

## Review Article

# Review of the gobionids of Iran (Family Gobionidae)

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**Abstract:** The systematics, morphology, distribution, biology and economic importance of the gobionids of Iran are described, the species are illustrated, and a bibliography on these fishes in Iran is provided. There are three native species in the genera *Gobio* and *Romanogobio* found in northeastern and northwestern Iran respectively and a widely introduced exotic species *Pseudorasbora parva*.

**Keywords:** Biology, Morphology, Exotic, *Abbottina*, *Gobio*, *Romanogobio*, *Pseudorasbora*.

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## Introduction

The freshwater ichthyofauna of Iran comprises a diverse set of about 297 species in 109 genera, 30 families, 24 orders and 3 classes (Esmaeili et al. 2018). These form important elements of the aquatic ecosystem and a number of species are of commercial or other significance. The literature on these fishes is widely scattered, both in time and place. Summaries of the morphology and biology of these species were given in a website ([www.briancoad.com](http://www.briancoad.com)) which is updated here for one family, while the relevant section of that website is now closed down. Other families will also be addressed in a similar fashion.

## Family Gobionidae

The gobionids are found in Eurasia, mostly in eastern Asia, and the family has 213 species (Catalog of Fishes, downloaded 5 October 2018). There are three native species in Iran and one exotic. The family is characterised by having one pair of barbels, papillae on the lips and chin, usually a flat belly, inferior mouth and laterally spread pectoral fins for benthic living, and derived sensory canal patterns and frontal

and supraoccipital bone morphology (Nelson et al. 2016). The gudgeons originated in the early Palaeocene about 63.5 MYA and diversified in the Eocene and early Miocene (Zhao et al. 2016).

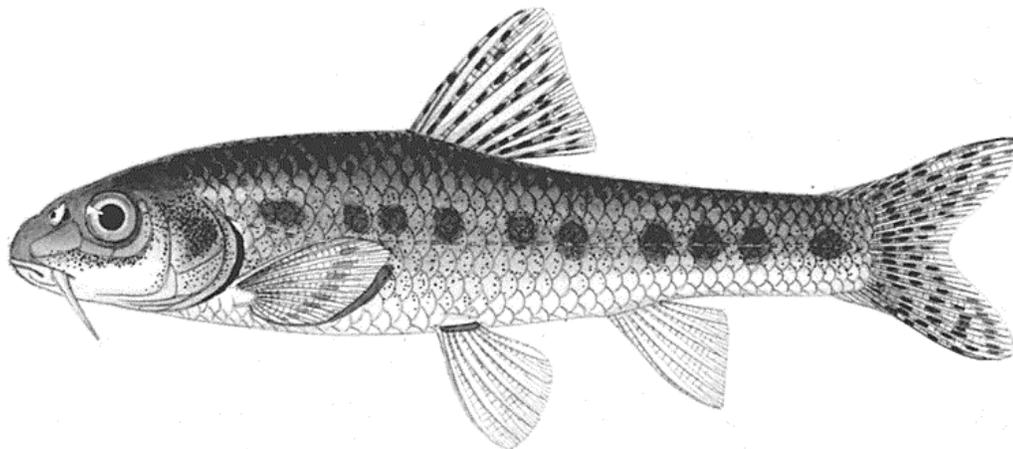
The family was formerly placed as a subfamily within the family Cyprinidae but is distinguished on the basis of osteological and molecular data (Tang et al. 2011; Stout et al. 2016; Tan & Armbruster 2018).

There is evidently a strong possibility of exotic species from Turkmenistan entering Iranian waters via the Hari River drainage. Fishes, including exotics, are farmed along the basin of the Karakum Canal, a 1,372km long diversion from the Amu Darya. Some of these exotics can be expected to enter the Hari River basin via its delta and eventually the Caspian Sea basin via the Atrak River through runoff and collector canals (Sal'nikov 1995, 1998). The Chinese false gudgeon, *Abbottina rivularis* (Basilevsky, 1855) and the Turkestan gudgeon (*Gobio lepidolaemus* Kessler, 1872) are two of these potential exotics (Figs. 1, 2).

Key to Gobionidae species in Iran (*Romanogobio* key by A. Naseka, Zoological Institute, St. Petersburg):



**Fig.1.** *Abbottina rivularis*, Suidokinenkan, Osaka, Japan, Wikimedia Commons, Kenpei.



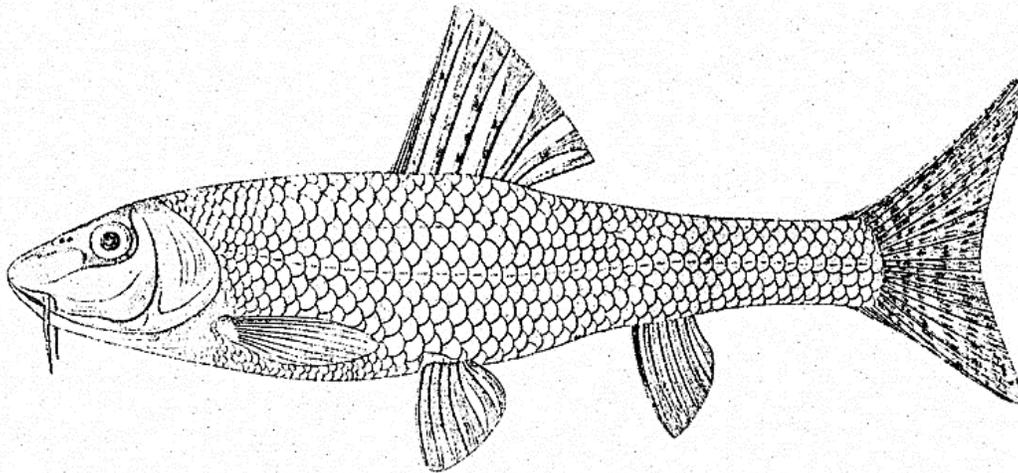
**Fig.2.** *Gobio lepidolaemus*, after Berg (1948-1949).

1a. Mouth very small and lying entirely before the nostril level, almost vertical, opening antero-dorsally with the gape entirely visible in dorsal view; no barbels; widely introduced ..... *Pseudorasbora parva*  
 1b. Mouth ventral; barbels present; northwestern and northeastern Iran ..... 2  
 2a. Epithelial crests absent; caudal peduncle depth 1.2-2.9 in its length; Hari River basin ..... *Gobio nigrescens*  
 2b. Epithelial crests on scales on dorsal half of body (easily lost when handled or preserved); caudal peduncle depth 2.9-4.0 in its length; Caspian Sea and Lake Urmia basins ..... 3 (*Romanogobio*)

3a. Number of lateral line scales 40 to 45 with modes of 42 and 43; total vertebrae 38 to 42 with modes of 40 and 41; connection between the supraorbital and infraorbital head canals usually present; Caspian Sea basin ..... *Romanogobio macropterus*  
 3b. Number of lateral line scales 39 to 43 with modes of 40 or 41; total vertebrae 37 to 40 with modes of 38 and 39; connection between the supraorbital and infraorbital head canals usually absent; Lake Urmia basin ..... *Romanogobio persus*

**Genus *Gobio* Cuvier, 1816**

The gudgeon genus includes about 38 species found



**Fig.3.** *Gobio nigrescens*, after Keyserling (1861).

from the British Isles through Europe and northern Asia to Korea. There is one species in Iran and two other species, formerly in *Gobio*, are now in the genus *Romanogobio*. A molecular phylogeny of the genus by Mendel et al. (2008) did not treat the sole Iranian species but confirmed the genus as a monophyletic group.

