

Edible Snails (Terrestrial) of Turkey

M. Zeki YILDIRIM

Süleyman Demirel University, Burdur Education Faculty, Burdur - TURKEY

Ümit KEBAPÇI, Burçin Aşkim GÜMÜŞ

Süleyman Demirel University, Institute of Sciences, Isparta - TURKEY

Received: 27.05.2003

Abstract: Edible species and their distribution in Turkey were studied. The absence of *Helix pomatia*, a species reported to occur in Turkey in resources in various disciplines, is mentioned, while 7 species of edible snails determined (*Theba pisana*, *Eobania vermiculata*, *Cryptomphalus aspersus*, *Cantareus apertus*, *Helix asemnis*, *Helix cincta* and *Helix lucorum*) are described in detail by means of morphology, distribution, systematical positions, and a key to the species is given. Additionally, problems about the future of snail harvesting in Turkey and standards to be applied are discussed.

Key Words: edible snails, *Helix*, collecting

Türkiye'nin Yenilebilir Karasal Salyangozları

Özet: Bu çalışmada, Türkiye'de yenilebilir kara salyangoz türleri ve yayılışları incelenmiştir. Çeşitli disiplinlere ait kaynaklarda var olduğu bildirilen *Helix pomatia* türünün Türkiye'de yaşamadığı belirtilmiş, buna karşın Türkiye'de tespit edilen 7 tür (*Theba pisana*, *Eobania vermiculata*, *Cryptomphalus aspersus*, *Cantareus apertus*, *Helix asemnis*, *Helix cincta* ve *Helix lucorum*) morfoloji, yayılış, sistematik durumları ile açıklanmış ve türlere ait bir anahtar verilmiştir. Ek olarak salyangoz toplayıcılığının geleceği için olası problemler ve uygulanması öngörülen standartlar tartışılmıştır.

Anahtar Sözcükler: yenilebilir salyangozlar, *Helix*, toplama

Introduction

There are thousands of land snail species, ranging in size from 1 mm to the Giant African snail (*Achatina fulica*) growing up to a foot long. Snails have been eaten since prehistoric times. In ancient Rome, cochlearia (=snail gardens) were established to fatten up selected and bred snails (Grise, 1991). Furthermore, Romans casually or purposely introduced edible species into Britain, Western Europe, the Balkan Peninsula, and Aegean islands. Especially larger species (like *Helix* spp., *Achatina* spp.) are eaten and cultured mainly in the USA, Europe and Far East.

Two species known as escargot, *H. aspersa* and *H. pomatia*, are commercially important. There are some additional species, but they are either less abundant (like *Cantareus apertus*=*Helix aperta*) or only locally eaten. For example, *Xerocrassa cretica* and *Helix cincta* are consumed in parts of Crete (Welter-Schültes, 1998).

Together with taste, snail meat (or escargot) has several advantages over others: quite low lipid rate and calorie values versus rich mineral, essential amino acid and fatty acid content (Table 1). With higher Ω -3 fatty acid content, quite low in other meats, snail meat is found be a factor affecting higher life span and lower cancer rate in Cretan people compared with those of continental Europe. The mineral salts are calcium, magnesium, zinc,

Table 1. Comparison of nutritional values in snail meat, beef, chicken, and fish (Cheney, 1988).

	Snail	Beef	Chicken	Fish
Lipids (%)	0.5-0.8	11.5	12	1.5
Calories / 100 gr	60-80	163	120	70
Proteins (%)	13.5	22.1	8.5	15
Water (%)	83.8	72	70.6	81
Others (%)	1.9	0.9	0.8	25

copper, manganese, cobalt, and iodine (Cadart, 1955; Grisse, 1991; Seer and Eken, 1993; Yıldırım, *et. al.*, 1999). Edible snails also play a role as a remedy and recent studies have shown that glandular substances from these cause agglutination of bacteria, an important hope for curing whooping cough and similar diseases (Daguzzan and Rouet, 1982; Cheney, 1988; de Grisse, 1991).

For taste and digestibility, it is an expensive food in USA markets, the price of live snails is ca. \$5.5/kg (to compare below \$0.3 in Turkey), and when extracted from the shell about \$28/kg (obtained from ca. 2 kg of live snails). The USA alone imports ca. \$200 million worth of snails each year, primarily from Taiwan and France (Cheney, 1988, Gicart, 1994).

