

## The Basommatophoran Pulmonate Species (Mollusca: Gastropoda) of Turkey

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**Abstract:** To date, based on the studies of foreign and Turkish malacologists, 28 basommatophoran snail species belonging to 16 genera from 5 families (Physidae, Lymnaeidae, Planorbidae, Ancyliidae, and Acroloxidae) have been found in freshwaters of Turkey. In Turkey, the genera *Acroloxus* (1 species), *Galba* (1), *Stagnicola* (1), *Radix* (2), *Lymnaea* (1), *Physa* (1), *Physella* (1), *Planorbarius* (1), *Ferrissia* (1), *Planorbis* (2), *Anisus* (4), *Bathyomphalus* (1), *Gyraulus* (8), *Hippeutis* (1), *Ancylus* (1) and *Bulinus* (1) are recognized. Also, 16 species (including 8 recent) and 5 subspecies are known from Quaternary fossil deposits of Turkey.

**Key Words:** Basommatophora, Pulmonata, freshwater, zoogeographic distribution, Turkey

### Türkiye'nin Basommatophora Ordosuna Ait Pulmonat (Mollusca: Gastropoda) Türleri

**Özet:** Bugüne kadar yerli ve yabancı malakologların çalışmaları sonucunda Türkiye'nin tatlı sularında yayılış gösteren 5 Basommatophora familyasına (Physidae, Lymnaeidae, Planorbidae, Ancyliidae ve Acroloxidae) ait, 16 cinse dahil olan 28 türün varlığı tespit edilmiştir. Bunlar *Acroloxus* (1 tür), *Galba* (1), *Stagnicola* (1), *Radix* (2), *Lymnaea* (1), *Physa* (1), *Physella* (1), *Planorbarius* (1), *Ferrissia* (1), *Planorbis* (2), *Anisus* (4), *Bathyomphalus* (1), *Gyraulus* (8), *Hippeutis* (1), *Ancylus* (1), *Bulinus* (1) cinsleridir. Ayrıca sekizi güncel olmak üzere 16 tür ve 5 alttür de Türkiye'nin Kuaterner fosil katmanlarından bilinmektedir.

**Anahtar Sözcükler:** Basommatophora, Pulmonata, tatlısu, zoocoğrafik yayılış, Türkiye

### Introduction

Turkey, one of the zoogeographically unique areas of the Western Palaearctic, has an interesting aquatic and terrestrial mollusk fauna, which is richer than the adjacent areas of Europe due to its location between 2 continents (Demirsoy, 1999).

Snails of the order Basommatophora (Gastropoda: Pulmonata) are distributed widely in fresh and rarely, marine waters; furthermore they are generally euryoecious to variable ecological factors. As primary consumers, they are among the essential components of various ecosystems. Freshwater pulmonates are of great importance for being definitive or intermediate hosts of infectious trematodes. One species encountered in Southeast Turkey, *Bulinus truncatus*, is known to be the

only host (in Turkey) for *Schistosoma haematobium*, which causes Bilharzia infections. *Echinostoma revolutum*, *Fasciola gigantica*, *Fasciola hepatica*, *Heterophyes heterophyes*, and *Metagonimus yokogawai*, which use freshwater gastropods as intermediate hosts, are other important parasites of domestic animals and, occasionally, humans in Turkey (Şeşen and Yıldırım, 1993).

Distributional data and other biological aspects of the Turkish population of pulmonate land snails are not well-known.

### Studies on the subject:

In his research on Erciyes Dağı (Kayseri) and its environs, Sturany (1905) gave distributional data of *L. stagnalis*, *R. auricularia*, *R. ovata*, *R. peregra*, *S. palustris*,

*G. truncatula*, *P. fontinalis*, *P. corneus*, *P. carinatus*, and *A. fluviatilis*, along with that of many terrestrial snails.

Boettger (1905) studied aquatic and terrestrial snails in Adana.

Materials collected by Henri Gadeau de Kerville from Anatolia were evaluated by L. Germain, in his study "Terrestrial and freshwater snails of Asia Minor" (1936) and some information related to the species were given.

Boettger (1957), in his research of several districts in Turkey reported *Galba truncatula* (Balıkkaya, Ereğli-Zonguldak; Toros Dağları), *Planorbis planorbis philippi* (Yarımburgaz-Istanbul, Ereğli, Malatya), *Anisus spirorbis* (Toprakkale-Erzurum), and *Gyraulus ehrenbergi* (Yenipınar-Gaziantep, Toprakkale-Erzurum).

Forcart (1960) reported *Planorbis planorbis* from Lake Abant.

Götting (1961) reported *Planorbis planorbis* and *Lymnaea balthica* f. *ovata* from Lake Abant.

Bilgin (1967) found *S. palustris*, *G. truncatula*, *R. peregra*, *P. planorbis*, *G. albus*, *G. laevis*, *P. corneus*, *F. wautieri*, *A. fluviatilis*, and *A. lacustris* from some 111 localities surveyed in the vicinity of Izmir.

Geldiay and Bilgin (1969), in their study concerning the aquatic mollusk fauna of Bolu, İzmir, Denizli, Aydın, Antalya, Burdur, Kütahya, Afyon, Niğde, and Konya, reported distributional data for *L. stagnalis*, *S. palustris*, *R. auricularia*, *R. peregra*, *P. planorbis*, and *P. carinatus*.

Paydak (1976) identified *R. peregra*, *G. truncatula*, *G. euphraticus*, *B. truncatus*, and *P. planorbis* from Diyarbakır, Mardin, and Urfa.

Bilgin (1980), in a study of some important wetlands of Western Anatolia, noted that *P. fontinalis*, *P. acuta*, *L. stagnalis*, *S. palustris*, *G. truncatula*, *P. planorbis*, *P. carinatus*, *G. albus*, *P. corneus*, *A. vortex*, *A. fluviatilis*, *A. lacustris*, and *F. wautieri* occur within the area.

Schütt (1983), in his study concerning mollusk fauna of the Orontes system, identified the freshwater pulmonates of Southern Turkey, *Galba truncatula*, *Stagnicola palustris*, *Radix auricularia auricularia*, *R. peregra tenera*, *Planorbis planorbis antiochianus*, *Anisus leucostoma*, and *Gyraulus piscinarum* were reported from 12 stations.

Schütt (1988) reported *R. peregra*, *Gyraulus* sp., *P. planorbis*, *A. lacustris*, and *S. palustris* from Lake Sapanca (Sakarya).

Schütt and Şeşen (1989) observed *Physa acuta* (Draparnaud, 1805), *Radix auricularia* (Linnaeus, 1758), *Bulinus truncatus* (Audouin, 1827), *Gyraulus euphraticus* (Mousson, 1874), *Hippeutis complanatus* (Linnaeus, 1758), and *Ancylus fluviatilis* (O. F. Müller, 1774) from the area of Ceylanpınar (Urfa).

Soylu (1990) found *R. peregra*, *S. palustris*, *G. truncatula*, *P. planorbis*, and *A. lacustris* in Lake Sapanca.

During his study of the gastropod paleogeography of Turkey, Schütt (1990) examined Pleistocene gastropod fossils from Burdur, Yarıklı, and Acı Lakes and their relationships to the present species.

Schütt (1991) studied the Pliocene molluscs of 3 Anatolian plains (Konya, Pasinler, and Erzurum).

Bilgin and Şeşen reported *P. acuta*, *G. truncatula*, *R. peregra*, *R. auricularia*, *P. planorbis*, *A. leucostomus*, and *G. piscinarum* from the provinces of Mersin, Adana, and Antakya (1991), and *P. acuta*, *R. auricularia*, *R. peregra*, *G. euphraticus*, *B. truncatus*, *A. fluviatilis*, and *F. wautieri* from the provinces of Diyarbakır, Mardin, and Urfa (1992).

Schütt (1993) studied the freshwater gastropods of Gölbaşı (Gölbaşı, Azaplı, and İnekli Lakes near Adıyaman) and reported *G. truncatula*, *S. palustris*, *R. auricularia*, *P. carinatus*, and *Gyraulus piscinarum acutissimus* (Schütt, 1993).

