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ARAŞTIRMA MAKALESİ **RESEARCH PAPER**

Range Extension of *Gobio microlepidotus* Battalgil, 1942 in the Southern Anatolia (Pisces: Cyprinidae)

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Abstract: *Gobio microlepidotus,* which has been known to be restricted to the Lake Beyşehir basin, was found to be distributed in the Mediterranean basin in this study. *Gobio microlepidotus*, populations an upper drainage of Göksu River and stream Limon , tributaries of the Mediterranean Sea, have distinguished features such as a scale-covered breast, scales extending slightly behind to isthmus; 43-46 lateral line scales; 7-9 scale rows between the dorsal-fin origin and lateral line; 6-7 scale rows between the anal-fin origin and lateral line; 5-7 scales between the anus and anal-fin origin; 9-11 scales between the posterior extremity of pelvic-fin bases and the anus.

Keywords: Gudgeon, New record, Turkish Mediterranean coast.

Gobio microlepidotus'un Güney Anadolu'da Dağılım Alanının Genişlemesi (Balıklar: Sazangiller)

Öz: *Gobio microlepidotus* türünün dağılım alanının Beyşehir Gölü havzası ile sınırlı olduğu bilinmektedir. Bu çalışma ile türün Akdeniz kıyılarında bulunan Göksu Nehri'nin yukarı kısımları ve Limon Çayı'nda dağılım gösterdiği tespit edilmiştir.. *Gobio microlepidotus* türünün Göksu ve Limon nehirleri popülasyonlarında, göğüs bölgesinin pullar ile örtülü olması, pulların hemen hemen isthusa kadar ulaşması, ligne-lateral de 43-46 adet pul bulunması, dorsal yüzgeç orijini ile ligne-lateral arasında 7-9 adet pul sırası bulunması, anal-yüzgeç orijini ile ligne-lateral arasında 6-7 adet pul sırası bulunması ve pelvik yüzgeç kaidesinin arka kenarı ile anüs arasında 9-11 adet pul bulunması ile ayrıt edilir.

Anahtar sözcükler: Kaya balığı, Yeni kayıt, Türkiye'nin Akdeniz Kıyıları.

INTRODUCTION

Gudgeon of the genus *Gobio* are widespread from Europe and northern Asia (Kottelat & Freyhof, 2007). In Turkey, the genus *Gobio* occurs in the streams in the Black Sea, the Marmara Sea, Aegean Sea and Central Anatolia basins as well as the an upper drainage of Göksu River in the Mediterranean Sea basin. Erk'akan et al., (2005) and Naseka et al., (2006) recognized seven species from Turkey, which are *G. battalgilae* (stream Eylik in the Lake Beyşehir basin), *G. bulgaricus* (Meriç and Ergene rivers from the Thrace part of Turkey), *G. gymnostethus* (the Eastern Lake Tuz basin), *G. insuyanus* (the western Lake Tuz basin), *G. intermedius* (the Lake Eber and the Lake Akşehir basin), *G. hettitorum* (the southern Lake Tuz basin), *G. microlepidotus* (the Lake Beyşehir), *G. maeandricus* (the Lake Işıklı basin). In recent years, five species of *Gobio* have been described or treated as valid in the region. These are: *G. artvinicus* (the Çoruh River), *G. baliki* (the stream Melen), *G. fahrettini* (the Lake Ilgın basin), *G. kizilirmakensis* (the Kızılırmak River) and *G. sakaryaensis* (the Sakarya River) (Turan et al., 2012; 2016; 2017; 2018). However, taxonomic positions of some populations still have not been settled.

Up to now, there has not been a detailed study on gudgeon species from the Turkish Mediterranean drainages. We collected some specimens of gudgeon from the Limon and an upper drainage of Göksu River in the Turkish Mediterranean coast. Here, we present results of our study on the *Gobio* population from these rivers and identified them as *G. microlepidotus*.