Although not eaten by Turkish people, snail meat (escargot) is an important export item in Turkey. Snail meat is exported mainly to European countries (France, Greece, Germany, Italy, and Spain). According to the IGEME 1994 report, 473,800 kg in 1988, 777,430 kg in 1989, and 527,948 kg. in 1990, were exported. Although actual numbers are expected to be higher, production is low compared to other suppliers, e.g. in Hungary annual production is roughly 3000 tons. The reasons must be the way of collecting without organization or standards, as well as the absence of active cultivation efforts. Turkey has the geographical and climatic potential for both cultivation and harvesting of snails, thus some methodological approach is needed for the development of this sector. Basic information about

the biology and identification of snails is necessary for collectors. This study deals with the identification of edible snails, potentials, and necessary standards in Turkey.

Material and Methods

The material used in this study was collected from different sites in Turkey between 1993 and 2002. Samples were collected in suitable seasons of the year (especially in spring); either by hand or with other standard methods mentioned in the literature (Licharew and Rammelmeier, 1962; Kerney and Cameron, 1979). Collected materials were deposited as alcohol samples and empty shells in the Eirdir Fisheries Faculty and the authors' collection.

Results and Discussion

According to the results of our study since 1993, 7 species found in Turkey are economically important and edible species (in paranthesis are their commercial names): *Cryptomphalus aspersus* (escargot chagrine, garden snail), *Cantareus aperta* (burrowing snail), *Helix lucorum* and *Helix (asemnis) adanensis* (escargo turc), *Eobania vermiculata* (vinyala, xona), *Theba pisana* (cargol avellanenc, banded snail), and *Helix cincta*.

Other similar edible or potentially edible species found in Turkey are unknown in world markets and some are either rare or local.

A key for the edible terrestrial species in Turkey

- 1 Shell small (D < 20 mm), white to light brown, narrow umbilicus.....*Theba pisana*
 - Shell large (D > 25 mm), darker, no umbilicus.....2
- 2 Spiral low, 5-6 whorls, mouth compressed, edges thick and reflected..... *Eobania vermiculata*
 - Spiral spherical to conical, 4-5 whorls, only the columellar edge reflected..... 3
- 3 Shell thin and weak, smaller (D = 23-39 mm)..... 4
 - Shell thick, larger (D = 35-55 mm)..... 5
- 4 Spiral conical, banded..... *Cryptomphalus aspersus*
 - Spiral rounded, not banded..... *Cantareus apertus*
- 5 Largest diameter > 45 mm, dark brown with whitish peripheral band.....*Helix lucorum*
 - Largest diameter < 45 mm, lighter with brown peripheral band..... 6
- 6 Last turn regular with broad bands, peristome high (=1/2 h) and whitish..... *Helix asemnis*
 - Last turn compressed with thin bands, peristome shorter and brown..... *Helix cincta*

Familia Helicidae RAFINESQUE, 1815**Subfamilia Helicinae RAFINESQUE, 1815****Tribus Euparyphini PERROT, 1939*****Theba pisana* (O. F. MÜLLER 1774) (Figure 1.1)**

Description: Shell moderate sized ($D = 18 \pm 2$ mm), somewhat compressed spherical, narrow umbilicus, thin with dense, irregular and fine stripes, with distinct spiral lines or ribs, white to light brown, pattern variable, ornated with bands, lines, or spots. Most characteristically lower bands are very thin, while the upper ones are branched and separated; also without bands. 5 turns, first turns with sharp keel that disappears slowly, last turn without keel, quite swollen and smooth sided. In young, all turns sharply keeled. Peristome rounded, crescent-like; edges sharp, most having rosy red lip and insides of peristome. Columellar edge briefly broadened and strongly curved.

Distribution in Turkey: Marmara, Ege, Akdeniz, West and Middle Karadeniz regions.

General Distribution: Distribution type is Atlantic-Mediterranean; found in whole Mediterranean area and in Atlantic coast from Morocco to England. Exported to South Africa (Kerney and Cameron, 1979; Fechter and Falkner; 1989, Schütt, 2001).

Habitat: Dunes, xerothermic und exposed places close to sea. The specimens may be observed in clusters on grasses and fences on which they climb for cooling.

