

Taxonomic assessment and distribution of fishes in upper Kura and Aras river drainages

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Abstract

In the present study, the actual fish fauna of the upper Kura and Aras river drainages in Turkey were re-examined. The distribution and latest taxonomic status of the species were assessed. The study area comprises the upper part of Kura and Aras river drainages, in Turkey. Overall, 32 sampling sites were prospected between 2004–2018 to inventory fish species in the area and a total of 33 species were recognized, five of which are recorded for the first time from the Turkish part of upper Aras river drainage, namely *Alburnus hohenerkeri*, *Blicca bjoerkna*, *Gobio artvinicus*, *Neogobius fluviatilis* and *Rhodeus amarus*.

Key Words

Anatolia, biodiversity, Caspian Sea basin; fish fauna

Introduction

The Kura and Aras rivers and their tributaries are located in the south of the Caucasus Mountains. Both rivers originate in Anatolia and flow towards the east. Kura, after leaving the borders of Turkey, passes through Georgia, and then flows into Azerbaijan. Aras, before leaving Turkey, flows along the borders between Turkey and Armenia, between Turkey and Nakhchivan and then flows throughout the borders between Iran and three countries (Nakhchivan, Armenia and Azerbaijan, respectively). Both rivers further merge in Sabirabad (Azerbaijan) and flow into the Caspian Sea.

Fricke et al. (2007) recorded many fish species new to Turkish freshwaters. Most of these records were given from some of the transboundary rivers (e.g. Maritza, Orontes, Tigris-Euphrates and Kura-Aras river systems, and Çoruh River). These records were partially accepted and followed as most of these new occurrences were not ascertained through specimens deposited in a national collection. This situation has caused an overestimate of the number of freshwater fish species in Turkey (Çiçek et al. 2015, 2018).

Çiçek and Sungur Birecikligil (2016) listed fish species of the upper Kura-Aras River drainages based on their own observations and earlier records in the literature. They observed 19 species but listed 32 species by including 13 species that were recorded in the previous studies.

Inconsistent and erroneous occurrence records of species given by previous studies from upper Kura and Aras drainages have resulted in contradictory taxonomic evaluations among researchers. Therefore, here we attempt to re-assess the fish fauna of the upper Kura and Aras river drainages based on materials from our field surveys and up-to-date taxonomic nomenclature.

Material and methods

Study area

The study area comprises the upper part of Kura and Aras river drainages, the Caspian Sea basin. Overall, 32 sampling sites, 9 from Kura and 23 from Aras drainages, were detected to reveal fishes in the area (Table 1).

Data collection and analyses

Fishes were caught between 2004–2018 by Samus 1000 pulsed DC electro-fishing equipment, cast and gill nets from 32 sampling sites (Fig. 1). After anaesthesia, fish specimens were fixed in 4% formaldehyde and transferred to the laboratory for further identification. Formalin-fixed specimens were deposited at FFR (Recep Tayyip Erdogan University Zoology Museum of the Faculty of Fisheries, Rize). We followed Berg (1949) and Kottelat and Freyhof (2007) to identify species, Van der Laan et al. (2015) to arrange species in families. All species were arranged alphabetically within their own families. Common and local names of the species originate from FishBase (Froese and Pauly 2019). If the species are unnamed or do not have a proper name, new names are recommended in this study. The new names are denoted by an asterisk (*) at the end of the name. The global conservation status of the species is provided by International Union for Conservation of Nature (IUCN 2020).

Results

Overall, 33 fish species (Table 1) belonging to nine families were recognized. The most species-rich family in the area is Leuciscidae (10 species), followed by Cyprinidae (7), Salmonidae (4), Gobionidae (3), Nemacheilidae (3), Cobitidae (2), Gobiidae (2), Acheilognathidae (1) and Siluridae (1).

Twenty species, which were reported in earlier studies, were excluded from the fish fauna of the upper Kura-Aras drainages. Some of these species were already highlighted as declining by some authors or accepted as extinct (See Table 2 for details). *Alburnus hohenackeri* Kessler, 1877, *Blicca bjoerkna* (Linnaeus, 1758), *Gobio artvinicus* Turan, Japoshvili, Aksu & Bektaş, 2016, *Neogobius fluviatilis* (Pallas, 1814) and *Rhodeus amarus* (Bloch, 1782) were recorded for the first time from the upper reaches of Aras River in Turkey. Among these species, *Alburnus hohenackeri* was recorded by Fricke et al. (2007) and Çiçek

Table 1. The species observed in this study according to the sampling sites.

No	Sampling Site	Coordinates	Observed Species
1	Stream Karaman at Aşıkzülal	41.4371N, 42.6226E	<i>Alburnoides eichwaldii</i> , <i>Barbus cyri</i> , <i>Ponticola cyrius</i>
2	Stream Çöt Suyu	41.2998N, 42.7087E	<i>Alburnoides eichwaldii</i>
3	Stream Kınavor at Çataldere	41.1976N, 42.6135E	<i>Salmo caspius</i>
4	Stream Açık yazı	41.1443N, 42.5908E	<i>Squalius agdamicus</i>
5	Stream Toros	41.1115N, 42.4468E	<i>Salmo caspius</i>
6	Kura River at Yalnızçam	41.0709N, 42.4844E	<i>Alburnoides eichwaldii</i> , <i>Alburnus filippii</i> , <i>Barbus cyri</i> , <i>Capoeta capoeta</i> , <i>Carassius gibelio</i> , <i>Leucalburnus satunini</i> , <i>Romanogobio macropterus</i> , <i>Squalius agdamicus</i>
7	Stream Çakır	40.9669N, 42.5861E	<i>Acanthobrama microlepis</i> , <i>Alburnoides eichwaldii</i> , <i>Alburnus filippii</i> , <i>Barbus cyri</i> , <i>Capoeta capoeta</i> , <i>Chondrostoma cyri</i> , <i>Leucalburnus satunini</i> , <i>Oxynoemacheilus cyri</i> , <i>Romanogobio macropterus</i> , <i>Sabanejewia aurata</i> , <i>Squalius agdamicus</i>
8	Stream Ölçek	41.1340N, 42.8560E	<i>Acanthobrama microlepis</i> , <i>Alburnoides eichwaldii</i> , <i>Alburnus filippii</i> , <i>Barbus cyri</i> , <i>Capoeta capoeta</i> , <i>Leucalburnus satunini</i> , <i>Oxynoemacheilus brandtii</i> , <i>O. cyri</i> , <i>Ponticola cyrius</i> , <i>Sabanejewia aurata</i> , <i>Squalius agdamicus</i>
9	Lake Aktaş	41.1917N, 43.1737E	<i>Pseudorasbora parva</i>
10	Stream Doğruyol	41.0620N, 43.3450E	<i>Acanthobrama microlepis</i> , <i>Alburnus filippii</i> , <i>Capoeta capoeta</i> , <i>Oxynoemacheilus veyselorum</i>
11	Lake Çıldır	41.0449N, 43.2804E	<i>Alburnoides eichwaldii</i> , <i>Alburnus filippii</i> , <i>Barbus cyri</i> , <i>Capoeta capoeta</i> , <i>Carassius gibelio</i> , <i>Chondrostoma cyri</i> , <i>Cyprinus carpio</i> , <i>Leuciscus aspius</i> , <i>Oncorhynchus mykiss</i> , <i>Squalius turcicus</i>
12	Stream Büyük Çayır	40.8431N, 43.3222E	<i>Alburnus filippii</i> , <i>Oxynoemacheilus brandtii</i> , <i>O. veyselorum</i>
13	Stream Fehmiyarabesi	40.7723N, 43.2959E	<i>Alburnoides eichwaldii</i> , <i>Alburnus filippii</i> , <i>Barbus cyri</i> , <i>Capoeta capoeta</i> , <i>Oxynoemacheilus brandtii</i> , <i>O. veyselorum</i> , <i>Sabanejewia aurata</i> , <i>Squalius turcicus</i>
14	Stream Tahtakaya	40.8539N, 43.0188E	<i>Salmo aff. caspius</i>
15	Stream Kayalık	40.8201N, 43.1268E	<i>Salmo aff. caspius</i>
16	Stream İncilipınar	40.8211N, 43.0751E	<i>Salmo aff. caspius</i>
17	Stream Susuz at Susuz	40.7806N, 43.1411E	<i>Alburnoides eichwaldii</i> , <i>Alburnus filippii</i> , <i>Capoeta capoeta</i>
18	Stream Kars	40.5814N, 43.0591E	<i>Alburnoides eichwaldii</i> , <i>Alburnus filippii</i> , <i>Barbus cyri</i> , <i>Capoeta capoeta</i> , <i>Chondrostoma cyri</i> , <i>Cobitis saniae</i> , <i>Squalius turcicus</i> , <i>Silurus glanis</i> , <i>Oxynoemacheilus veyselorum</i> , <i>Romanogobio macropterus</i>
19	Stream Maksutçuk	40.5160N, 42.9510E	<i>Alburnoides eichwaldii</i> , <i>Alburnus filippii</i> , <i>Barbus cyri</i> , <i>Capoeta capoeta</i>
20	Stream Kekeç at Selim	40.4715N, 42.8005E	<i>Alburnoides eichwaldii</i> , <i>Alburnus filippii</i> , <i>Barbus cyri</i> , <i>Capoeta capoeta</i> , <i>Cobitis saniae</i> , <i>Oxynoemacheilus brandtii</i> , <i>O. veyselorum</i> , <i>Squalius turcicus</i>
21	Stream Boyalı	40.4478N, 42.5833E	<i>Alburnoides eichwaldii</i> , <i>Alburnus filippii</i> , <i>Barbus cyri</i> , <i>Capoeta capoeta</i> , <i>Oxynoemacheilus veyselorum</i> , <i>Squalius turcicus</i>
22	Stream Kars at Çatak	40.4016N, 42.6783E	<i>Alburnoides eichwaldii</i> , <i>Squalius turcicus</i>
23	Stream Kızılcubuk	40.3736N, 42.5366E	<i>Alburnoides eichwaldii</i> , <i>Capoeta capoeta</i> , <i>Oxynoemacheilus veyselorum</i>
24	Stream Keklik	40.2955N, 42.6565E	<i>Barbus cyri</i> , <i>Salmo cf. ciscaucasicus</i>
25	Aras River at Köprüçay	39.9699N, 41.8883E	<i>Alburnoides eichwaldii</i> , <i>Acanthobrama microlepis</i> , <i>Alburnus filippii</i> , <i>Capoeta capoeta</i> , <i>Cobitis saniae</i> , <i>Romanogobio macropterus</i> , <i>Squalius turcicus</i>
26	Stream Digor	40.3731N, 43.4271E	<i>Alburnoides eichwaldii</i> , <i>Barbus cyri</i> , <i>Capoeta capoeta</i> , <i>Oxynoemacheilus brandtii</i> , <i>O. veyselorum</i> , <i>Squalius turcicus</i>
27	Aras River west of Donandı	40.1097N, 43.4349E	<i>Alburnoides eichwaldii</i> , <i>Acanthobrama microlepis</i> , <i>Capoeta capoeta</i>
28	Stream Gaziler	40.1072N, 43.4513E	<i>Acanthobrama microlepis</i> , <i>Alburnoides eichwaldii</i> , <i>Alburnus filippii</i> , <i>Barbus cyri</i> , <i>Carassius gibelio</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus capito</i> , <i>Luciobarbus mursa</i> , <i>Oxynoemacheilus brandtii</i>
29	Lake Balık	39.7451N, 43.5385E	<i>Barbus cyri</i> , <i>Cyprinus carpio</i> , <i>Squalius turcicus</i> , <i>Capoeta capoeta</i> , <i>Salmo cf. ciscaucasicus</i>
30	Stream Aktarla	39.7373N, 43.5815E	<i>Alburnoides eichwaldii</i> , <i>Barbus cyri</i>
31	Stream Sarısu	39.5409N, 44.0044E	<i>Barbus cyri</i> , <i>Capoeta capoeta</i>
32	B-20 canal at Aralık	39.8936N, 44.5256E	<i>Alburnoides eichwaldii</i> , <i>Alburnus filippii</i> , <i>A. hohenackeri</i> <i>Barbus cyri</i> , <i>Blicca bjoerkna</i> , <i>Capoeta kaput</i> , <i>Chondrostoma cyri</i> , <i>Cyprinus carpio</i> , <i>Gobio artvinicus</i> , <i>Neogobius fluviatilis</i> , <i>Rhodeus amarus</i> , <i>Silurus glanis</i> , <i>Squalius turcicus</i>

