



Mollusca Fauna of the Çoruh River and Its Tributaries

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Abstract: In this study, Mollusca (Gastropoda, Bivalvia) samples obtained from different distributaries drains the Çoruh River Basin were examined. It was aimed to contribute to the knowledge of mollusc species distribute in inland waters of Turkey. The samples were taken from 21 different locations at different times. At the end of the study, a total of 9 species of *Dreissena polymorpha* Pallas, 1771, *Gyraulus piscinatum* Bourguignat, 1852, *Pisidium casertanum* Poli, 1791, *Planorbis intermixtus* Mousson, 1874, *Galba truncatula* O.F. Müller, 1774, *Valvata piscinalis* Müller, 1774, *Valvata macrostoma* Morch, 1864, *Radix labiata* Rössmasler, 1835, *Ancylus fluviatilis* Schütt, 1964 were determined. The identified species were recorded for the first time for the Çoruh Basin.

Keywords: Bivalvia, Çoruh, Gastropod, stream systems, Turkey.

Çoruh Nehri ve Kollarının Mollusca Faunası

***Sorumlu yazar:**

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Öz: Bu çalışmada, Çoruh Nehir Havzasını besleyen farklı kollarından elde edilen Mollusca (Gastropoda, Bivalvia) örnekleri incelenmiştir. Bu sayede Türkiye içsularında dağılım gösteren Mollusca türleri hakkındaki bilgilere katkı sağlanması amaçlanmıştır. Örnekler 21 farklı istasyondan farklı tarihlerde alınmıştır. Çalışmanın sonunda toplam 9 tür *Dreissena polymorpha* Pallas, 1771, *Gyraulus piscinatum* Bourguignat, 1852, *Pisidium casertanum* Poli, 1791, *Planorbis intermixtus* Mousson, 1874, *Galba truncatula* O.F. Müller, 1774, *Valvata piscinalis* Müller, 1774, *Valvata macrostoma* Morch, 1864, *Radix labiata* Rössmasler, 1835, *Ancylus fluviatilis* Schütt, 1964 tespit edilmiştir. Tespit edilen türler Çoruh Havzası için ilk kez kaydedilmiştir.

Anahtar kelimeler: Akarsu sistemleri, bivalvia, Çoruh, Gastropoda, Türkiye.

INTRODUCTION

Molluscs are the richest group after arthropods in terms of number of species. It is known that there are more than 35 thousand fossil records, known for the presence of over 65 thousand living, strongly calcified crusts. Gastropoda and Bivalvia are common macrobentic groups in both aquatic and terrestrial ecosystems. While some of these groups are considered expensive foods, they contribute to the economy by the use of rare shell and pearl obtained from Bivalvia as natural ornaments (Salman, 2006). In their aquatic habitats, being food for some living organisms such

as fish, waterfowl and water mammals, being bioindicators in environmental changes and being one of the fossil groups used to determine the geological developments of the World, they are regarded as important in scientific studies (Öktener, 2004).

Çoruh River, which is accepted as one of the fastest flowing rivers of Turkey and one of the 10 fastest rivers in the world, consists of the lower Çoruh basin affected by the humid and temperate climate of the Black Sea and the upper Çoruh basin affected by the harsh climate of Eastern

Anatolia. Çoruh River Valley, which is on the migration route of birds, host endemic many plant and animal species and is home to diverse ecosystems Turkey's first and only biosphere reserve area (Camili-Macahel), 2 National Parks (Hatila Valley National Park, Karagöl Sahara National Park), 1 Nature Park (Borçka Karagöl Nature Park) and 3 Nature Protection Areas (Çamburnu Nature Protection Area, Camili-Efeler Nature Protection Area, Camili-Gorgit Nature Protection Area) (Yılmaz, 2010).