Schütt (1994) studied the Neogene molluscs of Afyon.

Şeşen and Yıldırım (1994) investigated the *Bulinus truncatus* life cycle under laboratory conditions.

Yıldırım et al. (1995) identified *Bathymphalus contortus* from streams flowing to Lake Egirdir as a first record for Turkey.

Ertan et al. (1996) reported *R. peregra*, *S. palustris*, *G. truncatula*, *P. acuta*, *P. planorbis*, *B. contortus*, *G. albus*, and *A. lacustris* from Konne Spring (Eğirdir, Isparta).

Yıldırım and Schütt (1996) reported *L. stagnalis*, *S. palustris*, *G. truncatula*, *P. acuta*, *P. carinatus*, *P. planorbis*, and *P. corneus* from Beyşehir-Konya.

Yıldırım et al. (1996), mentioned *P. acuta*, *L. stagnalis*, *S. palustris*, *G. truncatula*, *R. peregra*, *P. corneus*, *G. albus*, and *A. fluviatilis* distributed in freshwater systems in the vicinity of Egirdir (Isparta).

Yıldırım et al. (1999) investigated *Ancylus fluviatilis* found in the neighborhood of Lake Eğirdir (Isparta).

Yıldırım (1998) reported 16 freshwater pulmonates in the vicinity of Isparta (*P. fontinalis*, *P. acuta*, *R. auricularia*, *R. peregra*, *R. ovata*, *G. truncatula*, *S. palustris*, *L. stagnalis*, *P. planorbis*, *P. carinatus*, *G. albus*, *B. contortus*, *P. corneus*, *A. fluviatilis*, *A. lacustris*, and *F. wautieri*).

Yıldırım (1999), in a study of fossil and extant molluscs of the Burdur Lake Basin, identified fossil *S. palustris*, *R. auricularia*, *P. carinatus*, *A. crista*, and *A. fluviatilis* from lake sediments and *R. peregra*, *S. palustris*, *G. truncatula*, *P. planorbis*, *G. ehrenbergi*, and *G. piscinarum* from the surrounding streams.

Schütt and Yıldırım (1999) reported *P. corneus*, *P. planorbis*, *R. auricularia*, *S. palustris*, *G. truncatula*, and *G. piscinarum* from Lake Beyşehir (Konya).

Yıldırım and Kardeş (2000) reported *R. peregra*, *S. palustris*, *G. truncatula*, *P. acuta*, *P. carinatus*, *G. albus*, and *A. fluviatilis* in Antalya.

Yıldırım et al. (2003) reported 4 new records from Turkey; *Stagnicola turricola* (from Kayseri) and *Anisus vorticulus*, *Hippeutis complanatus*, and *Armiger crista* from Afyon.

Yıldırım (2004) reported *A. lacustris*, *G. truncatula*, *S. palustris*, *R. peregra*, *R. auricularia*, *L. stagnalis*, *P. fontinalis*, *P. acuta*, *P. corneus*, *P. planorbis*, *P. carinatus*, *B. Contortus*, *G. albus*, and *A. fluviatilis* from Lake Eğirdir, Isparta.

Öktener (2004) reported that *P. planorbis*, *S. palustris*, *R. auricularia*, *R. peregra*, *P. acuta*, and *P. fontinalis* are the freshwater pulmonate species distributed in Sinop and Bafra. *Gyraulus parvus* (Say, 1817) is reported as a first record for Turkey in his study.

### Material and Method

This study was carried out between 1993 and 2001, during all seasons and months of the years. The materials were collected from the permanent freshwater systems that were convenient for the survival of the aquatic snails. Standard techniques and methods were used (Zhadin, 1965; Glöer, 2002). Collected materials (alcohol samples and empty shells) are currently deposited in the senior author's private collection in the Burdur Educational Faculty of SDU, Burdur, Turkey.

## Results and Discussion

**The Systematic Position of the Basommatophoran Taxa and Their Distributions in Turkey:** 1. The Marmara Region, 2. The Aegean Region, 3. The Mediterranean Region, 4. The Central Anatolia Region, 5. The Black Sea Region, 6. The Eastern Anatolia Region, 7. The Southeastern Anatolia region (\*The fossil species, \*\* Recent species occurring also in fossil strata).

**Order:** Pulmonata CUVIER in BLAINVILLE 1814

**Subordo:** Basommatophora KEFERSTEIN 1864

**Superfamilia:** Acroloxoidea THIELE 1931

**Familia:** Acroloxidae THIELE 1931

**Genus:** *Acroloxus* BECK 1837

1. *Acroloxus lacustris* (Linnaeus, 1758)

*Patella lacustris* LINNAEUS (1758), p. 782, Nr. 662; *Acroloxus lacustris*: MÜLLER (1774), p. 199; –*Acroloxus lacustris*: ZHADIN (1965), p. 152; –*Acroloxus lacustris*: FECHTER and FALKNER (1990), p. 130; –*Acroloxus lacustris*: GLÖER and MEIER-BROOK (1998), p.51; –*Acroloxus lacustris*: PFLEGER (1999), p. 68.

–*Acroloxus lacustris*: GLÖER (2002), p. 198.

The shell is shallow and boat-shaped and its apex, which is more or less central, curves left and backwards (height of the shell: 1.2-2 mm; width of the shell: 3-3.5 mm.).

**Distribution in Turkey:** 2, 3, 4, 7. The Aegean Region, the Mediterranean Region, the Central Anatolia Region, the Southeastern Anatolia Region (Bilgin, 1980; Schütt, 1988; Şeşen and Yıldırım, 1993; Yıldırım and Şeşen, 1994; Ertan et al., 1996; Yıldırım, 1998; Yıldırım, 1999; Yıldırım and Kardeş, 2000; Yıldırım et al., 2001; Yıldırım, 2004).

**General Distribution:** Europe, Transcaucasia, Northern Caucasus, Crimea, Northern Asia (Zhadin, 1965; Soylu, 1990; Fechter and Falkner, 1990; Glöer and Meier-Brook, 1998, Glöer, 2002).

**Superfamilia:** Lymnaeoidea RAFINESQUE 1815

**Familia:** Lymnaeidae LAMARCK 1812

**Subfamilia:** Lymnaeinae RAFINESQUE 1815

**Genus:** *Galba* SCHRANK 1803

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

*Buccinum truncatum* O. F. MÜLLER (1774), P. 130; –*Limneus minetus*: DRAPARNAUD (1801), p. 51; –*Limnaea (Fossaria) truncatula*: BOETTGER (1905), p.113-114; –*Limnaea (Fossaria) truncatula*: STURANY (1905), p. 305; –*Limnaea (Galba) truncatula*: GERMAIN (1921), p.406; –*Galba truncatula*: ZHADIN (1965), p. 125; –*Galba truncatula*: SCHÜTT (1983), p. 46; –*Galba truncatula*: FECHTER and FALKNER (1990), p. 136; –*Galba truncatula*: GLÖER and MEIER-BROOK (1998), p. 42; –*Lymnaea truncatula*: PFLEGER (1999), p. 188; –*Galba truncatula*: GLÖER (2002), p. 202.

The shell is dextral, small, ovally conical, thin walled, and horn-colored. The shell has 7-8 regularly increasing whorls. The strongly convex and scaliform whorls are separated by deep sutures. The aperture is a third of the height of the shell, fairly narrow, oval and dorsally, with an obtuse angle. The buccal margin is sharp, but not curved (height of the shell: 5-8 mm; width of the shell: 2-4 mm.).

**Distribution in Turkey:** 1, 2, 3, 4, 5, 6, 7. The Marmara region, the Aegean Region, the Mediterranean Region, the Central Anatolia Region, the Black Sea Region, The Eastern Anatolia Region, the Southeastern Anatolia Region (Bilgin, 1967; Paydak, 1976; Bilgin and Şeşen, 1991; Şeşen and Yıldırım, 1993; Yıldırım and Şeşen, 1994; Yıldırım and Schütt, 1996; Ertan et al., 1996; Yıldırım, 1998; Yıldırım, 1999; Schütt and Yıldırım, 1999; Yıldırım and Karaşahin, 2000; Yıldırım et al., 2001; Yıldırım, 2004).