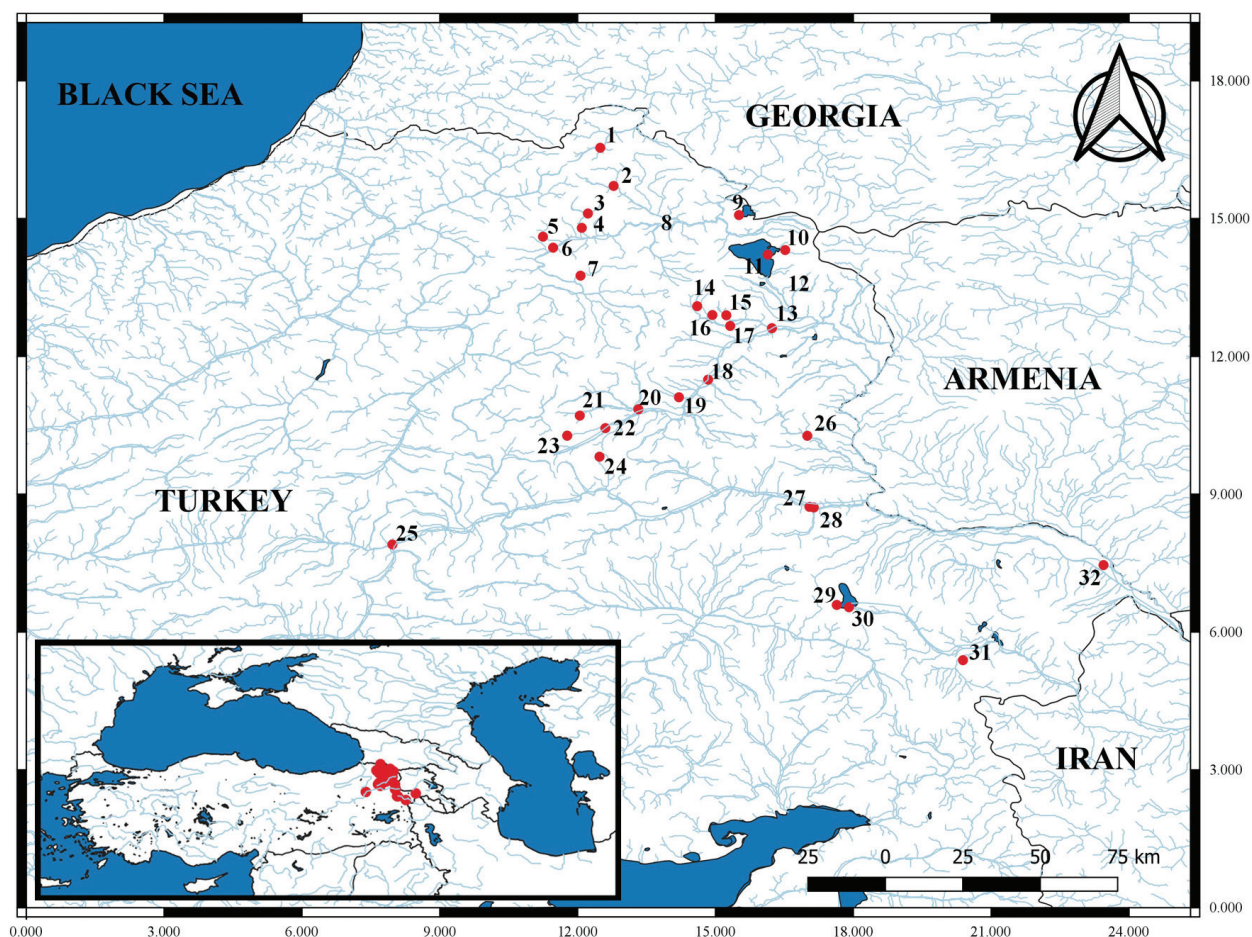


Figure 1. Distribution of the sampling sites in the area. Numbers refer the sampling sites indicated in Table 1.

et al. (2015), *Blicca bjoerkna* (as *Abramis bjoerkna*) by Fricke et al. (2007). In this study, however, the occurrence of these species was documented for the first time based on newly collected specimens deposited at Recep Tayyip Erdogan University Zoology Museum of the Faculty of Fisheries, Rize.

Family Cyprinidae

Barbus cyri De Filippi, 1865

Fig. 2a

Common / local names. Kura barbel / Kura bıyıklı balığı.

IUCN status. Not evaluated (NE).

Examined material. FFR 194, Stream Karaman at Aşıkzülal, Kura drainage, 41.4413N, 42.6591E. –FFR 219, Kura River at Yalnızçam, 41.0709N, 42.4844E. –FFR 234, Stream Çakır, 3 km south of Çakıldere, Kura drainage, 40.9669N, 42.5861E. –FFR 166, Stream Ölçek at Ölçek, Kura drainage, 41.1340N, 42.8560E. –FFR 217, Lake Çıldır, Aras drainage, 41.0449N, 43.2804E. –FFR 8817, Stream Fehmiharabesi at Akçalar, Aras drainage, 40.7723N, 43.2959E. Not preserved, Stream Kars at campus of Kafkas University, Aras drainage, 40.5814N,

43.0591E. –FFR 188, Stream Maksutçuk west of Dikme, Aras drainage, 40.5160N, 42.9510E. –FFR 195, Stream Kekeç at Selim, Aras drainage, 40.4715N, 42.8005E. –FFR 216, Stream Boyalı at Boyalı, Aras drainage, 40.4478N, 42.5833E. –FFR 165, Stream Keklik 6 km southeast of Sarıkamış, Aras drainage, 40.2955N, 42.6565E. –FFR 220, Stream Digor at Digor, Aras drainage, 40.3731N, 43.4271E. –FFR 215, Stream Gaziler, 2 km west of Donandı, Aras drainage, 40.1097N, 43.4349E. Not preserved, Lake Balık at Tanyolu, Aras drainage, 39.7451N, 43.5385E. –FFR 8804, Stream Aktarla at Aktarla, a southern drainage of Lake Balık, 39.7373N, 43.5815E. –FFR 221, Stream Sarısu West of Doğubeyazıt, Aras drainage, 39.5409N, 44.0044E. –FFR 233, B-20 canal at Aralık, Aras drainage, 39.8936N, 44.5256E.

Distribution in the area. Widespread in tributaries of Kura and Aras rivers.

Capoeta capoeta (Güldenstädt, 1773)

Fig. 2b

Common / local names. Seven khramulya; Caucasian scraper* / Kafkasya sirazı*.

IUCN status. Least concern (LC).

Table 2. List of the species to be excluded from the checklist of Kura-Aras drainages in Turkey.