The first study was conducted at 1841 by Recluz so as to determine the diversity of mollusca species in Turkey's inland water. In the following years, studies on the subject continued increasingly (Gürlek et al., 2019; Kalyoncu et al., 2008; Şereflişan et al., 2009; Koşal Şahin, 2013; Kılıçaslan and Özbek, 2010; Koşal Şahin and Zeybek, 2016; Odabaşı et al., 2015; Öktener, 2004; Yıldırım et al., 2006;). However, when the literature is examined, it is seen that these studies focus on the basins in Western Anatolia, Mediterranean and Aegean regions and there is no current study on the basin in Çoruh River. The aim of this study is to contribute to the determination of Gastropoda and Bivalvia fauna of the Çoruh Basin.

MATERIAL AND METHODS

Study Area: Çoruh River, which has rich water resources and is one of the 25 river basins of Turkey, rises from the west of the Mescit Mountains at an altitude of 3000 m and continues its flow towards the Bayburt plateau. The river, which makes a sharp turn eastward from Bayburt plateau, joins with Tortum Stream and Oltu Stream and continues to flow northward through Yusufeli (Artvin) district. Çoruh River, which joins with many branches in the direction of flow, leaves the borders of our country near Muratlı town. Near Batumi, the capital of Ajara, a semi-autonomous province of Georgia, it flows into the Black Sea via the delta formed by alluvium. (Akpınar et al., 2009).

In this study, sampling was carried out in 21 stations selected from Çoruh River and its tributaries. The diagnoses of Gastropoda and Bivalvia species were obtained from samples which had previously taken at different times. The map showing the sampling stations is given in Figure 1. QGIS 2.18 geographic information request was used for mapping these locations.

Sampling: Gastropoda and Bivalvia (Mollusca) samples were collected during field studies. A hand net of 30x30 cm and 250 µm mesh size was used for the collection of biological samples. Collets and straws were used to remove some organisms under the stones. The first fixations of the collected samples with 4% formaldehyde were made in the field and information such as date, name of the station, coordinate, altitude, and name of the province where it was located were recorded. Information such as coordinates and

sampling dates of the stations are given in Table 1. The samples were washed with plenty of water to remove formaldehyde and 4 mm-250 µm mesh size was used to facilitate separation. The separated samples were placed into 70% alcohol and made ready for diagnosis. The samples were examined using a loop and under Nikon SMZ 800N microscope respectively. Molluscs were identified according to Bilgin and Şeşen (1991), Bilgin (1969, 1973;1980), Schütt (1964;1965;1982) and Glöer et al., (1998).

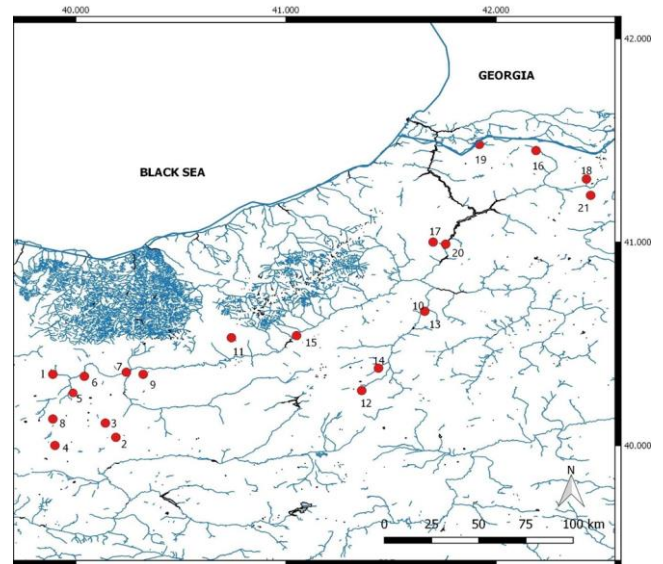


Figure 1. Map of Stations.

RESULTS

Dreissena polymorpha (Pallas, 1771)

Habitat preferences in this study: Two sampling points were found in Tortum Waterfalls. One of the stations where the species was identified was a pond habitat formed on the upper part of the waterfall, and the other one was a stony and vegetated area. Pictures of the species are given in the Figure 2.

Distribution in Turkey: Büyük Akgöl, Lake Abant, Yeniçağa Lake, Ceyhan River Basin (Gürlek et al., 2019), Sapanca Lake, Apolyont Lake (near Uluabat), Beyşehir Lake, Eğirdir Lake (Kinzelbach, 1986), Sapanca Lake (Koşal Şahin and Yıldırım, 2007).

