www.trjfas.org
ISSN 1303-2712
Turkish Journal of Fisheries and Aquatic Sciences 15: 181-186 (2015) DOI: 10.4194/1303-2712-v15_1_20

PROOF

Alburnus selcuklui, A New Species of Cyprinid Fish From East Anatolia, Turkey (Teleostei: Cyprinidae)

Mahmut Elp[1,*], Fazıl Şen[1], Müfit Özuluğ[2]

[1] Yüzüncü Yıl University, Fisheries Faculty, Zeve Campus, 65080, Van, Turkey.
[2] Istanbul University, Science Faculty, Department of Biology , Istanbul, Turkey.

* Corresponding Author: Tel.: +90.543 9133624; Fax: +90.432 2251247;
E-mail: mahmutelp@yyu.edu.tr

Received 25 November 2014
Accepted 31 March 2015

Abstract

Alburnus selcuklui, a new species from a branch of Botan stream of the River Tigris in East Anatolia Turkey, is distinguished from other Anatolian *Alburnus* species by the anal-fin origin 0-4 scales behind the base of the dorsal fin-base, 70-80 + 3-4 lateral line scales, 10-15 gill rakers, 8½-9 branched dorsal-fin rays, 11-12½ branched anal-fin rays, snout rounded, prominent epidermal lateral stripe and lateral body without black pigmentation along and below lateral line.

Keywords: Taxonomy, freshwater fish of Turkey, Euphrates-Tigris.

***Alburnus selcuklui*, Doğu Anadolu Bölgesinden Yeni Bir Cyprinid Türü, Türkiye (Teleostei: Cyprinidae)**

Özet

Doğu Anadolu Bölgesinde Botan Çayı'nın bir kolundan örneklenen ve yeni bir tür olan *Alburnus selcuklui* Anadolu'daki diğer *Alburnus* türlerinden anal yüzgeç başlangıcının dorsal yüzgeç bitimine gore 0-4 pul geriden başlaması, yanal çizgi hattında 70-80+3-4 pul bulunması, 10-15 solungaç dikeni, 8½-9 dorsal yüzgeç yumuşak ışını, 11-12½ anal yüzgeç yumuşak ışını, burunun yuvarlak oluşu, belirgin epidermal yanal bant ve vücudun yan tarafında yanal çizgi ve altında siyah pigmentlerin bulunmaması ile ayırt edilir.

Anahtar Kelimeler: Taksonomi, Türkiye tatlısu balıkları, Dicle-Fırat Havzası.

Introduction

The genus *Alburnus* is an excellent example for high diversity and endemism in western Palearctic freshwater fishes. During the last years, Freyhof and Kottelat (2007a-b) and Kottelat and Freyhof (2007) have reviewed the European species of *Alburnus* and Özuluğ and Freyhof (2007a-b) did so for some Western Anatolian species. With 21 species of *Alburnus*, Turkey is clearly the center of diversity of this genus, which actually holds 41 species (Özuluğ and Freyhof, 2007a). Euphrates-Tigris drainage basin is one of the most important basins in Turkey and the Middle East. However, fauna studies based on new characters have not completed yet in the region. Until now *A. heckeli, A. caeruleus, A.mossulensis* and *A. zagrosensis* were reported from the Euphrates-Tigris drainage basin (Kuru, 1975; Gül *et al.* 2004; Coad, 2009).

There have been still some uncertainties related to *Alburnus* species living in Anatolia. For example, it is not clear whether *A. sellal* and *A. mossulensis* are synonym or not (Bogutskaya, 1997, Coad, 2015, Krupp *et al.*, 1992, Özuluğ and Freyhof, 2007b). It is also doubtful whether *A. adanensis* is a valid species (Bogutskaya *et al.*, 2000). The last recent comprehensive study was done by Kuru (1975), but since then diagnostic characters have considerably changed. The last resolved problem on the Anatolian *Alburnus* species was in the Van Lake basin. *Alburnus timarensis* was described as valid species. Second *Alburnus* species was confirmed in Lake Van Basin (Elp *et al.*, 2013). During an ichthyological survey of a branch of Tigris in Eastern Anatolia in 2008, we collected an *Alburnus* species representing distinct characters. The aim of the present study is to describe the new distinct *Alburnus* species.

