

A description of three new species of the genus *Pseudophoxinus* from Turkey (Teleostei: Cyprinidae: Leuciscinae)

N.G. Bogutskaya, F. Küçük & M.A. Atalay

Bogutskaya, N.G., Küçük, F. & Atalay, M.A. 2007. A description of three new species of the genus *Pseudophoxinus* from Turkey (Teleostei: Cyprinidae: Leuciscinae). *Zoosystematica Rossica*, **15**(2), 2006: 335-341.

Three new species of the genus *Pseudophoxinus* are described from Turkey. *Pseudophoxinus elizavetae* sp. n. is distinguished from all other species of the genus by having terminal mouth; eye diameter less than snout length; lateral line incomplete, narrowly interrupted on caudal peduncle, number of lateral line scales 42-60; scales in lateral series 60-68; number of gill rakers 11-13; total vertebrae (36)37; caudal vertebrae 15(16); no lateral stripe in alive individuals. *Pseudophoxinus zekayi* sp. n. differs in terminal mouth; eye diameter markedly greater than snout length; lateral line complete, number of lateral line scales 37-42; number of gill rakers 8; total vertebrae 36-37; caudal vertebrae 15-16; no lateral stripe in alive individuals. *Pseudophoxinus firati* sp. n. is distinguished by dorsal fin with commonly 4 simple rays; subterminal mouth; eye diameter less than snout length; back markedly humped; lateral line complete or slightly incomplete (narrowly interrupted on caudal peduncle); number of lateral line scales 15-44; scales in lateral series 45-51; number of gill rakers 6-7, rarely 8; total vertebrae 37-38(39); caudal vertebrae 16-17; deep dark lateral stripe in alive individuals. A comparison with other species of *Pseudophoxinus* s. str. from Turkey and the type species of the genus, *P. zeregi*, is given.

N.G. Bogutskaya, Zoological Institute, Russian Academy of Sciences, Universitetskaya nab. 1, St.Petersburg 199034, Russia. E-mail: office@zin.ru

F. Küçük, Egirdir Fisheries Faculty, Süleyman Demirel University, 32500 Egirdir, Isparta, Turkey. E-mail: fkucuk@sdu.edu.tr

M.A. Atalay, Ministry of Agriculture and Rural Affairs, Government of Kütahya, 43040 Kütahya, Turkey. E-mail: aatalay72@hotmail.com

Introduction

About 28-32 species are assigned by different authors to the genus *Pseudophoxinus* Bleeker, 1860 (Lévêque & Daget, 1984; Krupp & Schneider, 1989; Bogutskaya, 1992, 1997; Küçük, 1997; Kottelat & Barbieri, 2004; Freyhof & Özulug, 2006). It was shown (Bogutskaya, 1997; Kottelat & Barbieri, 2004; Atalay, 2005) that the genus is morphologically heterogeneous and includes at least four distinct groups of species. The comparison of all the species with the type-species of the genus, *P. zeregi*, supports inclusion of the following species into *Pseudophoxinus* s. str.: *P. antalyae* Bogutskaya, 1992 (Turkey: Kırkgöz spring and Düden Kanalı at Antalya, Mediterranean basin), *P. atropatenus* (Derzhavin, 1937) (Azerbaijan: Turianchay R. system in Kura R. drainage), *P. battalgilae* Bogutskaya, 1997 (originally published as *battalgili*; Turkey, Central Anatolia: Beyşehir L. basin; Manavgat R.; Akkaya Reservoir at Nigde), *P. callensis* (Guichenot, 1850) (N Algeria), *P. chaignoni* (Vaillant,

1904) (NE Tunisia), *P. drusensis* (Pellegrin, 1933) (Israel and Syria: northern part of Jordan R.: Golan Heights and Jebel Druse), *P. egridiri* (Karaman, 1972) (Turkey, Central Anatolia: Egirdir L. basin), *P. ghigii* (Gianferrari, 1927) (Greece: Rhodes I.), *P. hasani* Krupp, 1992 (Syria: Nahr Marqiyah, Nab' Hasan), *P. irideus* (Ladiges, 1960) (W Turkey: Gediz R. to Dalaman R.), *P. kervillei* (Pellegrin, 1911) (Lebanon and Syria: Orontes and Jordan rivers), *P. maeandri* (Ladiges, 1960) (W Turkey: upper waters of Büyük Menderes R.), *P. maeandricus* (Ladiges, 1960) (W Turkey: upper waters of Büyük Menderes R.), *P. mermere* (Ladiges, 1960) (W Turkey: Marmara L.), *P. ninae* Freyhof & Özulug, 2006 (Turkey, Central Anatolia: Onaç stream), *P. punicus* (Pellegrin, 1920) (NW Tunisia: Wadi Kessab, Ghezala, Lendjas and El Amor), *P. sojuchbulagi* (Abdurakhmanov, 1950) (Azerbaijan: springs in Akstafa region, Kura R. drainage), *P. syriacus* (Lortet, 1883) (Lebanon: Litani R.), *P. zeregi* (Heckel, 1843) (Syria: Quwaiq R.). It was shown that all these species share a number of apomorphies, the

following ones among them: low number of sensory pores, comparatively large-sized scales regularly arranged on the body, low vertebral counts, and relatively small supraethmoid (Bogutskaya, 1996). On the contrary, *P. anatolicus* (Hanko, 1924) (Turkey, Central Anatolia: Akgöl at Eregli); *P. caralis* Battalgi, 1942 (Turkey, Central Anatolia: Beyşehir L. basin), *P. crassus* (Ladiges, 1960) (Turkey, Central Anatolia: Tuz Gölü tributaries and region of Aksaray and Niğde) and *P. handlirschi* (Pietschmann, 1933) (Turkey, Central Anatolia: Egirdir L.) represent a clearly distinct group within the genus sharing such characters as increased number of sensory canal pores, small scales, and comparatively high vertebral counts (Bogutskaya, 1996).