Planorbis intermixtus (Mousson, 1874)

Habitat preferences in this study: The vegetated areas of the rivers and stagnant areas with pond character were encountered. Pictures of the species are given in the Figure 2.

Distribution in Turkey: Doğu Beyazıt (Ağrı) mashes, Lake Sapanca (Gürlek et al., 2019; Arslan et al., 2017).

Euglesa casertana (Poli, 1791)

Habitat preferences in this study: Stony-vegetated areas of streams and stagnant areas such as fountain troughs,

irrigation canals and ponds. Pictures of the species are given in the Figure 2.

Distribution in Turkey: Çarşamba Stream, Beşgöl Spring, Sarıkum Lake, Karaçay (Finike), Kırkgöz (Antalya), Karıncalı Lake, Susam Lake, Özbek Village, Pınarlı Stream, Urla (İzmir), Gülbahçe Village Stream, Muradiye (Manisa), Göksu Spring, Kadiovacık Fountain, Çeşme (İzmir), Oğlananası Pond, İzmir-Menderes, Sarıçay Creek, Akhisar Reservoir, Istranca Stream, Lake Eğirdir, Kovada Channel, Gölbaşı Lake, Yuvarlakçay (Köyceğiz), Lake Acarlar, Gölbaşı Lake, Azaplı Lake, İnekli Lake (Gürlek et al., 2019).

***Gyraulus piscinarum* (Bourguignat, 1852)**

Habitat preferences in this study: Stony-vegetated areas of streams and stagnant areas such as fountain troughs and irrigation canals. Pictures of the species are given in the Figure 2.

Distribution in Turkey: Lake Gölbaşı, Lake Beyşehir, Yazır Lake, Duruca Lake, Limonlu (Lamos) Stream (Mersin), Ceyhan River Basin (Gürlek et al., 2019).

***Valvata macrostoma* (Morch, 1864)**

Habitat preferences in this study: It was found in the area where the water accumulates but the flow continues. Pictures of the species are given in the Figure 2.

Distribution in Turkey: Işıklı Lake, Lake Gölbaşı (Gürlek et al., 2019).

***Ancylus fluviatilis* Müller, 1774**

Habitat preferences in this study: Stony and vegetation was found in areas with higher altitude. Pictures of the species are given in the Figure 2.

Distribution in Turkey: Ayazma Stream (Çanakkale), Girne Stream (Edremit), Koçak Stream (Umurlu), Kestane Water Ditch (Buldan), Bakaran Village Stream (Beyşehir), Taşlıca Village (Beyşehir), Aykırcahanı Village Stream (Elmalı), Karaçay Stream (Finike), Çarşamba Stream, Antalya, Lake Eğirdir, İzmir, Ceylanpınar (Urfa), Başpınar Village (Tefenni), Ağlasun Dereköy, Erciyes Mountain (Kayseri), Eğirdir, Değirmendere Stream, Özbek Village, Pınarlı Stream, Yiğitler Stream, Kemalpaşa-İzmir, Seferihisar Reservoir, Seferihisar (İzmir), Malatya, Değirmendere Stream, Büyükmenderes River, Yuvarlakçay (Köyceğiz), Ceyhan River Basin (Gürlek et al., 2019).

***Galba truncatula* (O.F.Müller, 1774)**

Habitat preferences in this study: Stony and vegetation was found in areas with higher altitude. Pictures of the species are given in the Figure 2.

Distribution in Turkey: Lake Sapanca, Lake Beyşehir (Konya), Antalya, Konne Spring (Eğirdir, Isparta), Lake Eğirdir (Isparta), İzmir, Ereğli-Zonguldak, Toros Mountains, Bucak Yazıpınar Village Irrigation Channel, Pınarbaşı Spring, Bucak, Kuşbaba Village (Başgöz), Ağlasun Stream, Soğanlı Village, Örencik Village, Kurna Village, Terzipınar- Gölhisar, Kozpınar- Gölhisar, Çataloluk Spring, İncilipınar-Gölbaşı, Terkos Lake, Erciyes Mountain,

Istranca Stream, Sarıçay Creek, Malatya, Tunceli, Limonlu Stream- Mersin, Karasu (Sakarya River), Eleşkirt, Dolutaş Village (Ağrı), Gölbaşı Lake, Azaplı Lake, İnekli Lake, Ceyhan River Basin (Gürlek et al., 2019).