Materials and Methods

All fish were preserved in 4% formaldehyde. Measurements were made point-to-point with dial

© Published by Central Fisheries Research Institute (CFRI) Trabzon, Turkey
in cooperation with Japan International Cooperation Agency (JICA), Japan

calipers and recorded to 0.1 mm. All measurements are made point-to-point, never by projections. Methods for counts and measurements follow Kottelat and Freyhof (2007). Standard length (SL) is measured from the tip of the upper lip 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. Lateral line scales are counted from the anterior most scale (the first one to touch the shoulder girdle) to the posterior most one (at the end of the hypural complex). Scales on the caudal fin itself are indicated by "+". Gill rakers are counted on the first gill arch. The last two branched rays articulating on a single pterygiophore in the dorsal and anal fins are noted as "1½". The position of the anal-fin origin is given as the number of scales behind dorsal-fin base along dorsal midline under which is located the base of the first anal-fin ray. The length of the exposed part of the ventral keel is measured as the number of transverse scales rows along the exposed part of the keel, counted from the anus forwards.

Abbreviations used: SL, standard length; YYU-ZF, Private collection of Mahmut Elp, Fisheries Faculty, Yüzüncü Yıl University, Van, Turkey; IUSHM: Istanbul University, Science Faculty, Hydrobiology Museum, İstanbul, Turkey; FSJF, Fischsammlung J. Freyhof, Berlin.

Results

Key to the *Alburnus* Species of the Euphrates-Tigris Drainage, Lake Van and the Caspian Sea basins

1a. Anal-fin origin below dorsal-fin rays 4-5.
……*A. hohenackeri*
1b. Anal-fin origin bellow base of last dorsal fin ray or behind dorsal fin-base.
……2
2a. Usually 45-68 total lateral line scales.
……3
2b. Usually 73-98 total lateral line scales.
……5
3a. 18-23 gill rakers.
……*A. chalcoides*
3b. 13-19 gill rakers.
……4
4a. No or very faint lateral stripe; 11-13 scale rows between dorsal-fin origin and lateral line; anal-fin origin 3-4 scales behind dorsal-fin base.
……*A. timarensis*
4b. Prominent black lateral stripe; 8-11 scale rows between dorsal-fin origin and lateral line; anal-fin origin below the base of the last dorsal-fin ray or ½-1½ scales behind.
……*A. filippii*
5a. 10-17 gill rakers.
…… 6
5b. 19-29 gill rakers.
……8
6a. Anal fin branched rays 9-10, mode at 9
…… *A. zagrosensis*
6b. Anal fin branched rays 10-13, modes at 11-12
…… 7
7a. Snout rounded; ventral keel not distinct in front of the anus; 8½-9 branched dorsal-fin rays
…… *A. selcuklui*
7b. Snout pointed; ventral keel distinct and sharp in front of the anus; 7-8½ branched dorsal-fin rays …… *A. mossulensis*
8a. No or very faint lateral stripe; head obtuse; eye diameter 1.3-1.6 times in interorbital distance.
…… A. *tarichi*
8b. Prominent black lateral stripe; head pointed; eye diameter 0.8-1.2 times in interorbital distance.
…… *A. heckeli*

Alburnus selcuklui, New Species

Holotype: YYU-ZF 2008-14a, 115.5 mm SL; Turkey: Tatvan province: a branch of Botan Stream, 38°21.289 N 42°41.633 E; M. Elp & F. Şen, 21.05.2008.