Seven *Pseudophoxinus* species from Europe (Balkan Peninsula) are distinguished by a peculiar sexual dimorphism in the structure of the pectoral fin (Kottelat & Barbieri, 2004) and may represent a distinct lineage deserving a generic status. This group includes *P. epiroticus* (Steindachner, 1896) (Greece: Pamvotis L., Louros and Acheron drainages), *P. laconicus* Kottelat & Barbieri, 2004 (Greece, Peloponnese: Evrotas and upper Alfios drainages), *P. marathonicus* (Vinciguerra, 1921) (Greece: Marathon plain and Sperchios and Kifissos drainages), *P. minutus* (Karaman, 1924) (Albania and Macedonia: Ohrid L. basin; Montenegro: Drin drainage), *P. prespensis* (Karaman, 1924) (Greece, Macedonia, and Albania: Prespa L.), *P. stymphalicus* (Valenciennes, 1844) (Greece, Peloponnese: Stymphalia L.) and *P. thesproticus* (Stephanidis, 1939) (Greece: from Kalamas to Arachthos drainages; Corfu I.).

Pseudophoxinus fahirae (Ladiges, 1960) (SW Turkey: Tefenni; Karatas L. basin) as well as *Pseudophoxinus pleurobipunctatus* (Stephanidis, 1939) (Greece: Thiamos, Lourou, Acheron and Evinos streams; Trichonis L.; area of Kalamictisa; Corfu I.) are excluded from the genus and referred to *Telestes*, and *Pseudophoxinus persidis* Coad, 1981 (Iran: Shur R. drainage), to *Petroleuciscus* (Bogutskaya, 1996, 2002; Ketmaier et al., 1998).

Studies of *Pseudophoxinus* in Turkey (Bogutskaya, 1996, 1997; Hrbek et al., 2004; Freyhof & Özulug, 2006) and extensive collecting in earlier unexplored localities show that the diversity of *Pseudophoxinus* s. str. in Asia Minor is still underestimated. Three new species are described here.

Methods

Standard length (SL) is measured from the tip of the snout to the end of the hypural complex. Head length (HL) is measured including skin flap.

Other measurements made point to point as explained in the table. Lateral line scales count includes all pierced scales, from the first one just behind the supracleithrum to the posteriormost on the caudal-fin base. Last two branched rays articulated on a single pterygiophore in dorsal and anal fins are noted as "1½". Osteological characters are examined in cleared-and-stained with alizarin red S specimens and from radiographs. Cranium and pectoral girdle measurements and descriptions as in Bogutskaya (1992, 1996). Cephalic sensory canal terminology follows Illick (1956) and is discussed in Bogutskaya (1991): CIO, infraorbital canal; CPM, preopercular-mandibular canal; CSO, supraorbital canal; CST, supratemporal canal.

Institutional acronyms: NMW, Naturhistorisches Museum, Wien; SCFK-SDU, special collection of F. Kück at Faculty of Fisheries of Süleyman Demirel University, Egirdir; SMF, Senckenberg Museum, Frankfurt a. Main; TAU, Tel-Aviv University; ZISP, Zoological Institute, Russian Academy of Sciences, St. Petersburg; ZMH, Zoologisches Museum und Institut Universität Hamburg.

Pseudophoxinus elizavetae sp. n.

(Figs 1, 4a)

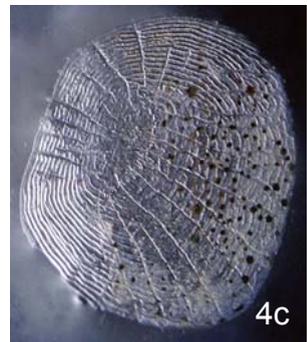
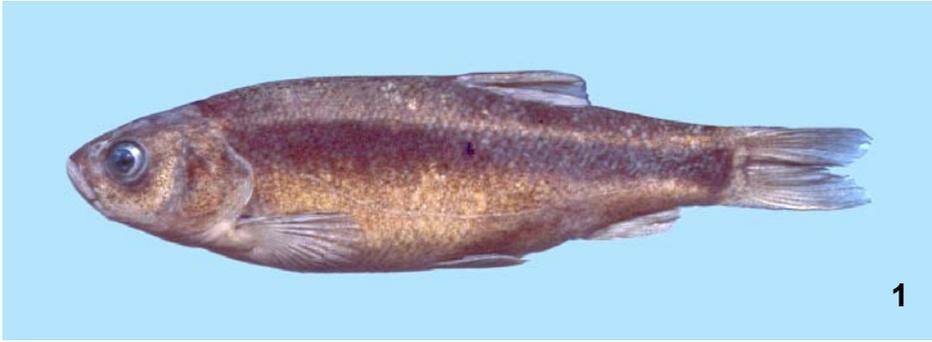
Holotype. SCFK-SDU 174, 68.3 mm SL, Kayseri Prov., Sultansazlığı, 28 Aug. 2004, M.A. Atalay.

Paratypes. SCFK-SDU 174a, 4 specs, 49.0-61.1 mm SL, same data as holotype; ZMH 8001, 1 spec, 43.4 mm SL, Kayseri Prov., between Incesu and Develi, C. Kosswig.