The body shape is distinctive, being elongate and fusiform with moderately large scales (36-51), the throat is naked or scaled, the mouth is inferior or terminal, horseshoe-shaped and has a barbel at each corner, the lower lip is thin like the upper lip but is interrupted medially, gill rakers are short and widely spaced, pharyngeal teeth are in two rows (usually 5 in the main row and 2-3 in the second) and are obviously hooked at the tips, both dorsal and anal fins are short and lack thickened unbranched rays ("spineless"), the gut is short and the peritoneum silvery, and the vent is remote from the anal and pelvic fin origins.

***Gobio nigrescens*** (Keyserling, 1861)

(Fig. 3)

**Common names:** Kapur-e kafzi-ye Harirud (= Hari River bottom-dwelling carp), mahi kopur kafzi (= bottom-dwelling carp fish), gav mahi (probably in error for *Neogobius* and related gobies) [Hari gudgeon].

**Systematics:** *Bungia nigrescens* Keyserling, 1861

was described from "Fluss Heri-Rud bei Herat" (the Harirud at Herat in Afghanistan, formerly part of Persia). *Bungia* Keyserling, 1861 is a synonym of *Gobio* Cuvier, 1816 (Eschmeyer 1990).

This species was represented in Iran as the subspecies *Gobio gobio lepidolaemus* Kessler, 1872, originally described as *Gobio fluviatilis* var. *lepidolaemus* from Ak-darja and Chodshaduk in the Zeravshan River basin, Uzbekistan and the Syr Darya at Khodzhent, Tajikistan. This subspecies is distinguished from the typical gudgeon (*Gobio gobio*) by having a scale-covered throat, deep body, deep and short caudal peduncle, slightly notched or emarginate caudal fin and small size (Amanov 1972). Berg (1948-1949) considered that these characters would be sufficient to distinguish this taxon as a full species but there are intermediate forms. Reshetnikov & Shakirova (1993) listed *Gobio lepidolaemus* as a full species, as did the *Catalog of Fishes* (downloaded 12 March 2018, but this taxon is not present in Iran as the *Catalog of Fishes* stated). Mousavi-Sabet et al. (2016) resurrected *Gobio nigrescens* based on COI barcode sequences and anatomical features.

There occurs in the western Caspian Sea basin *Gobio gobio lepidolaemus natio holurus* Berg, 1914 (the Terek gudgeon or Terskii peskar') but it is not recorded from Iranian waters. This was considered to represent intergrades between *G. gobio gobio* and

*G. gobio lepidolaemus* by Bănărescu in Bănărescu (1999) and was recognised as a distinct species *Gobio holurus* Fowler, 1976 by Kottelat & Freyhof (2007).

There are no types for *Bungia nigrescens*. Syntypes of *Gobio gobio lepidolaemus* are in the Natural History Museum, London under BM(NH) 1872.5.30.78-79 (2), 1872.5.30.80-82 (3), BMNH 1897.7.5:26, formerly in St. Petersburg University, and further syntypes are in the Zoological Institute, St. Petersburg under ZISP 2078 or 2076 or 2706 (25) with a possible syntype is in the Zoological Museum of Moscow State University under MMSU P.1052 (*Catalog of Fishes*, downloaded 12 March 2018). Svetovidova (1978) referred to ZISP 2078 as the holotype on page 257 and ZISP 2076 as the holotype on page 262 (Eschmeyer et al. 1996).

**Key characters:** This is the only gudgeon in eastern Iran and is separated from other cyprinids by the meristic characters, presence of barbels, absence of fin spines, mouth not transverse or crescentic but horseshoe-shaped, and colour pattern. It is separated from the other related species in Iran (*Romanogobio macropterus* and *R. persus*) by having the body and caudal peduncle compressed (caudal peduncle depth at anal fin insertion greater than caudal peduncle width) and by well-defined spots on the dorsal and caudal fins. This species is distinguished from *Gobio lepidolaemus*, the only species that is geographically close, by having a naked breast (versus scaled), scale rows on the caudal peduncle  $\frac{1}{2}3/1/3\frac{1}{2}$  ( $\frac{1}{2}2/1/2\frac{1}{2}$ ), usually 16 circumpeduncular scales (12-14), predorsal scales 16-18 (14-16), scales between the lateral line and pelvic fin origin  $4\frac{1}{2}$  ( $3\frac{1}{2}$ ), 6-7 (0-4) irregularly-shaped, black or brown blotches on the back behind the dorsal fin, and a slender caudal peduncle (depth in length 2.4-2.9 versus 1.7-2.2) (Mousavi-Sabet et al. 2016).

**Morphology:** Dorsal fin branched rays 7 after 3 unbranched rays, anal fin branched rays 6 (Mousavi-Sabet et al. (2016) gave  $5\frac{1}{2}$  which equals 5 in the counting system used here) after 3 unbranched rays, pectoral fin branched rays 14-17, and pelvic fin

branched rays 7. Lateral line scales 38-40. Scales have posterior radii only (or, if present, very few anterior radii) and the scale focus is subcentral anterior but not very eccentric in small fish, very eccentric in large fish. The anterior scale margin is rounded to wavy. There is a pelvic axillary scale. The anus is separated from the anal fin origin by 5-6 closely overlapping scales and is near the end of the pelvic fins but underneath them. Pharyngeal teeth 3,5-5,3 usually but Pipoyan (1998) found 21 variant counts for 141 *Gobio gobio*, a related species in Armenia, with 3,5-5,3 (34.0%), 2,5-5,2 (22.7%), 2,5-5,3 (10.0%) and other combinations at about 2% or less. The anterior teeth are blunt with small hooks, conical and short and are followed by long, thin, strongly hooked teeth (the description of *Bungia nigrescens* may be in error in stating that there is only one row of teeth but Pipoyan (1998) noted that related *Gobio gobio* in Armenia are exceptionally uniserial). Total gill rakers 1-7, only developed rakers being counted and anterior rakers reduced to bumps not included. Developed rakers are stubby and may or may not touch the adjacent raker when appressed. Total vertebrae 38-39. The gut is an elongate s-shape with a slight anterior loop. The chromosome number is  $2n = 50$  for *Gobio gobio* and is presumably the same for this species (Klinkhardt et al. 1995, Bănărescu in Bănărescu 1999).

Meristics for Iranian specimens are as follows: dorsal fin branched rays 7(3), anal fin branched rays 6(3), pectoral fin branched rays 15(1), 16(1) or 17(1), pelvic fin branched rays 7(3), lateral line scales 38(2) or 39(1), scales around caudal peduncle 14(1) or 16(2), total gill rakers 5(1) or 6(2), pharyngeal teeth 3,5-5,3(1), 3,5-4,3(1) or 3,4-5,2 or 3(1), and total vertebrae 38(2) or 39(1).