Paratype: YYU-ZF 2006-01, 4, 55.9-98.3 mm SL; YYU-ZF 2008-14, 9, 59.2-106.1 mm SL; same data as holotype.

Diagnosis: *Alburnus selcuklui* is distinguished from other species of *Alburnus* in East Anatolia by the combination of: head short, snout rounded, anal-fin origin 0-4 scales behind dorsal fin-base, 70-80 + 3-4 lateral line scales, 10-15 gill rakers, prominent epidermal lateral stripe; lateral body without black pigmentation along and below lateral line, 8½-9 branched dorsal-fin rays and 11-12½ branched anal-fin rays. A very weak ventral keel exposed for 8-16 scales in front of anus; head length 21-24 % SL, 0.9-1.2 times in body depth at dorsal-fin origin; predorsal length 52-56 % SL; caudal peduncle depth 9-11 % SL, caudal peduncle length 21-24 % SL; eye diameter 23-30 % head length, 0.78-1.08 times in interorbital distance; body depth at dorsal-fin origin 20-26 % SL; faint, dark lateral stripe on body. Caudal peduncle 2.0-2.6 times longer than deep.

Description: See Figure 1 for general appearance and Table 1 for morphometric data. Dorsal and ventral body profile slightly convex. Body and caudal peduncle moderately compressed. Head profile straight, head length 0.9-1.2 times in body depth. Back humped behind nape. Snout rounded its length 1.6-1.9 times in postorbital length. Mouth slightly superior, uppermost point of cleft at level of center of eye or slightly below, lower jaw very slightly projecting beyond tip of upper jaw. Eye diameter 1.8-2.3 times in head depth at eye, 0.8-1.1 times in

Figure 1. *Alburnus selcuklui*; Turkey: from a branch of Botan Stream: **a**, holotype, 115.1 mm SL, YYU-ZF 2008-14a; **b**, paratype, 106.1 mm SL, YYU-ZF 2008-14.

Table 1. Morphometric data of *A. selcuklui* (YYU-ZF 2006-01, YYU-ZF 2008-14a, YYU-ZF 2008-14; n=14)

	mean	min	max	SD
Standard length (mm)	84.8	55.9	115.5	18.2
In percent of standard length				
Dorsal Head length	17.3	14.7	18.8	1.1
Lateral head length	23.2	21.4	24.3	1.0
Body depth at dorsal-fin origin	23.4	20.9	26.5	1.7
Body width at dorsal-fin origin	13.0	11.0	16.4	1.6
Predorsal length	54.2	52.1	56.2	1.4
Prepelvic length	49.1	47.1	50.9	1.1
Preanal length	68.0	66.4	70.6	1.2
Head depth at eye	11.8	10.7	13.0	0.7
Head depth at nape	16.2	15.1	17.6	0.7
Head depth at gill opening	19.1	17.3	20.3	1.0
Depth of caudal peduncle	9.7	8.7	11.0	0.6
Length of caudal peduncle	22.9	21.0	24.3	1.0
Dorsal-fin length	19.0	17.1	20.3	1.0
Anal-fin base length	13.1	11.4	14.8	1.0
Pelvic fin length	14.5	13.8	16.0	0.7
Pectoral fin length	17.6	15.6	19.3	1.0
In percent of head length				
Eye diameter	25.4	23.0	29.8	2.0
Interorbital distance	28.4	24.3	31.8	2.2
Snout length	27.0	25.3	28.8	1.1
Head depth at eye	51.0	47.4	54.7	2.3

interorbital width. Caudal peduncle 2.0-2.6 times longer than deep. Anal-fin origin 0-4 scales behind dorsal-fin base. Pelvic-fin origin in front of dorsal-fin origin. Caudal-fin forked, lobes rounded. Pectoral fin reaching to about 60-80 % to pelvic-fin origin. Pelvic fins short, not reaching anal-fin. Pelvic axillary lobe present. Margin of dorsal and anal fins straight to slightly concave. Largest recorded specimen 115 mm SL.