***Radix labiata* (Rossmasler, 1835)**

Habitat preferences in this study: Stony and vegetation were found in areas with higher altitude. Pictures of the species are given in the Figure 2.

Distribution in Turkey: Hacılar Village, Lake Gölbaşı (Hatay), Lake Sapanca, Karacaören(Kargı) Dam Lake, Ağlasun Başköy, Burdur Lake, Örencik Village, Kocapınar Village, Düğer Village, Hacılar Village, Pınarbaşı Village, Karataş Lake, Çataloluk Spring, İncilipınar (Gölbaşı Village), Terkos Lake, Akyaka Kadın River Branch, Down Sakarya River (Karasu), Değirmendere Stream (Tunceli), Lake Eğirdir, Lake Kovada, Abant Lake, Emir Lake (Antakya), Akşehir Lake, Apolyont Lake, Sapanca Lake, Abant Lake, Marmara Lake, Köprüören Stream (Tavşanlı), Hamidiye Village Stream (Eskişehir-Konya Yolu), Çavuşçu Lake, Eber Lake, Deveönü, Köşkpınar Spring, Eğirdir Lake, Hendek (Beyşehir), Yılanlı Sazı Pond, Bakaran Village Stream, Akgöl (Gebekirse), Ağlasun (Burdur), Karataş Lake (Burdur), Akyaka (Muğla), Kızılcahamam, Beşgöl Spring, Balık Lake, Uzun Lake, Gıcı Lake, Cernek Lake, Derbent Dam Lake, Lake Sapanca (Sakarya), Antalya, Konne Spring (Eğirdir), Lake Eğirdir, İzmir, Isparta, Karınlake, Karıncalı Göl, Susam Lake, İlvat Lake, Sülüklü Lake, Erciyes Mountain, Eğirdir, Güzelhisar Reservoir, Aliğa (İzmir), Özbek Village, Pınarlı Stream, Urla (İzmir), Karagöl Lake, Seferihisar İ (İzmir), Göksu Springs, Muradiye (Manisa), Oğlananası Pond, Menderes (İzmir), Sarıçay Creek, Istranca Stream, Limonlu (Mersin) Stream, Yuvarlakçay (Köyceğiz), Eleşkirt, Uludal Village (Ağrı), Değirmendere (Ağrı), Sarısu (Ağrı), Doğubeyazıt Balık Stream (Ağrı), Saz Lake (Ağrı), Karaca Village (Ağrı), Hamur Suyu (Ağrı), Poyrazlar Lake, Taşkısığı Lake, Abant Lake, Yeniçağa Lake, Işıklı Lake (Denizli), Ceyhan River Basin (Gürlek et al., 2019).

***Valvata piscinalis* (Müller, 1774)**

Habitat preferences in this study: Stony and vegetation was found in areas with higher altitude. Pictures of the species are given in the Figure 2.

Distribution in Turkey: İzmir, Aliğa, Kuzgun Lake (Çoraklar Spring), Efes Lake (Selçuk), Narlıkuyu (Bornova), Mandacıyı (Bornova), Kocasu (Bornova), Lake Gölbaşı (Hatay), Göksu Spring, Kanı Fountain, Üçpınar Village, Oğlananası Pond, Akhisar Reservoir, Akçapınar Stream, Akyaka Kadın River Branch, Poyrazlar Lake, Taşkısığı Lake, Büyük Akgöl, Acarlar Lake, Abant Lake, Yeniçağa Lake, Azaplı Lake, İnekli Lake, Ceyhan River Basin (Gürlek et al., 2019).

DISCUSSION

As a result, there are almost no studies on Gastropoda and Bivalvia species in Çoruh River and its tributaries. This study will guide the work to be done in the basin.