**Sexual dimorphism.** Males darken in the spawning season. Fine tubercles develop on the side and upper surface of male heads, on the upper flank and back anteriorly, and the eight outer rays of the pectoral fin.

**Colour.** The top of the head, the back and the flanks above the lateral line are dark brown to olive-brown and may have a greenish tinge. The operculum has an

irregularly-shaped dark brown blotch. The lower flanks are paler and may have a silvery or whitish tinge or be a light yellow. The mid-flank bears a row of 6-13 dark spots which may merge into a line, merge in pairs or form a lattice. The back may have 4-5 longitudinal dark bands with a variegated pattern. A variably-developed, antero-ventral black stripe lies under the eye. The lateral line scales have a small brown or black blotch above and below the lateral line forming two longitudinal rows of spots, not as evident as in *Alburnoides* species. The dorsal and caudal fins have 3-7 rows of spots, the pectoral fins have several rows of small spots and the pelvic and anal fins may also have 2-6 rows of spots but are often colourless. Pectoral and pelvic fins yellow-orange in life. The peritoneum is silvery.

**Size:** Attains 95.2mm standard length (Mousavi-Sabet et al. 2016).

**Distribution:** Found in the Tedzhen (= Hari) River basin in Afghanistan, Iran and Turkmenistan, and probably in north flowing rivers of the Kopetdag in Turkmenistan. Iranian records are from the Hari River and the Kuh-e Sang Park in Mashhad.

**Zoogeography:** This taxon was formerly regarded as part of a widely distributed and very variable species (*Gobio gobio*) with many taxa listed as subspecies. It is part of the gobionine fauna found across Eurasia.

**Habitat:** Found in rivers, streams and ponds. Gudgeons generally are resistant to pollution and varying environmental conditions although there is little information on the eastern Iranian species.

**Age and growth:** Unknown.

**Food:** Food is mainly benthic invertebrates, chiefly insect larvae such as chironomids in Iranian fish, but varied items may be taken depending on the water body and food availability. Abdoli (2000) listed Chironomidae, Ephemeroptera, Plecoptera and Trichoptera. Some insects falling on the water surface are taken.

**Reproduction:** Well-developed eggs are present in Iranian fish caught on 10 November. Elsewhere gudgeons slap the water surface with the rear part of the body, and males and females rub their bodies

together while releasing eggs and sperm (Bănărescu in Bănărescu 1999).

**Parasites and predators:** None reported from Iran.

**Economic importance:** Related gudgeons in Europe have been used as bait fish and as food.

**Experimental studies:** None.

**Conservation:** This species is rarely collected in Iran and its status is unknown.

**Sources:** Iranian material:- CMNFI 2007-0014, 3, 81.5-85.0mm standard length, Razavi Khorasan, Kuh-e Sang Park, Mashhad (ca. 36°18'N, ca. 59°36'E).

**Comparative material:** BM(NH) 1886.9.21:176, 1, 83.5mm standard length, Afghanistan, Kushk (= Koshk-e Kohneh, ca. 34°52'N, 62°31'E); SMF 17137, 5, 61.3-84.1mm standard length, Afghanistan, tributary of the Harirud near Herat (34°21'N, 62°14'E); ZISP 10364, 8, 39.6-70.6mm standard length, Turkmenistan, Tedzhen River (no other locality data); ZISP 11048, 1, 61.9mm standard length, Turkmenistan, Tedzhen River (no other locality data).

### **Genus *Pseudorasbora* Bleeker, 1860**

This genus contains four species with a native distribution in Eastern Asia including the Amur River basin shared between Russia and China, in Japan, other parts of China, and in Korea. One species is an exotic now found in Europe and also accidentally introduced in Iran.

The genus is characterised by a small and transverse mouth positioned at the top of the snout rather than the anterior tip, the lower jaw has a trenchant edge and projects slightly beyond the upper jaw, no barbels, pharyngeal teeth are in a single row, the gut is short, scales are large, gill rakers are rudimentary, dorsal and anal fins are short and spineless, and there is no keel on the abdomen.

***Pseudorasbora parva*** (Temminck and Schlegel, 1846)

(Figs. 4-6)

**Common names:** Amorcheh or amurcheh, amurnama, parva (from origin and scientific name)

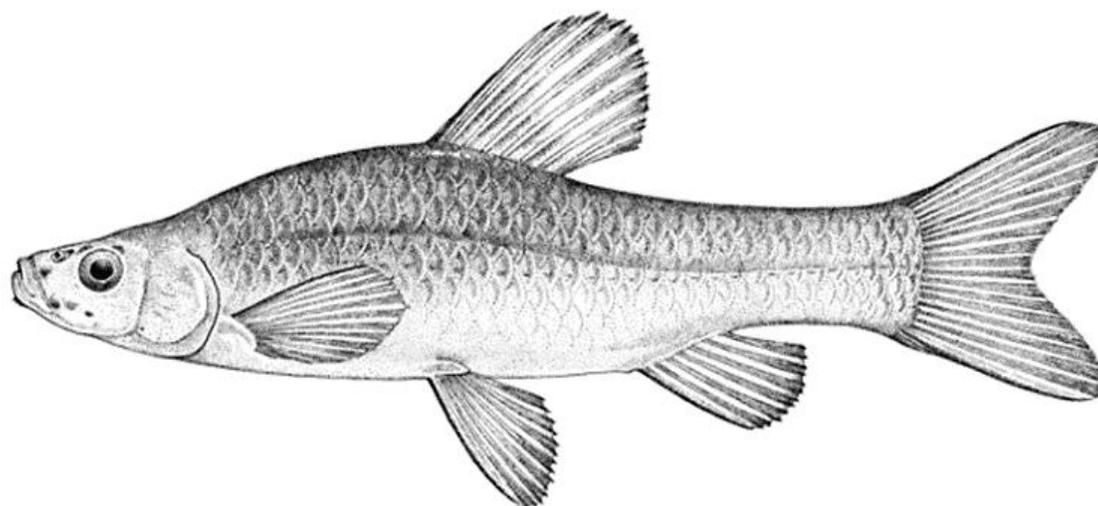


Fig.4. *Pseudorasbora parva*, line drawing, C. D. Douglas.



Fig.5. *Pseudorasbora parva*, Karun River drainage, H.R. Esmaeili.



Fig.6. *Pseudorasbora parva*, Wikimedia Commons, Seotara.

[Stone moroko, topmouth gudgeon, topmouth minnow, false rasbora; Amur chebachok or chebachek in Russian].

**Systematics:** *Leuciscus parvus* was originally described from Nagasaki, Japan. Subspecies have been described in China but exotic introductions are usually referred to the type subspecies. Reshetnikov et al. (1997) and Bănărescu in Bănărescu (1999) gave the date for this species as 1846. The phenotype of this species is highly influenced by environmental conditions and this is suggested to be one of the attributes that make this fish a successful invasive species (Záhorská et al. 2009). Khosravi Katuli et al. (2013) found that fish from three populations in Iran (Avaness (Aliabad Katoul), Lake Darg and Torqabeh (Mashhad)) had habitat-dependent morphology.