Additional material. SCFK-SDU 174b, 6 specs, 42.0-54.3 mm SL, same data as holotype.

Diagnosis. Distinguished from all other species in the genus by the following unique combination of characters: dorsal fin with commonly 7½ branched rays; anal fin with 6-7½ branched rays; terminal mouth; eye diameter less than snout length; lateral line incomplete, narrowly interrupted on caudal peduncle, number of lateral line scales 42-60; scales in lateral series 60-68; number of gill rakers 11-13; total vertebrae (36)37; caudal vertebrae 15(16); CPM interrupted between angular-articular and preoperculum; CSO short, with 8-9 pores and commonly no segment on parietal; no lateral stripe in alive individuals.

Description. Morphometric data in Table 1. Moderately deep-bodied species (Fig. 1). Body stout, slightly laterally compressed. Head relatively elongate, its length 28-31% SL, depth 72-74% HL. Snout moderately pointed, its length, 25-29% HL, markedly greater than eye diameter, 20-24% HL. Mouth terminal. Uppermost point of mouth cleft slightly lower than level of middle of eye. Posterior extremity of upper jaw slightly in front of anterior eye margin. Lower jaw rel-



Figs 1-4. 1, *Pseudophoxinus elizavetae* sp. n., holotype; 2, *P. zekayi* sp. n., holotype; 3, *P. firati* sp. n., holotype; 4, dorsal scale (a, *P. elizavetae* sp. n.; b, *P. zekayi* sp. n.; c, *P. firati* sp. n.).

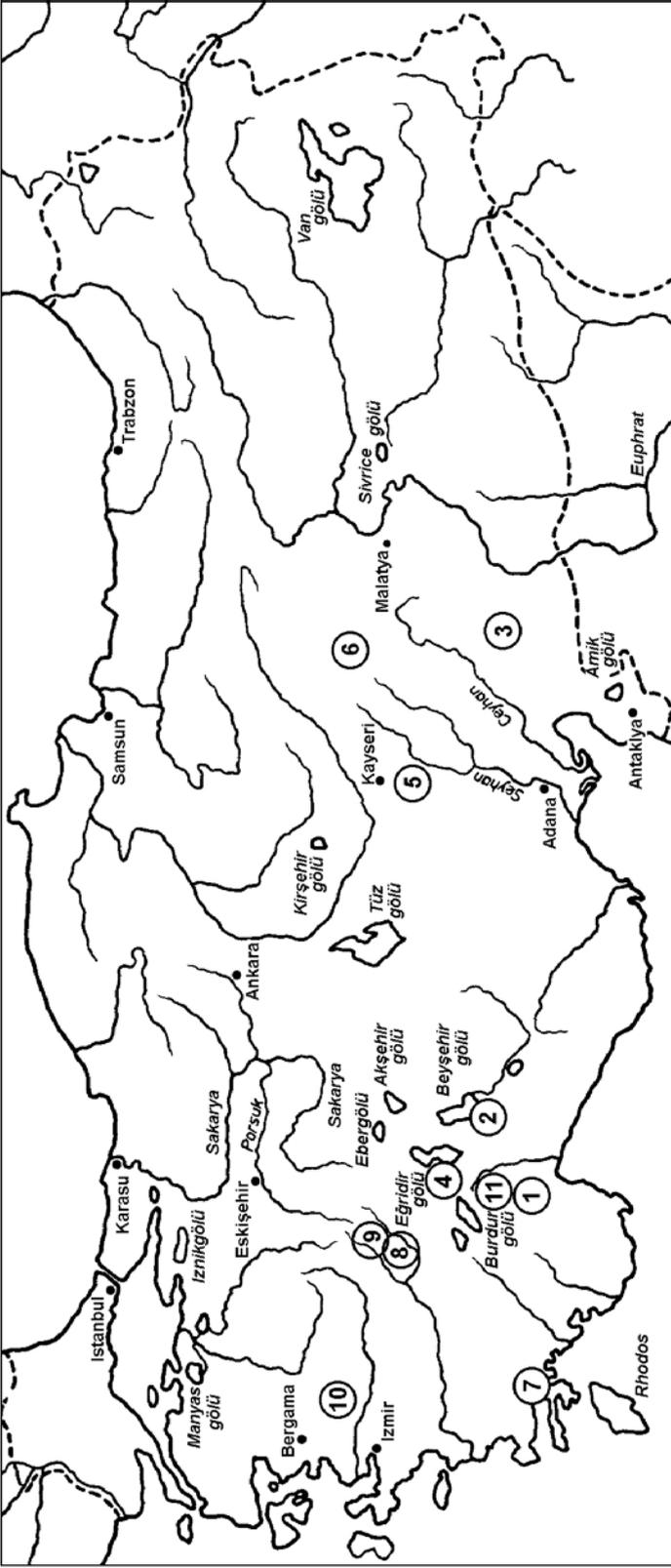


Fig. 5. Map showing type localities of *Pseudophoxinus* species in Turkey. 1, *P. antalyae*; 2, *P. battalgilae*; 3, *P. zekayi*; 4, *P. egridiri*; 5, *P. elzavetae*; 6, *P. firati*; 7, *P. irideus*; 8, *P. maeandricus*; 9, *P. mermere*; 10, *P. ninae*.

Table 1. Morphometric data of holotypes and paratypes of *Pseudophoxinus elizavetae*, *P. zekayi* and *P. firati*.