**General Distribution:** Transcaucasia, Caucasus, Ukrainian, Western and Eastern Siberia, Middle Asia (Zhadin, 1965; Schütt, 1983), Europe, North America (Glöer and Meier-Brook, 1998; Pfleger, 1999; Glöer, 2002).

**Genus:** *Stagnicola* JEFFREYS, 1830

### 3. *Stagnicola palustris* (O. F. Müller, 1774) \*\*

*Buccinum palustre*: MÜLLER (1774), p. 131; –*Limnaeus syriacus*: MOUSSON (1861), p. 143; –*Limnaeaimnophysa palustris*: STURANY (1905); –*Limnaea (Stagnicola) palustris* var. *syriacensis*: GERMAIN (1921), p. 402; –*Galba pallaryi* PETRBOK (1942), p. 154; –*Galba palustris*: ZHADIN (1965), p. 123; –*Stagnicola palustris*: SCHÜTT (1983), p. 46; –*Stagnicola palustris*: FECHTER and FALKNER (1990), p. 136; –*Lymnaea stagnalis*: GLÖER and MEIER-BROOK (1998), p. 50; : –*Stagnicola palustris*: GLÖER (2002), p. 205.

The shell is dextral, slender, elongate-ovoid, with a sharp-pointed, conical spire. The surface is marked with regular transversal and longitudinal grooving, but coarser growth lines are also frequent and denting is also common. The size of the 6-7 slightly and regularly convex whorls increases quite quickly, but the last one is not markedly swollen, it widens rapidly and exceeds all the preceding turns together. The aperture is inversely auriculate, with a relatively sharp upper corner. The margin is straight and sharp and only occasionally widens a little at the bottom. The parietal callus is thin and flat, but pale and distinct in adults. The color of the shell varies from deep brown to dark greenish grey. The wall of the aperture (and the whole of the shell) is strikingly dark, ranging from dark violet brown to light chestnut. The coloring of the cross stripes is of variable intensity, but it is always dark brown (height of the shell: 10-17.5 mm; width of the shell: 6-8 mm.).

**Distribution in Turkey:** 1, 2, 3, 4, 5. The Marmara Region, the Aegean Region, the Mediterranean Region, the Central Anatolia Region, the Black Sea Region (Bilgin, 1967; Geldiay and Bilgin, 1969; Bilgin, 1980; Schütt, 1988; Soylu, 1990; Şeşen and Yıldırım, 1993; Yıldırım and Şeşen, 1994; Yıldırım and Schütt, 1996; Ertan et al., 1996; Yıldırım, 1998; Schütt and Yıldırım, 1999; Yıldırım, 1999; Yıldırım and Karaşahin, 2000; Yıldırım et al., 2001; Yıldırım et al. 2003; Yıldırım, 2004; Öktener, 2004).

**General Distribution:** Europe, Northwest Africa, Northern Asia, Western Asia (to Iran) and North America (Zhadin, 1965; Schütt, 1983; Glöer and Meier-Brook, 1998; Pfleger, 1999; Glöer, 2002).

**Genus:** *Radix* MONTFORT, 1810

### 4. *Radix auricularia* (Linnaeus, 1758) \*\*

*Helix auricularia*: LINNAEUS (1758), p. 774, Nr. 617; *Limnaea auricularia*: WESTERLUND (1885), p. 29; –*Limnaea (Gulnaria) auricularia*: STURANY (1905), p. 304; –*Radix auricularia*: ZHADIN (1965), p. 118; –*Radix auricularia auricularia*: SCHÜTT (1983) p. 47; –*Radix auricularia*: FECHTER and FALKNER (1990), p. 139; –*Radix auricularia*: GLÖER and MEIER-BROOK (1998), p. 54; – *Radix auricularia*: GLÖER (2002), p. 213.

The shell is dextral, auricularly swollen, and has a very small, sharply-pointed spire, which usually projects above. It is thin-walled, fragile, lustrous, and marked with fine

irregular grooves. The first 3 of the 4 whorls are slightly convex and form the tapering tip of the spire; the last whorl is more tumid and increases very quickly in size. It appears to form the entire shell. The aperture is inversely auriculate; it has a simple, sharp margin, sometimes with an indistinct flat lip, and with an only mildly widened outer edge. The thin parietal callus overlaps the top of the columella and also covers the umbilical zone, so that the umbilicus is almost completely shut in. The color of the shell is light yellowish brown (height of the shell: 14-24 mm; width of the shell: 12-18 mm.).

**Distribution:** 3, 4, 5, 7. The Mediterranean Region, the Central Anatolia Region, the Black Sea Region, the Southeastern Anatolia Region (Geldiay and Bilgin, 1969; Schütt and Şeşen, 1989; Bilgin and Şeşen, 1991; Bilgin and Şeşen, 1992; Şeşen and Yıldırım, 1993; Yıldırım and Şeşen, 1994; Yıldırım, 1998; Yıldırım, 1999; Schütt and Yıldırım, 1999; Yıldırım et al., 2001; Yıldırım, 2004; Öktener, 2004).

**General Distribution:** North Africa, Europe, and Northern, Eastern, Central and Middle Asia to Kashmir, and the species has been introduced into North America (Zhadin, 1965; Schütt, 1983; Glöer and Meier-Brook, 1998; Pflieger, 1999; Glöer, 2002).

##### 5. *Radix labiata* (Rossmässler, 1835) \*\*

*Limnaeus pereger labiatus*: ROSSMÄSSLER (1821), p. 98, Nr. 54; *-Limnaea peregra* var. *alpicola*: WESTERLUND 1875, p. 86; *-Limnaea (Gulnaria) peregra*: STURANY (1905), p. 305; *-Radix pereger*: ZHADIN (1965), p. 121; *-Radix peregra peregra* SCHÜTT (1983), p. 47-48; *-Radix peregra* FECHTER and FALKNER, (1990), p. 138; *-Radix peregra*: GLÖER and MEIER-BROOK (1998), p. 55; *Radix labiata*: GLÖER (2002), p. 216-217.

The shell is dextral, elongate-ovate with a conical, pointed spire, but subject to considerable variation. It is relatively thick-walled, but fragile, slightly translucent, with a faint luster, and is irregularly marked with fine grooves or ribbing. It has 4,5-5 gradually increasing whorls. The last whorl expands irregularly, and this body whorl is dominant. The aperture is narrowly oval; it tapers towards the top, where it has a blunt upper corner. It has a simple, sharp margin, which widens only along the columellar segment. The aperture has a white lip. The parietal and the columellar segment together form a very faint arc or an indistinct, very obtuse angle.

The narrow umbilicus is not hidden. The color of the shell varies from light to dark yellowish brown. The shell is generally coated with a thick, variably colored deposit (height of the shell: 12-20 mm; width of the shell: 7-13 mm.).

**Distribution in Turkey:** 1, 2, 3, 4, 5, 7. The Marmara Region, the Aegean Region, the Mediterranean Region, the Central Anatolia Region, the Black Sea Region, the Southeastern Anatolia Region (Bilgin, 1967; Paydak, 1976; Bilgin, 1980; Schütt, 1988; Soylu, 1990; Bilgin and Şeşen, 1991; Bilgin and Şeşen, 1992; Şeşen and Yıldırım, 1993; Yıldırım and Schütt, 1996; Ertan et al., 1996; Yıldırım, 1998; Yıldırım, 1999; Yıldırım and Kardeşin, 2000; Yıldırım et al., 2001; Yıldırım, 2004; Öktener, 2004).

**General Distribution:** Europe, Northern Africa, and Central, Northern and Eastern Asia (Zhadin, 1965; Schütt, 1983; Glöer and Meier-Brook, 1998; Pflieger, 1999).

In addition to the widely spread *Radix* species, such as *R. auricularia* and *R. labiata*, Götting (1961) reported *Lymnaea balthica* f. *ovata* from the Lake Abant. This taxon is now known as *Radix balthica* (L., 1758) and is reported to be a Palearctic species (Glöer, 2002). The species exists without a taxonomical description in the book. The species was not added to the species list because a detailed study of the distribution area is needed for the confirmation.