**Key characters:** The mouth structure is unique, being very small and lying entirely before the nostril level,

almost vertical, opening antero-dorsally with the gape entirely visible in dorsal view. The lower jaw protrudes to form the most anterior part of the head.

**Morphology:** Dorsal fin unbranched rays 2-3, usually 3, followed by 7-8, usually 7, branched rays, anal fin with 2-3, usually 3, unbranched rays and 5-7 branched rays, usually 6, pectoral fin branched rays 11-14, and pelvic fin branched rays 6-8, usually 7. Lateral line scales 29-40, with the lateral line rarely incomplete. A pelvic axillary scale is present. The scale radii are restricted to the posterior field. Gill rakers are rudimentary and are only well-developed at the junction of the upper and lower arms of the gill arch. These rakers are stubby and rounded, reaching the adjacent raker when appressed, and bearing fine, fleshy fimbriae which extend onto the adjacent parts

of the gill arch. Anterior rakers are absent and patches of fimbriae are found. Rakers number 6-16, usually 9-13. Total vertebrae 31-38 presumably the result of different counting methods; Naseka (1996) gave 36-38 and fish from Turkey have 34-37, *cf.* below. Pharyngeal teeth usually 5-5, rarely 6-5, with the tips strongly hooked and the area below the hook flattened and without ridges or only very weakly ridged on some teeth. The gut is an elongate s-shape. The chromosome number is  $2n = 50$  (Klinkhardt et al. 1995, Arai 2011).

Meristic values for Iranian specimens are:- dorsal fin branched rays 7(11) or 8(1), anal fin branched rays 6(12), pectoral fin branched rays 13(7) or 14(5), pelvic fin branched rays 7(4) or 8(8), lateral line scales 34(4), 35(5) or 36(3), pharyngeal teeth 5-5(9), 6-5(2) or 4-4(1), and total vertebrae 34(2) or 35(10).

**Sexual dimorphism:** A horny pad develops on the jaws in males and females during spawning and strong, sharp tubercles in males. One tubercle is found between the eye and the nostril, one below the nostril (this may be absent), one next to the upper lip on a line across from the one below the nostril, 5-8 in a row from the extreme corner of the mouth along the side of the head over the flesh of the cheek, and 2-3 below the lower lip from the tip of the lower jaw to the end of the jaw on the lower head surface. Lower head surface tubercles may coalesce at the base but each tubercle bears a single rounded cusp. Rarely a tubercle may have a single base but two cusps.

Males are larger than females and have larger fins. Spawning males are darker than females and the flank has a metallic violet sheen.

**Colour:** The head and body has a mid-lateral stripe but this is obscured in adults by crescentic speckles situated posteriorly on each scale. The back is light grey, the flanks silvery and the belly whitish. Dorsal and anal fins are speckled and turn almost black in spawning fish. Preserved fish have a cream coloured belly with the back much darker. The head is black dorsally and fades to cream ventrally. The scales on the back and flanks, but not the belly, carry a broad band of pigment which follows the scale margin

distally. The extreme edge of the scale is hyaline but the arc of pigment effectively defines the posterior scale margin and outlines the scale pattern of the back and flanks. Pigmentation on fins is mostly restricted to the rays and their margins but is found also on fin membranes to varying extents. Pigmentation is strongest distally on all fins. The dorsal fin, particularly in smaller fish, bears patches on the membranes posterior to branched rays 1 or 2 through 5 or 6, starting on ray 1 or 2 below the mid-point of the ray length and descending gradually behind successive rays to lie near the base behind the last ray. These patches are vertically short and do not touch the succeeding ray. The leading edge of the dorsal, anal, pectoral and pelvic fins and the upper and lower edges of the caudal fin are black in large, and some small, fish. Pigment may be concentrated along the mid-line forming a thin stripe, only apparent posteriorly in some fish. There is a dark line along the mid-line of the back. The peritoneum is silvery with some scattered melanophores.

**Size:** Attains 12.0cm (Movchan & Kozlov 1978).

**Distribution:** The natural range of this species is in eastern Asia as given above under the genus. It has been introduced to Iran by accident and it is now probably distributed throughout the country. This species is found in the following basins: Caspian Sea, Dasht-e Kavir, Dasht-e Lut, Esfahan, Hamun-e Mashkid, Hari River, Kerman-Na'in, Kor River, Lake Maharlu, Lake Urmia, Namak Lake, Persis, Sistan, and Tigris River.

It is found in the Caspian Sea basin in the abbandans at Avanes, Hasan Tabeeb and Shaeed Ziaee (all about 40-45km east of Gorgan), at Teer Tash and Lemrask (about 20-25km east of Behshahr), at Lapoo (about 4km east of Babol Sar) on the Caspian Sea coast, at Gorgan-Aliabad, Golestan, from the Sefid River estuary and neighbouring waters, the Anzali Talab and tributaries such as the Siah Darvishan River, from the International Wetlands of Alma-Gol (= Ulmogol), Ajigol and Alagol, and from the Atrak, Babol, Gorgan, Haraz, Haviq, Kargan, Kelarud, Nesa, Polrud (= Pol-e Rud), Qareh Su, Sardab, Sefid,

Selin, Shad Kam, Shahrud, Shirud, Tajan, Totkabon and Zarrin Gol rivers and the Arasbaran Dam (Abdoli 1992; Coad & Abdoli 1993; *Iranian Fisheries Research and Training Organization Newsletter* 6: 8, 1994; Anonymous 1994; Karimpour 1998; Abbasi et al. 1999, 2007, 2017; Kiabi et al. 1999; Patimar et al. 2002a, b; Patimar 2008; Khosravi Katuli et al. 2013; Abdoli et al. 2014; Gholizadeh et al. 2014; Aazami et al. 2015; Salavatian et al. 2016; Zamani Faradonbe et al. 2017); in the Dasht-e Kavir basin (Jouladeh Roudbar et al. 2015); in the Hamun-e Mashkid basin (Esmaeili et al. 2013a, b; Malekzahi et al. 2014); in the Hari River basin at Mashhad and the Chalidare Dam in northeastern Iran, and the Kardeh Dam (Khosravi Katuli et al. 2013; Asgardun & Nowferesti 2014; Abbasi et al. 2016); in the Kor River basin at the Kaftar Wetlands (Barzegar & Jalali 2002; Rahimi & Tabiee 2013; Esmaeili et al. 2015); in the Lake Maharlu basin (Esmaeili et al. 2010); in the Lake Urmia basin in the Mahabad Dam and the Aji, Bitas, Mahabad, Mardogh, Qader, Simineh and Zarrineh rivers (Moradi & Eagderi 2014; Ghasemi et al. 2015; Radkhah & Eagderi 2015; Eagderi & Moradi 2017); from fish ponds at Arak in the Namak Lake basin, probably inadvertently carried there with carp fingerlings imported from Gilan on the Caspian shore, and in the Qareh Chai sub-basin of the Namak Lake basin (Abbasi 2009); in the Persis basin in the Dasht-e Arjan Lake, Parishan wetlands and Helleh River (Teimori et al. 2010; Esmaeili et al. 2015); in the Sistan basin at Hamun Kushk, the Chahnimeh Reservoir and the canal flowing into the Chahnimeh (J. Holčík, in litt. 1996; Hosseini et al. 2011); and in the Tigris River basin in springs near Kermanshah, in the Qarasu (= Qareh Su) and Niloufar and Yavari springs, Kermanshah, and in Lake Zaribar in Kordestan, in the Chaghkhor (= Chagha Khur) Wetland, in the Qeshlaq Dam, Kordestan, in the Agh-Gol, Gamasiab and Haramabad wetlands in Hamadan Province, in the Chamzarivar, Dinorab, Gamasiab, Garavand, Gaveh, Haramabad and Sirvan rivers (Coad 1996; Barzegar & Jalali Jafari 2006; Abbasi et al. 2009; Bozorgnia et al. 2012; Eagderi & Nasri