MATERIAL and METHOD

Fish were caught using pulsed DC electro-fishing equipment. After anesthesia, fish were fixed in 5% formaldehyde and stored in 70% ethanol or directly fixed in 99% ethanol. Measurements were made with a dial caliper and recorded to 0,1 mm. All measurements were made from point to point (never by projections). Methods for counts and measurements follow Turan et al. (2016). Scales along the lateral line are counted from the first one just behind the pectoral girdle to the last one on the caudal-fin base. Standard length (SL) is measured from the tip of the snout to the end of the hypural complex. The length of the caudal peduncle is measured from behind the base of the last anal-fin ray to the end of the hypural complex, at mid-height of the caudal-fin base. The last two branched dorsal and anal fin rays, which articulate on a single pterygiophore, were counted as "1½". In the descriptions, numbers in parentheses after a count indicated the number of specimens in which this count was observed.

The morphometric and meristic data for *G. artvinicus*, *G. baliki, G. battalgilae, G. bulgaricus, G. fahrettini*, *G. gymnostethus*, *G. intermedius*, *G. hettitorum*, *G. kizilirmakensis, G. maeandricus* and *G. sakaryaensis* are taken from Turan et al., (2012, 2016, 2017, and 2018). Collection codes: FFR, Recep Tayyip Erdogan University Zoology Museum of the Faculty of Fisheries, Rize.

RESULTS

Gobo microlepidotus from the stream Limon and an upper drainage of Göksu River slightly differs from its Lake Beyşehir population by having a shorter distance between pelvic-fin origin and anal-fin origin (19-23% SL, vs. 23-24 and longer barbels (barbels reaching to vertical of posterior margin of pupil, vs. not reaching).

Figure 1. *Gobio microlepidotus*, FFR uncat., Turkey: Mersin Prov., stream Limon, Mediterranean Sea basin about 90 mm SL, photo: Cüneyt Kaya.

Figure 2. *Gobio microlepidotus,* FFR05973, Turkey: Mersin Prov., stream Limon, Mediterranean Sea basin, from the top, 95 mm SL, male; 89 mm SL, male; 90 mm SL, female; 90 mm SL, female.

Description of Gobio microlepidotus from the stream Limon and an upper drainage of Göksu River: General appearance is shown in Figure 1, 2. Morphometric data are given in Table 1. Breast covered by scales, scales extending slightly behind to isthmus (Figure 3).

Figure 3. *Gobio microlepidotus,* FFR05973, 99 mm SL, male; Turkey: Mersin Prov., stream Limon, Mediterranean Sea basin.

Table 1. Morphometric data of *Gobio microlepidotus* from Limon River (FFR05954, 78-105 mm SL, n=16) and stream Kavaközü (FFR05953, 76-126 mm SL, n=15).

In percent of standard length	Samples		
	Range	Mean	SD
Head length	25.2-28.5	27.2	0.9
Body depth at dorsal fin origin	20.0-25.2	23.2	1.1
Caudal peduncle depth	8.6-11.2	9.7	0.6
Head width$_1$ (ant. margin of eye)	10.3-13.6	12.0	0.7
Head width$_2$ (post. margin of eye)	13.5-17.0	15.1	0.9
Head width$_3$ (at opercle)	14.7-17.6	16.2	0.8
Head depth$_1$ at interorbital region	12.0-14.6	13.1	0.6
Head depth$_2$ (at occiput)	15.1-18.6	16.8	0.9
Eye diameter	4.2-6.1	5.3	0.4
Snout length	9.8-12.1	10.6	0.5
Interorbital width	6.7-8.4	7.8	0.4
Postorbital length	12.4-15.0	13.6	0.6
Snout width at nostrils	9.0-11.7	10.1	0.7
Snout depth at nostrils	7.9-11.4	9.4	0.7
Width of lower jaw	7.0-8.7	7.9	0.5
Length of lower jaw	5.6-8.0	6.7	0.6
Length of barbel	6.4-10.5	7.9	0.9
Predorsal length	46.5-51.7	48.9	1.3
Prepelvic length	48.1-53.3	50.8	1.3
Preanal length	70.0-73.9	72.0	0.9
Pectoral-fin origin to anal fin	44.9-50.5	47.7	1.4
Pectoral-fin origin to pelvic fin	22.5-27.8	25.3	1.3
Pelvic-fin origin to anal fin	19.1-23.4	22.0	1.4
Distance between anus and anal-fin origin	4.8-7.9	6.0	0.9
Caudal peduncle length	18.9-22.9	21.0	1.0
Dorsal fin height	20.7-24.8	22.5	1.1
Pectoral-fin length	18.2-24.0	20.8	1.5
Pelvic-fin length	13.6-18.1	15.6	1.0
Anal-fin length	13.7-17.1	15.4	0.9
Upper caudal-fin lobe	18.1-23.6	20.8	1.4