Tribus Helicini RAFINESQUE, 1815***Eobania vermiculata* (O. F. MÜLLER 1774) (Figure 1.2)**

Description: Shell moderate (26 ± 4 mm, to 35 mm), compressed spherical, thick-walled, and with covered umbilicus. 5 to 6 slightly rounded turns low low sutures, embryonal turns ($1 \frac{1}{2}$) opaque, translucent, bright, remaining shell surface somewhat bright, with fine wrinkled to grooved surface sculpture; background color between pure white tinged with yellow to light gray-brown, mostly with 5 reddish to dark brown bands, first 2 often merged, 3rd widest just above the periphery line, and the 4th and 5th below this. Bands continuous, also regularly cut; all bands end at a wide light zone next to peristome. Locally albinistic populations may be encountered. Last turn descending, at the peristome broadened, edges sharp, with a poor lip, inside and

outside light; insertations are widely separated from each other and there is no callus; umbilicus is totally covered.

Distribution in Turkey: In all coastal parts.

General Distribution: Distributed in circummediterranean area, but not rare in synanthropic or agricultural areas (Licharew and Rammelmeier, 1962; Kerney and Cameron, 1979; Fechter and Falkner, 1989, Schütt, 2001).

Habitat: Fields, countryside, gardens, vineyards. It climbs up trees, palms, bushes and fences on hot daytime.

***Cryptomphalus aspersus* (O. F. MÜLLER 1774) (Figure 1.3)**

Description: Shell large ($H = 30-35$, $D = 32-39$ mm) and relatively thin-walled (nearly translucent), compressed spherical with broad conic spiral and blunt apex; 4 $\frac{1}{2}$ well rounded, quickly increasing turns, last being swollen and descending strongly towards peristome; shell surface covered with characteristic wrinkled pattern; with 5 broad, dark reddish brown to blackish bands on yellowish background, sometimes fused and yellow color is restricted to peripheral zone and the shell base. There is also a vertical buffish pattern of zigzags or broken stripes. Peristome high, egg-like, inclined outwards and downwards, notched slightly by penultimate turn. Mouth edges are thin and greatly reflected, lip being white.

Habitat: Shaded areas having low altitude: gardens, parks, hedges, forests etc.

Distribution in Turkey: It is not abundant in areas away from the coastal effect (like Burdur, Isparta) despite warm and quite humid locations (Istanbul, Antalya, Diyarbakır, İzmir, Bodrum etc.). However, it is recorded from cultivated lands in Outer Anatolia away from the sea.

General Distribution: Distribution type is West European-Mediterranean (Kerney and Cameron, 1979; Fechter and Falkner, 1989; Schütt, 2001).

***Cantareus apertus* (BORN 1778) (Figure 1.4)**

Description: Shell moderate (27 ± 4 mm), spherical, thin-walled and translucent, olive-brown to greenish, never banded; some 4 rounded, quickly increasing turns with deep sutures and rough growth ridges; last turn strongly broadened and slightly descending towards peristome. Peristome inclined, rounded egg-like, slightly

notched; edges narrow, whitish, and barely covering umbilicus. Insertations interconnected by a thick, round, whitish callus. Drought periods are survived in a thick, whitish epiphragma.

Habitat: Restricted to Mediterranean climate and coastal habitats like vineyards, olive orchards, coastal areas, and macchia.

Distribution in Turkey: Previously only in few localities in İzmir and Aydın. It was encountered rarely in areas without urban effect in Kuşadası and Bodrum during the study (in 2002)

General Distribution: A circummediterranean species, S. France to Turkey, Cyprus, and North Africa (Kerney and Cameron, 1979; Fechter and Falkner, 1989; Schütt, 2001).

***Helix (Rhododerma) asemnis* BOURGUIGNAT 1860 (Figure 1.5)**

Description (according to subspecies *adanensis*): Shell large ($D = 40 \pm 5$ mm), thick-walled and heavy, spherical conic, roughly striated with short, irregular spiral striae. Brown bands; 3 bands on the periphery almost fused to form a broad belt, 1 light brown zone on the periphery and between 2 lower bands present. $4 \frac{1}{2}$ well rounded turns (last regularly descending); apex broad with somewhat pointed and bright, protoconch light yellow. Inside and outsides of peristome lighter (whitish), broadly rounded, slightly curved crescent-shaped, edges simple or thick, with a weak inner lip. Mouth edges are interconnected by a bulging callus, whitish columellar edge rounded, while transition to base vertical to inclined; mouth height about half the shell height.

Habitat: All habitats including coasts.

Distribution in Turkey: Taurus Mountains to Hatay (in İçel, Adana, Hatay).

