

Supplement to the Prosobranchia (Mollusca: Gastropoda) Fauna of Fresh and Brackish Waters of Turkey

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Abstract: This study re-evaluated the brackish and freshwater Prosobranch fauna list of Turkey. Furthermore, recent systematic changes and future studies to be performed were discussed.

Theodoxus (Theodoxus) danubialis (C. PFEIFFER 1828), *Th. (Th.) subthermalis* (ISSEL 1865), *Bythinella opaca* (FRAUENFELD 1857), *Pseudamnicola macrostoma* (KÜSTER 1852), *P. kotschy* FRAUENFELD 1856 and *P. elbursensis* STARMÜHLER & EDLAUER 1957 were removed from the list, while the following taxa were added: *Viviparus mamillatus* (KÜSTER 1852), *Bithynia pentheri* STURANY 1905, *Hydrobia ventrosa* (MONTAGU 1803), *Hydrobia (Peringia) ulvae* (PENNANT 1777), *Belgrandiella adsharica* (LINDHOLM 1913), *Sadleriana byzanthina demirsoyii* YILDIRIM and MORKOYUNLU 1997, *Sadleriana fluminensis* (KÜSTER 1852), *Tefennia tefennica* SCHÜTT and YILDIRIM 2003, *Falsipyrgula schuetti* YILDIRIM 1999, *Bythinella occasiuncula* BOETERS and FALKNER 2001 and *Paludinella littorina* (DELLE CHIAJE 1825). The number of currently recognised taxa reaches 80.

Key Words: Prosobranchia, Gastropoda, Turkey

Türkiye Tatlı ve Acısu Prosobranchia (Mollusca: Gastropoda) Faunası'na Katkılar

Özet: Bu çalışmada, Türkiye'nin acı ve tatlısularında yayılış gösteren Prosobranch türleri listesinde yeni bir değerlendirme yapılarak, son sistematik değişiklikler ve ileride yapılması gerekenler tartışılmıştır.

Theodoxus (Theodoxus) danubialis (C. PFEIFFER 1828), *Th. (Th.) subthermalis* (ISSEL 1865), *Bythinella opaca* (FRAUENFELD 1857), *Pseudamnicola macrostoma* (KÜSTER 1852), *P. kotschy* FRAUENFELD 1856 ve *P. elbursensis* STARMÜHLER & EDLAUER 1957 türleri listeden çıkarılırken; *Viviparus mamillatus* (KÜSTER 1852), *Bithynia pentheri* STURANY 1905, *Hydrobia ventrosa* (MONTAGU 1803), *Hydrobia (Peringia) ulvae* (PENNANT 1777), *Belgrandiella adsharica* (LINDHOLM 1913), *Sadleriana byzanthina demirsoyii* YILDIRIM ve MORKOYUNLU 1997, *Sadleriana fluminensis* (KÜSTER 1852), *Tefennia tefennica* SCHÜTT ve YILDIRIM 2003, *Falsipyrgula schuetti* YILDIRIM 1999, *Bythinella occasiuncula* BOETERS ve FALKNER 2001 ve *Paludinella littorina* (DELLE CHIAJE 1825) türleri listeye eklenilmiştir. Bu düzenleme ile ülkemizdeki iç sularda yayılış gösteren Prosobranchia tür sayısı 80' e ulaşmıştır.

Anahtar Sözcükler: Prosobranchia, Gastropoda, Türkiye

Introduction

Taxonomical studies dealing with the fresh and brackish water gastropods of Turkey, particularly concentrated on spring snails (Hydrobioidea), are rather scarce and have been done mainly in second half of the last century. Thus, it can still be said that aquatic gastropods of Turkey are poorly known.

In the previous list of the fresh and brackish waters of Turkey (Yıldırım, 1999a), 73 recent prosobranch taxa, of which 40 being Anatolian endemics, were recorded,

whilst in the Lakes Region 32 prosobranch taxa from 18 genera and 10 families were recorded, 25 of the latter being also endemics (Yıldırım, 1999b). In addition, 22 species and 6 subspecies of fossil prosobranchs were also listed, which have been reported from Quaternary sediments in various parts of Anatolia, where all but one species originally described from Anatolia (Yıldırım, 1999a). Among the literature not previously mentioned, Boettger (1857) described several Prosobranch species from different parts of Turkey, *Pseudamnicola lindbergi* (Pınarbaşı, Elbistan) and *Belgrandiella cavernica* (İnsirtu

Cave, Ereğli, Zonguldak), and reported *Theodoxus anatolicus* from Antakya. Forcart (1961) recorded *Theodoxus anatolicus* (Denizli), *Viviparus mamillatus* (Belgrad Forest, İstanbul; Abant Lake), and *Melanopsis praemorsa* (Karakaya, Balıkesir; Denizli).