2012; Biukani et al. 2013; Esmaeili et al. 2010; Hasankhani et al. 2014; Alizadeh Marzenaki et al. 2016; Taghiyan et al. 2016). Also found in Chitgar Lake, an artificial water body in northwest Tehran (Ramin et al. 2016; Abbasi et al. 2017; Ramin & Doustdar 2017) and in qanats in Kerman County, southeast Iran (Rezaei Tavabe & Azarnivand 2013).

Abdoli (2000) recorded it generally from the middle Atrak, lower Neka, Babol, Heraz, Chalus, Tonekabon, and Sefid rivers and the Anzali Talab in the Caspian Sea basin; Dasht-e Kavir, Dasht-e Lut, Kerman-Na'in and Sistan basins; the middle and lower Zayandeh River in the Esfahan basin; the lower Kashaf River in the Hari River basin; the middle to lower Talkheh and lower Zarrineh rivers in the Lake Urmia basin; the lower Shur and middle and lower Qareh Chai in the Namak Lake basin; and the Simareh and lower Gamasiab rivers in the Tigris River basin. Jolodar & Abdoli (2004) and Abdoli & Naderi (2009) recorded it from most water bodies on the Iranian Caspian coast.

It is also recorded in the Karakum Canal, Kopetdag Reservoir and Tedzhen River of Turkmenistan (Shakirova & Sukhanova 1994; Sal'nikov 1995). Pipoyan (1996) reported it from the Aras River in Armenia.

**Zoogeography:** This species was first recorded in western Eurasia in Romania in 1960 as an accidental introduction with Chinese carps from the lower Yangtze River of China. The species is now widespread in Europe and is becoming common in western Asia including Kazakhstan, Uzbekistan, Kyrgyzstan and southern Anatolian Turkey as well as Iran (Wildekamp et al. 1997). Gozlan et al. (2010) documented its pan-continental invasion attributing its spread to introduction with Chinese carps (65%), recreational fishing (22%), ornamental fish trade (9%) and natural dispersal (1%). Natural dispersal is the main secondary pathway at 72% with angling at 25% and the ornamental fish trade at 3%. Hardouin et al. (2018) found the phylogeography of this species in Europe indicated as few as two introduction events. Native populations had greater genetic

diversity than introduced populations, in contrast to previous studies.

**Habitat:** This species prefers well-vegetated areas as protection from predators. It may be found in streams, rivers and ponds, qanats, and more rarely in the shallows of large lakes. It is apparently quite resistant to pollution (Bănărescu in Bănărescu 1999) and is found in waters that freeze over and that attain 30°C in summer (Boltachev et al. 2006). The plasticity of life history traits enables it to colonise a wide variety of waters rapidly (Gozlan et al. 2010). Zamani Faradonbe et al. (2017) studied niche overlap among fishes from the Totkabon River, a tributary of the Sefid River in the Caspian Sea basin. The presence-absence and abundance of *P. parva* was related to the presence of large stones, slope, elevation and depth.

**Age and growth:** Patimar et al. (2002a, 2002b) reported 4 age groups from the Iranian International Wetlands of Alma-Gol (= Ulmogol), Ajigol and Alagol, with the smallest mature specimens found at 2 years. Esmaili & Ebrahimi (2006) gave a significant length-weight relationship based on 33 Iranian fish measuring 3.29-5.99cm standard length. The *b*-value was 2.763. Asgardun & Nowferesti (2014) found *b* values for 268 fish from the Mashhad Chalidare Dam to be 3.09 for males (positive allometric growth) and 2.16 for females (negative allometric growth). Patimar & Baensaf (2012) studying 92 fish gave a maximum age of 3<sup>+</sup> years for females and 4<sup>+</sup> for males in the Alma-Gol (= Ulmogol) Wetland with males longer and heavier than females in all age groups. The length-weight relationship was negative allometric for both sexes and significantly different (*b* = 2.93 for females and 2.73 for males), and the male:female sex ratio was 1.625:1. Hasankhani et al. (2014) found a *b* value of 3.37 for 30 fish (3.0-7.2cm total length) from the Sirvan River. Aazami et al. (2015b) gave a *b* value of 3.1 for five fish measuring 4.6-7.5cm from the Tajan River. Radkhah & Eagderi (2015) gave a *b* value for 25 fish from the Zarrineh River, 3.1-7.5cm total length, as 3.15, positive allometric growth. Condition

factor was 1.02. Asadi et al. (2017) gave a *b* value of 2.942 for 12 fish (21-71mm total length) from the Shahrbijar River, Gilan with a total length condition factor of 0.79.

Life span is about 5 years with maturity attained at 1-2 years, usually at 1 year in Europe or the second year of life in the Crimea (Boltachev et al. 2006). Most fish in a population are 2-3 years old or 1-2 years in the Crimea.

**Food:** This species feeds on benthos but also some zooplankton. Food items include various aquatic insects such as stone flies, caddis flies, chironomids, water sawbugs and midge larvae but guts also contain sponges, bryozoans, *Spirogyra*, detritus, and fragments of higher plants (Movchan & Kozlov 1978). It may also feed on the eggs and juveniles of native fishes (Gozlan et al. 2010, q.v. for further diet details). Young fish take zooplankton (Movchan & Kozlov 1978). Bănărescu in Bănărescu (1999) reported also isopods and aquatic worms and, in fish ponds, artificial food.

**Reproduction:** Female specimens from Iran collected in March, April and May are ripe and males have well-developed breeding tubercles, and Patimar et al. (2002a, 2002b) reported a spawning peak in April in the International Wetlands of Alma-Gol (= Ulmogol), Ajigol and Alagol of Iran. Patimar & Baensaf (2012) for their Alma-Gol Wetland study gave the highest gonadosomatic index of 11.93 for females and 6.98 for males in spring with absolute fecundity reaching 2,930 eggs.