Character	<i>P. elizavetae</i>				<i>P. zekayi</i>			<i>P. firati</i>		
	Holotype, SCFK-SDU 174	Paratypes, SCFK-SDU 174a, ZMH 8001 (n=5)		Holotype, SCFK-SDU 181	Paratype, SCFK-SDU 181a	Paratype, SCFK-SDU 181a	Holotype, SCFK-SDU 187	Paratypes, SCFK-SDU 187a, 176 (n = 8)		
		range	mean					CD	range	mean
SL (mm)	68.3	43.4-61.1	—	66.4	61.5	59.1	84.2	44.6-59.2	—	—
Percent of standard length										
Head length	30.4	28.4-30.6	29.8	27.0	27.0	27.1	26.5	26.8-30.7	28.6	2.1
Maximum body depth	29.5	28.3-31.4	29.7	29.4	28.1	29.9	27.8	25.5-31.4	28.7	1.3
Minimum body depth	12.6	12.4-12.9	12.5	12.5	13.7	13.5	12.9	11.4-13.0	12.2	0.4
Predorsal distance	56.5	56.0-59.7	57.1	58.3	56.4	55.0	55.6	54.9-57.7	56.8	0.4
Postdorsal distance	34.9	33.8-35.8	34.7	37.0	34.3	36.2	34.6	32.3-35.6	33.7	0.9
Caudal peduncle length	13.4	13.7-15.0	14.2	18.8	17.4	17.8	16.7	16.7-18.4	17.4	0.8
Dorsal fin length	13.2	11.3-13.3	12.3	11.7	11.7	11.7	12.6	11.3-13.0	11.9	0.7
Dorsal fin depth	17.2	17.0-18.9	18.0	21.4	23.4	23.4	20.4	20.1-21.1	20.8	0.3
Anal fin length	9.7	10.0-11.1	10.4	9.5	11.5	10.3	9.9	8.9-10.0	9.4	0.5
Anal fin depth	13.5	12.6-15.9	13.8	14.8	15.9	15.7	17.5	16.4-17.7	16.9	0.6
Pectoral fin length	20.0	18.8-20.0	19.6	18.0	20.0	21.3	18.9	18.2-19.2	18.4	0.5
Pelvic fin length	16.3	15.0-16.5	16.1	15.7	17.4	18.8	17.0	15.0-17.0	16.1	1.0
Distance between pectoral and pelvic fins	30.7	27.5-30.8	29.2	25.0	27.0	23.4	27.9	24.4-27.8	25.8	1.4
Distance between pelvic and anal fins	23.4	21.0-24.4	22.9	25.3	24.1	23.4	22.4	20.8-22.5	21.5	0.8
Percent of head length										
Snout length	25.6	25.1-28.6	26.8	24.6	22.9	26.3	29.1	25.8-28.6	26.8	1.7
Eye diameter	19.8	20.0-23.9	22.7	29.6	31.3	33.1	22.0	22.9-23.9	25.5	2.1
Postorbital distance	58.9	51.9-55.0	57.6	47.4	46.4	46.3	57.4	48.8-56.4	52.3	3.8
Head depth at nape	72.5	72.4-74.3	72.5	77.1	71.7	75.6	76.2	73.7-76.3	74.7	1.4
Head width at nape	50.2	45.4-52.4	48.9	50.3	50.0	50.0	56.1	47.5-54.4	52.3	3.1
Interorbital distance	29.5	28.6-31.7	30.2	37.4	38.0	38.8	37.7	35.0-36.3	35.5	1.5
Upper jaw length	29.5	28.4-30.2	29.4	27.9	26.5	30.0	30.0	27.3-29.2	28.4	1.5
Lower jaw length	38.6	35.4-39.7	37.5	40.2	38.0	38.1	36.8	36.5-37.4	36.9	0.5
Operculum depth	37.7	36.5-37.7	37.2	40.2	42.8	40.0	37.7	36.5-37.7	37.0	0.5

Table 2. Some counts distinguishing species of *Pseudophoxinus* s. str. distributed in Turkey and the type species of the genus, *P. zeregi*.

Species	Lateral series/ lateral line	Anal-fin segmented rays	Gill rakers	Pharyngeal teeth	Total vertebrae	Abdominal vertebrae	Caudal vertebrae
<i>P. antalyae</i>	54-64/43-59	(6)7½	9-12	5-5	37-38	21-22	16-17
<i>P. battalgilae</i>	53-61/53-60	8½	11-14	5-5	38	20-21	17-18
<i>P. elizavetae</i>	60-68/33-60	6½	11-13	5-5	36-37	22	15-16
<i>P. egridiri</i>	43-54/ 0-2	6½	7-9	5-4	35-36	18-19	16-17
<i>P. firati</i>	45-51/15-44	6½	6-7	5-4	37-38	22	16-17
<i>P. irideus</i>	27-33/5-11	8½	10-11	2.5-5.2	35-36	20	15-16
<i>P. kervillei</i>	36-45/4-27	6½	7-9	5-4	35-37	20-21	15-16
<i>P. maeandri</i>	45-48/21-25	6½	8-9	5-4	35-36	20	15-16
<i>P. maeandricus</i>	60-67/58-65	7½	11-13	5-5	36-37	20-21	16
<i>P. mermere</i>	29-35/21-27	8½	10-11	2.5-5.2	35-36	19-20	15-16
<i>P. ninae</i> (from Freyhof & Özulug, 2006)	48-55/7-30	6-7½	9-10	5-4	?	?	?
<i>P. zekayi</i>	38-42/37-42	7½	8	5-5	36-37	21	15-16
<i>P. zeregi</i>	57-66/32-55	6½	7-9	5-4	36-37	19-20	16-17

atively long, lower jaw-quadrate junction on vertical through anterior margin of pupil. Upper jaw length 28-30% HL, lower jaw length 35-39% HL. Operculum relatively low, its depth 37-38% HL.