Results

Additions to the list:

Viviparus mamillatus (KÜSTER 1852)

1961 *Viviparus mamillatus* – FORCART, L., p.176.

1990 *Viviparus mamillatus* – FECHTER and FALKNER, p.118.

This species was recorded only from lake Abant and Belgrad forest so far (Forcart, 1961). General distribution of the species was given as western Balkan Peninsula from Croatia to Epirus (Fechter and Falkner, 1990).

Bithynia pentheri STURANY 1905

1905 *Bithynia pentheri* STURANY, Ann. Naturhist. Hofmus. Wien, 20: 307, fig. 10.

Translation from the original description: "...Shell compact, oval to compressed cylindrical, dull, rough, greenish yellow to brown, with closed or slit-like umbilicus; 3 1/2 - 4 rapidly increasing, fairly increasing turns with quite deep sutures. Growth lines irregular and ± clear spiral lines towards mouth. Last whorl more developed, mouth oblong-oval, edges sharp, connected and dark-brown rimmed. Operculum oval, upper edge angular, concentric. Height 8-9.5, width 6-7.5 mm, aperture height 5, width 3 1/2 mm .." (Sturany, 1905). It is known from the original description, from Sousali (=Soysallı) and a few recently collected samples from Kayseri.

Recent Material: Karpuz Sekisi, Kayseri; Ambar Park Brook, Kayseri.

Hydrobia (Hydrobia) ventrosa (MONTAGU 1803)

1803 *Turbo ventrosus*, p. 317

2002 *Hydrobia (Hydrobia) ventrosa* GLÖER, p. 99

2003 *Ventrosia ventrosa* DEMİR, Tr. J. of Zoology, 27: 108

It is recorded from coastal brackish waters of Turkey.

Localities: Sarıkum Lake, Derbent Dam Lake (Öktener, 2004), (Demir, 2003), Aegean and Mediterranean coasts (Demir, 2003).

Hydrobia (Peringia) ulvae (PENNANT 1777)

1777 *Turbo ulvae* PENNANT, TH., p. 132, Taf. 86, Fig. 129.

1933 *Hydrobia ulvae* ERMAN, P. 188

2002 *Hydrobia ulvae* GLÖER, P. 101

This species was recorded from the Aegean coast of Turkey (Demir, 2003).

Belgrandiella adsharica (LINDHOLM 1913)

1913 *Bythinella adsharica* LINDHOLM, 67.

Empty shells assigned to this species were collected from a spring 5 km N of Borçka (Artvin) (Schütt and Şeşen, 1993).

Sadleriana byzanthina demirsoyii YILDIRIM and MORKOYUNLU 1997

1997 *Sadleriana byzanthina demirsoyii* YILDIRIM and MORKOYUNLU, III. Ulusal Ekoloji ve Çevre Kongresi Cilt 2: 156-159

The shells of these snails differ from the nominal form by the incurved palatal edge. It has been recorded so far from the provinces of Antalya (Yarıkpınar Spring, Gömbe Spring; Yıldırım and Karaşahin, 2000), and Burdur (Kümbetlipınar Spring, Yarışlı Village Spring, and Yeşilova; Yıldırım et al., 2002). The nominal subspecies is known around İzmir, Manisa and Kütahya (Schütt, 1965; Soylu, 1990), while *demirsoyii* seems to be isolated in south-western Anatolia.

Sadleriana fluminensis (KÜSTER 1852)

It was recorded once from Lake Sapanca (Schütt, 1988). This record is dubious as it has never recorded since then and the distribution of *fluminensis* is in the western Balkans (Radoman, 1983).

Genus *Tefennia* SCHÜTT and YILDIRIM, 2003

This genus is conchologically characterised by a sinuate aperture on the strongly developed aperture. This monotypic genus is currently endemic to the type locality of *T. tefennica*. This new genus possibly has a relicary

origin in the old Tefenni basin (Bering, 1971; Steininger and Rögl, 1985).

***Tefennia tefennica* SCHÜTT and YILDIRIM 2003**

2003 *Tefennia tefennica* SCHÜTT and YILDIRIM Arch. Molluskende 132: 1/2: 1-7. Frankfurt am Main.

