INTRODUCTION

The Caspian Sea basin belongs to the Ponto–Caspian biogeographical region, encompassing the basins of the Black, Azov, Caspian, and Aral Seas (Berg 1949). The native fish fauna of the Caspian Sea basin consists of an estimated 162 fish species, 100 of them being endemic species or subspecies (Bogutskaâ et al. 2013); many of them of commercial importance.

The fishes of the family Gobiidae inhabiting the area are usually less important commercially and therefore knowledge on their biodiversity is far from being complete (Miller 2003, 2004, Bogutskaâ et al. 2013). A total of eight gobiid species have been recorded in the Caspian Sea basin (Miller 2003, 2004). They represent three genera: Neogobius Ilijin 1927, Chasmar Ilijin, 1927, and Ponticola Ilijin, 1927. The former genus includes three species: Neogobius caspius (Eichwald, 1831), Neogobius melanostomus affinis (Eichwald, 1831), and Neogobius fluviatilis pallasi (Berg, 1916) (see Miller 2003). One species belongs to a monotypic genus Chasmar and it is a deep-water goby: Chasmar bathybius (Kessler, 1877) (see Miller 2004). The third genus Ponticola, accepted after molecular–genetic studies (Neilson and Stepchen 2009, Medvedev et al. 2013), accommodates remaining four species: Ponticola gorlap (Ilijin, 1949), Ponticola syrman (Nordmann, 1840), Ponticola ratan (Nordmann, 1840), and Ponticola cyrius (Kessler, 1874).

Vasil’eva E.D., Mousavi-Sabet H., Vasil’ev V.P. 2015. Ponticola iranicus sp. nov. (Actinopterygii: Perciformes: Gobiidae) from the Caspian Sea basin. Acta Ichthyol. Piscat. 45 (2): 189–197.

Background. Five species of Ponticola have hitherto been recognized among freshwater gobies in the Ponto–Caspian basin. In 2014 a number of specimens representing this genus were collected in northern Iran. The detailed morphological and karyological study of those gobies collected revealed significant differences between them and their known congeners. The aim of this study was to describe these fish as a new species from the Caspian Sea basin.

Materials and methods. The fish specimens were collected in August 2014 at two localities of the Sefid-Rud River drainage, and in the Gisum River, Guilan Province, northern Iran. In total, 18 specimens were used for karyological study following a previously described method. Both karyotyped and intact specimens were then morphologically investigated using characters developed for study on gobiids, and particular for freshwater Caucasian gobies. The comparative materials were specimens from museum collections, as well as published descriptions, illustrations, and measurements of other species.

Results. Ponticola iranicus sp. nov. differs from its congeners in a set of the following features: D1 VI, D2 I/(14½) 15½ – 17½, A I/10½ – 13½; nape scaled completely, scales cycloid; cycloid scales covering upper part of opercle; lateral line system with posterior sub-orbital row d continuous; predorsal area uniform, dark grey; first dorsal fin with oblique black stripe between first two or three rays; short dark grey strip on upper part of pectoral fin base; karyotype consisting of 46 acrocentric chromosomes.

Conclusion. All known Ponto–Caspian gobies demonstrate mosaic pattern of morphological and karyological features that presumes their polyphyletic origins. Further phylogenetic studies by molecular genetic methods are necessary for identification of their marine ancestors and clarifying of common trends in the evolution of the Ponto–Caspian goby group.

Keywords: Ponticola iranicus sp. nov., description of a new species, freshwater gobies, taxonomy, Ponto–Caspian basin, Iran
The genus *Ponticola* includes at least ten species characterized by several common morphological characters, namely anterior pelvic membrane with well developed, acute lateral lobes; dentary with several large conical teeth on its rear part; maxilla with expanded posterior end, and some other cranio logical features (Vasil’eva et al. 1993, Miller and Vasil’eva 2003).

Ahnelt and Holčík (1996) reported gobiids found in small rivers of the Anzali Lagoon, Guilan Province, northern Iran as *Ponticola cyrius*. The latter finding is important from the perspective of the presently reported study.