Reproduction begins at 16-18°C and lasts 2 months in its native Amur River basin. Fecundity is about 5,000 elliptical eggs with a diameter of 2.0-2.5mm, and this species has intermittent spawning with up to 85 eggs per batch in introduced populations in Central Asia (Makeyeva & Mokhamed, 1982). Absolute fecundity may reach 7,124 eggs in newly invasive populations (Gozlan et al. 2010). Up to 60 batches may be laid in a spawning season. The males court the females, chasing and leading them. The spawning site is cleaned of ooze and plant material. Adhesive eggs are deposited on

the lower surface of stones, and occasionally sticks or empty mollusc shells, and are protected by the male using the head tubercles to drive away other fishes. The ellipsoidal eggs are laid in strips, usually of five eggs but as many as 10. Males clean the eggs and remove dead ones. The spawning season in Central Asia is April to August and spawning takes place in warm, shallow and calm waters in the morning. Spawning in the Crimea is in second half of May or in June, late May to July in the Ukraine and from the end of June to the beginning of August in the Amur (Boltachev et al. 2006).

**Parasites and predators:** Gozlan et al. (2010) gave a general summary of parasites for this species. Malek & Mobedi (2001) reported *Clinostomum complanatum* from this species in Mazandaran, in the Shirud. Barzegar & Jalali (2009) reviewed crustacean parasites in Iran and found *Lernaea cyprinacea* on this species. Hosseini et al. (2011) recorded the plerocercoid stage of *Ligula intestinalis* in fish from the Chahnimeh Reservoir in Sistan. This parasite can harmful to humans. Hosseini Fard et al. (2017) examined fish from Babol and found no parasites while other introduced species (*Carassius carassius* (sic), *Cyprinus carpio* and *Hemiculter leucisculus*) were heavily infested.

The pikeperch *Sander lucioperca* and the catfish *Silurus glanis* are predators in Turkmenistan (Aliev et al. 1988).

**Economic importance:** Makeyeva & Mokhamed (1982) and Movchan & Kozlov (1978) reported competition with commercial species and predatory behaviour on carp larvae if there is insufficient food. Male reproductive aggression may inhibit breeding of native fishes. Boltachev et al. (2006) found that it is a facultative parasite of other fishes in enclosed areas, including commercial species such as the silver carp (*Hypophthalmichthys molitrix*). Areas of the body are attacked such as behind the dorsal fin and above the anal fin out of sight of the affected fish. Skin and muscles are eaten away. Welcomme in Courtenay & Stauffer (1984) regarded this species as a pest when introduced. Bănărescu in Bănărescu

(1999) reported this species as a competitor for food with native species in Europe. Khaval et al. (2010) investigated the use of northern pike (*Esox lucius*) in polyculture carp ponds in Iran for removing pests such as this species. Jackson & Britton (2013) demonstrated resource sharing with native cyprinids in England. Robins et al. (1991) listed this species as important to North Americans. Importance is based on its use in textbooks.

**Experimental studies:** None.

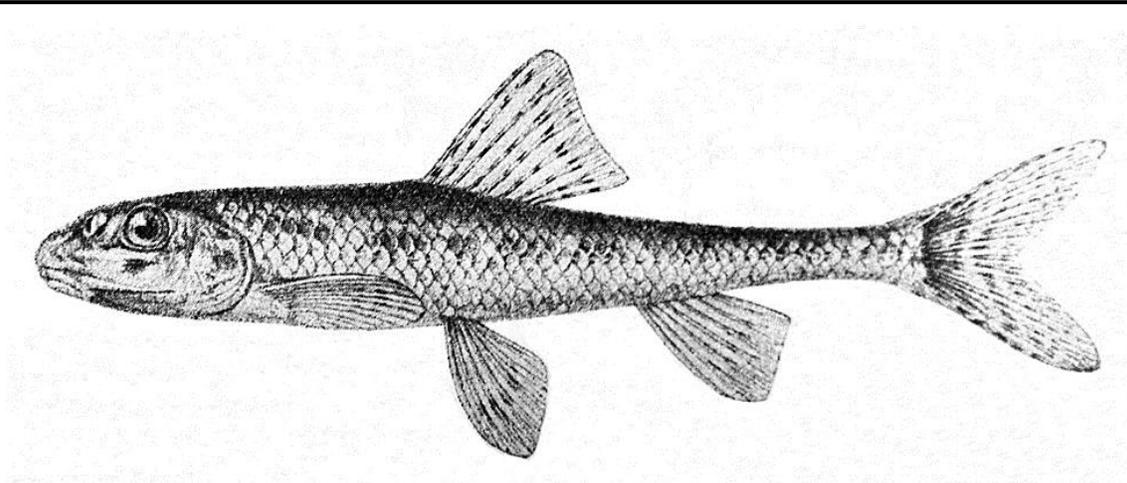
**Conservation:** None required for an introduced species. The distribution of this species as an exotic in Iran should be thoroughly documented and its biology and effects on native species studied. Gozlan et al. (2010) briefly summarised tools for dealing with such an invasive species but once established in open-water bodies of some size, it is almost impossible to eradicate economically. Listed as of Least Concern by the IUCN (2015, <https://newredlist.iucnredlist.org/>, downloaded 15 October 2018) in its native range.

**Sources:** Iranian material: CMNFI 1991-0160, 3, 47.8-55.8mm standard length, Golestan, Abgeer-e Avanness (37°03'N, 54°47'E); CMNFI 1991-0161, 1, 52.5mm standard length, Golestan, Madar Su (37°23'N, 55°47'E); CMNFI 1993-0134, 7, 45.0-59.1mm standard length, Golestan, Gorgan-Aliabad (37°01'30"N, 54°47'36"E); CMNFI 2008-0102, 1, 87.7mm standard length, Kermanshahan, sarabs near Kermanshah (no other locality data); CMNFI 2008-0158, 1, 62.4mm standard length, Lake Urmia basin (no other locality data); CMNFI 2008-0204, 2, 61.3-64.0mm standard length, Sistan (no other locality data).

**Comparative material:-** CMNFI 1983-0204, 7, 51.7-76.6mm standard length, Turkey, Edirne, Meriç River at Ipsala (40°55'N, 26°23'E); CMNFI 1983-0343, 5, 49.9-83.4mm standard length, same locality as preceding.

**Genus *Romanogobio*** Bănărescu, 1961

There are about 19 species in the genus found from Europe to China with two species recorded from Iran.



**Fig.7.** *Romanogobio macropterus*, after Berg (1932; Fig. 328).

Members of the genus have a shallower body than the related *Gobio*, an elongated, usually cylindrical, caudal peduncle, epithelial keels on dorsal scales (easily lost when handled or preserved), an anus placed closer to the pelvic or ventral fins, absolute or average prevalence of caudal vertebrae over abdominal ones, and a higher number of preanal vertebrae (Naseka 1996). Bănărescu in Bănărescu & Paepke (2002) noted that he considered *Romanogobio* as a subgenus and further work was needed to resolve this difference of opinion. Most literature is under the genus *Gobio*.

***Romanogobio macropterus*** (Kamensky, 1901) (Fig. 7)

**Common names:** Kapur-e kafzi-ye Aras (= bottom-dwelling Aras carp), gav mahi (probably in error for *Neogobius* and related gobies) [Kur gumlagcisi in Azerbaijan; Kurinskii peskar' or Kura gudgeon in Russian; Aras gudgeon, South Caucasian gudgeon].