Shell minute, thin, light corneous, with a blunt apex and 4 whorls; shell ovoid conical with a strongly developed last whorl and a broad oval aperture having 2 small depressions above and below its lip; umbilicus almost closed. It is known from a single locality.

Material: Başpınar Spring (Tefenni, Burdur).

***Falsipyrgula schuetti* YILDIRIM 1999**

1999 *Falsipyrgula schuetti*, SCHÜTT and YILDIRIM, Malakol. Abh. Mus. Tierkd. Dresden, 19:243, F. 4.

Shell very small, conical, spire short; the embryonic whorls smooth, the following whorls with 2 distinct keels. It is known only from a single locality in Lake Beyşehir (Schütt and Yıldırım, 1999).

Material: Lake Beyşehir

***Bythinella occasiuncula* BOETERS& FALKNER, 2001**

2001 *Bythinella occasiuncula* BOETERS& FALKNER, Heldia Band 3, Heft 2/3: S. 51-52.

It is a relatively small *Bythinella* species (height 1.9-2.3 mm, width 1.3-1.5 mm) with 3 1/2 whorls. Shell oval, sutures deep. Mouth oblique oval, edges with a slight thickening on the umbilical side; umbilicus slit-like. It was described from "Kirk Oluk" spring in Boz Dağlar, between Birgi and Bozdağ, SE of Ödemiş, İzmir (Boeters and Falkner, 2001).

***Paludinella littorina* (DELLE CHIAJE 1825)**

1828 *Helix littorina* DELLE CHIAJE, p. 225.

This is a minute snail species (shell height 2-3 mm) living in lagoons and rocky shores. Shells collected from Aegean and Mediterranean coasts of Turkey were identified as *P. littorina* (Demir, 2003). Another Mediterranean species, *Paludinella sicana* (BRUGNONE 1876), was recorded from Israel, but not *littorina* (Henk Mienis, *in litt.*).

Deleted taxa

***Theodoxus (Theodoxus) danubialis* (C. PFEIFFER 1828)**

This species lives in the Danube river and drainage systems flowing into the north-western parts of the Black Sea (Zhadin, 1965; Fechter and Falkner, 1990; Glöer, 2002), and is recorded from the shores of Lake Sapanca (Schütt, 1988). However, we have not been able to sort this species during surveys so far. Thus we conclude that the record probably belongs to *Th. fluviatilis euxinus* (CLESSIN 1885) confusable with *Th. danubialis* due to the common zigzag pattern on the lighter shell background.

***Theodoxus (Theodoxus) subthermalis* (ISSEL 1865)**

All records of *Theodoxus subthermalis* (ISSEL 1865) are from western and south-western Anatolia (Bilgin, 1980), and those further west (e.g., Lesbos) are misidentifications of *Th. fluviatilis fluviatilis* (LINNAEUS 1758), because recent studies show that only 4 *Theodoxus* species (*fluviatilis*, *altenai*, *anatolicus*, and *heldreichi*) occur in the area. The species is apparently endemic to Iran and Caucasia (Zhadin, 1965), and thus the possibility of its occurrence within the borders of Turkey is still questionable, as it has been recorded from Erivan, Poti, Kutaisi and Sokhumi (Zhadin, 1865) quite near to the NE borders of Turkey.

***Bythinella opaca* (FRAUENFELD 1857)**

The genus *Bythinella* in general includes stenoecious species with limited distributions (Zhadin, 1965). From Turkey, the endemic *B. turca* (Radoman, 1976) and Central European *B. opaca* (Schütt, 1965) have been recorded, both from single localities, but we think that the latter species is not *opaca*, but a new species.

***Pseudamnicola macrostoma* (KÜSTER 1852)**

This species lives in continental Greece and Euboa (Schütt, 1980) and does not seem to reach the Anatolian mainland. Thus the record from İzmir probably does not belong to this species.

Pseudamnicola kotschy FRAUENFELD 1856 and
P. elbursensis STARMÜHLER & EDLAUER 1957

According to material gathered from sites in which the taxa are said to be collected, both are misidentifications of *P. bilgini* and they are not present in Turkey, but are present in Iran (Şeşen, 1992; Schütt and Şeşen, 1993).