	Species	Explanation
1	<i>Abramis brama</i> (Linnaeus, 1758)	The species reported in the Turkish Kura and Aras drainages by Fricke et al. (2007). Actually, the species is distributed in the Caspian Sea and it is possible to occur in Turkey. However, it was not found by Çiçek and Sungur Birecikligil (2016), as well as in our surveys in the area. Therefore, it was omitted from the fishes of upper Kura and Aras drainages until the species has been documented by the observed material.
2	<i>Acipenser persicus</i> Borodin, 1897	The species was erroneously reported in the upper Aras drainages by Fricke et al. (2007), followed by Çiçek et al. (2015) and Çiçek and Sungur Birecikligil (2016). The species has not been documented by the observed material.
3	<i>Alburnus chalcoides</i> (Güldenstädt, 1772)	Because of the problematic taxonomy of the genus (Bogutskaya et al. 2017), the species was recorded in the Black Sea and the Caspian Sea basin in Turkey by many researchers (e.g. Turan 2003; Geldiay and Balık 2007; Fricke et al. 2007; Çiçek et al. 2015). However, the occurrence of the third shemaya, except <i>A. filippii</i> and <i>A. hohenackeri</i> , has never been documented by the observed material.
4	<i>Alosa caspia</i> (Eichwald, 1838)	This predominantly marine and estuarine species has never been observed in any parts of the Turkish Kura and Aras drainages, except erroneously in a report by Fricke et al. (2007), followed by Çiçek et al. (2015) and Çiçek and Sungur Birecikligil (2016).
5	<i>Alosa braschnikowi</i> (Borodin, 1904)	The species was recorded in Turkish Aras drainages as <i>Rutilus sojuchbulagi</i> (Fricke et al. 2007). However, it is a brackish species and nonanadrom (Afraei Bandpei et al. 2012). Therefore, the occurrence of the species in the Turkish Aras River is not deemed likely.
6	<i>Caspiomyzon wagneri</i> (Kessler, 1870)	It is an endemic lamprey to the Caspian Sea basin and may be extinct from Kura (Berg 1949). It was claimed that the species was extinct in Turkey (Fricke et al. 2007; Çiçek and Sungur Birecikligil 2016). However, the species has never been reported in Turkey.
7	<i>Chelon saliens</i> (Risso, 1810)	The species has never been reported in the upper Kura and Aras drainages until an erroneous record by Fricke et al. (2007). The record was not supported by the following researchers (Çiçek et al. 2015; Çiçek and Sungur Birecikligil 2016).
8	<i>Gambusia holbrooki</i> Girard, 1859	Erroneously reported to be in the upper Aras drainages based on the following literature “Kuru 2004, Fricke et al. 2007; Çiçek et al. 2015”. However, none of these studies had directly reported this species in the area.
9	<i>Luciobarbus caspius</i> Berg, 1914	The species erroneously reported in the upper Aras drainage by Fricke et al. (2007), followed by Çiçek et al. (2015) and Çiçek and Sungur Birecikligil (2016). The species has not been documented by the observed material.
10	<i>Luciobarbus brachycephalus</i> (Kessler, 1872)	Fricke et al. (2007) verified the presence of the species from Hasankale Stream (Erzurum Province) based on museum material. However, this claim has not been supported by the following researchers (Çiçek et al. 2015; Çiçek and Sungur Birecikligil 2016). The species reported from the lower Aras river (Coad 2020). Even though we have a sampling site close to Hasankale, we did not observe the species in the area. Moreover, a third <i>Luciobarbus</i> species, except <i>L. capito</i> and <i>L. mursa</i> , was not found in the upper Aras drainages. Perhaps, the museum material presented by Fricke et al. (2007) was mislabelled or misidentified. We omitted it from the fishes of upper Kura and Aras drainages until the species has been documented by the observed material.
11	<i>Neogobius melanostomus</i> (Pallas, 1814)	These three gobiid species had never been reported in the upper Kura and Aras drainages until they were erroneously recorded by Fricke et al. (2007). These records were not supported by the following researchers (Çiçek et al. 2015; Çiçek and Sungur Birecikligil 2016). We omitted them from the fishes of upper Kura and Aras drainages until the species have been documented by the observed material.
12	<i>Neogobius syrmian</i> (Pallas, 1814)	
13	<i>Ponticola ratan</i> (Pallas, 1814)	
14	<i>Proterorhinus marmoratus</i> (Pallas, 1814)	The species reported from lower reaches of Aras, near Baku (Kessler 1877; Derzhavin 1934; Berg 1949). Erroneously reported in the upper Aras drainages by Fricke et al. (2007). They also claimed the species was extinct in the Caspian Sea watersheds.
15	<i>Romanogobio persus</i> (Günther, 1899)	The type locality of this species from Gader Chai, Lake Urmia basin. The specimens collected from Horasan (Erzurum) were identified as <i>R. persus</i> (Kuru, 1975). This record was followed by Kuru (2004) and, Fricke et al. (2007). However, Çiçek et al. (2015) and Çiçek and Sungur Birecikligil (2016), claimed that maybe the species was misidentified. We omitted the species from the fishes of upper Kura and Aras drainages for now. See remarks of <i>R. macropterus</i> for details about the taxonomy of <i>Romanogobio</i> populations in the area.
16	<i>Rutilus kutum</i> (Kamensky, 1901)	The species recorded from Turkey as <i>Rutilus frisii caspius</i> Kuru (2004), later synonymised with <i>R. kutum</i> (Bogutskaya and Iliadou 2006). This record was followed by Fricke et al. (2007). However, the occurrence of the species has never been documented by the observed material. Recently, Kuljanishvili et al. (2020) treated <i>R. kutum</i> as a junior synonym of <i>R. frisii</i> .
17	<i>Sabanejewia caspia</i> (Eichwald, 1838)	The species reported in the upper Kura and Aras drainages by Fricke et al. (2007), probably instead of <i>S. aurata</i> which had already been known in the area. This report followed by Çiçek et al. (2015) and Çiçek and Sungur Birecikligil (2016). The species is distributed in the southern Caspian Sea basin (Anzali wetland, Sefid River and Amirkolayeh Wetland) (Sayyadzadeh et al. 2018)
18	<i>Sander lucioperca</i> (Linnaeus, 1758)	It was reported that the species spawned in the lower and middle Kura River (Berg 1949). Çiçek and Sungur Birecikligil (2016) erroneously reported it in the upper Aras drainages based on the following literature “Kuru 2004, Fricke et al. 2007; Çiçek et al. 2015”. However, none of these studies had reported this species in the area.
19	<i>Squalius orientalis</i> Heckel, 1847	The species was erroneously reported in the upper Aras drainages by Çiçek et al. (2015) and Çiçek and Sungur Birecikligil (2016). The type locality of the species is Abkhazia, Black Sea basin. <i>S. turcicus</i> and <i>S. agdamicus</i> are inhabiting Kura and Aras drainages (Bayçelebi 2019).
20	<i>Stenodus leucichthys</i> Abdurakhmanov, 1950	The species was erroneously reported to be in the upper Aras drainage by Fricke et al. (2007), followed by Çiçek et al. (2015) and Çiçek and Sungur Birecikligil (2016). Poursaeid and Falahatkar (2012) discussed the distribution of the species in the Caspian Sea basin, however, they did not mention the occurrence of the species in the upper Kura and Aras rivers.

Examined material. FFR 1812, Kura River at Yalnızçam, 41.0709N, 42.4844E. –FFR 1815, Stream Çakır, 3 km south of Çakıldere, Kura drainage, 40.9669N, 42.5861E. –FFR 1606, Stream Ölçek at Ölçek, Kura drainage, 41.1340N, 42.8560E. –FFR 1608, Stream Doğruyol at Doğruyol, Aras drainage, 41.0620N, 43.3450E. –FFR 1819, Lake Çıldır, Aras drainage, 41.0449N, 43.2804E.

Not preserved, Stream Fehmiharabesi at Akçalar, Aras drainage, 40.7723N, 43.2959E. –FFR 1603, Steam Susuz at Susuz, Aras drainage, 40.7806N, 43.1411E. Not preserved, Stream Kars at campus of Kafkas University, Aras drainage, 40.5814N, 43.0591E. –FFR 1607, Stream Maksutçuk west of Dikme, Aras drainage, 40.5160N, 42.9510E. –FFR 1604, Stream Kekeç at Selim, Aras