General Distribution: Only in Turkey and Syria (Zilch, 1952; Schütt, 2001).

***Helix (Helix) cincta* O. F. MÜLLER 1774 (Figure 1.6)**

Description: (for subspecies *anatolica*): Shell moderate ($D = 37 \pm 4$ mm, also larger) and thick, spherical with short spiral, surface rough, but bright, light brown, on the periphery 3 bands fused into a broad hazelnut brown belt, under periphery 2 bands (a diffuse and a distant, much narrower one). $4 \frac{1}{2}$ regularly rounded turns with small, horn colored protoconch, first

turns rapidly increasing, last compressed and descending; peristome roundish crescent-shaped; edges smooth, ventrally spread, rounded at columella, insertations interconnected weakly by a thin callus; peristome and callus brown.

Habitat: Low and moist parts of hilly areas under the effect of marine climate.

Distribution in Turkey: Marmara, Aegean, Mediterranean, W. Black Sea regions. Occurrence in the undisturbed habitats of the whole of SW Anatolia is observed during the study, as the second most common species after *lucorum*.

General Distribution: Three conchologically identified subspecies spread from N. Italy, Balkans, and Outer Anatolia to Libya. *H. cincta anatolica* is identified by thick, quite compressed shell, thicker mouth parts as compared to *H. cincta cincta* of Balkans. Closer species are *anctostoma*, *mersinae*, *mississiensis* and *antiochiensis* (Zilch, 1952; Schütt, 2001).

***Helix (Helix) lucorum* LINNAEUS 1758 (Figure 1.7)**

Description: Shell large ($H = 50 \pm 5$ mm, also smaller) and thick, compressed spherical with prominent and rounded apex; $4 \frac{1}{2}$ to 5 somewhat rounded, rapidly increasing turns, last being plump and low at suture, swollen at the periphery, not or only slightly widened towards mouth, slowly and shortly descending to front; first turns striated with distinct spiral striae, absent in the strongly striated last one. Whitish background color seen as a peripheral band obscured by dark brown irregular transverse bands, mostly washed with red brown; uppermost band thin, with 2nd and 3rd often forming a broad belt, also 4th and 5th fused; lighter crossings in irregular distances cover the bands; peristome relatively small, oval, upper margin strongly notched, lower margin regressed, inside blue-gray, bands seen through the wall, edges smooth, blunt, base somewhat broadened, palatal wall weakly curved, inside broad light or dark brown, upper corner of brownish columellar wall curved, the rest slowly descending, strongly broadened and compressed, upper side low.

Habitat: Most abundant in low, moist, riverine grasslands, also in moist forests at moderate altitude, gardens, and orchards.

Distribution in Turkey: Present in the whole of Anatolia, especially abundant in moist coastal parts of N.