Dorsal fin with 3 simple and 7½ branched rays (8½ found in one paratype). Dorsal-fin outer margin straight. Dorsal-fin origin above pelvic-fin base. Anal fin with 3 simple and 6½ (6 specs including holotype) or 7½ (2) branched rays. Anal-fin outer margin clearly convex. Anal-fin origin markedly behind posterior end of dorsal-fin base.

Gill rakers high, narrow, 11 (2), 12 (2 including holotype) or 13 (2) in total on outer side of first left gill arch. Pharyngeal teeth 5-5, narrow, hooked, slightly serrated.

Scales well ossified, regularly arranged on whole body. Scale at dorsal-fin origin (Fig. 4a) with 16-19 clearly developed posterior radii reaching nucleus. Nucleus well pronounced. Anterior radii 12-15, most of them extending from nucleus to very margin of scale. No pelvic axillary lobe. Lateral line incomplete, with narrow interruptions on caudal peduncle and 2-4 unpierced scales at caudal fin base. Number of scales in lateral series 60-68 (61 in holotype), number of lateral line scales 33-60 (53 in holotype).

CSO short, with 8-9 pores and commonly no segment on parietal. CIO with 16-18 pores, sometimes interrupted in one or two places between infraorbitals. Second to fourth infraorbitals nar-

row, and fifth one slightly ossified, tube-like. CPM interrupted between angular-articular and preoperculum; 7 pores on lower jaw and 9-11, commonly 10, on preoperculum; canal segment on operculum always present. CST medially interrupted (4+4 pores) or complete (7 pores).

Total vertebrae 36 (1), 37 (5); predorsal abdominal vertebrae 12 (2), 13 (4); abdominal vertebrae 21 (2), 22 (4); caudal vertebrae 15 (4), 16 (2). Modal vertebral formulae 22+15 with 13 predorsal vertebrae (4, including holotype).

Maximum cranial width (between lateral pterotic margins) 69-78% of cranial roof length. Supraethmoid very narrow, its width 15-18% maximum cranial width. Posterior part of pharyngeal process compressed, without any lateral expansion. Postcleithrum very long.

No sexual dimorphism revealed in examined specimens.

Coloration. Both alive and preserved specimens markedly pigmented on back and flanks. Alive specimens dark green except for creamy belly, with bronze tint. Fins grayish. No lateral stripe in alive individuals though faint inner stripe appears after preservation in formaldehyde.

Distribution. The species is only known from Sultansazlığı (Sultan Swamps, 38.2°-38.6°N 35.2°-35.5°E), an endorheic basin isolated from Kizilirmak drainage in the north and from Seyhan drainage in the south (Fig. 5).

Etymology. The species is named after Elizaveta Bogutskaya.

Comparison. *Pseudophoxinus elizavetae* is distinguished from all species of *Pseudophoxinus* s. str. but *P. maeandri* and *P. zeregi* by having 60-68 scales in lateral series (Table 2). From *P. kervillei*, *P. elizavetae* differs in possessing gill rakers high, numbering 11-13 (vs. low, 7-9), pharyngeal teeth 5-5 (vs. 5-4), and abdominal vertebrae commonly 22 (vs. 19-20). From *P. maeandricus*, *P. elizavetae* is distinguished by the incomplete lateral line with 33-60 scales (vs. almost complete or complete, with 58-65 scales), abdominal vertebrae commonly 22 (vs. 20-21), body stout, slightly laterally compressed (vs. elongate, considerably compressed), lower jaw-quadrate junction on vertical through anterior margin of pupil (vs. in front of vertical through anterior margin of eye), head length 28-31% SL (vs. 24-28).

***Pseudophoxinus zekayi* sp. n.**
(Figs 2, 4b)

Holotype. SCFK-SDU 181, 66.4 mm SL, Kahramanmaraş Prov., at Çöçelli, Sept. 2004, M.A. Atalay.

Paratypes. SCFK-SDU 181a, 2 specs, 61.5, 59.1 mm SL, same data as holotype.

Additional material. SCFK-SDU uncat., 5 specs, 61.4-87.3 mm SL, Kahramanmaraş Prov., Pazarcık, Çöçelli Köyü (37° 16'N 37° 08'E), Aug. 2004, M.A. Atalay.

Diagnosis. Distinguished from all other species in the genus by having the following unique combination of characters: dorsal fin with 7½ branched rays; anal fin with 7½ branched rays; terminal mouth; eye diameter markedly greater than snout length; lateral line complete, number of lateral line scales 37-42; number of gill rakers 8; total vertebrae 36-37; caudal vertebrae 15-16; CPM interrupted between angular-articular and preoperculum; CSO short, with 7-8 pores and no segment on parietal; no lateral stripe in alive individuals.

Description. Morphometric data in Table 1. Moderately deep-bodied species (Fig. 2). Body laterally compressed. Head short, its length 27% SL, depth 72-76% HL. Snout pointed, its length, 23-26% HL, markedly less than eye diameter, 30-33% HL. Mouth terminal. Uppermost point of mouth cleft on level of middle of eye. Posterior extremity of upper jaw markedly in front of anterior eye margin (on vertical of middle of nostril). Lower jaw relatively long, lower jaw-quadrate junction on vertical through anterior margin of eye. Upper jaw length 27-30% HL, lower jaw length 38-40% HL. Operculum high, its depth 40-43% HL.