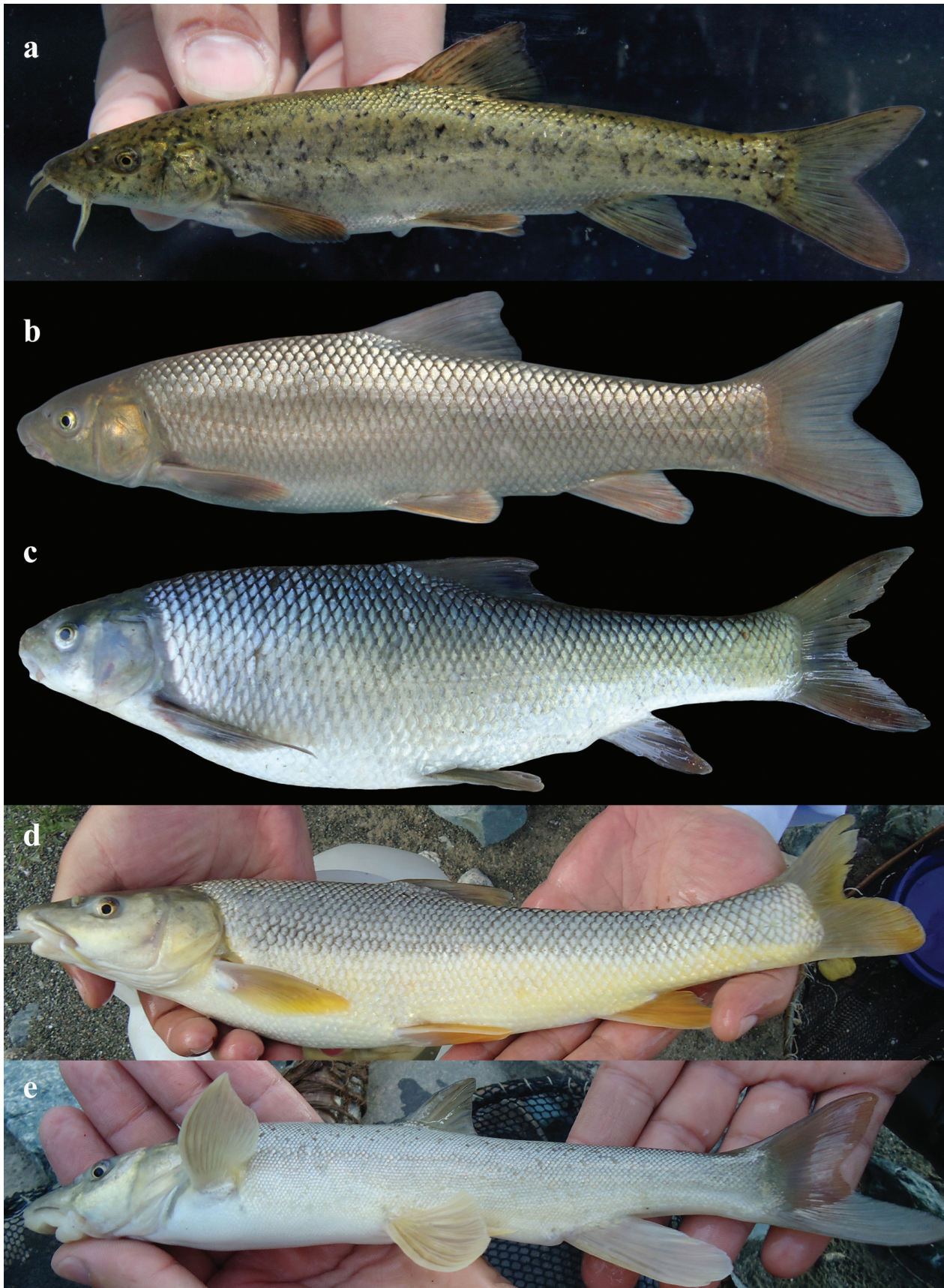


Figure 2. Native Cyprinid species collected in the area, **a**, *Barbus cyri* from Kura River at Yalnızçam; **b**, *Capoeta capoeta* from stream Kars, Aras; **c**, *Capoeta kaput* from B-20 canal, Aras; **d**, *Luciobarbus capito* from stream Gaziler, Aras; **e**, *Luciobarbus mursa* from stream Gaziler, Aras.

drainage, 40.4715N, 42.8005E. –FFR 1814, Stream Boyalı at Boyalı, Aras drainage, 40.4478N, 42.5833E. –FFR 1800, Stream Kızılçubuk at Kızılçubuk, Aras drainage, 40.3736N, 42.5366E. –FFR 1945, Aras River at Köprüçay, 39.9699N, 41.8883E. –FFR 1821, Stream Digor at Digor, Aras drainage, 40.3731N, 43.4271E. Not preserved, Aras River 4 km west of Donandı, 40.1097N, 43.4349E. Not preserved, Lake Balık at Tanyolu, Aras drainage, 39.7451N, 43.5385E. –FFR 1816, Stream Sarısu West of Doğubeyazıt, Aras drainage, 39.5409N, 44.0044E.

Distribution in the area. Widespread in tributaries of Kura and Aras rivers.

Capoeta kaput Levin, Prokofiev & Roubenyan, 2019

Fig. 2c

Common / local names. Blue Aras scraper* / Mavi Aras sirazı*.

IUCN status. Not evaluated (NE).

Examined material. FFR 1835, B-20 canal at Aralık, Aras drainage, 39.8936N, 44.5256E.

Distribution in the area. *Capoeta kaput* was found only in B-20 canal. The species was described from Aras River in Armenia (Levin et al. 2019). Recently, it has been recorded from Aras River in Turkey (Kaya 2019).

Carassius gibelio (Bloch, 1782)

Fig. 3a

Common / local names. Prussian carp / Havuz balığı.

IUCN status. Not evaluated (NE).

Examined material. Not preserved, Kura River at Yalnızçam, 41.0709N, 42.4844E. –FFR 2217, Lake Çıldır, Aras drainage, 41.0449N, 43.2804E. –FFR 2216, Stream Gaziler, 2 km west of Donandı, Aras drainage, 40.1097N, 43.4349E.

Distribution in the area. The species was found in Lake Çıldır and streams Gaziler and Yalnızçam. It was also reported from Lake Aktaş and Stream Sarısu (Çiçek and Sungur Birecikligil 2016).

Cyprinus carpio Linnaeus, 1758

Fig. 3b

Common / local names. Common carp / Sazan.

IUCN status. Vulnerable (VU).

Examined material. FFR 2749, Lake Çıldır, Aras drainage, 41.0449N, 43.2804E. –FFR 2751, Stream Gaziler, 2 km west of Donandı, Aras drainage, 40.1097N, 43.4349E. Not preserved, Lake Balık at Tanyolu, Aras drainage, 39.7451N, 43.5385E. –FFR 2744, B-20 canal at Aralık, Aras drainage, 39.8936N, 44.5256E.

Distribution in the area. The species was found in stream Gaziler, B-20 canal and Lake Çıldır.

Note. Both native and introduced *Cyprinus carpio* inhabit Lake Çıldır. The native common carp is very distinct due to its slenderer body and yellow general body color (Fig. 3b). When compared to the introduced one, the native *C. carpio* is very popular and economically valuable among the local people in the area.

Luciobarbus capito (Güldenstädt, 1773)

Fig. 2d

Common / local names. Bulatmai barbel / Hazar tilkiburunu*.

IUCN status. Vulnerable (VU).

Examined material. FFR 355, Stream Gaziler, 2 km west of Donandı, Aras drainage, 40.1097N, 43.4349E.

Distribution in the area. The species was found only in stream Gaziler.

Luciobarbus mursa (Güldenstaedt, 1773)

Fig. 2e

Common / local names. Mursa / Murzu.

IUCN status. Least concern (LC).

Examined material. FFR 334, Stream Gaziler, 2 km west of Donandı, Aras drainage, 40.1097N, 43.4349E.

Distribution in the area. The species was found only in stream Gaziler.

Family Acheilognathidae Bleeker, 1863

Rhodeus amarus (Bloch, 1782)

Fig. 3c

Common / local names. European bitterling / Acıbalık.

IUCN status. Least concern (LC).

Examined material. FFR 3524, B-20 canal at Aralık, Aras drainage, 39.8936N, 44.5256E.



Figure 3. Acheilognathidae, Siluridae and two Cyprinid species collected in the area, **a**, *Carassius gibelio* from Kura River at Yal-nızçam; **b**, *Cyprinus carpio* from Lake Çıldır, Aras; **c**, *Rhodeus amarus* from B-20 canal, Aras; **d**, *Silurus glanis* from stream Kars, Aras.

Distribution in the area. The species is recorded in B-20 canal located very close to the border with Armenia. *Rhodeus amarus* was recorded from Lake Urmia and Caspian Sea basins in Iran (Derzhavin 1934; Holčík and Oláh 1992; Kiabi et al. 1999; Abbasi et al. 1999; Abdoli, 2000; Ghasemi et al. 2015; Coad 2018). Probably it also occurs in Aras River in Armenia (Pipoyan, 1996).

Family Gobionidae Bleeker, 1863

Gobio artvinicus Turan, Japoshvili, Aksu & Bektaş, 2016

Fig. 4d

Common / local names. Artvin gudgeon* / Artvin Derékayası*.

IUCN status. Not evaluated (NE).

Examined material. FFR 5923, B-20 canal at Aralık, Aras drainage, 39.8936N, 44.5256E.

Distribution in the area. The species has been known to occur in Çoruh River and has not been recorded in any another place, including Kura and Aras river drainages, despite intensive field work. However, it has recently been declared that *G. artvinicus* translocated to the Caspian Sea basin and occurs in Armenia, Azerbaijan and Georgia (Kuljanishvili et al. 2020). In the present study also, some specimens belonging to genus *Gobio* were observed and they are superficially similar to *G. artvinicus*.

Pseudorasbora parva (Temminck & Schlegel, 1842)

Fig. 4c

Common / local names. Stone moroko / Çakıl balığı.

IUCN status. Least concern (LC).

Examined material. Not preserved, Lake Aktaş at Kenarbel, Kura drainage, 41.1917N, 43.1737E.

Distribution in the area. The species was recorded only from Lake Aktaş. It was also recorded in Lake Çıldır (Çiçek and Sungur Birecikligil 2016).

Romanogobio macropterus (Kamensky, 1901)

Fig. 4d

Common / local names. Kura gudgeon / Kura Derékayası*.

IUCN status. Least concern (LC).

Examined material. FFR 5977, Kura River at Yalnızçam, 41.0709N, 42.4844E. –FFR 5922, Stream Çakır, 3 km south of Çakıldere, Kura drainage, 40.9669N, 42.5861E. Not preserved, Stream Kars at campus of Kafkas University, Aras drainage, 40.5814N, 43.0591E. –FFR 5969, Aras River at Köprüçay, 39.9699N, 41.8883E.