Body moderately deep, slightly compressed laterally. Predorsal profile convex, postdorsal profile straight and ventral profile slightly convex. Head somewhat long, dorsal profile straight at interorbital area, slightly convex at nostril. Snout with slightly rounded tip, snout length smaller than postorbital distance. Mouth inferior, horseshoe-shaped. Length of mouth gape markedly smaller than its width. Barbels short, reaching to vertical of posterior margin of pupil. Interorbital width 7–8% SL, 1.2–1.7 times eye diameter. Largest individual observed 143 mm SL.

Lateral line with 43 (3), 44 (13), 45 (10) and 46 (3) scales; 8 (20) and 9 (9) scale rows between lateral line and dorsal-fin origin; 6 (14) and 7 (15) scale rows between lateral line and anal-fin origin; 9 (2), 10 (17) and 11 (10) scales between posterior extremity of pelvic fin base and anus; 5 (9), 6 (15) and 7 (5) scales between anus and anal-fin origin. Breast scaled between pectorals, scales extending slightly behind to isthmus (Figure 3). Dorsal fin with 3 simple and 7½ branched rays, its height greater than pectoral-fin length, distal margin slightly concave. Pectoral fin with 16–18 branched rays, reaching zero to 2 in males and 3 to 6 scales in front of pelvic-fin origin in females, distal margin convex. Pelvic fin not reaching to the anus in females but reaching to anus in males, distal margin rounded, with 7 branched rays. Anal fin slender, its depth slightly smaller than pelvic-fin length, with 3 simple and 6½ branched rays, distal margin straight or slightly convex. Caudal fin long, forked, lobes slightly rounded. Pharyngeal teeth 3.5–5.3, slightly hooked.

***Sexual dimorphism*:** There are numerous small tubercles on head and checks in males. Besides, paired fins are longer in males: Pelvic-fin reaching to the anus in males but not reaching in females. Pectoral fin reaching the pelvic-fin origin or 2 scales in front of it in males, while 3 to 6 scales in front of the pelvic-fin origin in females.

Coloration: Formalin preserved individuals: background light brown on dorsum and flank; whitish on belly. Five to nine midlateral blotches in specimens smaller than about 95 mm SL. Blotches fused to one another in specimens larger than about 95 mm SL, forming midlateral stripe. Four to nine blotches on back. Head pale brownish in most individuals or with numerous small dark brown spots and blotches. Slightly dense dark brownish pigments on back and flank scales; pectoral, pelvic and anal fins yellowish, dorsal and caudal fins greyish with small black blotches.

Distribution: *Gobio microlepidotus* is widespread in the from Lake Beyşehir basin. Here, it was recorded first from an upper drainage of Göksu River and stream Limon (Fig. 4, 5).

The differences between Gobio microlepidotus from the stream Limon and an upper drainage of Göksu River and species in adjacent waters: *Gobio microlepidotus* is distinguished from *G. fahrettini* by having more total lateral line scales (43-46 vs. 39-42), more scale rows between dorsal-fin origin and lateral line (8-10 vs. 6-7) and more scales between posterior extremity of pelvic-fin base and anus (9-11 vs. 6-8). *Gobio microlepidotus* is further distinguished from *G. fahrettini* by having a greater postorbital distance (postorbital distance 1.2-1.4 times snout length, vs. 0.9-1.1). *Gobio microlepidotus* is distinguished

from *G. gymnostethus* by having a more slender caudal peduncle (caudal peduncle depth 9-11% SL vs. 11-13), a deeper mouth gape (6-8% SL, vs. 4-6), few black spots on pelvic and anal fins in most individuals (vs. numerous), slightly denser light brownish pigments on dorsum and flank (vs. denser dark brown pigments), the profile of head slightly convex at nostrils (vs. markedly convex) and straight in front of nostrils (vs. slightly concave). *Gobio microlepidotus* is distinguished from *G. insuyanus* by having more scales along lateral line (43-46, vs. 39-44), more scales between posterior extremity of pelvic-fin base and anus (10-11, vs. 8-10) and more slender caudal peduncle (caudal peduncle depth 9-11% SL, vs. 11-13). *Gobio microlepidotus* is distinguished from *G. hettitorum* by having fewer lateral line scales (43-46, vs. 45-49), denser brownish pigments on dorsum and flank (vs. slightly denser light brown pigments), a slightly rounded snout (vs. pointed), five to nine bold midlateral blotches (vs. 5-7 pale brownish midlateral blotches), more fleshy lips (lips fleshy, vs. slightly fleshy) and a greater postorbital length (postorbital length 1.2-1.4, mean 1.3 times snout length, vs. 1.1-1.3, mean 1.2). *Gobio microlepidotus* is distinguished from *G. intermedius* by having fewer lateral line scales (43-46, vs. 45-63), the pelvic fin reaching behind to anus in males (vs. not reaching).