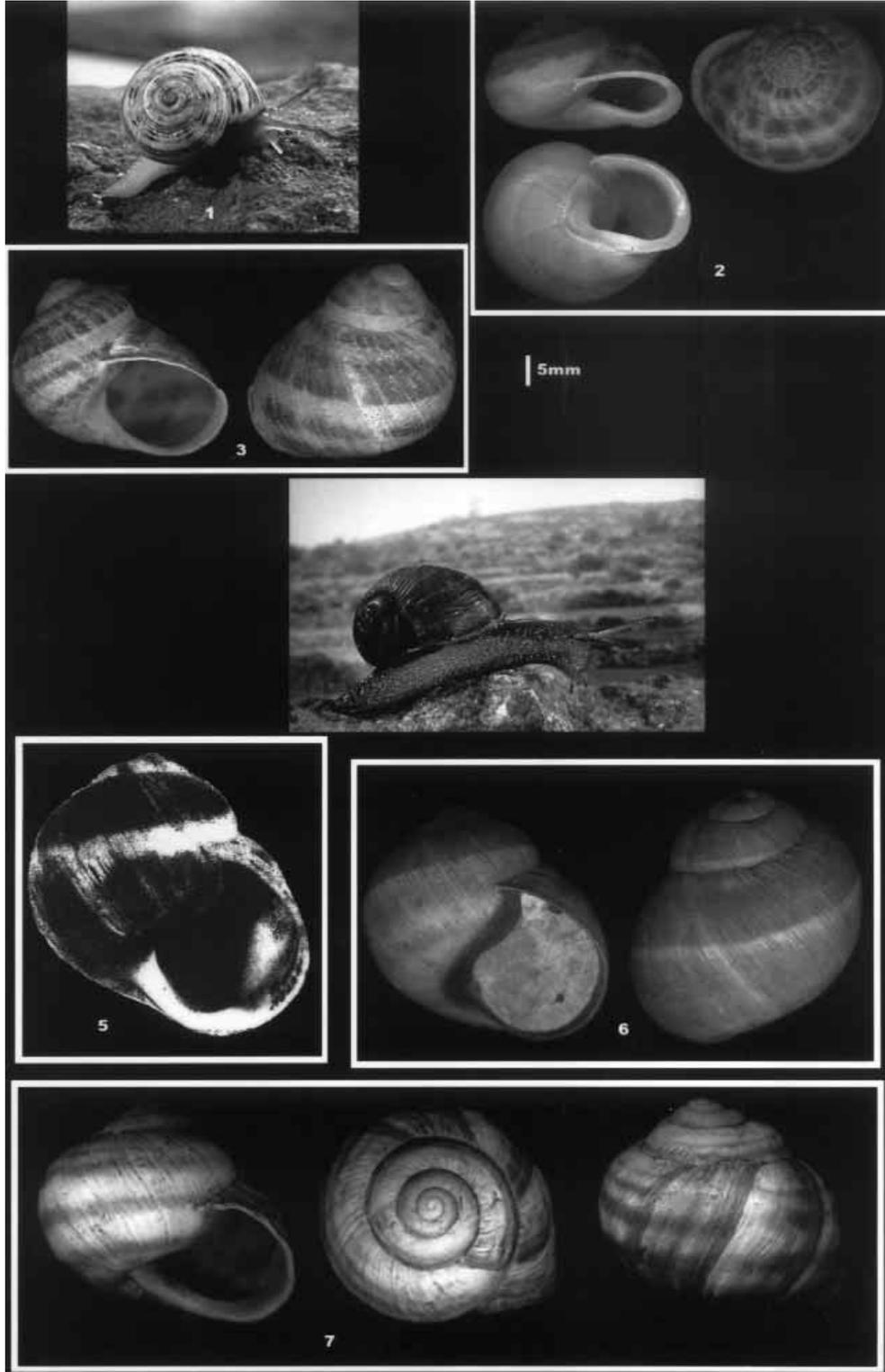


Figure 1. Edible terrestrial snails of Turkey (1. *Theba pisana*, 2. *Eobania vermiculata*, 3. *Cryptomphalus aspersus*, 4. *Cantareus apertus*, 5. *Helix asemnis*, 6. *Helix cincta*, 7. *Helix lucorum*).

Anatolia and European Turkey. It is the most collected and exported snail in Turkey, therefore the most vulnerable species.

General Distribution: From Iran and Caucasia to Central France (scarcer). In all varieties, compressed spherical shell and the light peripheral band are almost always seen. Bands, especially in Anatolian populations, may irregularly be cut showing a zebra pattern (Licharew and Rammelmeier, 1962; Kerney and Cameron, 1979; Fechter and Falkner, 1989, Schütt, 2001).

Remark: Most of the previous records of *H. pomatia* in Turkey must be assigned to this species. For over 200 years, numerous synonyms to this variable species have been encountered. The following are for Turkey: *castanea* OLIVIER 1801; *taurica* KRYNICKI 1833; *radiosa* ZIEGLER 1837; *socia* L.PFEIFFER 1853; *onixiomicro* BOURGUIGNAT 1860; *mahometana* BOURGUIGNAT 1860; *euphratica* E. MARTENS 1874; *schahbulakensis* BOURGUIGNAT 1876; *martensi* O. BOETTGER 1883; *dorylaensis* NAEGELE 1903; *angustefasciata* KOBELT 1904; *berytensis* KOBELT 1903; *halepensis* KOBELT 1905; *haussknechti* KOBELT 1905; *hueti* KOBELT 1905; *loebbeckeii* KOBELT 1905; *quinquefasciata* KOBELT 1905; *ancyrensis* KOBELT 1906; *byzantina* KOBELT 1906; *minima* KOBELT 1906; *trapezuntensis* FORCART 1963 (Zilch, 1952).