Dorsal fin with 2-3 simple and 8½ (12), 9½ (1) branched rays. Anal fin with 3 simple and 11 (1), 11½ (8), 12 (1), 12½ (2) branched rays. Caudal-fin forked, lobes rounded, 10-14 principal and 17-18 branched rays. Pectoral fin with 13-16 (mode 14) rays and pelvic fin 7-8 (mode 8) rays. Body covered by overlapping scales. Lateral line complete, reaching caudal–fin base, perforating 70(1), 71(0), 72(3), 73(0), 74(1), 75(3), 76(1), 77(0), 78(1), 79(1), 80(1) scales on body and 3-4 on caudal-fin base (total 73-83 (mode 75). Frequency distribution of total lateral line

scales are given in Table 2. A very weak keel between posterior pelvic-fin base and anus not reaching pelvic-fin base, exposed for 8-16 scales in front of the anus. This week keel is not good visible, it is covered with left and right ventromedial scales (Figure 2). 13-18 (mode 14) scales between lateral line and dorsal-fin origin, 5-7 (mode 6) scales between lateral line and pelvic-fin origin. Pharyngeal teeth in two rows, 2.5-5.2, slightly serrated, hooked at tip. Gill rakers short and thick, 10 (1), 11 (2), 12 (2), 13 (3), 14 (3), 15 (1) total gill rakers in outer side of first gill arch in material examined. Males with fine nuprial tubercles on dorsal part of head in Mai.

Coloration: Body silvery with greenish back. A faith dark external stripe along lateral midline in live and preserved individuals. Scattered minute black spots on body above lateral midline in some individuals. An inner axial stripe in preserved individuals. Based of paired fins silvery. Fin membranes and rays hyaline.

Distribution and Ecological Notes: *Alburnus selcuklui* was collected from a small branch of Botan stream from Tigris drainage. The stream bed is stony-gravely. Sampling locality is 5 km far from the head water. The water is clean and flow is currently because of downgrade. The stream water has been used for irrigation. The stream flow rate is about 200-3000 liter/sc. Its flow rate changes with season. Its flow rates increase with the melt of snow in spring, but decreases in hot summer.

Etymology:The species is named for The Great Selcuklu (Seljuk) Empire (1037–1194), originating from the branch of Oguz Turks, which controlled a vast area stretching from the Hindu Kush to eastern Anatolia and from Central Asia to the Persian Gulf.

Comparative Remarks

The samples were collected from Euphrates-Tigris drainage basins. In Euphrates-Tigris drainage, four species of *Alburnus* are known, *A. caeruleus* (widely distributed in Tigris drainage), *A. heckeli* (endemic to Lake Hazer in upper Tigris drainage) *A. mossulensis* (widely distributed in Tigris drainage) and *A. zagrosensis* (restricted to upper Karum River basin, Iran) (Kuru, 1975; Gül *et al.*, 2004; Coad,

Table 2. Frequency distribution of total lateral line scales in *Alburnus selcuklui* (n= 13), *A. timarensis* (n=25) and *A. tarichi* (n=36)

Species	*A. selcuklui*	*A. timarensis*	*A. tarichi*
57		1	
58		0	
59		0	
60		1	
61		1	
62		4	
63		3	
64		1	
65		3	
66		6	
67		2	
68		3	
69			
70			
71			
72			
73	2		
74	0		1
75	3		0
76	0		1
77	1		1
78	3		4
79	1		1
80	0		7
81	1		5
82	1		2
83	1		6
84			2
85			3
86			1
87			0
88			1
89			1

Figure 2. Ventral view of ventral keel **a**, *Alburnus selcuklui*; **b**, *Alburnus mossulensis.*

2009). Another species *A. sellal* is known from Kuveik drainage. It is also doubtful whether *A. sellal* is a valid species (Bogutskaya, 1997, Coad, 2015). We have examined some examples from Turkish part of Kuveik drainage, but we not found any good diagnostic differences between *A. sellal* and *A. mossulensis*. The evidence is not definite for separation or synonymy for this two taxa.