Dorsal fin with 3 simple and 7½ branched rays. Dorsal-fin outer margin straight to slightly concave. Dorsal-fin origin behind vertical of posterior end of pelvic-fin base. Anal fin with 3 simple and 7½ branched rays. Anal-fin outer margin

straight to slightly concave. Anal-fin origin markedly behind posterior end of dorsal-fin base.

Gill rakers low, thick, 8 in total on outer side of first left gill arch. Pharyngeal teeth 5-5, narrow, hooked, slightly serrated.

Scales well ossified, regularly arranged on whole body. Scale at dorsal-fin origin (Fig. 4b) with 13-15 clearly developed posterior radii reaching nucleus. Nucleus diffuse. Anterior field of scale very narrow, anterior radii about 10, most of them not reaching margin of scale. One pelvic axillary lobe. Lateral line complete; no, 1 or 2 unpierced scales at caudal fin base; number of lateral line scales 37-42.

CSO short, with 7-9, commonly 8, pores and no canal segment on parietal. CIO with 14-16 pores, sometimes interrupted in one or two places between infraorbitals. Second to fourth infraorbitals narrow, and fifth one slightly ossified, tubelike or absent. CPM interrupted between angular-articular and preoperculum; 6-7 pores on lower jaw and 9-11 on preoperculum; canal segment on operculum always present. CST medially interrupted, 4+4.

Total vertebrae 36 (2), 37 (1); predorsal abdominal vertebrae 12 (2), 13 (1); abdominal vertebrae 21; caudal vertebrae 15 (2), 16 (1). Modal vertebral formula in holotype 21+15 with 12 predorsal vertebrae.

Maximum cranial width (between lateral pterotic margins) 74-78% of cranial roof length. Supraethmoid relatively wide, its width 20-23% maximum cranial width. Posterior part of pharyngeal process compressed, without any lateral expansion. Postcleithrum minute.

No sexual dimorphism revealed in examined specimens.

Coloration. Both alive and preserved specimens slightly pigmented on back and flanks. Alive specimens with brownish back; belly whitish. Fins pale. No lateral stripe in both alive and preserved individuals.

Distribution. Only known from Ceyhan River drainage, Aksu River system east of Kahramanmaraş (Fig. 5).

Etymology. The species is named after Zekay Atalay.

Comparison. *Pseudophoxinus zekayi* is clearly distinguished from all Turkish species of the genus by having 38-42 scales in lateral series and complete lateral line (Table 2). The same lateral series count is only found in *P. kervillei* from Orontes but the latter species has the lateral line incomplete and interrupted, with 4-27 scales. Besides this character, *P. zekayi* differs from *P. kervillei* in possessing 5-5 pharyngeal teeth (vs. 5-4), snout pointed (vs. rounded), snout length markedly less than eye diameter (vs. markedly greater), large eye, 30-33% HL (vs. small, espe-

cially in larger specimens, 24-28% HL), mouth terminal (vs. subterminal).

***Pseudophoxinus firati* sp. n.**
(Figs 3, 4c)

Holotype. SCFK-SDU 187, 84.2 mm SL, Euphrates drainage, Tohma Çayı at Yazıyurdu, 2000, F. Küçük.

Paratypes. SCFK-SDU 187a, 4 specs, 41.2-47.7 mm SL, same data as holotype; SCFK-SDU 176, 15 specs, 34.6-51.7 mm SL, same locality as holotype, July 2004, M.A. Atalay.

Diagnosis. Distinguished from all other species in the genus by having the following unique combination of characters: dorsal fin with commonly 4 simple and 7½ branched rays; anal fin with 6½ branched rays; subterminal mouth; eye diameter less than snout length; back markedly humped; lateral line slightly complete or incomplete (narrowly interrupted on caudal peduncle); number of lateral line scales 15-44; scales in lateral series 45-51; number of gill rakers 6-7, rarely 8; total vertebrae 37-38(39); caudal vertebrae 16-17; CSO, CIO and CPM variably interrupted or not interrupted; deep lateral stripe in alive individuals.

Description. Morphometric data in Table 1. Deep-bodied species with humped back (Fig. 3). Body stout, slightly laterally compressed. Head length 27-31% SL, depth 74-76% HL. Snout stout, moderately rounded, its length, 25-29% HL, greater than eye diameter, 22-25% HL. Mouth subterminal. Uppermost point of mouth cleft on level of lower margin of eye. Posterior extremity of upper jaw slightly in front of anterior eye margin. Lower jaw-quadrate junction on vertical through anterior margin of pupil. Upper jaw length 27-30% HL, lower jaw length 36-37% HL. Operculum depth subequal to lower jaw length.

Dorsal fin with 4 (9, including holotype) or 3 (3) simple and 7½ branched rays (8½ found in one paratype). Dorsal-fin outer margin markedly convex. Dorsal-fin origin above pelvic-fin base. Anal fin with 3 simple and 6½ branched rays. Anal-fin outer margin slightly concave. Anal-fin origin markedly behind posterior end of dorsal-fin base.

Gill rakers low, thick, 6 (3), 7 (9) or 8 (8, including holotype) in total on outer side of first left gill arch. Pharyngeal teeth 5-4, narrow, slightly hooked, smooth.

Scales well ossified, regularly arranged on whole body. Scale at dorsal-fin origin with 12-14 clearly developed posterior radii reaching nucleus. Nucleus diffuse. Anterior field relatively wide; anterior radii 8-10, of variable length, some of them not reaching margin of scale (Fig. 4c). One pelvic axillary lobe. Lateral line complete or incomplete and interrupted. Degree of lateral line development being clearly depend-

ent on size of fish; definitive structure of lateral line (complete line) found in individuals of much larger relative size than that in other *Pseudophoxinus* species. Number of scales in lateral series 45-51, number of lateral line scales 15-44. Holotype with 45 scales in lateral series and 44 lateral line scales.