According to Glöer and Pesic 2010, *Planorbis intermixtus* show the distribution island of Greece, the Caspian Sea basin, and from Turkey's mountain to Kyrgyzstan. *Planorbis intermixtus* detected in the Çoruh Basin conforms to these data. *Dreissena polymorpha*, which is thought to be able to live in very different habitats according to proper water quality and nutritional conditions, was encountered in the Çoruh Basin at the station showing the pond character with the facilities establish around it for commercial purposes. Gyraulus species are distinguished shell structure, dimensions, and prostate diverticles. In the

Çoruh Basin 1 species belonging to the Gyraulus genus were determined.

In this study, *Galba truncatula* was detected in stagnant waters such as pond and fountain and slow running streams. *Radix labiata* was detected in permanent and slow-running freshwater by Schniebs et al., 2013. The findings in the Çoruh Basin are similar to these data. *Ancylus fluviatilis* was identified from the source and its tributaries and habitat features were generally shown as stony, sandy soils by Yıldırım et al., 1999. The stations where *Ancylus fluviatilis* is detected in the closest to the source (İremköy Stream) and have stony, vegetated, and sandy habitats in the Çoruh Basin.

In this region, the shells of *Belgrandiella nemethi* were found by Shütt and Şeşen in 1993. This species, which has been identified within the borders of Borçka district (Artvin) where the Çoruh River abandons the borders of Turkey. Species identified as a result of sampling were recorded for the first time in the Çoruh Basin.

Table 1. Information of sampling stations

Station No	Station Name	District/Province	Coordinate	Sampling Tool
1	Çatıksu Stream	Aydıntepe/Bayburt	40. 41 N, 40.064 E	D-Frame Net
2	Saruhan Stream	Aydıntepe/Bayburt	40,042 N, 40,191 E	D-Frame Net
3	Güder Stream	Aydıntepe/Bayburt	40,1180 N, 40,1425 E	D-Frame Net
4	Otlukbeli Stream	Aydıntepe/Bayburt	40,0060 N, 38,8925 E	D-Frame Net
5	Kırkpınar Stream	Aydıntepe/Bayburt	40, 2972 N, 39,9704 E	D-Frame Net
6	Nişantaşı Pond	Aydıntepe/Bayburt	40,3475 N, 40,040 E	D-Frame Net
7	Değirmencik Fountain	Aydıntepe/Bayburt	40,3681 N, 40,2449 E	D-Frame Net
8	Güvercindere Irrigation Channel	Demirözü/Bayburt	40,13 N, 38,89 E	D-Frame Net
9	Aydıncık Stream	Merkez/Bayburt	40,356 N, 40,32 E	D-Frame Net
10	Tortum Waterfall (Lower)	Tortum/Erzurum	40,660 N, 41,66 E	D-Frame Net
11	Anur Stream	İspir/Erzurum	40,53 N, 40,74 E	D-Frame Net
12	Yağcılar Stream	Tortum/Erzurum	40,27 N, 41,36 E	D-Frame Net
13	Tortum Waterfall (Upper)	Tortum/Erzurum	40,66 N, 41,66 E	D-Frame Net
14	Doruklu Stream	Tortum/Erzurum	40,35 N, 41,31 E	D-Frame Net
15	Yedigöze Stream (Çoruh River Anakol)	İspir/ Erzurum	40,54 N, 41,05 E	D-Frame Net
16	Mansuret Stream ,	Şavşat/Artvin	41,45 N, 42,19 E	D-Frame Net
17	Narlık Stream	Yusufeli/Artvin	41,00 N, 41,70 E	D-Frame Net
18	Şavşat Stream (Veliköy)	Şavşat/Artvin	41,31 N, 42,43 E	D-Frame Net
19	İremköy Stream	Borçka/Artvin	41,4856, 41,922	D-Frame Net
20	Kirazalan Stream	Yusufeli/Artvin	40,99 N, 41,76 E	D-Frame Net
21	Ballı Stream	Şavşat/Artvin	41,23 N, 42,45 E	D-Frame Net

Table 2. Species observed in the stations.