Remarks and Corrigenda

Hydrobia acuta (DRAPARNAUD 1805)

The record from the Neogene of Kilbasan District (Karaman, Turkey) (Yeşilyurt and Taner, 2002) belongs more likely to another genus, as the whorls are less swollen and numerous, while the apex is blunt or corroded. However, we think that the species is overlooked and does occur on Turkish coasts.

Theodoxus pallasii (LINDHOLM 1924) and
Assimineia grayana (FLEMING 1828)

Both were recorded from Yamansaz lake in Antalya (Falakali-Mutaf et al., 2004). *Th. pallasii* is found in Caspian lake (Zhadin, 1965), while *A. grayana* is found on the Atlantic coasts of north-western Europe (Glöer, 2002). The figures should actually belong to *Th. anatolicus* and possibly a juvenile Enid sp.; but an exact separation couldn't be made.

Semisalsa longiscata (BOURGUIGNAT 1856)

This species was erroneously reported in the previous list as endemic to Turkey (Yıldırım, 1999a), and is actually found in Hatay, Syria, Lebanon, Jordan, and Israel (Schütt, 1982; Mienis, 2004).

Valvata macrostoma (MORCH 1864)

Valvata pulchella STUDER 1820 was synonymised with *V. macrostoma* only recently (Glöer, 2002), and therefore previous *pulchella* records are to be moved to *macrostoma*.

With the last additions, the current list of recent Prosobranchs of the fresh and brackish waters of Turkey is as follows (higher level systematics is based on Glöer, 2002):

Classis GASTROPODA CUVIER 1795

Subclassis Orthogastropoda PONDER and LINDBERG 1995

(=Prosobranchia MILNE-EDWARDS 1848)

Ordo Neritopsina COX and KNIGHT 1960

Superfamilia Neritoidea LAMARCK 1809

Familia Neritidae LAMARCK, 1809

Genus *Theodoxus* MONTFORT 1810

Theodoxus fluviatilis fluviatilis (L. 1789)

Theodoxus fluviatilis euxinus (CLESSIN 1885)

Theodoxus heldreichi heldreichi (MARTENS 1879)

Theodoxus heldreichi fluvicola SCHÜTT and SEŞEN 1992

Theodoxus anatolicus (RECLUZ 1841)

Theodoxus syriacus (BOURGUIGNAT 1852)

Theodoxus altenai SCHÜTT 1965

Theodoxus jordani (SOWERBY 1832)

Theodoxus cinctellus (MARTENS 1874)

Ordo Architaenioglossa HALLER 1890

Superfamilia Ampullarioidea J. E. GRAY 1824

Familia Viviparidae J. E. GRAY 1847

Subfamilia Viviparinae J. E. GRAY 1847

Genus *Viviparus* MONTFORT 1810

Viviparus mamillatus (KÜSTER 1852)

Viviparus contectus (MILLET 1813)

Viviparus viviparus costae (MOUSSON 1863)

Ordo Neotaenioglossa HALLER 1892

Superfamilia Cerithioidea A. FERUSSAC 1822

Familia Thiaridae TROSCHER 1857

Subfamilia Thiarinae TROSCHER 1857

Genus *Melanoides* OLIVIER 1804

Melanoides tuberculatus (O. F. MÜLLER 1774)

Familia Melanopsidae H. and A. ADAMS 1854

Subfamilia Melanopsinae H. and A. ADAMS 1854

Genus **Melanopsis** A. FERUSSAC 1807

Melanopsis praemorsa praemorsa (L. 1789)

Melanopsis praemorsa ferussaci ROTH 1839

Melanopsis praemorsa maximalis SCHÜTT 1974

Melanopsis buccinoidea (OLIVIER 1801)

Melanopsis costata costata (OLIVIER 1804)

Melanopsis costata chantrei LOCARD 1921

Melanopsis nodosa FERUSSAC 1823

Genus **Esperiana** BOURGUIGNAT 1877

Esperiana (Esperiana) esperi (A. FERUSSAC 1823)

Esperiana (Microcolpia?) sangarica SCHÜTT 1974

Esperiana (Microcolpia?) acicularis stussineri SCHÜTT 1974

Superfamilia **Rissooidea** J. E. GRAY 1847

Familia **Bithyniidae** TROSCHER 1857

Genus **Bithynia** LEACH 1818

Subgenus **Bithynia** LEACH 1818

Bithynia tentaculata (LINNAEUS 1758)

Subgenus **Codiella** LOCARD 1894

Bithynia leachi (SHEPPARD 1823)