**Genus:** *Lymnaea* Lamarck, 1799

##### 6. *Lymnaea stagnalis* (Linnaeus, 1758)

*Helix stagnalis*: LINNAEUS (1758), p. 774; *-Limnaea callopleura*: LOCARD (1883), p. 278; *-Limnaea lagodeschina* (1883), LOCARD, p. 281; *-Limnaea (Lymnus) stagnalis*: STURANY (1905), p. 304; *-Lymnaea stagnalis*: SCHÜTT (1983), p. 48; *-Lymnaea stagnalis*: ZHADIN (1965), p. 116; *-Lymnaea stagnalis* FECHTER and FALKNER (1990), p. 138; *-Lymnaea stagnalis*: GLÖER and MEIER-BROOK (1998), p. 49; *-Lymnaea stagnalis*: GLÖER (2002), p. 222.

The shell is dextral, large, and spiral, elongated. It has a sharply pointed spire with a clearly concave general outline. The walls of the shell are thin, fragile, partly transparent, and somewhat shiny. Its surface is marked with fine and almost regular axial and spiral grooving, but these structures are often obliterated by coarse growth lines and by denting. The color of the shell varies from

dark brown to white and pink. The shell has 7-7,5 whorls, which increase very quickly in size. The first whorls are very small and the middle ones and the last one are highly convex. The aperture is inversely auriculate, usually higher than the spire. The columella is strongly developed and it has a well-developed columellar fold in the upper part of the columellar segment (height of the shell: 29-54 mm; width of the shell: 12-27 mm).

**Distribution in Turkey:** 2, 3, 4, 5. The Aegean Region, the Mediterranean Region, the Central Anatolia Region, the Black Sea Region (Geldiay and Bilgin, 1969; Bilgin, 1980; Şeşen and Yıldırım, 1993; Schütt and Şeşen, 1993; Yıldırım and Schütt, 1996; Yıldırım, 1998; Yıldırım, 1999; Yıldırım, 2004).

**General Distribution:** North Africa, Europe, Russia, West Siberia, North America, and the species has been introduced into Tasmania and New Zealand (Zhadin, 1965; Schütt, 1983; Glöer and Meier-Brook, 1998; Pflieger, 1999).

**Superfamilia:** Planorboidea RAFINESQUE 1815

**Familia:** Physidae FITZINGER 1833

**Subfamilia:** Physinae FITZINGER 1833

**Genus:** *Physa* DRAPARNAUD, 1801

#### 7. *Physa fontinalis* (Linnaeus, 1758)

*Bulla fontinalis* LINNAEUS (1758), p. 727, nr.340; *-Physa fontinalis* WESTERLUND (1885), p. 54; *-Physa fontinalis*: STURANY (1905), p. 305; *-Physa fontinalis*: ZHADIN (1965), p. 128; *-Physa fontinalis*: FECHTER and FALKNER (1990), p. 131; *-Physa fontinalis*: GLÖER and MEIER-BROOK (1998), p.64; *-Physa fontinalis*: GLÖER (2002), p. 235.

Shell is sinistral, thin, shiny, yellowish-horn colored, with 3-4 whorls. The very swollen ultimate turn forms almost the entire shell; the aperture is elongate-oval, almost as high as the shell, buccal margin is sharp (shell height: 7-12 mm; shell width: 4-7 mm.).

**Distribution:** 1, 3, 4, 5. The Marmara Region, the Mediterranean Region, the Central Anatolia Region, the Black Sea Region (Sturany, 1905; Bilgin, 1980; Şeşen and Yıldırım, 1993; Yıldırım and Şeşen, 1994; Yıldırım, 1998; Yıldırım, 1999; Yıldırım, 2004).

**General Distribution:** Europe and North America (Zhadin, 1965, Schütt, 1983; Glöer and Meier-Brook, 1998; Pflieger, 1999).

**Genus:** *Physella* HALDEMAN, 1842

#### 8. *Physella (Costatella) acuta* (Draparnaud, 1805)

*Physa acuta* DRAPARNAUD (1805), p. 55, T. 3, F. 10, 11; *-Physa subopaca*: LAMARCK (1822), p. 157;

*Physa (Physa) syriaca* GERMAIN (1911), p. 64; *-Physa subopaca*: TCHERNOV (1971), p. 209; *-Physa acuta*: ZHADIN (1965), p. 129; *-Physa acuta*: SCHÜTT (1983), p. 45-46; *P-hysella acuta*: FECHTER and FALKNER (1990), p. 131; *-Physella acuta*: GLÖER and MEIER-BROOK (1998), p. 65; *-Physella acuta*: GLÖER (2002), p. 238.

The shell is sinistral, elongate-oval, pointed, ovoid, with a sharply conical spire and thin but relatively strong walls. It is transparent and glossy with fine reticular markings. There are 5-6 faintly convex whorls; the body whorl, which dominates the rest, is swollen and the edges of it are slightly compressed, narrowing at the base. The aperture is long, oval, and dorsally acute-angled. The buccal margin usually has a white, translucent lip. The columella has a small fold (height of the shell: 8-12 mm; width of the shell: 5-7 mm.).

**Distribution in Turkey:** 2, 3, 4, 5, 7. The Aegean Region, the Mediterranean Region, the Central Anatolia Region, the Black Sea Region, the Southeastern Anatolia Region (Bilgin, 1980; Bilgin and Şeşen, 1991; Bilgin and Şeşen, 1992; Yıldırım and Şeşen, 1994; Schütt and Şeşen, 1989; Yıldırım and Şeşen, 1994; Yıldırım and Schütt, 1996; Ertan et al., 1996; Yıldırım, 1998; Yıldırım, 1999; Yıldırım and Kardeş, 2000; Yıldırım, 2004; Öktener, 2004).

**General Distribution:** Mediterranean (Zhadin, 1965), Northern Caucasus, Central Europe (Schütt, 1983; Glöer and Meier-Brook, 1998; Pflieger, 1999).

**Familia:** Planorbidae RAFINESQUE 1815

**Subfamilia:** Bulininae P. FISCHER and CROSSE 1880

**Genus:** *Planorbarius* DUMERIL 1806

#### 9. *Planorbarius corneus* (Linnaeus, 1758) \*\*

*Helix corneus* LINNAEUS (1758), p.770, Nr. 587; *Planorbis corneus* WESTERLUND (1885), p. 65; *Planorbis (Coretus) corneus* var. *etruscus*: STURANY (1905), p. 305; *-Coretus corneus*: ZHADIN (1965), p. 132; *-Planorbarius corneus*: FECHTER and FALKNER (1990), p. 133; *-Planorbarius corneus*: GLÖER and MEIER-BROOK (1998), p. 63; *-Planorbarius corneus*: GLÖER (2002), p. 244.

The shell is very large and thickly discoid with the spire in a funnel-shaped depression and a mildly concave under side. Its walls are fairly thick, strong, and faintly translucent, with a dim luster. It is finely and irregularly grooved, with faint longitudinal or spiral lines, which fade away on the last whorl, but are so pronounced on the initial whorls that the first three in the young snail are always distinctly reticulated. It has 5 whorls. The ultimate whorl is twice as wide as the penultimate whorl and it is compressed from above and from below, especially in its last quarter. The aperture is widely kidney-shaped and slightly oblique, and is made mildly concave by a dip in the parietal wall. The margin is simple and sharp-edged and widens somewhat at the top; a parietal callus is present as a mere trace. The ground color of the shell is reddish brown to olive brown. The upper surface is often tinged blue or greenish grey and it is white ventrally. The wall of the aperture is white just behind the margin and reddish brown further inside (height of the shell: 9-12 mm; width of the shell: 20-34 mm.).

**Distribution in Turkey:** 2, 3, 4. The Aegean Region, the Mediterranean Region, the Central Anatolia Region (Geldiay and Bilgin, 1969; Bilgin, 1980; Yıldırım and Schütt, 1996; Yıldırım, 1998; Yıldırım, 1999; Schütt and Yıldırım, 1999; Yıldırım et al. 2001; Yıldırım, 2004).

