀: 60.0-75.0 mm SL. Same data as holotype.

Comparison materials: *Schistura namiri*: SMF 23448: 6 examples: 27.0-52.0 MM SL, Syria, Orontes atJisr ash-Shughur, 35°48'N 36°19'E; Krupp, 21 March 1979. HUIC: AS-3 (6 examples): 49.0-70.0 mm SL; Turkey: Entrance of Gölbaşı Lake, Asi Basin; Ş. Yalçın, 20 February1996.

Fin rays formula: D III/8; A III/5; P I/10 -11; V II/ 7; C 16

Diagnosis: *Schistura evreni* differs from *S. namiri* and *S. ceyhanensis* in northeast Anatolia with sixteen principal caudal fin rays; dorsal fin rays with eight branched; shape of mouth and furrowed lips; absence of processus dentiformis; swim-bladder bony capsule;digestive tract; colour pattern and shape of vertical cross-bars.

Description: Body and caudal peduncle deep; lateral line complete; scales rather small and embedded in skin (Fig.12). Head moderately pointed dorsally and laterally view; depth of head contained 2 times in its length. Mouth horse-shoe shaped; lips and barbells papillated; processus dentiformis not developed; lips upper lip is densely groove; lower lip with a median slit and roundish lobes beside it. Eyes are quite large; the ratio of snout length and postorbital length almost equal (1.04 mm). Posterior nare with oval form; anterior nasal opening is a short tube with small rounded posterior flap; maxillar jaw barbels reach to anterior region of the eyes;

Dorsal fin with eight branched rays and concave. Caudal fin moderately forked and lobes are rounded; Predorsal and preventral distance is approximately equal; adipose crests are usually present and well-developed above the caudal peduncle.

In % standard length (mm): maximum body depth 13.73-16.67 (x = 15.20); head length 23.60-23.67 (x = 23.63); head depth 11.07-12.83 (x = 11.95); longitudinal eye diameter 4.00-4.67 (x = 4.33); interobital width 5.73-6.67 (x = 6.20); snout length 11.00-11.07 (x = 11.03); postorbital length 10.50-10.67 (x = 10.58); length of dorsal fin base 16.27-17.50 (x = 16.88); depth of dorsal fin 20.00-22.40 (x = 21.20); length of anal fin base 8.00-8.33 (x = 8.17); depth of anal fin 17.73-18.83 (x = 18.28); length of pelvic fin 15.07-17.00 (x = 16.03); length of pectoral fin 16.67-19.47 (x = 18.07); predorsal length 44.67-45.33 (x = 45.00); postdorsal length 30.40-32.50 (x = 31.45); preventral length 47.33-55.20 (x = 51.27); postventral length 38.33-44.00 (x = 41.17); preanal length 68.33-70.27 (x = 69.30); P-V distane 22.33-25.73 (x = 24.03); V-A distance 15.47-16.00 (x = 15.73); caudal peduncle length 13.00-15.47 (x = 14.23); caudal peduncle depth 9.47-10.33 (x = 9.90); longest caudal fin rays 14.67-16.67 (x = 15.67).

In % head length (mm): head depth 46.89-54.23 (x = 50.56); maximum body depth 58.19-70.42 (x = 64.31); longitudinal eye diameter 16.95-19.72 (x = 18.33); interorbital width 24.29-28.17 (x = 26.23); snout length 46.48-46.89 (x = 46.69); postorbital length 44.37-45.20 (x = 44.78); maxillar barbel length 25.99-29.58 (x = 27.78).

Table 11: Comparison the average ratio of morphometric measurements of *S. evreni* and *S. namiri*

	S. evreni n = 2	*S. namiri* n = 6
Standard length (mm)	60.0-75.0 (67.5)	49.0-70.0 (59.8)
(%) Standard length		
Head length	23.63	21.76
Head depth	11.95	10.80
Body depth	15.20	19.00
Predorsal lenght	45.00	44.12
Caudal peduncle length	14.23	13.79
Caudal peduncle depth	9.90	10.78
Length of middle caudal fin rays	15.67	16.99
Length of upper caudal fin lobe	19.42	21.13
Length of lower caudal fin lobe	19.42	21.13
Depth of dorsal fin	21.20	17.41
Length of anal fin base	8.17	21.76
Snout length	11.03	9.63
Postorbital length	10.58	10.20

Coloration: The ground colour of the body is yellowish ventrally and dark brown cross-bars laterally and dorsally. Dorsal fin with 2 series of horizontal dark brown line; caudal fin with 2-3 series of bands same colour in dorsal fin.

Sexual dimorphism: Sexual dimorphism not observed because of female samples.

Remarks: *Schistura evreni* is similar to *S. namiri* (Krupp and Schneider, 1991) with the colour pattern; but its distinguish from that species with moderately pointed head structure; posterior region of the swim-bladder bony capsule pointed; digestive tract; furrowed lips; absence of proccessus dentiformis structure on the upper jaw; adipose crests is well-developed above and below on caudal peduncle; densely brown spots on caudal fin base; caudal fin lobes with rounded. The other distinctive features given in (Table 11).