Figure 4. Turkey: an upper drainage of Göksu River, photo: Cüneyt Kaya.

Discussion: *Gobio microlepidotus* species were only known from the Beyşehir basin. With this study, the distribution area of the species has been expanded. It is first recorded from the Limon and Göksu rivers in the Mediterranean basin. These populations are slightly separated in the Beysehir population. However, this distinction is not at the species level.

Examined Materials: FFR 05973, 16, 54-99 mm SL, male; Turkey: Mersin Prov.: stream Limon 4 km southern Özboynuinceli; 36°56'30" N 33°44'54" E, 10 Nov 2016. - FFR 05953, 26, 52-125 mm SL; Turkey: Mersin Prov.: an upper drainage of Göksu River, at southeastern Kavaközü; 36°52'08" N 33°24'07" E; 04 June 2008. - FFR 05975, 26, 52-125 mm SL; Turkey: Mersin Prov.: an upper drainage of Göksu River at southeastern Kavaközü; 36°52'08" N 33°24'07" E; 13 May 2018. - FFR 05954, 26, 40-107 mm SL; Turkey: Mersin Prov.: stream Limon at 5 km southern Özboynuinceli; 36°56'13" N 33°44'57" E; 05 July 2010.

Figure 5. Turkey: stream Limon, photo: Cüneyt Kaya.

Comparative Material;

***Gobio sakaryaensis*:** FFR 02505, 10, 49-89 mm SL; Turkey: Bilecik prov.: stream Tozman at north of Tarpak. - IUSHM 2010-1000, 4, 73-115 mm SL, Turkey: Eskisehir prov.: stream Pürtek at eastern Oğlakçı. - IUSHM 2010-1001, 5, 72-93 mm SL, Turkey: Eskisehir prov.: stream Porsuk at southeastern Kümbetyeniköy.

***Gobio hettitorum*:** FFR 05948, 3, 100-102 mm SL; Turkey: Karaman prov.: stream Güves above Gödet reservoir at north of Basharman. - FFR 05950, 20, 82-127 mm SL; Turkey: Karaman prov.: stream Yesildere above drainage of Ibrala reservoir at east of Taskale.

FFR 05948, 18, 55-97 mm SL; Turkey: Konya Prov.: Cihanbeyli County, stream İnsuyu at İnsuyu, drainage of Tuz Lake.

***Gobio gymnostethus*:** FFR 05943, 34, 39-117 mm SL; Turkey: Aksaray Prov.: stream Melendiz at Demirci, drainage of Tuz Lake. - FFR 05951, 15, 88-120 mm SL; Turkey: Aksaray Prov.: Melendiz River at Kızlarpınarı, drainage of Tuz Lake. *Gobio intermedius*: FFR 01153, 10, 63-90 mm SL, Turkey: Afyon Prov.: stream Gali at 5 km northeastern İnli, drainage of Lake Eber. - FFR 05949, 26, 48-130 mm SL, Turkey: Afyon Prov.: stream Gali at southwestern Maltepe, drainage of Lake Eber.

***Gobio microlepidotus*:** FFR 05944, 30, 49-138 mm SL; Turkey: Konya Prov.: stream Akçay at Gökçehüyük, drainage of Lake Beysehir. - FFR 05947, 3, 107-126 mm SL; Turkey: Konya Prov.: stream Kugulu at southern Seydisehir, drainage of Lake Beysehir. - FFR 01154, 12, 70-100 mm SL; Turkey: Konya Prov.: Sarıöz canal, the lower part of stream Eyilikler at eastern Beysehir, drainage of Lake Beysehir. - FFR 05945, 5, 94-124 mm.

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