**General Distribution:** Europe (but not in the mountains or the most northern and most southern parts), Asia Minor, Transcaucasia, Northern Caucasus, Crimea, and Western and Eastern Siberia (Zhadin, 1965; Glöer and Meier-Brook, 1998; Pflieger, 1999).

**Genus:** *Ferrissia* WALKER 1903

**10. *Ferrissia (Petancyclus) wautieri* (Mirolli, 1960)**

*Watsonula wautieri*: MIROLLI (1960), p. 121; *-Ferrissia (Petancyclus) wautieri*: HUBENDICK (1964), p. 59; *-Ferrissia (Petancyclus) wautieri*: SCHÜTT (1983), p. 52; *-Ferrissia wautieri*: FECHTER and FALKNER (1990), p. 132; *-Ferrissia wautieri* GLÖER and MEIER-BROOK (1998), p. 64; *-Ferrissia wautieri* GLÖER (2002), p. 249.

The shell is thin-walled, long and cap-shaped. The apex is rounded and the spire is on the right side of the median line (height of the shell: 2-3.5 mm; width of the shell: 3.5-6 mm.).

**Distribution in Turkey:** 1, 2, 3, 7. The Marmara Region, the Aegean Region, the Mediterranean Region,

the Southeastern Anatolia Region (Bilgin, 1967; Bilgin, 1980; Bilgin and Şeşen, 1992; Yıldırım, 1998).

**General Distribution:** Europe, Syria, Western Asia (Schütt, 1983; Fechter and Falkner, 1990; Glöer and Meier-Brook, 1998).

**Subfamilia:** Planorbinae RAFINESQUE 1815

**Genus:** *Planorbis* O. F. MÜLLER, 1773

**11. *Planorbis (Planorbis) planorbis* (Linnaeus, 1758) \*\***

*Helix planorbis* LINNAEUS (1758), p. 769, Nr. 578; *-Planorbis umbilicatus* MÜLLER (1774), p. 160; *-Planorbis planorbis*: ZHADIN (1965), p. 131; *-Planorbis planorbis antiochianus*: SCHÜTT (1983), p. 49; *-Planorbis planorbis*: FECHTER and FALKNER (1990), p. 133; *-Planorbis planorbis*: GLÖER and MEIER-BROOK (1998), p. 57; *-Planorbis planorbis*: GLÖER (2002), p. 251.

The shell is discoid and light brown. The mildly concave upper and under surface of the shell is relatively thick, strong, and mildly translucent. The faintly glossy walls are marked with fine, regular grooving structures. The spiral grooving is somewhat less distinct, but the surface in general has a reticular structure. The upper surface of the 5,5-6 whorls is clearly convex, the under surface less so. The thread-like keel lies closer to the under surface of the shell. The last whorl is maximally twice the width of the penultimate whorl and the width of the spire. The whorls are separated by deep sutures. The oblique aperture has the form of a short transverse short cut in the region of the parietal wall. Where the keel joins its edge, there is a clearly distinct corner. The margin is sharp-edged, simple, or mildly blunted and its lower segment is in contact with the keel of the penultimate whorl (shell height: 2-3.5 mm; shell width: 9-18 mm.).

**Distribution in Turkey:** 1, 2, 3, 4, 5, 7. The Marmara Region, the Aegean Region, the Mediterranean Region, the Central Anatolia Region, the Black Sea Region, the Southeastern Anatolia Region (Bilgin, 1967; Geldiay and Bilgin, 1969; Bilgin, 1980; Schütt, 1988; Yıldırım and Schütt, 1996; Soylu, 1990; Bilgin and Şeşen, 1991; Şeşen and Yıldırım, 1993; Yıldırım and Şeşen, 1994; Ertan et al., 1996; Yıldırım, 1999; Schütt and Yıldırım, 1999; Yıldırım and Kardeş, 2000; Yıldırım et al., 2001; Yıldırım, 2004)

**General Distribution:** Europe, Northern Africa, Asia Minor as far as Syria, Caucasus, Siberia, and Western and Northern Asia to Lake Baykal (Zhadin, 1965; Schütt, 1983; Glöer and Meier-Brook, 1998; Pflieger, 1999).

**12. *Planorbis (Planorbis) carinatus* O. F. Müller, 1774 \*\***

*Planorbis carinatus* MÜLLER (1774), p. 157. –*Planorbis (Tropidiscus) carinatus*: STURANY (1905), p. 306. –*Planorbis carinatus* – ZHADIN (1965), p. 131. –*Planorbis carinatus*: FECHTER and FALKNER (1990), p. 133. –*Planorbis carinatus*: GLÖER and MEIER-BROOK (1998), p. 57. –*Planorbis carinatus*: GLÖER (2002)

The shell is fairly thin-walled, but relatively strong. The shell is light horn-colored. It has 4.5-5 whorls. The whorls are flattened and increase rapidly in size. The whorls appear almost equally convex, dorsally and laterally by the view from the carinate side. The last whorl is twice as wide as the penultimate whorl. The aperture is oblique and rhombic. The dorsal margin of the aperture protrudes slightly (height of the shell: 1.5-3 mm; width of the shell: 9-15 mm.).

**Distribution in Turkey:** 3, 4. The Mediterranean Region, the Central Anatolia Region (Bilgin, 1980; Şeşen and Yıldırım, 1993; Yıldırım and Şeşen, 1994; Yıldırım and Schütt, 1996; Yıldırım, 1998; Yıldırım, 1999; Yıldırım and Karaşahin, 2000; Yıldırım et al., 2001; Yıldırım, 2004).

**General Distribution:** Europe, Siberia, Asia (Zhadin, 1965; Glöer and Meier-Brook, 1998).

**Genus:** *Anisus* S. STUDER 1820

**Subgenus:** *Anisus* S. STUDER 1820

**13. *Anisus (Anisus) spirorbis* (LINNAEUS, 1758)**

*Helix spirorbis* LINNAEUS (1758), p. 770, Nr. 588. –*Anisus (Anisus) spirorbis* GLÖER (2002), p. 256

This species was reported by Boettger (1957) from Toprakkale- Erzurum and known as a Palearctic species.

**Distribution in Turkey:** 6. The Eastern Anatolia Region (Boettger, 1957).

**General Distribution:** Palearctic (Glöer, 2002).

**14. *Anisus (Anisus) leucostoma* (Millet, 1813)**

*Planorbis leucostomus* MILLET (1813), p. 16. –*Anisus (Anisus) leucostoma*: ZHADIN (1965), p. 142. –*Anisus leucostomus*: SCHÜTT (1983), p. 49. –*Anisus*

*leucostoma*: FECHTER and FALKNER (1990), p. 132. –*Anisus (Anisus s. str.) leucostoma*: GLÖER and MEIER-BROOK (1998), p. 58. –*Anisus (Anisus) leucostoma*: GLÖER (2002), p. 257.

The shell is thin-walled, horn-colored, slightly depressed, dorsally and ventrally, almost flat. It has 6-6.5 whorls that are slowly increasing in size. The ultimate whorl is slightly wider than the penultimate whorl. The aperture is rounded and oblique (height of the shell: 1-1.5 mm; width of the shell: 5-7 mm.).

**Distribution in Turkey:** 3. The Mediterranean Region (Bilgin and Şeşen, 1991; Yıldırım, 1999).

**General Distribution:** Ukrainian, Moldavian, Western Siberia, Baykal Region, Europe (Zhadin, 1965; Glöer and Meier-Brook, 1998).

**Subgenus:** *Disculifer* C. R. BOETTGER, 1944

**15. *Anisus (Disculifer) vortex* (Linnaeus, 1758)**

*Helix vortex* LINNAEUS (1758), p. 770, Nr. 583. –*Planorbis vortex*: WESTERLUND (1885), p. 71. –*Anisus (Spiralina) vortex*: ZHADIN (1965), p. 134. –*Anisus vortex* FECHTER and FALKNER (1990), p. 133. –*Anisus (Disculifer) vortex*: GLÖER and MEIER-BROOK (1998), p. 59. –*Anisus (Disculifer) vortex*: GLÖER (2002), p. 261.