In August 2014, we succeeded in collecting numerous samples of gobies in the Sefid-Rud River and Gisum River in Guilan Province, northern Iran. The detailed morphological study showed that these gobies are conspecific with the populations from the Anzali Lagoon previously identified as *P. cyrius*. However, morphological data, as well as karyological analysis revealed noticeable differences between all of these fishes and other known *Ponticola* species including *P. cyrius*. The goal of this study is the description of a new goby species from the Caspian Sea basin based on our new materials but also considering the data from Ahnelt and Holčík (1996).

**MATERIALS AND METHODS**

The specimens were collected on August 8, 2014 in two localities of the Sefid-Rud River drainage: the Sahrebijar Stream in its lower part (37º01.153′N, 049º37.985′E), and the Tutkabon Stream in the upper part (36º50.756′N; 049º35.021′E), as well as in the Gisum River (37º40.512′N; 049º03.024′E), in the southern Caspian Sea basin, Guilan Province, northern Iran (Fig. 1). Fishes were collected by scoop nets, and kept alive in aerated water from their rivers in cans of water and aquaria before karyological study.

For karyological study we used 18 specimens with total body length (TL) 56–102 mm. All specimens were injected with 0.2–0.7 mL colchicine solution (0.3%–0.4%) depending on their weight. After 4 h cells of anterior part of kidney and thymus were used for chromosome slide preparing by using previously published karyological method (Vasil’ev 1978). The study was conducted by using anesthesia of fishes with a solution of MS-222. Metaphase chromosomes stained in 4% Giemsa solution in phosphate buffer (pH 6.8) were counted with PC software Quick Photo Micro. A total of 10 metaphase plates from five specimens (males and females) were suitable for further analysis. The chromosomes were classified according to the systems suggested by Levan et al. (1964).

Karyotyped specimens, as well as several intact ones after removal of fin clips for further molecular–genetic investigations were fixed in 4% formaldehyde solution. For morphological analysis we used characters developed for study on gobids (Miller 2003), and particular for Caucasian freshwater gobies (Vasil’eva and Vasil’ev 1994b). All measurements were made point to point and recorded with precision of 0.1 mm. The last two branched rays articulating on a single pterygiophore in the second dorsal (*D₂*) and anal (*A*) fins are noted as “1½”. For lateral line system we used terminology from Miller (1986). The number of studied specimens is presented in the description of the new species. For comparative morphological analysis we calculated mean values and standard deviations for the sample included the holotype and paratypes on all morphometric characters. As a comparative material we used the following samples from the collection of the Zoological Museum of the Moscow State University (ZMMU).

- *Ponticola cyrius*: ZMMU P-4274, Kura R. at Borzhom, 4 spec.; P-17491, Khrami R., 17 spec.; P-19235, Kura R. at Borzhom, 37 spec.; P-19236, Kura R. at Akhaldabo, 30 spec.; P-19237, Tbilisi reservoir, 15 spec.
- *Ponticola gorlap*: ZMMU P-16835, Kura R. basin at Mingechaur, 26 spec.; P-23315, Bol’shoi Uzen’ River, 28 spec.; P-23660, Sefid-Rud R., 9 spec.
- In this study we also used data, previously obtained by our investigations of the type specimens in the collec-

![Fig. 1. Iranian southern Caspian Sea basin showing some of the most important river system and the sampling sites; ▲ Tutkabon and ■ Sahrebijar streams in the Sefid-Rud River drainage; ○ Gisum River](image-url)
tion of Zoological Institute of Russian Academy of Sciences (S.-Petersburg) (ZIN);

• Gobius cyrius (ZIN 2235, 3 spec.) and

• G. weidemanni Kessler, 1874 (ZIN 2224, 2 spec.); as well as

• the syntype of G. constructor Nordmann, 1840 in the collection of Muséum National d’Histoire Naturelle (Paris) (MNHN) (MNHN A-1196) (Vasil’eva and Vasil’ev 1994b).