Distribution in the area. Kura and Aras River drainages in northeastern Turkey.

Remarks. The type locality of the species is the Caucasus. The Kura population was identified as *R. macropterus*. However, we observed some morphological differences between Kura and Aras populations obtained in this study. The Aras population has a slenderer body and caudal peduncle than *R. macropterus* from Kura (Fig. 4d, 4e). Therefore, we encourage detailed morphologic and molecular research including the Kura, Aras and Urmia populations to clarify the taxonomic position of the Aras population.

Family Leuciscidae Bonaparte, 1835

Acanthobrama microlepis (De Filippi, 1863)

Fig. 5a

Common / local names. Blackbrow bream / Kura akçapağı*.

IUCN status. Least concern (LC).

Examined material. FFR 1172, Stream Çakır, 3 km south of Çakıldere, Kura drainage, 40.9669N, 42.5861E. –FFR 1167, Stream Ölçek at Ölçek, Kura drainage, 41.1340N, 42.8560E. –FFR 1170, Stream Doğruyol at Doğruyol, Aras drainage, 41.0620N, 43.3450E. –FFR 1196, Aras River at Köprüçay, 39.9699N, 41.8883E. Not preserved, Aras River 4 km west of Donandı, 40.1097N, 43.4349E. –FFR 1165, Stream Gaziler, 2 km west of Donandı, Aras drainage, 40.1097N, 43.4349E.

Distribution in the area. Kura and Aras River drainages in northeastern Turkey.

Note. Both molecular (Perea et al. 2010) and morphologic (Küçük et al. 2014) studies suggested the synonymization of the genus *Acanthalburnus* with *Acanthobrama*. Therefore, this species is now under the genus *Acanthobrama*.

Alburnoides eichwaldii De Filippi, 1863

Fig. 6a

Common / local names. Kura spirilin* / Kura noktalı incisi*.

IUCN status. Least concern (LC).

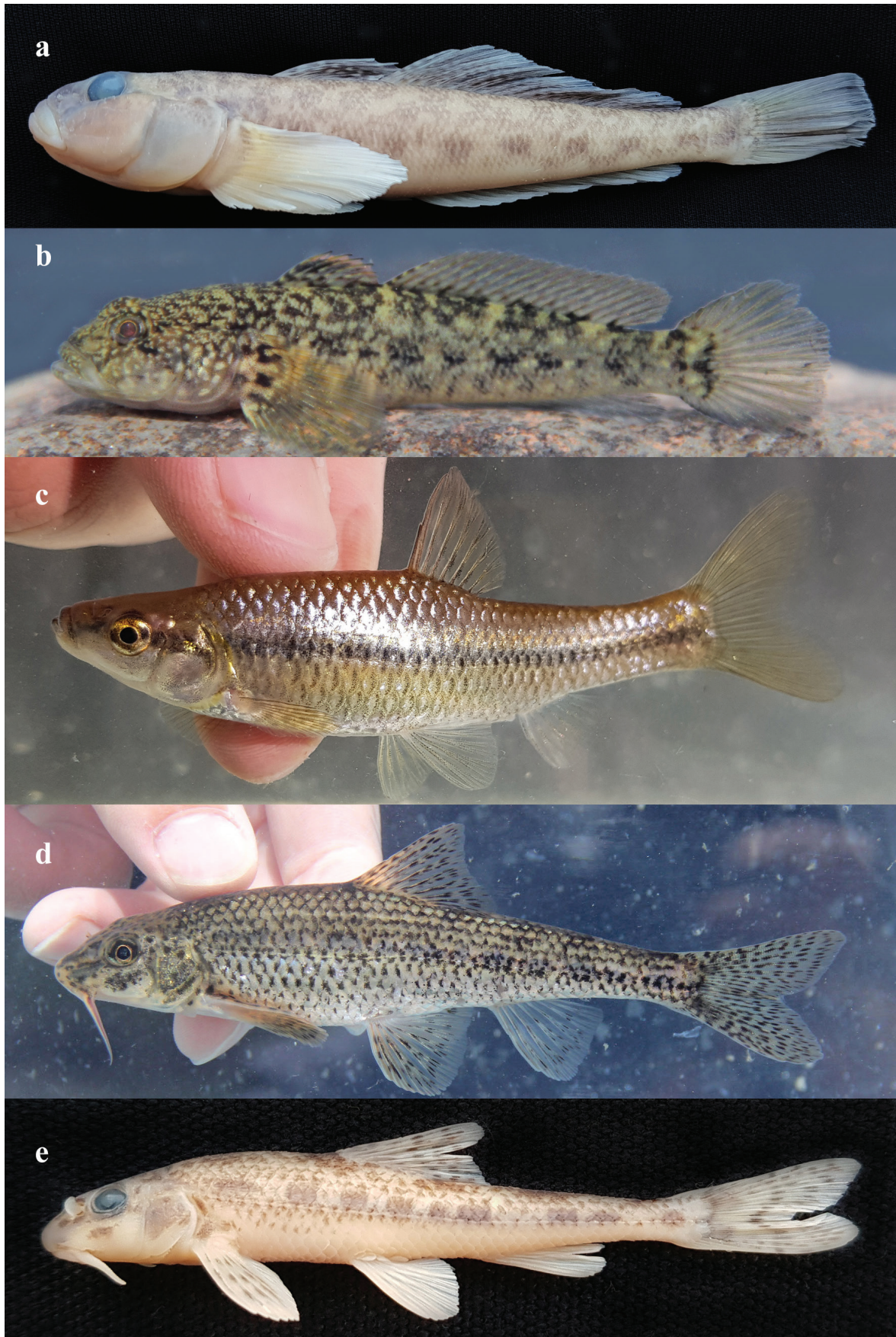


Figure 4. Gobiidae and Gobionidae species collected in the area, **a**, *Neogobius fluviatilis* from B-20 canal, Aras; **b**, *Ponticola cyrius* from Kura River at Yalnızcəm; **c**, *Pseudorasbora parva* from Lake Aktaş, Kura; **d**, *Romanogobio macropterus* from Kura River at Yalnızcəm; **e**, *Romanogobio macropterus* from Kura River at Yalnızcəm.

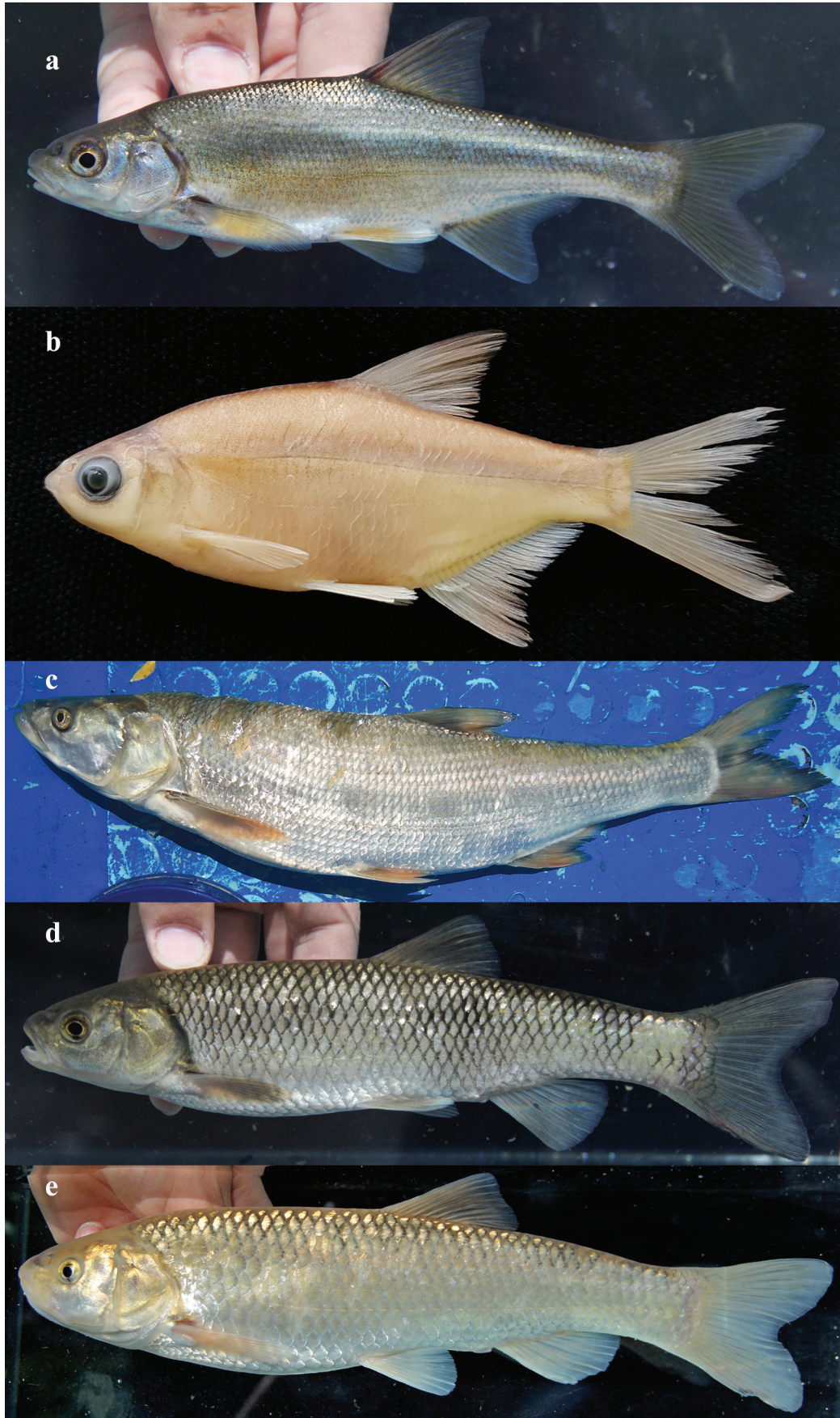


Figure 5. Some Leuciscidae species collected in the area, **a**, *Acanthobrama microlepis* from Kura River at Yalnızçam; **b**, *Blicca bjoerkna* from B-20 canal, Aras; **c**, *Leuciscus aspius* from Lake Çıldır, Aras; **d**, *Squalius agdamicus* from Kura River at Yalnızçam; **e**, *Squalius turcicus*, from stream Fehmiharabesi, Aras.