The shell is small, thinly discoid with a mildly sunken spire, and an almost flat under side. It is pale brown. The thin-walled shell is translucent, faintly glossy, and covered with very fine, dense grooving. The upper surface of the 6.5-7 whorls is markedly, but not absolutely, regularly convex, while their under side is almost flat. The simple, sharply prominent keel lies on the under side; the last whorl is almost triple the width of the penultimate whorl. The very oblique aperture is irregularly transversely oval and is pointed on its external surface. The margin is simple and sharp and its lower segment is in contact with the keel of the penultimate whorl (height of the shell: 0.8-1.1 mm; width of the shell: 6-9 mm.).

**Distribution in Turkey:** 3. The Aegean Region (Bilgin, 1980).

**General Distribution:** Most of Europe, except the most northern and southern parts, and western and eastern Siberia as far as the Yenisey (Zhadin, 1965; Glöer and Meier-Brook, 1998; Pflieger, 1999).

**16. *Anisus (Disculifer) vorticulus* (Troschel, 1834)**

*Planorbis vorticulus* TROSCHEL (1834), p. 51. –*Anisus (Spiralina) vorticulus*: ZHADIN (1965), p. 134. –*Anisus vorticulus*: FECHTER and FALKNER (1990), p. 135. –*Anisus (Disculifer) vorticulus*: GLÖER and MEIER-BROOK (1998), p. 59. –*Anisus (Disculifer) vorticulus*: GLÖER (2002), p. 262.

The shell is thin-walled, very delicate. It has 5-5.5 whorls. They are fairly convex on both the ventral and the dorsal surfaces, but somewhat flatter ventrally. The last whorl is slightly wider than the penultimate whorl and it is medially bearing a blunt carina. The aperture is elongate-cordate (height of the shell: 0.7-0.8 mm; width of the shell: 4-5 mm).

**Distribution in Turkey:** 4. The Central Anatolia Region (Yıldırım et al. 2003).

**General Distribution:** Europe, Western Siberia (Zhadin, 1965; Glöer and Meier-Brook, 1978; Fechter and Falkner, 1990).

**Genus:** *Bathyomphalus* CHARPENTIER, 1837

**17. *Bathyomphalus contortus* (Linnaeus, 1758)**

*Helix contortus* LINNAEUS (1758), p. 770, Nr. 589. – *Planorbis contortus* WESTERLUND (1885), p. 74.

–*Anisus (Bathyomphalus) contortus*: ZHADIN (1965), p. 137. –*Bathyomphalus contortus* GLÖER and MEIER-BROOK (1998), p. 59. –*Bathyomphalus contortus*: FECHTER and FALKNER (1990), p. 135. –*Bathyomphalus (Anisus) contortus*: YILDIRIM et al. (1995), p. 83-88. –*Bathyomphalus contortus* GLÖER (2002), p. 264.

The shell is relatively high, dorsally flattened, ventrally with a wide and deep umbilicus. The shell is densely coiled with 7-8 whorls that expand very slowly. The shell is taller in proportion to its width than many other planorbids. The aperture is narrow and crescent-shaped. The shell is yellow-brown, but often colored darkly by deposits in the mud and also darkened in life by the color of the animal showing through. (height of the shell: 1-2 mm; width of the shell: 3-6 mm.).

**Distribution in Turkey:** 3, 4. The Mediterranean Region, the Central Anatolia Region (Yıldırım and Şeşen, 1994; Yıldırım et al., 1995; Ertan et al., 1996; Yıldırım, 1999; Yıldırım and Karaşahin, 2000; Yıldırım, 2004).

**General Distribution:** Europe, Siberia, Russia, Transcaucasia, Northern Caucasus, Crimea, and Northern Asia (Zhadin, 1965; Glöer and Meier-Brook, 1998; Pflieger, 1999).

**Genus:** *Gyraulus* CHARPENTIER, 1837

**Subgenus:** *Gyraulus* CHARPENTIER, 1837

**18. *Gyraulus (Gyraulus) albus* (O. F. Müller, 1774)**

*Planorbis albus* MÜLLER (1774), p. 164 Nr. 350. –*Gyraulus albus*: ZHADIN (1965), p. 138. –*Gyraulus albus*: FECHTER and FALKNER (1990), p. 135. –*Gyraulus (Gyraulus) albus*: GLÖER and MEIER-BROOK (1998), p. 60. –*Gyraulus (Gyraulus) albus*: GLÖER (2002), p. 268.

The shell is discoid, but fairly coiled. It has 4-4.5 whorls, expanding increasingly rapidly to the aperture. The first whorls are convex and the last whorl is somewhat flattened dorsoventrally, rapidly widening, and slightly descending near the aperture. The aperture and the whorls are fairly rounded, without a keel. The main diagnostic feature of this species is the distinct spiral sculpture on the shell that can be seen through a hand lens. The shell is typically white, but often darkened by external deposits from the mud (height of the shell: 1.2-1.8 mm; width of the shell: 4-7 mm.).

**Distribution in Turkey:** 2, 3, 4. The Aegean Region, the Mediterranean Region, the Central Anatolia Region (Bilgin, 1967; Yıldırım, 1998; Bilgin, 1980; Yıldırım and Şeşen, 1994; Ertan et al., 1996; Yıldırım, 1999; Yıldırım and Karaşahin, 2000; Karaşahin and Yıldırım, 2001; Yıldırım et al. 2001; Yıldırım, 2004).

**General Distribution:** Transcaucasia, Northern Caucasus, Crimea, Ukrainian, Europe, Western and Northern Asia, Japan, and North America (Zhadin, 1965; Glöer and Meier-Brook, 1998).

**19. *Gyraulus (Gyraulus) ehrenbergi* (Beck, 1837)**

*Planorbis ehrenbergi* BECK (1837), p. 119. –*Planorbis (Gyraulus) ehrenbergi*: BOETTGER (1905), p. 114. –*Gyraulus ehrenbergi*: ZHADIN (1965), p. 139. *Gyraulus ehrenbergi*: Meier-Brook (1983), p. 52.

The shell is slightly flattened, with or without inconspicuous spiral lines. The shell has 4 rapidly increasing whorls. The ultimate whorls are much wider before the aperture. The aperture is rounded in juvenile specimens, but it subsequently becomes roundly elliptical. The aperture is oblique (width of the shell: 4-5 mm.).

**Distribution in Turkey:** 1, 2, 3, 4. The Marmara Region, the Aegean Region, the Mediterranean Region, and the Central Anatolia Region (Bilgin, 1967; Bilgin, 1980; Yıldırım and Şeşen, 1994).

**General Distribution:** Middle Asia, Caucasus (Zhadin, 1965).

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

*Planorbis piscinarum* BOURGUIGNAT (1852), p. 22. –*Planorbis piscinarum* var. *B. Minima*: BOURGUIGNAT (1853), p. 57. –*Planorbis (Gyraulus) piscinarum* var. *heterocostata*: GERMAIN (1921), p. 425. *Gyraulus piscinarum kaiserii*: SCHÜTT (1973), p. 327. –*Gyraulus piscinarum*: SCHÜTT (1983), p. 49-50.

The shell is discoid, sharply keeled, and flattened. The whorls are strongly curved. The juvenile forms have a carinate, which is distinguishable.

**Distribution in Turkey:** 3. The Mediterranean Region (Bilgin and Şeşen, 1991; Yıldırım and Schütt, 1996; Schütt and Yıldırım, 1999).

**General Distribution:** Eastern Mediterranean (Levantine) (Schütt, 1983).

**21. *Gyraulus (Gyraulus) euphraticus* (Mousson, 1874)**

*Planorbis (Gyraulus) devians* Porro var. *euphratica* MOUSSON (1874) p. 40. –*Gyraulus euphraticus* MEIER-BROOK (1983), p. 48.

The shell is thin-walled, fragile. The surface of the shell is covered with longitudinal and spiral stripes. The striation is very slender, but is easily seen. The color of the shell is yellowish white. The whorls rapidly increase in size. The last whorl is wider than the preceding ones. The whorls are separated by deep sutures. The aperture is roundly oblique (height of the shell: 1-1.2 mm; width of the shell: 4-9 mm.).

**Distribution in Turkey:** 7. The Southeastern Anatolia Region (Paydak, 1976; Schütt and Şeşen, 1989; Bilgin and Şeşen, 1992).