Etymology: The species name is given in Evren Erk'akan

REFERENCES

Balık, S., 1974. Investigation of taxonomic and ecologic properties of freshwater fishes of West Anatolia (Batı Anadolu Tatlısu Balıklarının Taksonomisi ve Ekolojik Özeelikleri Üzerine Araştırmalar) (in Turkish). Ege University, Fac. of Science, Ser. 236 (Ph.D. Thesis).

Balık, S., 1979. Taxonomic revision of Southeast fishes (in Turkish). Ege University, Fac. of Science, Biologic Oseonagraphy Dept. Hydrobiol. Inst. (Habiltation Thesis), pp: 86.

Banarescu, P. and T.T. Nalbant, 1964. Süßwasserfische der Türkei, 2. Teil: Cobitidae. Mitt. Hamburg Zool. Mus. Inst., 61: 159-201.

Banarescu, P. and T.T. Nalbant, 1966. Cobitidae (Pisces) from Afghanistan and Iran. Vidensk. Medd. Dansk. Naturh. Foren., 129: 149-186.

Banarescu, P. and T.T. Nalbant, 1968. Cobitidae (Pisces, Cypriniformes) collected by the German India Expedition. Mitt. Hamburg Zool. Mus. Inst., 65: 327-351.

Banarescu, P., T.T. Nalbant and S. Balık, 1978. Süßwasserfische der Türkei, 11. Teil. Die Gattung *Orthrias* in der Turkei und in Südbulgarien. Mitt. Hamburg Zool. Mus. Inst., 75: 255-266.

Banarescu, P. and T.T. Nalbant, 1995. A generical classification of nemacheilinae with description of two new genera (Teleostei: Cypriniformes: Cobitidae). Trav. Mus. Hist. Nat. Grigore Antipa, Vol, XXXXV: 429-496.

Banarescu, P., T.T. Nalbant and M. Goren, 1982. The Noemacheiline Loaches from Israel (Pisces: Cobitidae: Noemacheilinae). Israel J. Zool., 31: 1-25.

Berg, L.S., 1949. Freshwater fishes of the U.S.S.R. and adjacent countries. Academy of Sciences of the U.S.S.R., (Translated from Russian, Published by the Israel Program for Scientific Translations, Ferusalem 1963), 2.

Delmastro, G.B., 1982. Uno Nouvo Cobite dai Tributari del Mar Nero in Asia Minore (Osteichtys, Cobitidae). Riv. Piem. St. Nat., 3: 53-59.

Erk'akan, F. and M. Kuru, 1982. Systematical researches on the sakarya basin fishes. Hacettepe Bull. Natural Sci. Eng., 11: 15-24.

Erk'akan, F. and M. Kuru, 1986a. A New noemacheilinae loach subspecies from Turkey (Osteichthyes: Cobitidae). Turkish J. Biol., 10: 106-109.

Erk'akan, F. and M. Kuru, 1986b. A new noemacheilinae loach subspecies from the lake Van Basin, Turkey (Osteichthyes: Cobitidae). Turkish J. Biol., 10: 160-162.

Hanko, B., 1925. Fische Aus Klien-Asien. Ann. Mus. Nat. Hung., 31: 137-158.

Kottelat, M., 1989. Zoogeography of the fishes from indochinese island waters with an annotated check-list. Bull. Zool. Museum Amsterdam, 12: 1-56.

Kottelat, M., 1990. Indochines nemacheilines: A revision of nemacheiline loaches (Pisces: Cypriniformes) of Thailand, Burma, Laos, Cambodia and Southern Vietnam: Verl. F. Pfeil., München, pp: 1-262.

Krupp, F. and W. Schneider, 1991. Two new species of *Nemacheilus* Bleeker 1863 from the Orontes River Drainage Basin of Lebanon, Syria and Turkey. Ienckenbergiana Biol. Frankfurt am Main, 71: 23-34.

Kuru, M., 1971. The Freshwater Fish Fauna of Eastern Anatolia. Istanbul Universiy, Fac. Sci., B., 36: 3-4.

Kuru, M., 1976. Systematical and zoogeographical researches on the dicle-firat, kura-aras, Van Lake and Blacksea Basins Freshwater Fishes (in Turkish: Habiltation Thesis), pp: 185.

Kuru, M., 1980. Key to the Inland Water Fishes of Turkey. Hacettepe Bull. Natural Sci. Eng., 9: 103-133.

Menon, A.G. K., 1987. The Fauna of India and Adjacent Countries, Pisces, 4, Teleostei-Cobitidae, 1, Homalopteridae: Zoological Survey of India, Culcutta, pp: 1-260.

Sawada, Y., 1982. Phylogeny and Zoogeography of the Superfamily Cobitoidea (Cyprinoidei, Cypriniformes). Mem. Fac. Fish. Hokkaido Univ., 28: 65-223.

Stoumboudi, M.Th., M. Kottelat and R. Barbieri, 2006. The Fishes of the Inland Waters of Lesbos Island, Greece. Ichthyol. Explor. Freshwaters, 17: 129-146.