Figure 6. Some Leuciscidae species collected in the area, **a**, *Alburnoides eichwaldii* from Kura River at Yalnızcım; **b**, *Alburnus filippi* from Kura River at Yalnızcım; **c**, *Alburnus hohenackeri* from B-20 canal, Aras; **d**, *Chondrostoma cyri* from stream Kars, Aras; **e**, *Leucalburnus satunini* from Kura River at Yalnızcım.

Examined material. FFR 1013, Stream Karaman at Aşıkzülal, Kura drainage, 41.4413N, 42.6591E. Not preserved, Stream Çöt Suyu South of Çatköy, Kura drainage, 41.2998N, 42.7087E. –FFR 1089, Kura River at Yalnızçam, 41.0709N, 42.4844E. –FFR 1091, Stream Çakır, 3 km south of Çakıldere, Kura drainage, 40.9669N, 42.5861E. –FFR 1047, Stream Ölçek at Ölçek, Kura drainage, 41.1340N, 42.8560E. –FFR 1085, Lake Çıldır, Aras drainage, 41.0449N, 43.2804E. Not preserved, Stream Fehmiharabesi at Akçalar, Aras drainage, 40.7723N, 43.2959E. –FFR 1015, Stream Maksutçuk west of Dikme, Aras drainage, 40.5160N, 42.9510E. –FFR 1019, Steam Susuz at Susuz, Aras drainage, 40.7806N, 43.1411E. Not preserved, Stream Kars at campus of Kafkas University, Aras drainage, 40.5814N, 43.0591E. –FFR 1088, Stream Kekeç at Selim, Aras drainage, 40.4715N, 42.8005E. –FFR 1086, Stream Boyalı at Boyalı, Aras drainage, 40.4478N, 42.5833E. –FFR 1082, Stream Kızılçubuk at Kızılçubuk, Aras drainage, 40.3736N, 42.5366E. –FFR 7012, Aras River at Köprüçay, 39.9699N, 41.8883E. –FFR 1093, Stream Digor at Digor, Aras drainage, 40.3731N, 43.4271E. –FFR 7020, Aras River 4 km west of Donandı, 40.1097N, 43.4349E. –FFR 1087, Stream Gaziler, 2 km west of Donandı, Aras drainage, 40.1097N, 43.4349E. –FFR 7011, Stream Aktarla at Aktarla, a southern drainage of Lake Balık, 39.7373N, 43.5815E. –FFR 1090, B-20 canal at Aralık, Aras drainage, 39.8936N, 44.5256E.

Distribution in the area. Widespread in tributaries of Kura-Aras rivers.

Alburnus flippii Kessler, 1877

Fig. 6b

Common / local names. Kura bleak / Kura incisi*.

IUCN status. Least concern (LC).

Examined material. FFR 4687, Kura River at Yalnızçam, 41.0709N, 42.4844E. –FFR 942, Stream Çakır, 3 km south of Çakıldere, Kura drainage, 40.9669N, 42.5861E. –FFR 943, Stream Ölçek at Ölçek, Kura drainage, 41.1340N, 42.8560E. –FFR 936, Lake Çıldır, Aras drainage, 41.0449N, 43.2804E. –FFR 4688, Stream Büyük Çayır at Arpaçay, Aras drainage, 40.8431N, 43.3222E. –FFR 4685, Stream Fehmiharabesi at Akçalar, Aras drainage, 40.7723N, 43.2959E. –FFR 872, Steam Susuz at Susuz, Aras drainage, 40.7806N, 43.1411E. –FFR 4686, Stream Kars at campus of Kafkas University, Aras drainage, 40.5814N, 43.0591E. –FFR 899, Stream Maksutçuk west of Dikme, Aras drainage, 40.5160N, 42.9510E. –FFR 940, Stream Kekeç at Selim, Aras drainage, 40.4715N, 42.8005E. –FFR 939, Stream Boyalı at Boyalı, Aras drainage, 40.4478N, 42.5833E. –FFR 4654, Aras River at Köprüçay, 39.9699N, 41.8883E. –FFR 948, Stream Gaziler, 2 km west of Donandı, Aras

drainage, 40.1097N, 43.4349E. –FFR 947, B-20 canal at Aralık, Aras drainage, 39.8936N, 44.5256E. –FFR 820, Stream Doğruyol at Doğruyol, Aras drainage, 41.0620N, 43.3450E.

Distribution in the area. Widespread in tributaries of Kura-Aras rivers.

Alburnus hohenackeri Kessler, 1877

Fig. 6c

Common / local names. Caspian bleak / Hazar Denizi incisi*.

IUCN status. Least concern (LC).

Examined material. FFR 4699, B-20 canal at Aralık, Aras drainage, 39.8936N, 44.5256E.

Distribution in the area. It was recorded from B-20 canal, Aras River.

Note. The occurrence of the species in the region has been reported by earlier studies based on estimates (Fricke et al. 2007; Çiçek et al. 2015). *A. hohenackeri* was documented with the materials observed for the first time in the B-20 canal, Turkey. We observed two syntopic shemeya from the B-20 canal. *Alburnus hohenackeri* is easily distinguished from *A. flippii* by having a stout and deep body as well as large scales (Fig. 6b, c).

Blicca bjoerkna (Linnaeus, 1758)

Fig. 5b

Common / local names. White bream / Tahta balığı.

IUCN status. Least concern (LC).

Examined material. FFR 2425, B-20 canal at Aralık, Aras drainage, 39.8936N, 44.5256E.

Distribution in the area. It was first recorded from B-20 canal, Aras River.

Chondrostoma cyri Kessler, 1877

Fig. 6d

Common / local names. Colchic nase / Kura kababurunu*.

IUCN status. Least concern (LC).

Examined material. FFR 2040, Stream Çakır, 3 km south of Çakıldere, Kura drainage, 40.9669N, 42.5861E. –FFR 2041, Lake Çıldır, Aras drainage, 41.0449N, 43.2804E.

–FFR 2030, Stream Kars at campus of Kafkas University, Aras drainage, 40.5814N, 43.0591E. –FFR 2042, B-20 canal at Aralık, Aras drainage, 39.8936N, 44.5256E.

Distribution in the area. Widespread in tributaries of Kura-Aras rivers.

***Leucalburnus satunini* (Berg, 1910)**

Fig. 6e

Common / local names. White Kura bleak / Satunin incisi.

IUCN status. Least concern (LC).

Examined material. FFR 2467, Kura River at Yalnızçam, 41.0709N, 42.4844E. –FFR 2464, Stream Çakır, 3 km south of Çakıldere, Kura drainage, 40.9669N, 42.5861E. –FFR 2465, Stream Ölçek at Ölçek, Kura drainage, 41.1340N, 42.8560E.

Distribution in the area. Known from upper Kura River drainage. Endemic to the area.

***Leuciscus aspius* (Linnaeus, 1758)**

Fig. 5c

Common / local names. Asp / Kocağız balığı.

IUCN status. Least concern (LC).

Examined material. FFR 2441, Lake Çıldır, Aras drainage, 41.0449N, 43.2804E.

Distribution in the area. Aras River drainage. Recorded from in Lake Çıldır.

***Squalius agdamicus* Kamensky, 1901**

Fig. 5d

Common / local names. Agdam dace / Agdam tatlısu kefalı*.

IUCN status. Not evaluated (NE).

Examined material. FFR 638, Stream Açıkyazı at Kazlıköy, Kura drainage, 41.1443N, 42.5908E. –FFR 687, Kura River at Yalnızçam, 41.0709N, 42.4844E. –FFR 684, Stream Çakır, 3 km south of Çakıldere, Kura drainage, 40.9669N, 42.5861E. –FFR 684, Stream Ölçek at Ölçek, Kura drainage, 41.1340N, 42.8560E.

Distribution in the area. Kura River drainage in north-east Anatolia. The species has been known from lower Kura. Recently, it was recorded from Kura River in Turkey (Bayçelebi 2019).

***Squalius turcicus* De Filippi, 1865**

Fig. 5e

Common / local names. Kura chub* / Kura tatlı su kefalı*.

IUCN status. Least concern (LC).

Examined material. FFR 692, Lake Çıldır, Aras drainage, 41.0449N, 43.2804E. Not preserved, Stream Fehmi-harabesi at Akçalar, Aras drainage, 40.7723N, 43.2959E. Not preserved, Stream Kars at campus of Kafkas University, Aras drainage, 40.5814N, 43.0591E. –FFR 681, Stream Kekeç at Selim, Aras drainage, 40.4715N, 42.8005E. –FFR 689, Stream Boyalı at Boyalı, Aras drainage, 40.4478N, 42.5833E. –FFR 634, Stream Kars at Çatak, Aras drainage, 40.4016N, 42.6783E. –FFR 6273, Aras River at Köprüçay, 39.9699N, 41.8883E. –FFR 690, Stream Digor at Digor, Aras drainage, 40.3731N, 43.4271E. not preserved, Lake Balık at Tanyolu, Aras drainage, 39.7451N, 43.5385E. –FFR 683, B-20 canal at Aralık, Aras drainage, 39.8936N, 44.5256E.