**General Distribution:** Syria, Iraq (Paydak, 1976)

**Subgenus:** *Torquis* DALL, 1905

**22. *Gyraulus (Torquis) laevis* (Alder, 1839)**

*Planorbis laevis* ALDER (1838), p. 337. –*Planorbis planoconcauus*: WESTERLUND (1897), p. 26. –*Gyraulus*

*laevis*: ZHADIN (1965), p. 141. –*Gyraulus laevis* FECHTER and FALKNER (1990), p. 134. –*Gyraulus (Torquis) laevis*: GLÖER and MEIER-BROOK (1998), p. 61. –*Gyraulus (Torquis) laevis*: GLÖER (2002), 272.

The shell is thin-walled, finely striated, without spiral lines. The surface of the shell is smooth. It has a shiny, yellowish-horn color and 3.5 whorls, which increase in size rapidly. The last turn is not markedly widened before the aperture. The aperture is oblique and roundly oval. The buccal margin protrudes (height of the shell: 1-1.5 mm; width of the shell: 4-5 mm.).

**Distribution in Turkey:** 2. The Aegean Region (Bilgin, 1967; Bilgin, 1980; Yıldırım, 1999; Yıldırım et al., 2001).

**General Distribution:** Transcaucasia, Northern Caucasus, Northern Africa, Europe, Middle and Northern Asia, and North America (Zhadin, 1905; Glöer and Meier-Brook, 1998).

**23. *Gyraulus (Torquis) parvus* (Say, 1817)**

*Planorbis parvus* SAY (1817): Nr. 3, T. 1, F.5. –*Gyraulus (Torquis) parvus*: GLÖER and MEIER-BROOK (1998), p. 61. –*Gyraulus (Torquis) parvus*: GLÖER (2002), p. 273.

The shell is rounded without a keel. The aperture is somewhat oblique. It has 4.5 whorls. The last 2 whorls are clearly extended to the front (height of the shell: 1.2-1.3 mm; width of the shell: 3.6-5 mm.).

**Distribution in Turkey:** 5. Black Sea Region (Öktener, 2004)

**General Distribution:** North America, Russia, Central Europe (Zhadin, 1905; Glöer and Meier-Brook, 1998; Glöer, 2002)

**Subgenus:** *Armiger* HARTMANN, 1843

**24. *Gyraulus (Armiger) crista* (Linnaeus, 1758) \*\***

*Nautilus crista* LINNAEUS (1758), p. 799. –*Planorbis imbricatus*: MÜLLER (1774), p. 165. –*Planorbis cristatus*: DRAPARNAUD (1905), p. 44. – *A r m i g e r crista*: ZHADIN (1965), p. 142. –*Gyraulus crista*: FECHTER and FALKNER (1990), p. 135. *Gyraulus (Armiger) crista* –GLÖER and MEIER-BROOK (1998), p. 62.

–*Gyraulus crista*: YILDIRIM (1999), p. 31.

The shell is thin-walled. The color of the shell is dirty yellowish. The shell is transversed with numerous costae projecting above the shell surface. It has 3 rapidly and regularly increasing whorls. The last whorl is much wider and is descending below the preceding whorl. The aperture is elongate-oval, with a rounded angle at the periphery. The juvenile specimens have spines on the shell, which are eventually shed (height of the shell: 0.75-0.9 mm; width of the shell: 2-2.8 mm.).

**Distribution in Turkey:** 3. The Central Anatolia Region (Yıldırım et al. 2003).

**General Distribution:** Holarctic, Europe, West Siberia, parts of Middle Asia (Zhadin, 1965; Fechter and Falkner, 1990; Glöer and Meier-Brook, 1998).

#### 25. *Gyraulus hebraicus* (Bourguignat, 1852)

*Planorbis hebraicus* BOURGUIGNAT (1852), p. 23.  
*Gyraulus hebraicus* MEIER-BROOK (1983), p. 51.

Meier-Brook (1983) reported that this species is "a lectotype, which is designated here from Bourguignat's original lot in *Musée d'Histoire Naturelle Genève* (without a registration number) labeled "*Planorbis hebraicus* Bourg., type, Bahr-el-Houl" (Syrie)" (Bourguignat's hand writing kindly identified by Dr. Zilch). Since alcohol material from Syria or Lebanon was not obtainable, material tentatively identified as *G. hebraicus* from the geographically least distant localities in Turkey was examined; 2 specimens from Kumluca and from Limra, 8 specimens".

**Distribution in Turkey:** 3. The Mediterranean Region.

**General Distribution:** Turkey, Syria, and Lebanon (Meier-Brook, 1983).

**Genus:** *Hippeutis* CHARPENTIER, 1837

#### 26. *Hippeutis complanatus* (Linnaeus, 1758)

*Helix complanatus*: LINNAEUS (1758), p. 769.  
–*Hippeutis complanatus*: ZHADIN (1965), p. 144.  
–*Hippeutis complanatus*: SCHÜTT (1983), p. 50-51.  
–*Hippeutis complanatus*: FECHTER and FALKNER (1990), p. 135. –*Hippeutis complanatus*: GLÖER and MEIER-BROOK (1998), p. 62. –*Hippeutis complanatus*: GLÖER (2002) p. 279. –*Hippeutis complanatus*: YILDIRIM et al. (2004), p.321-322.

The shell is lens-shaped. The surface is smooth, lustrous, and translucent. The color of the shell is dirty whitish horn-colored. It has 4 whorls. The last whorl is much wider. It is evenly flattened on the periphery on both sides and has a sharp median carina. All of the whorls, especially the last one, increase in size very slowly, so the shell is loosely coiled and the last whorl forms a considerable portion of the total area. The aperture is oblique. The umbilicus is narrow, but deep, and transverses all the whorls (height of the shell: 0.8-4.5 mm; width of the shell: 4-5 mm.).

**Distribution in Turkey:** 3, 7. The Central Anatolia Region, the Southeastern Anatolia Region (Schütt and Şeşen, 1989; Yıldırım et al. 2003).

**General Distribution:** Holarctic, Europe, West Siberia (Zhadin, 1965; Schütt, 1983; Fechter and Falkner, 1990; Fechter and Falkner, 1990; Glöer and Meier-Brook, 1998).

**Genus:** *Bulinus* MÜLLER, 1781

**Subgenus:** *Isidora* EHRENBERG, 1831

#### 27. *Bulinus (Isidora) truncatus* (Audouin, 1827)

*Physa truncata* AUDOUIN (1827), p. 166. –*Physa lirata*: MOUSSON (1874), p. 43. –*Physa moussoni* ANCEY (1900), p. 84. *Bulinus (Isidora) asiatica* GERMAIN (1911), p. 64. *Bulinus (Bulinus) truncatus* –SCHÜTT (1983), p. 48-49.

The shell is sinistral, elongate-ovoid, fragile, and thin-walled, with a very short spire. The color of the shell is shiny amber-brown. The surface of the shell is covered with fine and irregular stripes. The shell has 5 rapidly growing convex whorls. The apex is slightly sharp. The sutures are deep and somewhat oblique. The last whorl is fairly wide and swollen. The aperture is elongate-ovoid and dorsally angled. It is flattened by the columellar edge. The aperture is bearing on the fissure of the umbilicus (height of the shell: 8-10 mm; width of the shell: 4-6 mm.).

**Distribution in Turkey:** 7. The Southeastern Anatolia Region (Paydak, 1976; Schütt and Şeşen, 1989; Bilgin and Şeşen, 1992; Şeşen and Yıldırım, 1993; Yıldırım and Şeşen, 1994).

**General Distribution:** Eastern Mediterranean, Crete, Syria, Iran, Iraq, and Africa (Paydak, 1976; Schütt, 1983).

Genus: *Ancylus* O. F. MÜLLER, 1774

**28. *Ancylus fluviatilis* O. F. Müller, 1774 \*\***

*Ancylus fluviatilis* MÜLLER (1774), p. 201 Nr. 286. –*Ancylus fluviatilis* STURANY (1905), p. 306. –*Hippeutis complanatus*: ZHADIN (1965), p. 151. –*Ancylus fluviatilis*: SCHÜTT (1983), p. 51-52. –*Ancylus fluviatilis* FECHTER and FALKNER (1990), p. 132. –*Ancylus fluviatilis*: GLÖER and MEIER-BROOK (1998), –*Ancylus fluviatilis*: GLÖER (2002), p. 282-283.