CSO short, with 8-9 pores, interrupted between nasal and frontal bones or complete; commonly no canal segment on parietal. CIO with 15-17 pores, complete or interrupted between fourth infraorbital and pterotic bones with fifth infraorbital lacking. CPM interrupted between angular-articular and preoperculum (with 6-7 pores on lower jaw), or interrupted between preoperculum and operculum, or complete; 7-9 pores on preoperculum; canal segment on operculum always present. CST medially interrupted or complete, with 7 pores.

Total vertebrae 37 (3), 38 (7), 39 (2); predorsal abdominal vertebrae 12 (1), 13 (10), 14 (1); abdominal vertebrae 21 (8), 22 (4); caudal vertebrae 16 (5), 17 (7). Modal vertebral formulae 21+17 with 13 predorsal vertebrae; holotype with 22+16 and 13, respectively.

Maximum cranial width (between lateral pterotic margins) 70-74% of cranial roof length. Supraethmoid narrow, its width 18-22% of maximum cranial width. Posterior part of pharyngeal process compressed, without any lateral expansion. Postcleithrum minute.

No sexual dimorphism revealed in examined specimens.

Coloration. Both alive and preserved specimens considerably pigmented on back and flanks, with very deep, especially from behind head to dorsal-fin origin, dark stripe along midline of flank. Lateral stripe crossed by narrow light strip along lateral line. Fins dusty.

Distribution. Only known from the type locality, Tohma Çayı at Yazıyurdu (38.80°N 36.93°E) (Fig. 5). This is the first record of *Pseudophoxinus* species from Euphrates drainage.

Etymology. The species is named after Firat Nehri (Euphrates River).

Comparison. *Pseudophoxinus firati* is distinguished from all species of *Pseudophoxinus* s. str. by having lateral stripe very deep, back markedly humped in front of dorsal fin and commonly four simple dorsal-fin rays. Besides these characters, it is also differing from most species of the group but *P. ninae*, *P. egridiri* and *P. maeandri* in the lateral series with 45-51 scales (Table 2). From *P. egridiri*, *P. firati* clearly differs in possessing relatively long lateral line, with 15-44 scales (vs. 0-2) and 22 abdominal vertebrae (vs. 18-19). From *P. maeandri*, *P. firati* is distinguished by the higher number of vertebrae, 37-38 total and 22 abdominal (vs. 35-36 and 20, re-

spectively). When compared to *P. ninae*, *P. firati* has fewer gill rakers, 6-8 (vs. 9-10), and pelvic axillary lobe (vs. no axillary lobe).

Comparative material of *Pseudophoxinus* s. str. from Turkey and adjacent Asian areas

P. antalyae: ZMH 1114 (holotype, SW Turkey: Kirkgöz near Antalya), ZMH 1681 (2 paratypes, same data as holotype), ZMH 2445 (42 paratypes, same data as holotype), SCFK-SDU 159 (5, Turkey: Düden Kanali at Antalya); *P. battalgilae*: ZMH 1080 (holotype, Turkey, Central Anatolia: Beyşehir L. basin), ZMH 1080 (2 paratypes, same data as holotype), ZMH 2701 (3 paratypes, same data as holotype), ZMH 6634 (3 paratypes, same data as holotype), SCFK-SDU161 (18, SW Turkey: Oymapinar Reservoir, Manavgat R.), SCFK-SDU 182 (12, Turkey, Central Anatolia: Akkaya Reservoir south of Nigde); *P. drusensis*: TAU P.9448 (10, Israel); *P. egridiri*: ZMH 4633 (holotype, Turkey, Central Anatolia: Egirdir L. basin), ZMH 4634 (2 paratypes, same data as holotype), ZMH 1102 (69, same data as holotype), ZMH 2484 (18, same data as holotype), SCFK-SDU 164 (13, Turkey, Central Anatolia: Egirdir L. at Karaot); *P. hasani*: SMF 24564 (holotype, Syria: Nahr Marqiyah), SMF 24565 (4 paratypes, same data as holotype), SMF 24567 (3 paratypes, Syria: Nab' Hasan); *P. irideus*: ZMH 1085 (holotype, W Turkey: between Marmaris and Mugla), ZMH 1086 (2 paratypes, SW Turkey: Dalaman R. at Köycegiz), ZMH 1088-90 (11, same data as paratypes), ZMH 4692 (10, SW Turkey: Aksapinar), ZMH 8412 (7, SW Turkey: Marmaris); *P. kervillei*: SMF 14010 (3, Syria: Homs), SMF 24497 (5, Syria: Orontes R.), SMF 24509 (8, SE Turkey: Hüpnik Çayı), SMF uncat. (53, Syria: Litani R.); *P. maeandri*: ZMH 1093 (holotype, W Turkey: upper waters of Büyük Menderes R. at Isikli), ZMH 1094 (1 paratype, same data as holotype), ZMH 1095 (11, W Turkey: upper waters of Büyük Menderes R., Düden-Pinari at Dinar); *P. maeandricus*: ZMH 1077 (holotype, W Turkey: upper waters of Büyük Menderes R. at Isikli), ZMH 1078 (4 paratypes, same data as holotype); *P. mermere*: ZMH 1087 (holotype, W Turkey: Marmara L.), ZMH 1091 (2 paratypes, same data as holotype), ZMH 1092 (5, same data as holotype); *P. sojuchbulagi*: ZISP 35698 (2, Azerbaijan: Sojuchbulag R. in Kura R. drainage); *P. syriacus*: SMF 23692 (6, Syria: Barak), SMF uncat. (28, Ş a Ş a at Damascus), ZISP 6738 (33, syntypes of *P. libani* Lortet, 1883, Syria: Yammuneh (Yammouni) L.), ZISP 26627 (2, same data); *P. zeregi*: NMW 51068-69 (6 syntypes, Syria: Aleppo), SMF 24518-19, 24521 (10, Syria: Nahr al Qiss), SMF 24520 (2, Syria: Quwaiq R. at Arsaq), SMF 24522 (9, Syria: Quwaiq R. at Aleppo).