Other data on morphological features of different Ponto–Caspian gobies used in this work were earlier presented in our many publications and in Miller 2003, 2004.

Type specimens, as well as fishes used as additional material are kept in the ZMMU, in Guilan University ichthyologic collection (GUIC), and in the Vatandoust and Mousavi-Sabet fish collection, Tehran (VMFC).

RESULTS AND DISCUSSION

Ponticola iranicus sp. nov. (Figs. 2–4)

Gobius platyrostris cyrius (non Kessler, 1874): Deržavin 1926: 181 (part.: Sefi d-Rud – partim). Deržavin 1934: 116 (part.: tributaries of the Sefi d-Rud – partim).

Gobius (Ponticola) platyrostris cyrius (non Kessler, 1874): Il’in 1927: 141 (part.: northern Asia).

Neogobius cephalarges constructor (non Nordmann, 1840): Berg 1949: 1087 (part.: rivers of the south Caspian coast).

Neogobius cyrius (non Kessler, 1874): Ahnelt and Holčík 1996: 103.

Ponticola cyrius (non Kessler, 1874): Esmaeili et al. 2010: 378 (partim). Coad 2015: part.: Anzali Mordab and tributaries.

Type material. Holotype. ZMMU P-23677, female, TL 81 mm, standard body length (SL) 68 mm, upper Sefi d-Rud River basin, Tutkabon Stream, 36°50.756′N, 049°35.021′E, 08 August 2014.

Paratypes. ZMMU P-23678, 7 females, 2 males (6 karyotyped) TL 80.5–99.0 mm, SL 65.0–83.0 mm, Sefi d-Rud River basin, 36°50.756′N, 049°35.021′E and 37°01.153′N, 049°37.985′E, 08 August 2014.

Additional material. ZMMU P-23679, 5 spec. (4 karyotyped) TL 59.0–73.5 mm, collected together with paratypes; ZMMU P-23680, 10 spec. (5 karyotyped) TL 40.2–77.0 mm, Gisum River, 37°40.512′N, 049°03.024′E, 08 August 2014; GUIC POI-AM, 7 spec. TL 44.1–79.5 mm, Gisum River, 37°40.512′N, 049°03.024′E, 11 December 2014; VMFC POI-P, 9 females, 3 males TL 75.2–98.5 mm, SL 61.1–82.4 mm, Sefi d-Rud River basin, 36°50.756′N, 049°35.021′E and 37°01.153′N, 049°37.985′E, 27 October 2013.

Diagnosis. A species of the genus Ponticola; D VI, D I/(14½) 15½–17½, A I/10½–13½; I. l. 54–70; The specimens from the Sefi d-Rud River usually have 15½ or 16½ branched dorsal rays (46.7% each) and 11½ branched anal rays (60.0%); in the Anzali Lagoon specimens with 16½ dorsal rays and 12½ anal rays were predominant (73.7% and 68.4%, respectively) (Ahnelt and Holčík 1996 counted the last two branched rays articulating on a single pterygiophore as one ray), and in the Gisum River the majority of specimens have 15½ dorsal rays (80.0%) and 11½ anal rays (50.0%). The majority of specimens from the Sefi d-Rud and Gisum rivers have 55–60 scales in lateral series, in the Anzali Lagoon: 57–58 scales. Studied specimens have a relatively short body, laterally compressed at caudal peduncle; caudal peduncle elongated and high, minimum body depth contains 1.5–1.9 times in caudal peduncle length; head relatively high and short, its length contains 3.0–3.4 times in SL; head width slightly larger than depth, cheeks swollen; interorbit distance not wide: in specimens from the Sefi d-Rud River it varies from 0.4 to 0.8 eye diameter, in fishes from the Gisum River—from 0.4 to 0.5, and from the Anzali Lagoon—from 0.3 to 0.7 (in average 0.5); lower jaw sometimes slightly protruded, usually upper and lower jaws are of the same length; upper lip expanded in the middle and slightly swollen; pelvic disc sometimes reaching anus or even extending beyond anus in smaller specimens; other features are as in the holotype. Morphometric characters of...
Fig. 2. Ponticola iranicus sp. nov.; holotype, ZMMU P-23677, female, TL 81 mm (A); pelvic disc in the paratype, ZMMU P-23677, female, TL 99 mm (B); living specimen from the Gisum River (C)
type specimens and a few diagnostic characteristics are presented in Tables 1 and 2. In our samples the largest specimen was a male of SL 86 mm and TL 102 mm; in the Anzali Lagoon the largest male had SL 101.3 mm and TL 128.9 mm (calculated from Ahnelt and Holčík 1996).