Subgenus **Incertae sedis**

Bithynia pseudemmericia SCHÜTT 1964

Bithynia phialensis (CONRAD 1852)

Bithynia badiella (KÜSTER 1852)

Bithynia pentheri STURANY 1905

Familia **Hydrobiidae** TROSCHER 1857

Subfamilia **Tateinae** THIELE 1925

Genus **Potamopyrgus** STIMPSON 1865

Potamopyrgus antipodarum (J. E. GRAY 1843)
(=*Hydrobia jenkinsi* SMITH 1889)

Subfamilia **Hydrobiinae** TROSCHER 1857

Genus **Hydrobia** W. HARTMANN 1821

Subgenus **Hydrobia** W. HARTMANN 1821

Hydrobia ventrosa (MONTAGU 1803)

Hydrobia stagnorum (GMELIN 1790)

Subgenus **Peringia** PALADILHE 1874

Hydrobia (Peringia) ulvae (PENNANT 1777)

Subgenus **Incertae sedis**

Hydrobia soosi (WAGNER 1928)

Hydrobia anatolica SCHÜTT 1965

Genus **Pseudamnicola** PAULUCCI 1878

Pseudamnicola geldiyana SCHÜTT 1970

Pseudamnicola intranodosa SCHÜTT 1993

Pseudamnicola bilgini SCHÜTT 1993

Subfamilia **Pyrgorientalia** RADOMAN 1973

Genus **Pyrgorientalia** RADOMAN 1973

Pyrgorientalia zilchi (SCHÜTT 1964)

Genus **Kirelia** RADOMAN 1973

Kirelia carinata RADOMAN 1973

Kirelia murtici RADOMAN 1973

Subfamilia **Falsipyrgulinae** RADOMAN, 1983

Genus **Falsipyrgula** RADOMAN, 1973

Falsipyrgula pfeiferi (WEBER 1927)

Falsipyrgula beysehirana (SCHÜTT 1965)

Falsipyrgula schuetti YILDIRIM 1999

Subfamilia **Orientalininae** RADOMAN 1983

Genus **Horatia** BOURGUIGNAT 1887

Horatia parvula (NAEGELE 1894)

Genus **Pseudorientalia** RADOMAN 1973

Pseudorientalia natolica natolica (KÜSTER 1852)

Pseudorientalia natolica smyrnensis SCHÜTT 1970

Genus **Falsibelgrandiella** RADOMAN 1973

Falsibelgrandiella bunarica RADOMAN 1973

- Genus **Tefennia** SCHÜTT and YILDIRIM 2003
Tefennia tefennica SCHÜTT and YILDIRIM 2003
- Genus **Orientalina** RADOMAN 1978
Orientalina caputlacus SCHÜTT 1993
- Genus **Turkorintalia** RADOMAN 1973
Turkorintalia anatolica RADOMAN 1973
- Genus **Sheitanok** SCHÜTT and ŞEŞEN 1991
Sheitanok amidicus SCHÜTT and ŞEŞEN 1991
- Subfamilia **Graecoanatolicinae** RADOMAN 1973
Genus **Graecoanatolica** RADOMAN 1973
Graecoanatolica lacustriturca RADOMAN 1973
Graecoanatolica tenuis RADOMAN 1973
Graecoanatolica kocapinarica RADOMAN 1973
Graecoanatolica conica RADOMAN 1973
Graecoanatolica brevis RADOMAN 1973
Graecoanatolica pamphylica (SCHÜTT 1964)
- Subfamilia **Cochliopinae** TRYON 1866
Genus **Heleobia** STIMPSON 1865
Subgenus **Semisalsa** RADOMAN 1974
Heleobia (Semisalsa) longiscata (BOURGUIGNAT 1856)
- Subfamilia **Belgrandiinae** DE STEFANI 1877
Genus **Belgrandiella** A. J. WAGNER 1928
Belgrandiella edessana SCHÜTT 1993
Belgrandiella cavernica BOETTGER 1957
Belgrandiella adsharica (LINDHOLM 1913)
- Genus **Sadleriana** CLESSIN 1890
Sadleriana affinis (FRAUENFELD 1863)
Sadleriana byzanthina byzanthina (KÜSTER 1852)
- Sadleriana byzanthina demirsoyii* YILDIRIM and MORKOYUNLU 1997
Sadleriana fluminensis (KÜSTER 1852)
Sadleriana minuta (NAEGELE 1903)
- Genus **Islamia** RADOMAN 1973
Islamia pseudorientalica RADOMAN 1973
Islamia anatolica RADOMAN 1973
Islamia bunarbasa (SCHÜTT 1964)
- Subfamilia **Lithoglyphinae** TROSCHEL 1857
Genus **Lithoglyphus** C. PFEIFFER 1828
Lithoglyphus naticoides (C. PFEIFFER, 1828)
- Subfamilia **Amnicolinae** TRYON 1862
Genus **Bythinella** MOQUIN-TANDON 1856
Bythinella turca RADOMAN 1976
Bythinella occasiuncula BOETERS and FALKNER 2001
Bythinella sp. A*
- Familia **Assimineidae** H. and A. ADAMS 1856
Genus **Paludinella** L. PFEIFFER 1841
Subgenus **Paludinella** L. PFEIFFER 1841
Paludinella littorina (DELLE CHIAJE 1828)
- Superordo **Heterobranchia** J. E. GRAY 1840
Ordo **Ectobranchia** P. FISCHER 1884
Superfamilia **Valvatoidea** J. E. GRAY 1840
Familia **Valvatidae** J. E. GRAY 1840
Genus **Valvata** O. F. MÜLLER 1773
Subgenus **Valvata** O. F. MÜLLER 1773
Valvata cristata O. F. MÜLLER 1774
Valvata saulcyi BOURGUIGNAT 1853
Subgenus **Tropidina** H. & A. ADAMS 1854
Valvata macrostoma (MORCH 1864)
Subgenus **Cincinna** HÜBNER 1810
Valvata (Cincinna) piscinalis (O. F. MÜLLER 1774)