Alburnus selcuklui is distinguished from *A. caeruleus*, *A. heckeli*, *A. mossulensis* and *A. sellal* by rounded snoth (vs. pointed) and very slightly projected lower jaw (vs. distinctly projected). *Alburnus selcuklui* is distinguished from *A. caeruleus* by 70-80 +3-4 lateral line scales (vs. 48-53 + 2-3), 10-15 gill rakers (vs. 8-12), 11-12½ branched anal-fin rays (vs. 14-15), anal-fin origin 0-4 scales behind dorsal-fin base (vs. below dorsal-fin rays 7-8) and the ventral keel is not reaching to pelvic fins base (vs. reaching to pelvic fins base). *Alburnus selcuklui* is distinguished from *A. mossulensis* and *A.sellal* by 10-15 gill rakers (vs. 13-17), snout rounded (vs. snout pointed) and ventral keel weak (vs. distinct). *Alburnus selcuklui* is distinguished from *A. heckeli* by 70-80 +3-4 lateral line scales (vs. 82-93 + 3-4) and 10-15 gill rackers (vs. 19-26) and 11-12½ branched anal-fin rays (vs. 12-14). *Alburnus selcuklui* is distinguished from *A. zagrosensis* by 11-12½ branched anal-fin rays (vs. 9-10), 8½-9 branched dorsal-fin rays (vs. 7-8), ventral keel exposed for 8-16 scales in front of the anus (vs. 1-11, almost no keel). Euphrates and Tigris drainage is situated also geographically close the Caspian Sea basin by Aras River inhabited by *A. chalcoides*, *A. filippi* and *A. hohenackeri*. *Alburnus selcuklui* is distinguished from *A. chalcoides*, *A. filippi* and *A. hohenackeri* by rounded snoth (vs. pointed) and very slightly projected lower jaw (vs. distinctly projected). *Alburnus selcuklui* is distinguished from *A. chalcoides* by having 10-15 gill rakers (vs. 18-23), 11-12½ branched anal-fin rays (vs. 13-15½) and faint dark lateral stripe in life (vs. absent). *Alburnus selcuklui* is distinguished from *A. filippi* by having 70-80 +3-4 lateral line scales (vs. 45-60+3) and 13-18 scale rows between dorsal-fin origin and lateral line (vs. 8-11). *Alburnus selcuklui* is distinguished from *A. hohenackeri* by having usually 70-80 + 3-4 lateral line scales (vs. 38–43 + 3) and anal-fin origin 0-4 scales behind dorsal-fin base (vs. below dorsal-fin rays 4-5).

Van Lake basin is another basin close to Euphrates and Tigris drainage and it is inhabited by *A. tarichi* and *A. timarensis* (Elp *et al.*, 2013; Elp *et al.*, 2014). *Alburnus selcuklui* is distinguished from *A. tarichi* by having 10-15 gill rakers (vs. 21-29), 8½-9 branched anal-fin rays (vs. 10-12½) and faint dark lateral stripe in life (vs. absent). *Alburnus selcuklui* is distinguished from *A. timarensis* by having 70-80 +3-4 lateral line scales (vs. usually 54-65 + 3-4), 8½-9 branched anal-fin rays (vs. 10-12½) and 10-15 gill rakers (vs. 13-17).

Comparison Material

Alburnus caeruleus Heckel, 1843*:* IUSHM 37800-349, 5, SL 47.9-51.6 mm, Turkey, Adıyaman province, Stream Eğri 6 km SE of Adıyaman, tributary to Atatürk Damlake (37°45'N, 38°20'E). IUSHM 37800-351, 18, SL 29.7-49.6 mm, Turkey, Adıyaman province, Stream Çakal, 13 km W of Adıyaman, tributary to Atatürk Damlake (37°43'N, 38°10'E); IUSHM 37800-341, 11, SL 42.9-53.1 mm, Turkey, Diyarbakır province, River Tigris S of Diyarbakır at Ten-eye-bridge (37°53'N, 40° 14'E).