	<i>Dreissena polymorpha</i>	<i>Gyraulus piscinarum</i>	<i>Valvata macrostoma</i>	<i>Euglesa casertana</i>	<i>Planorbis intermixtus</i>	<i>Galba truncatula</i>	<i>Valvata piscinalis</i>	<i>Radix labiata</i>	<i>Ancylus fluviatilis</i>
Çatıksu Stream								*	
Saruhan Stream		*		*					
Güder Stream				*					
Otlukbeli Stream				*	*			*	
Kırkpınar Stream				*	*	*	*	*	
Nişantaşı Pond		*		*	*	*			
Değirmencik Fountain		*		*		*			
Güvercindere I.C				*		*			
Aydıncık Stream				*		*			
Tortum Waterfall 2	*		*	*					
Anur Stream		*							
Yağcılar Stream				*					
Tortum Waterfall 1	*								
Doruklu Stream				*	*	*			*
Yedigöze Stream				*					
Mansuret Stream		*		*					
Narlık Stream									*
Şavşat Stream				*				*	
İremköy Stream		*		*					*
Kirazalan Stream		*							
Ballı Stream				*		*			

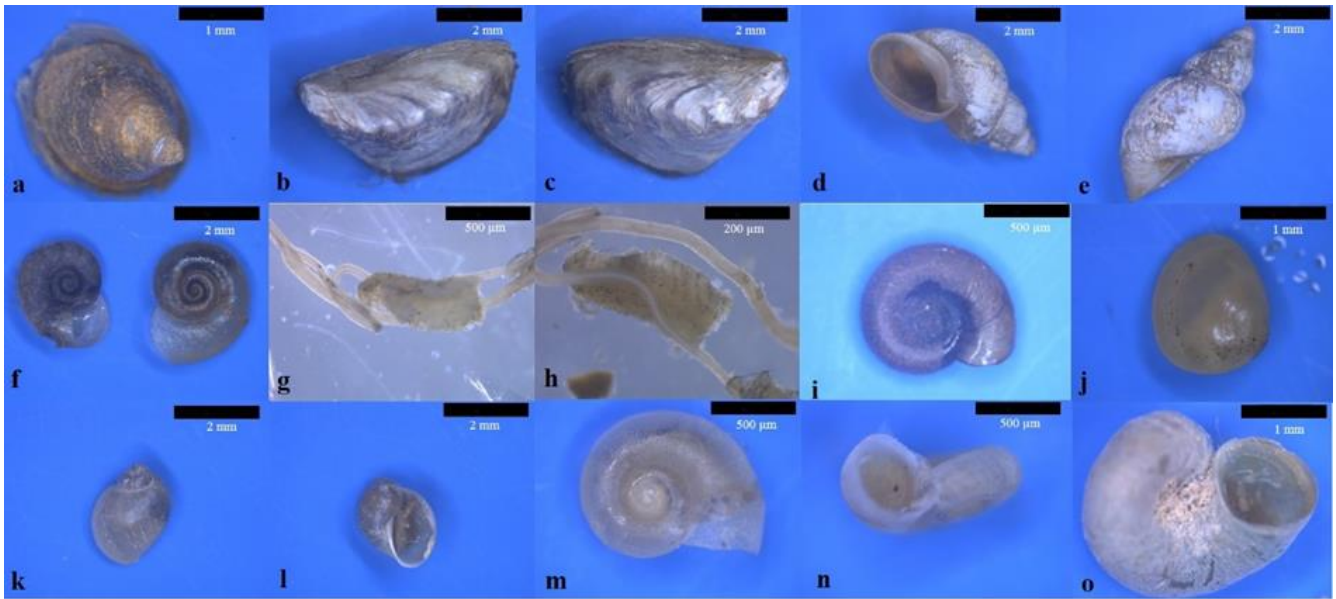


Figure 2. Pictures of diagnosed species (a: *Ancylus fluviatilis*; b, c: *Dreissena polymorpha*; d,e: *Galba truncatula*; f: *Gyraulus piscinarum*; g,h,i: *Planorbis intermixtus*; j: *Euglesa casertana*; k,l: *Radix labiata*; m,n; *Valvata macrostoma*; o: *Valvata piscinalis*)

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