**Systematics:** *Gobio macropterus* was originally described from the Caucasus. The 14 specimens in the type series were deposited in the Georgian State Museum, Zoological Section, Tbilisi (ZMT) and in Kharkov University, Ukraine. Naseka et al. in Bănărescu (1999) cited types of *Gobio macropterus* in the Museum of the Caucasus (Tbilisi, presumably the Georgian State Museum) under numbers 128a (one fish from Alazan) and 129 (four fish from Kars-tschai) and 1-2 fish from the Kura (catalogue number unknown) in Khar'kov University. See below under

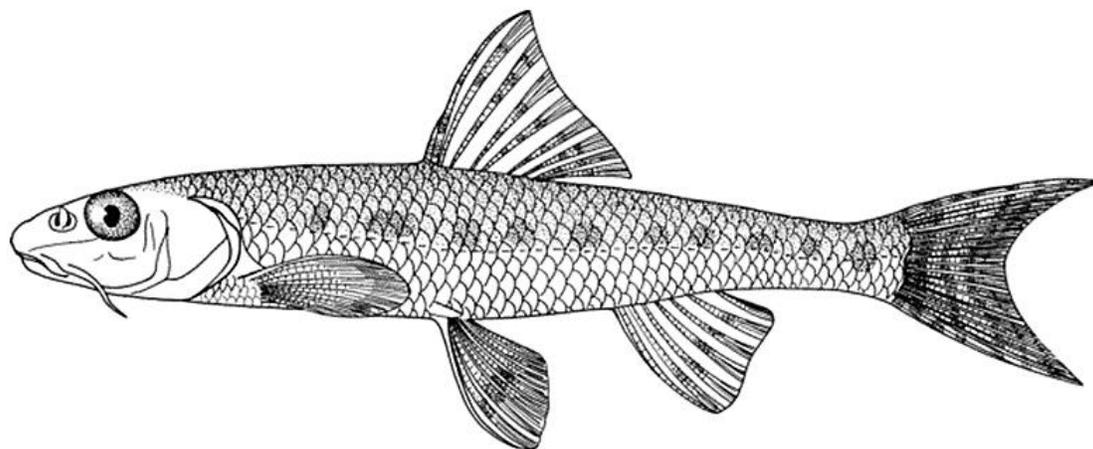
*R. persus* for its changing status.

**Key characters:** The 7 dorsal fin branched rays are characteristic and this is the only *Romanogobio* species in the Caspian Sea basin of Iran (see also below under *R. persus* for distinction of that species).

**Morphology:** Dorsal fin with 3-4, usually 3, unbranched and 7 branched rays, anal fin with 2-3, usually 3, unbranched and 5-7, usually 6, branched rays, lateral line scales 40-45, with modes of 42 and 43. Scales are absent from the throat region. Gill rakers absent or 1-3 on the central part of the arch. Pharyngeal teeth 2,5-5,2 or 3,5-5,3, and more rarely 2,4-5,3, 2,4-6,3, 2,5-5,2, 2,5-5,3 or 3,5-5,2. Total vertebrae 38-42 with modes of 40 and 41. Connections between the supraorbital and infraorbital canals are usually present. The chromosome number is  $2n = 50$ .

**Sexual dimorphism:** Males have scales above the lateral line covered by longitudinal streaks and the head has irregularly-shaped tubercles. Kamensky (1899-1901) noted that males have longer pectoral and pelvic fins than females, snout to anus distance is shorter in males, head width at the nape equals head depth in males but is less in females, and snout length is nearly equal to postorbital distance in males but greater in females.

**Colour:** The body is a light, yellowish-grey above the lateral line and each scale is delineated by pigment. Scales below the lateral line have a dark yellowish border. The flank has 6-12 (usually 7-8) large and



**Fig.8.** *Romanogobio persus*, line drawing by S. Laurie-Bourque.

irregular black spots which may merge into a stripe. A row of spots extends along the back mid-line, about eye diameter size. The head, back and flank have numerous small, dark speckles. The lateral line pits are marked with dark pigment above and below (as in *Alburnoides* species). Dorsal, anal and caudal fins with rows of faint brownish spots, also on the pectoral fins in some. Overall fin colour is similar to the adjacent body.

**Size:** Reaches 13.0cm (Naseka et al. in Bănărescu, 1999).

**Distribution:** Found in the Kura and Aras river basins of Armenia, Azerbaijan and Iran. Abdoli (2000) maps the middle Aras River and its lower Qara Chai or Qara Su tributary, and it is found in the Balekhlu Chai.

**Zoogeography:** Its closest relative is found in the Lake Urmia basin.

**Habitat:** Found in running water probably over sand and gravel in fast, shallow water (Naseka et al. in Bănărescu 1999).

**Age and growth:** Life span is 3 years with maturity at 2-3 years (Banărescu and Nalbant, 1973; Naseka et al. in Bănărescu 1999).

**Food:** The chitinous remains of aquatic insects comprised 30% of the gut contents from samples in the Kura River basin, caddisflies 21%, mayflies 14%, chironomids 12%, sevryuga (= *Acipenser stellatus*) eggs 6%, fish scales 3%, and much of the remainder

was detritus at 20% (Abdurakhmanov 1962). It feeds rarely on fry and eggs of other fishes such as sturgeons (Banărescu & Nalbant 1973).

**Reproduction:** Spawning takes place in May in Azerbaijan (Abdurakhmanov 1962) and each female may spawn several times in a season. Eggs number up to 15,840 and are up to 1.62mm in diameter. Water temperatures of 12-18°C are recorded for Georgia in April to June (Naseka et al. in Bănărescu 1999).

**Parasites and predators:** None reported from Iran.

**Economic importance:** None, except as a predator on sturgeon eggs.

**Experimental studies:** None.

**Conservation:** Vulnerable in Turkey (Fricke et al. 2007).

**Sources:** Iranian material:- CMNFI 1980-0155, 3, 45.9-69.3mm standard length, East Azarbayjan, Qareh Su near Ardebil (ca. 38°15'N, ca. 48°18'E).

**Comparative material:** CMNFI 1980-0806, 1, 93.4mm standard length, Turkey, Kars Çayı, Kars (40°37'N, 43°05'E); CMNFI 1986-0007, 4, 49.4-84.0mm standard length, Turkey, Kars, Kars Çayı north of Kars (41°00'N, 43°00'E).

*Romanogobio persus* (Günther, 1899)

(Fig. 8)

**Common names:** Kapur-e kafzi-ye Irani (= bottom-dwelling Iranian carp), gav mahi (probably in error

for *Neogobius* and related gobies) [Persian gudgeon].

**Systematics:** This species was once thought to belong to the genus *Rheogobio* Bănărescu, 1961 variously regarded as a synonym of *Gobio*, a subgenus or a distinct genus. P.M. Bănărescu (in litt., 1984) and A. Naseka (pers. comm. 1994, in litt. 1995) placed *Gobio persa* in the subgenus *Romanogobio* sensu Bănărescu (1961, 1992) and Naseka (1996) elevated *Romanogobio* to a genus.