Distribution in the area. Widespread in Aras River drainage.

Family Cobitidae Swainson, 1838

***Cobitis saniae* Eagderi, Jouladeh-Roudbar, Jalili, Sayyadzadeh & Esmaceli, 2017**

Fig. 7e

Common / local names. Caspian spined loach* / Hazar taşemeni*.

IUCN status. Not evaluated (NE).

Examined material. Not preserved, Stream Kars at campus of Kafkas University, Aras drainage, 40.5814N, 43.0591E. –FFR 5500, Stream Kekeç at Selim, Aras drainage, 40.4715N, 42.8005E. –FFR 5549, Aras River at Köprüçay, 39.9699N, 41.8883E.

Distribution in the area. Recently recorded from streams Selim and Kars, Aras River drainage (Freyhof et al. 2018).

***Sabanejewia aurata* (De Filippi, 1863)**

Fig. 7d

Common / local names. Golden Spined Loach / Altın dikenli çöpçü balığı*.

IUCN status. Least concern (LC).

Examined material. FFR 5514, Stream Çakır, 3 km south of Çakıldere, Kura drainage, 40.9669N, 42.5861E. –FFR

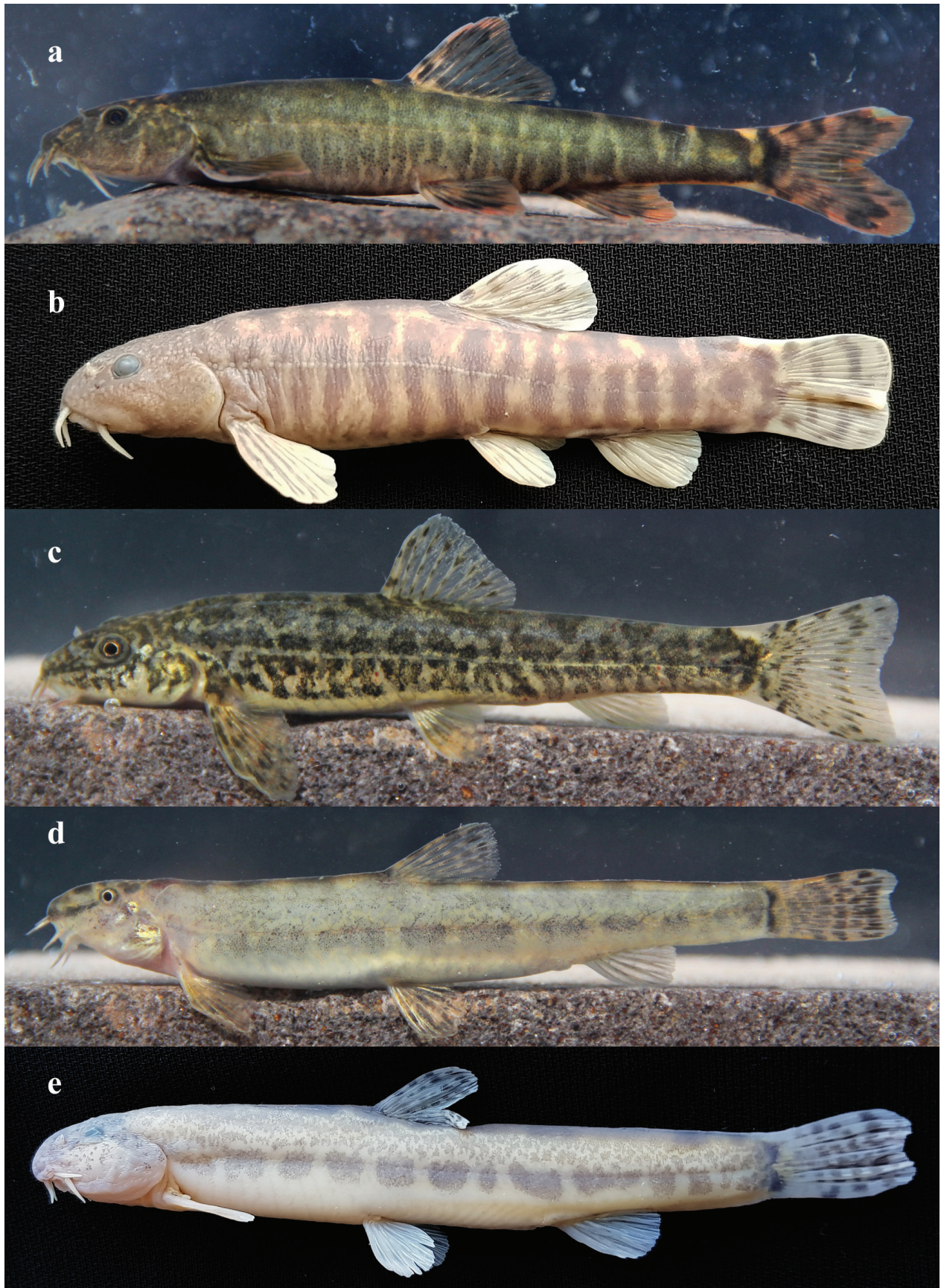


Figure 7. Nemacheilidae and Cobitidae species collected in the area, **a**, *Oxynoemacheilus brandtii* from Kura River at Yalnızçam; **b**, *O. cyri* from stream Çakır, Kura; **c**, *O. veyssorum* from stream Kars, Aras; **d**, *Sabanejewia aurata* from stream Kars, Aras; **e**, *Cobitis saniae* from Aras River at Köprüçay.

5513, Stream Ölçek at Ölçek, Kura drainage, 41.1340N, 42.8560E. –FFR 5559, Stream Fehmiharabesi at Akçalar, Aras drainage, 40.7723N, 43.2959E.

Distribution in the area. The species is known from Aras River drainage.

Family Nemacheilidae Regan, 1911

Oxynoemacheilus brandtii (Kessler, 1877)

Fig. 7a

Common / local names. Kura loach* / Aras çöpçü balığı*.

IUCN status. Least concern (LC).

Examined material. FFR 1460, Stream Ölçek at Ölçek, Kura drainage, 41.1340N, 42.8560E. –FFR 15551, Stream Büyük Çayır at Arpaçay, Aras drainage, 40.8431N, 43.3222E. –FFR 15549, Stream Fehmiharabesi at Akçalar, Aras drainage, 40.7723N, 43.2959E. –FFR 1350, Stream Kekeç at Selim, Aras drainage, 40.4715N, 42.8005E. –FFR 1382, Stream Maksutçuk west of Dikme, Aras drainage, 40.5160N, 42.9510E. –FFR 1427, Stream Digor at Digor, Aras drainage, 40.3731N, 43.4271E. –FFR 1422, Stream Gaziler, 2 km west of Donandı, Aras drainage, 40.1097N, 43.4349E.

Distribution in the area. The species is widespread in Kura and Aras river drainages.

Oxynoemacheilus cyri (Berg, 1910)

Fig. 7b

Common / local names. Göle loach / Göle çöpçü balığı*.

IUCN status. Least concern (LC).

Examined material. FFR 1426, Stream Çakır, 3 km south of Çakıldere, Kura drainage, 40.9669N, 42.5861E.

Distribution in the area. The species is endemic to the upper reaches of the Kura River drainage.

Oxynoemacheilus veyselorum Çiçek, Eagderi & Sungur, 2018

Fig. 7c

Common / local names. Aras loach* / Aras çöpçü balığı*.

IUCN status. Not evaluated (NE).

Examined material. FFR 3621, Stream Doğruyol at Doğruyol, Aras drainage, 41.0620N, 43.3450E. –FFR 15550, Stream Büyük Çayır at Arpaçay, Aras drainage, 40.8431N, 43.3222E. –FFR 15548, Stream Fehmiharabesi

at Akçalar, Aras drainage, 40.7723N, 43.2959E. Not preserved, Stream Kars at campus of Kafkas University, Aras drainage, 40.5814N, 43.0591E. –FFR 1352, Stream Kekeç at Selim, Aras drainage, 40.4715N, 42.8005E. –FFR 3622, Stream Boyalı at Boyalı, Aras drainage, 40.4478N, 42.5833E. –FFR 3623, Stream Kızılçubuk at Kızılçubuk, Aras drainage, 40.3736N, 42.5366E. –FFR 1597, Stream Digor at Digor, Aras drainage, 40.3731N, 43.4271E.

Distribution in the area. Aras River drainages in north-eastern Anatolia. The species recently described from stream Bozkuş (40°37'03.7"N, 42°47'04.9"E), a drainage of Aras River (Çiçek et al. 2018). Here it was recorded from eight additional localities (streams Doğruyol, Kekeç, Kars, Fehmiharabesi, Boyalı, Digor, Kızılçubuk and Büyük Çayır) in tributaries of Aras River (Table 1).

Notes on nomenclature. Çiçek et al. (2018) described *Oxynoemacheilus veyseli* in honor of Veysel Çiçek. The epithet stands for two persons as father and son of the first author. In Article 31.1.2. of the International Code for Zoological Nomenclature (ICZN 1999), it is clearly indicated that: “A species-group name, if a noun in the genitive case (see Article 11.9.1.3) formed directly from a modern personal name, is to be formed by adding to the stem of that name -i if the personal name is that of a man, -orum if of men or of man (men) and woman (women) together, -ae if of a woman, and -arum if of women; the stem of such a name is determined by the action of the original author when forming the genitive.” Therefore, the name of the species is treated here as *Oxynoemacheilus veyselorum*.