A. chalcoides (Güldenstädt, 1772): FSJF 1573, 13, SL 103-230 mm, Russia, mouth of River Samur (41°52'N, 48°33'E); FSJF 1769, 7, SL 120-167 mm, Iran, Mazandaran province, River Tajan below Shahid dam, about 30 km S of Sari (36°17'N, 53°14'E).

A. filippii Kessler, 1877: FSJF 2193, 7, SL 84-120 mm, Turkey, stream Hanata, a tributary to River Kura; FSJF 2194, 10, SL 57-95 mm, Turkey, Kars province, stream Selin, a tributary of River Aras; ZMH 4410, 1, SL 14.4 mm, Turkey, Kotanlı.

A. heckeli Battalgil, 1944: IUSHM 37980-490, 21, SL 60.8-119.2 mm; Turkey, Elazığ province, outflow of Lake Hazer west of Gezin (38°30'N, 39°30'E).

A. hohenackeri Kessler, 1877: FSJF 1577, 15, SL 55.3-78.9 mm, Russia, irrigation canal between Rivers Terek and Kuma (43°23'N, 47°22'E).

A. mossulensis Heckel, 1843: IUSHM 2013-1047, 13, SL 56.7-116.4 mm, Turkey, Sivas province, stream Malcılı at road from Gürün to Kangal, about 30 km N of Gürün (39°05'N, 37°14'E); IUSHM 2013-1049, 11, SL 65.1-94.5 mm, Turkey, Adıyaman province, upper River Göksu, 5 km NE of Gölbaşı (37°50'N, 37°41'E); IUSHM 2013-1048, 8, SL 67.9-106.9 mm, Turkey, Diyarbakır province, River Tigris south of Diyabakır at Ten-eye-bridge (37°53'N, 40°14'E); IUSHM 2015-1162, 10, SL 38.3-100.3 mm, Turkey, Diyarbakır province, River Tigris 5 km west of Hasankeyf (37°43'N, 40°21'E).

Alburnus sellal Heckel, 1843: IUSHM 2015-1161, 8, SL 76.3-109.9 mm, Turkey, Kilis province, Stream Kuveik.

Alburnus tarichi (Güldenstädt 1814): IUSHM 2013-1046, SL 169 mm, Lake Van, (38°31'N, 43°17'E); IUSHM 28200-822, 4, SL 142-151 mm, Lake Van; YYU-ZF 2006-02, 9, SL 132-202 mm, stream Güzelkonak, Lake Van drainage (38°19'N, 42°59'E); YYU-ZF 2006-06, 6, SL 136-199 mm, stream Çem, Lake Van drainage (38°18'N, 43°06'E); YYU-ZF 2006-09, 3, SL 155-186 mm, stream Sapur, Lake Van drainage (38°28'N, 42°18'E); YYU-ZF 2006-11, 3, SL 153-159 mm, stream Karmuç, Lake Van drainage (38°44'N, 42°25'E); YYU-ZF 2007-01, 11, SL 136-167 mm, Lake Van (38°30'N, 43°04'E).

Alburnus timarensis Kuru, 1980: IUSHM 37990-509, 5, SL 54-100 mm, Van province, stream Karasu (38°39'N, 43°17'E). IUSHM 2013-1045, 5, SL 53-94 mm, Van province, stream Karasu 5 km east

of Alaköy village (38°39'N, 43°17'E); YYU-ZF 2006-23, 15 SL 60-108 mm, Van province, stream Karasu (38°39'N, 43°17'E).