**Coloration.** Studied specimens after fixation are usually yellowish grey. Among fishes from the Gisum River two dark grey males were found, probably by reason of dark water in this river. All fins of these males were dark grey with pelvic disc somewhat lighter; lighter edging was present along the outer margin of the first dorsal and anal fins only; their belly was entirely covered by black speckles. Predorsal area in every specimen uniform, dark grey; row of elongated dark grey spots along the midline of the sides; short dark grey stripe on the upper part of the pectoral fin base usually present: it was observed in 86.7% (13 spec.) of fishes studied from the Sefid-Rud River, and in all ten specimens from the Gisum River. A clear oblique black stripe on the first dorsal fin usually can be seen between the first and second rays only (78.6% in the Sefid-Rud and 80% in the Gisum rivers); in other specimens this stripe is visible also between the second and third rays. Data from Ahnelt and Holčík (1996) are less complete, but they mentioned a “conspicuous black spot” in anterior part of the first dorsal fin and “well visible row of 8–10 elongated dark spots along the lateral line” (p. 104).

**Head lateral-line system** in *Ponticola iranicus* is similar to the majority of the other species studied in the genera *Neogobius* and *Ponticola* (Fig. 3): neuromast organs form seven transverse rows, four (4a–4d) before and three (5s, 6s, and 7) above hyomandibular row b. Row 7 consists of several papillae before anterior oculoscapular pore α; two papillae rows below hyomandibular row b—5i and 6i separated, with row 5i well behind anterior end of row b and row 6i short of row b; sub-orbital longitudinal row d consists of two parts: the anterior d, oblique, following the border of the upper lip and reaching below the anterior origin of d, and the posterior longitudinal row d, row a lacking. Anterior and posterior oculoscapular canals, and preopercular canals, present, with pores σ, ω, α, β, ρ, θ, τ, and y, δ, ε, respectively. Anterior oculoscapular pore p and posterior oculoscapular pore θ well separated.

**The karyotype** of all investigated specimens consists of 46 acrocentric chromosomes (2n); the number of chromosome...
arms (NF) 46 (Fig. 4); no chromosome polymorphism or sexual dimorphism in chromosome numbers is observed.

**Distribution.** The new species is found in rivers of the southwestern part of the Caspian Sea: Sefid-Rud and GISum rivers, as well as rivers of the Anzeli Lagoon drainage (Massuleh, Pasikhan).

**Etymology.** The name of the species is based on its distribution in Iranian territory of the Caspian Sea basin.

**Ecological features.** This goby inhabits freshwater biotopes with a rapid current and the bottom covered by stones and boulders.

**Comparative remarks.** *Ponticola iranicus* differs from the freshwater Caspian goby *P. cyrius* of the Kura River basin in coloration (predorsal area of *P. cyrius* always marbled, first dorsal fin typically with distal dark band or shading and lacking oblique black stripe in anterior part), lower numbers of branched dorsal and anal fin rays (*P. cyrius* has *D₁* 1/15½–19½, usually 17½–18½, and *A* 1/11½–15½, usually 13½), significantly shorter anal fin base and longer pelvic disc (Table 2), and in karyotype structure: *P. cyrius* has 36–42 chromosomes with chromosome polymorphism observed for a number of subtelocentric chromosomes (Vasil’eva and Vasil’ev 1994a, 1994b).