Genus *Borysthenia* LINDHOLM 1913

Borysthenia naticina (MENKE 1845)

*The *Bythinella* species from İstanbul belongs to an unidentified species and is shown as *Bythinella* sp. A in the list.

Discussion

With the last additions the fresh and brackish water gastropod fauna of Turkey reaches 80 taxa. Additions to the list are *Bithynia pentheri* STURANY 1905, *Hydrobia ventrosa* (MONTAGU 1803), *Hydrobia (Peringia) ulvae* (PENNANT 1777), *Belgrandiella adsharica* (LINDHOLM 1913), *Sadleriana byzanthina demirsoyii* YILDIRIM and MORKOYUNLU 1997, *Sadleriana fluminensis* (KÜSTER 1852), *Tefennia tefennica* SCHÜTT and YILDIRIM 2003, *Falsipyrgula schuetti* YILDIRIM 1999, *Bythinella occasiuncula* BOETERS & FALKNER 2001, *Paludinella littorina* (DELLE CHIAJE 1825), and *Valvata (Tropidina) macrostoma* (MORCH 1864).

Generally, identifications without anatomical evidence lead to misidentifications, particularly in older studies in which only the conchological features were used.

Thus the present data must be re-evaluated, particularly in brackish water species. According to Falniowski and Szarowska (2002), separation between *Hydrobia acuta*, *H. ulvae* and *H. ventrosa* is impossible without a study of genital anatomy or pigmentation. It is evident that most identifications have been based solely on the conchological features. Therefore, the identity of

Hydrobia s.l. populations in Turkey is still under discussion.

The records of *V. mamillatus* and *S. fluminensis* from Turkey, together with those of other congeners, are also dubious due to the split with their main distribution centres, in the western Balkan Peninsula and central Europe.

In the determination of the aquatic malacofauna of Turkey, there seem to be 3 major pitfalls. The first is the small number of researchers on the subject, and the second is the determination of species only with conchological parameters, which leads to confusion and misidentifications. The last major problem is the complex hydrogeographic connections and active paleogeography of Anatolia.

A general delineation of the origins of the inland species is very difficult, because terrestrial evolution by late Miocene, and the presence of Sarmatian Sea, Aegeopotamus River, and the longlasting Superior Lake of Anatolia enabled connections with various faunas but also the development of a unique and isolated fauna. For instance, *Tefennia tefennica* (Tefenni spring snail) is found only in a spring in Tefenni basin (Burdur) is a relict with no close relatives. However, practises of irrigation, tourism etc. severely threaten inland water resources and aquatic biota. Spring snails (Hydrobiidae s.l.) may be the most affected group as they are quite intolerant to physical changes in the environment, and in such cases become extinct as their distribution generally restricted to a few springs. For this reason, faunistic and conservation studies on aquatic molluscs are needed on a wide basis.

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