Acknowledgements

We thank for supporting this project the Head of Scientific Research Project of Yüzüncü Yil University (Project No: 2006-ZF-YTR 12). We are pleased to thank Jörg Freyhof (Berlin) for his comments and the loan of material.

References

Bogutskaya, N.G. 1997. Contribution to the knowledge of leuciscine fishes of Asia Minor. Part 2. An annotated checklist of leuciscine fishes (Leuciscinae, Cyprinidae) of Turkey with descriptions of a new species and two new subspecies. Mitteilungen aus dem Hamburgischen Zoologischen Museum und Institut, 94: 161-186.

Bogutskaya, N.G., Kucuk, F. and Unlu, E. 2000. Alburnus baliki, a new species of cyprinid fish from the Manavgat River system, Turkey. Ichthyological Exploration of Freshwaters, 11(1): 55-64.

Coad, B.W. 2009. *Alburnus zagrosensis* N. sp., a new species of fish from the Zagros Mountains of Iran, Zoology in the Middle East, 48 (1): 63-7. doi: 10.1080/09397140.2009.10638367

Coad, B.W. 2015. Freshwater fishes of Iran. http://www.briancoad.com/species%20accounts/Cyprinidae%20Introduction%20and%20Abramis%20to%20Cyprinus.htm (accessed April 06, 2015).

Elp, M., Özuluğ, M., Şen, F. and Freyhof, J. 2013. Validation of Alburnus timarensis from the Lake Van basin, eastern Anatolia (Teleostei: Cyprinidae). Zoology in the Middle East, 59(3): 235-244. doi: 10.1080/09397140.2013.841430

Elp, M., Şen, F. and Atıcı, A.A. 2014. İnci Kefalinin (*Alburnus tarichi* (Guldenstaedtii, 1814)) Van Gölü Havzası Su Kaynaklarındaki Yayılım Bölgeleri. YYU Tar Bil Drg. (YYU J AGR SCI), 24(3): 228-232.

Freyhof, J. and Kottelat, M. 2007a. *Alburnus* vistonicus, a new species of shemaya from eastern Greece, with remarks on *Chalcalburnus macedonicus* from Lake Volvi (Teleostei: Cyprinidae). Ichthyological Exploration of Freshwaters, 18: 205-212.

Freyhof, J. and Kottelat, M. 2007b. Review of the Alburnus mento species grupe with description of two new species (Teleostei: Cyprinidae). Ichthyological Exploration of Freshwaters, 18: 213-225.

Gül, S., Çolak, A., Sezgin, İ. and Kaloğlu, B. 2004. Karyotype Analysis in *Alburnus heckeli* (Battalgil, 1943) from Lake Hazer. Turkish Journal of Veterinary and Animal Sciences, 28: 309-314.

Kottelat, M. and Freyhof, J. 2007. Handbook of European freshwater fishes (Vol. 13). Cornol: Publications Kottelat, 646 pp.

Kuru, M. 1975. Dicle-Fırat, Kura-Aras, Van Gölü ve Karadeniz Havzası Tatlısularında Yaşayan Balıkların (Pisces) Sistematik ve Zoocoğrafik Yönden İncelenmesi. Associate Professor Thesis. Erzurum: University of Atatürk.

Krupp, F., Al-Hassan, L.A.J. and Ziegler, T. 1992. A possible natural hybrid of *Acanthobrama marmid* and *Alburnus mossulensis* from Haur al-Hammar, southern Iraq. Senckenbergiana Biologica, 72(4/6):219-223.

Özuluğ, M. and Freyhof, J. 2007a. Rediagnosis of four shemayas from western Turkey and description of two new species (Teleostei: Cyprinidae). Ichthyological Exploration of Freshwaters, 18: 233-246.

Özuluğ, M. and Freyhof, J. 2007b. *Alburnus demiri*, a new species of bleak from Western Anatolia, Turkey (Teleostei: Cyprinidae). Ichthyological Exploration of Freshwaters, 18: 307-312.