*Ponticola iranicus* is easy distinguishable from *P. gorlap*, which is widely distributed in the Caspian Sea basin and sympatric with the new species in the Sefid-Rud River, by its colour pattern: *P. gorlap* is characterized by specific reticulations or mottling on cheeks, upper lips, and pectoral bases, and by lacking a dark spot on anterior part of the first dorsal fin. Moreover, *P. gorlap* has more branched dorsal fin rays (*D₁* 1/16½–18½), its upper lip usually slightly or not expanded and never swollen, and the karyotype includes 43–46 chromosomes, NF = 46 (Vasil’eva and Vasil’ev 2003, Prazdnikov et al. 2013).

Among other Caspian species of the genus *Ponticola*, *P. syrman* differs noticeably from *P. iranicus* in the presence of ctenoid scales on the nape, at least before dorsal fin, narrow upper lip, of uniform width, never swollen, head depth usually greater than head width, anterior membrane of pelvic disc with very shallow, rounded lateral lobes, and three transverse infraorbital papillae rows below lon-
Vasil'eva and Vasil'ev 1994b (for Source: the presently reported study (for SL = standard body length, lA = length of anal fi n base, lV = length of ventral disc, Vasil'eva and Vasil'ev 1994b, Miller 2003).

Species Locality 19½, usually 17½) and the fi rst dorsal fi n uniformly stip-
tications from 17.4% to 19.1%), and in coloration of the fi rst 16.0%–20.5% SL with mean values in different popula-

tions: P. syrman is characterized by wide chromosome polymorphism with 2n = 32–40, NF = 46 (populations from the Black Sea and the Sea of Azov basins were investigated). Ponticola ratan (P. ratan goebelii) (Kessler, 1874) in the Caspian Sea basin, in contrast to P. iranicus, has a narrow upper lip, small lateral lobes of pelvic anterior membrane, head laterally depressed, and cheeks not prominent; moreover P. ratan is euryhaline species and typically inhabits inshore brackish waters (Miller 2003, Vasil'eva 2007). At the same time, P. iranicus belongs to the purely freshwater Ponticola species represented in the Ponto–Caspian basin by another fi ve species according to recent taxonomic concept. In addition to P. cyrus, two freshwater goby species distributed in the Black Sea basin were karyotyped previously. P. constructor is characterized by chromosome polymorphism with 2n = 42–44 and NF = 46–48; this species also differs from P. iranicus in greater numbers of branched dorsal fi n rays (D2, 1/16½–19½, usually 17½) and the fi rst dorsal fi n uniformly stippled or with inconspicuous dark banding. Another freshwater species, P. rhodioni Vasil'eva et Vasil'ev, 1994, is more similar to P. iranicus having 2n = 46, NF = 46, uniform predorsal colour, and the same biotopic preferences: both species occur in habitats with a rapid current and stony bottom, whereas P. cyrus and P. constructor populate rivers with slow current, sandy and muddy bottom and vegetation (Vasil'eva and Vasil'ev 1994a). However, P. rhodioni differs signifi cantly from P. iranicus in greater numbers of branched dorsal fi n rays (D2, 1/16½–19½, usually 17½–18½), shorter and rounded pelvic disc (IV 16.0%–20.5% SL with mean values in different populations from 17.4% to 19.1%), and in coloration of the fi rst dorsal fi n, usually evenly covered by small speckles or with stripes of small dark speckles on a light background (Vasil'eva and Vasil'ev 1994b, Miller 2003).