Acknowledgements

NGB was supported by the Cypriniformes Tree of Life Project and a grant from Ministry of Education and Science "St.Petersburg Ichthyological School". We are pleased to thank H. Wilkens, G. Schulze (ZMH), B. Herzig, E. Miksch, C. Prenner (NMW), F. Krupp, K. Jentoch (SMF), M. Goren (TAU) and G.A. Volkova (ZISP) for providing material under their care and support during NGB stays in Hamburg, Vienna and Frankfurt.

References

- Atalay, M.A. 2005. *Pseudophoxinus* (Pisces, Cyprinidae) genusü'nün anadoloda yayılışı ve taksonomik özelliklerinin belirlenmesi [Taxonomic revision of the genus *Pseudophoxinus* (Pisces, Cyprinidae)]. Unpubl. Thesis, Süleyman Demirel Üniversitesi Fen Bilimleri Enstitüsü. Isparta. 127 p. (In Turkish).
- Bogutskaya, N.G. 1991. Sensory canal structure in cyprinid fishes of the genus *Pseudophoxinus* (Leuciscinae, Cyprinidae). *Trudy zool. Inst. Akad. Nauk SSSR*, **235**: 96-112. (In Russian).
- Bogutskaya, N.G. 1992. A revision of species of the genus *Pseudophoxinus* (Leuciscinae, Cyprinidae) from Asia Minor. *Mitt. Hamb. zool. Mus. Inst.*, **89**: 261-290.
- Bogutskaya, N.G. 1996. Contribution to the knowledge of leuciscine fishes of Asia Minor. Part 1. Morphology and taxonomic relationships of *Leuciscus borysthenticus* (Kessler), *Leuciscus smyrmaeus* Boulenger and *Ladigoesocypris ghigii* (Gianferrari) (Cyprinidae, Pisces). *Publ. espec. Inst. Esp. Oceanogr.*, **21**: 25-44.
- Bogutskaya, N.G. 1997. Contribution to the knowledge of leuciscine fishes of Asia Minor. Part 2. An annotated check-list of leuciscine fishes (Leuciscinae, Cyprinidae) of Turkey with descriptions of a new species and two new subspecies. *Mitt. Hamb. zool. Mus. Inst.*, **94**: 161-186.
- Bogutskaya, N.G. 2002. *Petroleuciscus*, a new genus for the *Leuciscus borysthenticus* species group (Teleostei: Cyprinidae). *Zoosyst. Ross.*, **11**: 235-237.
- Freyhof, J. & Özlüç, M. 2006. *Pseudophoxinus ninae*, a new species from Central Anatolia, Turkey (Teleostei, Cyprinidae). *Ichthyol. Explor. Freshwaters*, **17**: 255-259.
- Hrbek, T., Störling, K.N., Bardakci, F., Küçük, F., Wildekamp, R.H. & Meyer, A. 2004. Plate tectonics and biogeographical patterns of the *Pseudophoxinus* (Pisces: Cypriniformes) species complex of central Anatolia, Turkey. *Mol. Phylog. Evol.*, **32**: 297-308.
- Illick, H.J. 1956. A comparative study of the cephalic lateral line system of North American Cyprinidae. *Amer. Midl. Natur.*, **36**: 204-223.
- Ketmaier, V., Cobolli, H., Matthaes, E.D. & Bianco, P.G. 1998. Allozymic variability and biogeographic relationships in two *Leuciscus* species complexes (Cyprinidae) from Southern Europe, with the rehabilitation of the genus *Telestes* Bonaparte. *Ital. J. Zool.*, **65** (suppl.): 41-48.
- Kottelat, M. & Barbieri, R. 2004. *Pseudophoxinus laconicus*, a new species of minnow from Peloponnese, Greece, with comments on the west Balkan *Pseudophoxinus* species (Teleostei: Cyprinidae). *Ichthyol. Explor. Freshwaters*, **15**: 147-160.
- Krupp, F. & Schneider, W. 1989. The fishes of the Jordan River drainage basin and Azraq oasis. *Fauna Saudi Arabia*, **10**: 347-416.
- Küçük, F. 1997. *Antalya Körfezi'ne dökülen akarsuların balık faunası ve bazı ekolojik parametreleri üzerine bir araştırma* [Study on fish fauna and some ecological parameters of rivers flowing into Antalya Bay]. Unpubl. Thesis, Süleyman Demirel Üniversitesi Fen Bilimleri Enstitüsü. Isparta. 121 p. (In Turkish).
- Lévêque, C. & Daget, J. 1984. Cyprinidae. In: Daget, J., Gosse, J.-P. & Thys van den Audenaerde, D.F.E. (Eds.). *Check-list of the freshwater fishes of Africa*, **1**: 217-342. ORSTOM Paris & MRAC Tervuren.

Received 25 January 2007