Family Siluridae Rafinesque, 1815

Silurus glanis Linnaeus, 1758

Fig. 3d

Common / local names. Wels catfish / Yayın.

IUCN status. Least concern (LC).

Examined material. Not preserved, Stream Kars at campus of Kafkas University, Aras drainage, 40.5814N, 43.0591E. –FFR 2704, B-20 canal at Aralık, Aras drainage, 39.8936N, 44.5256E.

Distribution in the area. The species is found from the stream Kars in this study.

Family Salmonidae Jarocki or Schinz, 1822

Oncorhynchus mykiss (Walbaum, 1792)

Fig. 8a

Common / local names. Rainbow trout / Gökkuşağı alabalığı.

IUCN status. Not evaluated (NE).

Examined material. Not preserved, Lake Çıldır, Aras drainage, 41.0449N, 43.2804E.

Distribution in the area. The species was recorded from Lake Çıldır.

***Salmo caspius* Kessler, 1877**

Fig. 8b

Common / local names. Caspian trout / Hazar alası*.

IUCN status. Not evaluated (NE).

Examined material. Not preserved, Stream Çöt Suyu South of Çatköy, Kura drainage, 41.2998N, 42.7087E. – FFR 1129, Stream Kınavur at Çataldere, Kura drainage, 41.1976N, 42.6135E. – FFR 3164, Stream Toros, 4 km south of Çimenkaya, Kura drainage, 41.1115N, 42.4468E. – FFR 3135, Stream Çakır, 3 km south of Çakıldere, Kura drainage, 40.9669N, 42.5861E.

Distribution in the area. Kura River drainage.

***Salmo aff. caspius* Kessler, 1877**

Fig. 8c

Common / local names. Aras trout / Aras alası*.

Examined material. FFR 3122, Stream Tahtakaya at Kırkpınar, Aras drainage, 40.8539N, 43.0188E. – FFR 3114, Stream Kayalık at Kayalık, Aras drainage, 40.8201N, 43.1268E. – FFR 3144, Stream İncilipınar at İncilipınar, Aras drainage, 40.8211N, 43.0751E.

Distribution in the area. Aras River drainage.

Remarks. The species is morphologically most similar to *S. caspius*. However, it seems that there are some significant differences between Kura and Aras populations. A detailed morphological examination is needed to clear the taxonomic position of salmonids in Aras drainage.

***Salmo cf. ciscaucasicus* Dorofeeva, 1967**

Fig. 8d

Common / local names. Caucasian trout* / Kafkas alası*.

Examined material. FFR 3229, Stream Keklik 6 km southeast of Sarıkamış, Aras drainage, 40.2955N, 42.6565E.

Distribution in the area. Aras River drainage.

Remarks. The species is morphologically similar to *S. ciscaucasicus*, however, more comparison materials from upper Aras and Keyranchay River (its type locality) are needed to clear the taxonomic position of Aras populations. For the first observation by limited samples identified here as *Salmo cf. ciscaucasicus* differ from *S. caspius* from Kura drainages by having a brownish general body color (vs. grayish), irregular black and red spots (vs. circular). On the other hand, the samples we obtained have grayish general body color, numerous black spots on the body, irregularly shaped, small to medium, maxilla reaching slightly beyond the eye, adipose-fin of moderate size, not reaching caudal-fin base. These features overlap with the original description of Dorofeyeva (1967) and the figure and description of Kottelat & Freyhof (2007). Therefore, we consider that species closely related to *S. ciscaucasicus*, and we encourage further research to clarify the trout taxonomy in the area.

Family Gobiidae Cuvier, 1816

***Neogobius fluviatilis* (Pallas, 1814)**

Fig. 4a

Common / local names. Monkey goby / Tatlısu kayası.

IUCN status. Least concern (LC).

Examined material. FFR 2636, B-20 canal at Aralık, Aras drainage, 39.8936N, 44.5256E.

Distribution in the area. The species native for the Caspian Sea basin (Pinchuk et al. 2003). The species was recorded from B-20 canal. It is the first record for the Turkish Aras River.

***Ponticola cyrius* (Kessler, 1874)**

Fig. 4b

Common / local names. Kura goby / Kura kayası*.

IUCN status. Least concern (LC).

Examined material. FFR 2620, Stream Karaman at Aşıkzülal, Kura drainage, 41.4413N, 42.6591E. – FFR 2635, Stream Ölçek at Ölçek, Kura drainage, 41.1340N, 42.8560E.

Distribution in the area. Kura River drainage.

Remarks

Among the species listed above, 26 are native and two of them (*Oxynoemacheilus cyri* and *Leucalburnus satunini*) are also endemic to the upper Kura River. *L. satunini* was



Figure 8. Salmonid species collected in the area, **a**, *Oncorhynchus mykiss* from Lake Çıldır, Aras; **b**, *Salmo caspius* from stream Çataldere, Kura; **c**, *Salmo* aff. *caspius* from stream İncilipınar, Aras; **d**, *Salmo* cf. *ciscaucasicus* from stream Keklik, Aras.

not included endemic fish species of Turkey by Çiçek et al. (2018). However, the species has never been reported from Armenia or adjacent countries. Even though these

species are restricted to the Turkish part of Kura River, the population density detected was high. Probably, this was due to the limited human population in nearby rural

areas, hence the negative effect of anthropogenic pollutants. In addition, hydro power plants could not be installed in the area since the geographical structure of the region is a flat plateau. Both species are already assessed as “Least concern” by IUCN.

Carassius gibelio, *Cyprinus carpio*, *Pseudorasbora parva*, *Gobio artvinicus* and *Oncorhynchus mykiss* are exotic species of upper Kura and Aras drainages. Even though *P. parva* and *C. gibelio* are not very widespread throughout the area, they have high invasiveness potential. Therefore, caution is necessary to prevent the spread of these species.

Discussion

Fricke et al. (2007) claimed that *Caspiomyzon wagneri* (Kessler, 1870), *Acipenser persicus* Borodin, 1897, *Alosa braschnikovi* (Borodin, 1904), *Alosa caspia* (Eichwald, 1838), *Rutilus kutum* (Kamensky, 1901), *Stenodus leucichthys* (Güldenstädt, 1772), *Neogobius melanostomus* (Pallas, 1814), *Neogobius ratan* (Pallas, 1814), *Neogobius syrman* (Pallas, 1814) and *Proterorhinus marmoratus* (Pallas, 1814) are extinct in the Caspian Sea watersheds of Turkey. However, these species had never been documented by field observations and collected specimens in Turkish Kura and Aras river drainages (See Table 2 for details). Furthermore, several incorrect records and misidentifications were identified (Table 2).

Alburnus hohenerkeri, *Blicca bjoerkna*, *Gobio artvinicus*, *Neogobius fluviatilis* and *Rhodeus amarus* were recorded for the first time in the upper reaches of Aras River in Turkey by the observed samples.

Turan et al. (2012, 2014a, 2014b, 2017, 2020) showed that there is a high diversity within Salmonids in Anatolia. The presence of five trout species in Turkish Mediterranean tributaries and four species in Euphrates River drainages encouraged us to compare the trout population of Kura-Aras River systems in detail. Also based on a limited number of specimens, our study evidenced that Kura populations belong to *Salmo caspius*, but populations from Aras drainage need further study. We are considering the occurrence of *S. ciscaucasicus* and an unnamed trout species in upper Aras drainages. Therefore, we encourage a detailed study on trout taxonomy in the upper Aras drainages.

Introduced salmonid, *Coregonus albula*, was recorded in Lake Aktaş, which is a transboundary lake shared between Turkey and Georgia (Yerli 2019). During our single survey in July 2017 in the Lake Aktaş, we were not able to find this species. Perhaps this species was introduced to the lake after the present survey.

There are two species categorized under the red list of IUCN; both were assessed as Vulnerable. The first is native populations of *Cyprinus carpio*, which were observed only in Lake Çıldır in the area. The population density of the species is declining due to overfishing and destruction of breeding and feeding areas (Zengin et al.

2012). Besides, invasive *Pseudorasbora parva* and *Carassius gibelio*, and introduced *Cyprinus carpio* inhabit Lake Çıldır and compete with the native *C. carpio* populations for food and habitat. The second species is *Lucio-barbus capito*, which was found only in stream Gaziler in the present study. However, Çiçek and Sungur Birecikligil (2016) recorded the species in five sampling sites. We observed only 4 samples in stream Gaziler despite our intense efforts. This suggests that *L. capito* population is drastically declining due to damming in the 1950's and 1960's in the Caspian Sea. *L. capito* decline is continuing, especially for mature individuals (Freyhof and Kottelat 2008). Because of its big size, overfishing is also a major threat for *L. capito*.

There are nine species not evaluated against IUCN criteria. Among these: *Capoeta kaput*, *C. saniae* and *Oxy-noemacheilus veyselorum*, were described after 2017; therefore they have not yet been assessed by IUCN. *C. kaput* was found only from B-20 canal in this study, and from two localities by (Levin et al. 2019). *C. saniae* was described from two localities by Eagderi et al. (2017), which were covered by the present study and resulted in the capture of only a few specimens. *O. veyselorum* was described from a single locality by Çiçek (2018), however, in this study, it was recorded from eight additional sampling sites, with multiple individuals. The situation with respect to *C. kaput* and *C. saniae*, in particular, would appear to be critical. Therefore, we encourage researchers to study the conservation status of these species.

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