The shell is roundly oval, fairly high, and cap-shaped. It is thin-walled and fragile. The surface of the shell is covered with fine radial stripes. The apex is blunt and is situated ? along the shell. It is slightly on the right of the median line and near the posterior end. The color of the shell varies from reddish brown to light brown, yellow and grayish white (height of the shell: 2-3.5 mm; width of the shell: 3.5-6 mm.).

**Distribution in Turkey:** 1, 2, 3, 4, 7. The Marmara Region, the Aegean Region, the Mediterranean Region, the Central Anatolia Region, the Southeastern Anatolia Region (Bilgin, 1967; Paydak, 1976; Bilgin, 1980; Schütt and Şeşen, 1989; Bilgin and Şeşen, 1992; Şeşen and Yıldırım, 1993; Yıldırım and Şeşen, 1994; Yıldırım, 1998; Yıldırım, 1999; Yıldırım and Karaşahin, 2000; Yıldırım et al., 2001; Yıldırım, 2004).

**General Distribution:** Europe, Transcaucasia, Caucasus, Northern Africa (Zhadin, 1965; Schütt, 1983; Fechter and Falkner, 1990; Glöer and Meier-Brook, 1998; Pflieger, 1999).

The fossil Basommatophoran species and subspecies that were reported from rarely investigated fossil deposits in Turkey are given below:

*Corymbina aegaea* (Oppenheim) (Northwest Anatolia; Harmancık-Kütahya-Bursa) (Schütt and Kavuşan, 1983); *Galba (Galba) gaudryi* Wenz, 1922 (The Aegean Region; Çifteçeşme-west of Afyon, Koçgazi, Sandıklı-south of Afyon) (Schütt, 1994); *Radix lessonae* (Andrusow, 1923) (The Eastern Anatolia Region; Pasinler Plain) (Schütt, 1991); *Radix (Radix) socialis praelongata* (Gottschick and Wenz 1916) (The Aegean Region; Çifteçeşme-west of Afyon) (Schütt, 1994); *Planorbis fischeri* Wenz, 1919 (Southwest Turkey; Koçgazi, Sandıklı-south of Afyon) (Schütt, 1994); *Gyraulus (Gyraulus) trochiformis* cf. *costatus* (Klein, 1846) (The Aegean Region; Koçgazi, Sandıklı-south of Afyon) (Schütt, 1994); *Gyraulus sibirjensis sibirjensis*

(Brusina 1897) (The Eastern Anatolia Region; Pasinler Plain) (Schütt, 1991); *Gyraulus sibirjensis horasanensis* Schütt, 1991 (The Eastern Anatolia Region; Pasinler Plain) (Schütt, 1991); *Planorbarius cornu mantelli* (Dunker, 1848) (The Marmara Region, the Aegean Region; Çifteçeşme-west of Afyon; Koçgazi, Sandıklı-south of Afyon and the Mediterranean Region (Schütt, 1994); *Anisus (Anisus) dupuyanus* (Noulet, 1854) (The Aegean Region; Koçgazi, Sandıklı-south of Afyon) (Schütt, 1994); *Anisus (Costorbis) densecostatus* Schütt, 1994 (The Aegean Region; Çifteçeşme-west of Afyon) (Schütt, 1994); *Hippeutis (Hippeutis) fasciatus* Gottschick, 1920 (The Aegean Region; Koçgazi, Sandıklı-south of Afyon) (Schütt, 1994), *Acroloxus anatolicus* Schütt, 1983 (Northwest Anatolia; Harmancık-Kütahya-Bursa) (Schütt and Kavuşan, 1983). Also, 8 fossil species (*S. palustris*, *Radix auricularia*, *R. peregra*, *Planorbis planorbis*, *Planorbis carinatus*, *Gyraulus (Armiger) crista*, *Planorbarius corneus*, and *Ancylus fluviatilis*) that were collected from different sites in Turkey are reported to be living in different aquatic systems.

So far, 28 species of freshwater pulmonates (Pulmonata: Basommatophora) have been reported from Turkey. The species given below belong to 5 families and 16 genera. These are: *Acroloxus lacustris* (Linnaeus, 1758); *Galba truncatula* (O. F. Müller, 1774); *Stagnicola palustris* (O. F. Müller, 1774); *Radix auricularia* (Linnaeus, 1758); *Radix labiata* (Rossmässler, 1835); *Lymnaea stagnalis* (Linnaeus, 1758); *Physa fontinalis* (Linnaeus, 1758); *Physella acuta* (Draparnaud, 1805); *Planorbarius corneus* (Linnaeus, 1758); *Planorbis planorbis* (Linnaeus, 1758); *Planorbis carinatus* O. F. Müller, 1774; *Anisus leucostoma* (Millet, 1813); *Anisus (Disculifer) vortex* (Linnaeus, 1758); *Anisus (Disculifer) vorticulus* (Troschel, 1834); *Anisus (Anisus) spirorbis* (LINNAEUS, 1758); *Bathyomphalus contortus* (Linnaeus, 1758); *Gyraulus albus* (O. F. Müller, 1774); *Gyraulus (Gyraulus) ehrenbergi* (Beck, 1837); *Gyraulus (Gyraulus) piscinarum* (Bourguignat, 1852); *Gyraulus (Gyraulus) euphraticus* Mousson, 1861; *Gyraulus (Torquis) laevis* (Alder, 1839); *Gyraulus (Torquis) parvus* (Say, 1817); *Gyraulus (Armiger) crista* (Linnaeus, 1758); *Gyraulus hebraicus* (Bourguignat, 1852); *Hippeutis complanatus* (Linnaeus, 1758); *Ancylus fluviatilis* O. F. Müller, 1774; *Ferrissia wautieri* (Mirolli, 1960); *Bulinus (Isidora) truncatus* (Audouin, 1827).

As a result of all the research on the family Pulmonata in Turkey, 28 species (8 of them have both living and fossil forms) and 13 fossil taxa have been recorded. The distribution of the Pulmonata species in Turkey is related to the paleogeographic evolution of Anatolia, especially the uplifting movements of the African continent to the north, the formation of the mountains and the chains of mountains from the deposits of Tethys during the pre-Neogene and Neogene, the large freshwater lake in Central Anatolia, which was bordered by the Taurus Mountains during the Eocene, the tectonic movements of the volcanoes during the Miocene, the collapse of the Aegean plate and the flooding of the barriers in Western Anatolia by Tethys during the Pliocene, and the drought of numerous lakes and inland waters. Additionally, some of the Neogene layers in western and central Anatolia were not effected by the tectonic movements, which led to the formation of Lakes Eğirdir, Beyşehir, Burdur, and Akşehir during the Pleistocene (Yıldırım, 1998). The data obtained from the research on Pulmonata fauna of the lakes, the inland waters, and the springs of Anatolia are useful and also will be useful in realizing the paleogeographic and paleozoogeographic evolution of Turkey.

The pulmonates are generally eurytopic, they are widely distributed in different aquatic systems, even those with high trophic content (Zhadin, 1965; Hart and Fuller, 1974). The Pulmonate fauna of Turkey, under these paleozoogeographic conditions, have an ordinary composition. Owing to this, their distribution in Turkey can be evaluated in consideration of these ordinary dimensions.

This zoogeographic study, which aimed to determine the Basommatophoran species of Turkey and their distribution, is supported by the results of the studies that have been conducted in different regions of Turkey for years. We proved that the morphological characteristics were not used for description and diagnosis in the majority of these studies. Based on this, we suggest that the results of this study will be an initiative for the general evaluations. The further descriptions and diagnoses based on trustworthy and effective taxonomical characteristics will be helpful in revising the species list. The new taxa will probably be added to the existing species list.

The methods of descriptions and diagnoses have to be more definitive in order to avoid unfortunate mistakes. We suggest that in particular, the Planorbidae and Lymnaeidae species need to be revised.

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