A. Naseka (pers. comm. 1994, in litt. 1995, Naseka et al. in Bănărescu 1999) has studied *R. persus* from the Lake Urmia basin and from the Kars, Kura and Aras rivers of Turkey, Georgia and Azerbaijan. He distinguished two subspecies, *R. p. persus* from the Lake Urmia basin and *R. p. macropterus* from the Kura River basin which included the Kars River in Turkey and the Aras River on the border of Iran and Azerbaijan. *Gobio macropterus* Kamensky, 1901 is now regarded as a distinct species (Naseka & Freyhof 2004).

The type series of *Gobio persa* consists of seven specimens, 53.1-65.9mm standard length, in the Natural History Museum, London from "Ocksa in the Gader Chai" in the description and "Ockra. NW Persia. Günther" in the jar, the former being more accurate (BM(NH) 1899:30:90-96).

**Key characters:** The 7 dorsal fin branched rays are characteristic and this is the only *Romanogobio* species in the Lake Urmia basin. The number of lateral line scales is 39-43 with modes of 40 or 41 (41 to 45 with modes of 42 and 43 in *R. macropterus*), vertebrae are 37 to 40 with modes of 38 and 39 (38 to 42 with modes of 40 and 41), and the connection between the supraorbital and infraorbital head canals is usually absent (present in *R. macropterus*). The Lake Urmia species also has a shorter caudal peduncle, a shorter snout, a shorter barbel, and a longer predorsal distance.

**Morphology:** The barbel is broad and fleshy, the mouth subterminal and horseshoe-shaped with thick, papillose lips. The lower head surface between the jaws and the sides of the head are papillose in a mature female.

Dorsal fin with 3, rarely 4, unbranched and 7, rarely 8, branched rays, anal fin with 3, rarely 2, unbranched and 5-7, usually 6, branched rays, pectoral fin branched rays 11-16, and pelvic fin branched rays 6-8, usually 7. Lateral line scales 39-43. A pelvic axillary scale is present. The throat, breast and anterior belly are naked. Dorsal scales bear epithelial keels, usually one central keel and one to several lateral ones. Scales have a very anterior focus and few posterior radii. Gill rakers 0-5, small and irregularly spaced, not obvious and easily lost on examination or obscured on the arch. Vertebrae 37-40. Pharyngeal teeth 2,5-5,2 or 3,5-5,3, or more rarely 2,5-5,1, 2,5-5,3, 2,4-5,3, 2,4-6,3, and 3,5-5,2. Teeth are strongly hooked at the tip, broadly concave or flattened below the tip, the surface sloping medially. Connections between the supraorbital and infraorbital canals are usually absent. The gut is s-shaped with a slight anterior loop to the left. The anus lies between the pelvic fins, remote from the anal fin origin.

Meristic values for Iranian specimens are:- dorsal fin branched rays 7(19), anal fin branched rays 6(19), pectoral fin branched rays 11(1), 12(1), 13(6), 14(5), 15(5) or 16(1), pelvic fin branched rays 7(19), lateral line scales 39(3), 40(6), 41(2), 42(1) or 43(2), pharyngeal teeth 3,5-5,3(5), and total vertebrae 37(1), 38(6), 39(10) or 40(2).

**Sexual dimorphism:** Males and females bear irregular-shaped, elongate tubercles on the head. In a female specimen (and presumably males too), the pectoral and pelvic fin rays and adjacent membranes bear tubercles both dorsally and ventrally although the latter are less well developed. Even small males bear tubercles on the pectoral and pelvic fin rays.

Males have longer pectoral and pelvic fins than females, reaching the pelvic fin and anal fin origin respectively in males. The snout to anus distance is more than half body length in females and about equal in males, head width is less than head depth at nape in females and equal in males, and snout length is longer than postorbital distance in females and about equal in males.

**Colour:** The upper flank is a light yellow-grey to brown with each scale outlined with, or partially filled in with, dark pigment, fading to a yellowish colour below. The mid-flank has 6-12 elongate to rectangular black spots although these may be diffuse. The lateral line pores may have small dark spots above and below reminiscent of *Alburnoides* species. The back also bears vague dark spots. Dorsal, caudal and anal fins with up to five thin bars, this pigment being on the rays and the membranes yellowish. Scales above the lateral line in mature males have longitudinal streaks. Peritoneum silvery with scattered melanophores.

**Size:** Largest fish seen by me is 86.5mm standard length.

**Distribution:** Found in the Lake Urmia basin as an endemic (Günther 1899). Abdoli (2000) mapped the middle and lower Talkheh, lower Simineh and Zarrineh. Also recorded from the Gadar (= Qader), Mahabad, Mardogh and Zarrineh rivers and the Mahabad Dam (Abbasi et al. 2005, Moradi & Eagderi 2014, Ghasemi et al. 2015, Eagderi & Moradi 2017).

**Zoogeography:** Its closest relative is *R. macropterus* in the Caspian Sea basin and like other Lake Urmia fishes is doubtless derived from that basin.

**Habitat:** Found in rivers and streams. Presumably similar to *R. macropterus*.

**Age and growth:** Radkhah & Eagderi (2015) gave a *b* value for 28 fish from the Zarrineh River, 2.9-6.7cm total length, as 2.86, negative allometric growth. Condition factor was 1.019. Age and maturity are probably similar to *R. macropterus*.

**Food:** The principal foods are aquatic insects and crustaceans but detritus and vegetation are also taken and presumably, though rarely, the eggs and fry of other fishes. Abdoli (2000) listed Trichoptera, Ephemeroptera and Chironomidae as food items.

**Reproduction:** An Iranian specimen had relatively large eggs (1.2mm) when captured on 23 June.

**Parasites and predators:** None reported.

**Economic importance:** None, although the presumed habit of feeding on fish eggs make it important in

conservation of other species.

**Experimental studies:** None.

**Conservation:** Endemic to the Lake Urmia basin where few specimens have been caught and deposited in museums. The numbers of this species in the wild are unknown.

**Sources:** Type material: *Gobio persa* (BM(NH) 1899:30:90-96).

Iranian material: CMNFI 2007-0101, 12, 28.8-64.3mm standard length, West Azarbayjan, Tat'u River (ca. 36°54'N, ca. 46°07'E); CMNFI 2008-0158, 1, 86.5mm standard length, Lake Urmia basin (no other locality data).

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## مقاله مروری

### مروری بر گوبیونیدهای ایران (خانواده *Gobionidae*)

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موزه تاریخ طبیعی کانادا، اتاوا، انتاریو، K1P 6P4، کانادا.

چکیده: در این مقاله مروری، سیستماتیک، ریخت‌شناسی، پراکنش، زیست‌شناسی و اهمیت گوبیونیدهای ایران شرح داده شده، تصاویری از آن ارائه گردیده و فهرستی از منابع موجود درباره این گونه لیست شده است. سه گونه بومی از جنس‌های *Gobio* و *Romanogobio* در شمال شرق و شمال غرب ایران و یک گونه بیگانه با پراکنش وسیع *Pseudorasbora parva* در ایران یافت می‌شود. کلمات کلیدی: زیست‌شناسی، ریخت‌شناسی، بیگانه، *Pseudorasbora Romanogobio*، *Gobio Abbottina*.