Two new freshwater species were described (Kovačić and Engin 2008) from two small streams on the south-eastern coast of the Black Sea (north-eastern Turkey). Both descriptions were based on a few specimens: only five individuals of Ponticola rizensis Kovačić et Engin, 2008 and three individuals of Ponticola turani Kovačić et Engin, 2008 were investigated; at the same time, the majority of their diagnostic characters were morphometric, their study needs representative samples and statistical analysis. That is why their comparison in morphometric data looks doubtful; however, P. rizensis differs from P. iranicus in colour of the fi rst dorsal fi n (it has “one lower longitudinal band, and two upper longitudinal rows of brown dots”), the presence of seven rays in this fi n, and according to Kovačić and Engin (2008) in shorter pelvic disc, greater interorbital width and discontinuous sub-orbital longitudinal row d of lateral line system consisting of three parts: d1, d2, and d3. A similarly divided sub-orbital row d is described for the second species P. turani (see Kovačić and Engin 2008.). As opposed to these species, the posterior longitudinal row d in P. iranicus is continuous (Fig. 3). In addition, P. turani is characterized by atypical structure of lateral line pore λ which looks “as transversal furrow with two openings on the ends” (Kovačić and Engin 2008). Moreover this species has only two longitudinal rows of brown dots on the fi rst dorsal fi n, greater numbers of branched dorsal fi n rays (D2, 1/18½–19½), and shorter interorbit distance (0.3–0.5 eye diameter) (Kovačić and Engin 2008).

Evolution remarks. At present, the number of described freshwater goby species in the Ponto–Caspian basin increased to six. These species demonstrate mosaic pattern of both morphological (including colour pattern) and karyological features. This may constitute an evidence for their polyphyletic origins, similarly to freshwater forms in other anadromous or euryhaline fi sh species. However, in contrast to the majority of situations observed in salmons, lam-

| Table 2 |

Morphometric characters differentiating Ponticola iranicus sp. nov. and P. cyrus in studied samples of both species

| Species | Locality | Character | SL [mm] | IA | IV |
|---------|----------|----------|---------|----|----|
| P. iranicus | Gisum River (n = 7) | Range | 44.0–60.7 | 22.6–25.4 | 19.0–24.7 |
|          | Mean | 63.7 | 24.2 | 22.3 |
|          | Anzali Lagoon (n = 38) | Range | 40.8–101.3 | 22.5–29.9 | 18.6–22.9 |
|          | Mean ± SD | 66.1 ± 0.95 | 25.0 ± 1.64 | 20.8 ± 0.97 |
|          | Kura River at Borzhom (n = 13) | Range | 39.3–85.5 | 26.8–29.8 | 16.4–20.6 |
|          | Mean ± SD | 57.9 | 27.9 ± 0.94 | 18.8 ± 1.12 |
| P. cyrus | Kura River at Akhaldabo (n = 30) | Range | 45.2–94.0 | 24.5–30.0 | 14.8–19.9 |
|          | Mean ± SD | 63.1 | 27.7 ± 1.42 | 17.7 ± 1.37 |
|          | Tbilisi Reservoir (n = 15) | Range | 39.3–56.3 | 25.6–30.1 | 17.1–19.5 |
|          | Mean ± SD | 50.8 | 27.1 ± 1.12 | 18.0 ± 0.62 |
|          | Khrami River (n = 10) | Range | 54.1–71.7 | 24.6–30.4 | 16.5–18.6 |
|          | Mean ± SD | 62.0 | 28.3 ± 1.64 | 17.5 ± 0.76 |

SL = standard body length, IA = length of anal fi n base, IV = length of ventral disc, n = number of fi sh studied, SD = standard deviation; Source: the presently reported study (for P. iranicus from Gisum), Ahnelt and Holčík 1996 (for P. iranicus from Anzali Lagoon), and Vasil'eva and Vasil'ev 1994b (for P. cyrus; four samples from the Kura River drainage).
ACKNOWLEDGEMENTS

The authors are very grateful to S. Eadery, K. Abbasi, M. Mansuri, M. Mohammad, K. Ghasemzadeh, and H. Parnoush for their help in collecting the material. This taxonomic study and field works were partially supported by the Russian Foundation for Basic Researches, Project No. 13-04-00279-a, and the University of Guilan, Project No. 93-1754, and the analysis of museum collections – by the Russian Scientific Fund, Project No. 14-50-00029.

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Published electronically: 30 June 2015