Discussion

Along with the species given above, species lacking in Turkey like *Achatina fulica*, *Sphincterochila candidissima*, *Iberus (gualtierianus) alonensis*, *Otala lactea*, *Otala punctata*, *Cepaea nemoralis*, *Cepaea hortensis* and *Helix pomatia* are reported to be eaten in parts of Europe (Cheney, 1991). *Helix* snails constitute 70% of the world's market. The most important species with an annual production of 8000 tons is *H. pomatia*. It is erroneously reported to be common in Turkey; most records should be belonging to *H. lucorum*, the commonest species of *Helix* in Turkey. The original distribution of *H. pomatia* is restricted to Europe, spreading from S. England and S. Sweden to Macedonia and Ukraine in the south and east. It is absent in E. Balkan Peninsula and Thrace. Therefore it does not occur near Turkish borders (Kerney and Cameron, 1979; Fechter and Falkner, 1989).

Theoretically all snails are edible, but size and taste are the most important criteria for palatability. As seen above, all species in Turkey are in the subfamily Helicinae. This group includes the largest snails in Turkey and Europe. In this group; 1 *Theba*, 6 *Isaurica*, 11 *Assyriella*, 2 *Levantina*, 1 *Cepaea*, 1 *Tacheopsis*, 3 *Caucasotachea*, 1 *Eobania* and 20 *Helix*-sensu lato (including *Maltzaniella*, *Cornu* or *Cryptomphalus*, *Cantareus*, and *Helix*) species are found in Turkey. Two genera (*Tacheopsis* and *Isaurica*) and 18 species are endemic to Anatolia, and 20 others have limited ranges (Schütt, 2001).

Practically all *Helix* species are collected, as is the case in E. Europe. It is notable to add here that not all the congeners are edible. For instance *H. buchii*, the largest land snail in Turkey, is not preferred. However, being identical to a non-specialist, all Helicinae species and many others like *Zonites* spp. are likely to be collected as understood from empty shell masses near factories. Furthermore, habitats are destroyed during searches and juveniles or even smaller species in the same place like *Chondrus zebrula* are collected. This may affect the product quality and threaten the local stocks.

In Turkey, there is no legal collecting standard for species, neither for the density, productivity, nor quantity, supposedly resulting in the decline in populations. In a study about meat production in *H. lucorum* (in Eğirdir, Isparta), some regional standards for the collection of mature and productive snails were suggested. According to the study, minimum levels were determined to be 30 mm for shell height, 32 mm for shell diameter, and 11 g for total weight. Harvesting by the end of March or April, after the copulation and ovulation periods, was also suggested in the same study (Yıldırım et al., 1999). It is essential that some legal adjustments be made. Furthermore, distribution and stock record analyses of the edible snails of Turkey must be performed, to sustain commercial profits.

Due to over-harvesting and the increasing use of agricultural chemicals, edible species (particularly *H. pomatia* and *C. aspersus*) have become apparently rare and collecting from the wild is legally prohibited in most of Europe. In France, considerable amounts of escargot are imported annually from Turkey and Eastern Europe, relabeled and sold to USA and European countries. On the other hand, helicicultures (snail farms) in Germany and some other countries meet the demands instead of exploitation of the natural stocks. Heliciculture is a cheap

alternative, with relatively low space and food expenses (\$ 0.5/kg). Favorable species (*H. pomatia*, *C. aspersus*, and *Achatina fulica*) could be cultured in Turkey, especially in coastal areas.

References

- Cadart, J. 1955. Les Escargots (*Helix pomatia* L. et *Helix aspersa* M.). Editions Lechevalier. S.A.R.L. 19. Rue Augereau. Paris - VIII e. 443 pp.
- Cheney, S. 1988. Raising Snails. Special Reference Briefs Series no. SRB 88-04. Beltsville, MD: USDA, National Agricultural Library, 15 pp.
- Daguzan, J. and H. Rouet. 1982. Contribution to production of 'Petit-gris' snails (*Cryptomphalus aspersus* Müller). *Annales de Zootechnie* [Paris: Institut National de la Recherche Agronomique] 31, no.2: 87-110.
- De Grisse, A. 1991. Automatisatie van de vestmesting van Escargots. Med. Fac. Landbouww. Rijksuniv. Gent, 56/1.
- Elmslie, L.J. 1984. Edible Snails: Evolution of Domesticated Animals. Mason, Ian L., ed. London: Longman. pp. 432-433.
- Fretter, V. and Peake, J. 1975. Pulmonates. London. Academic Press Inc. 404 pp.
- Gicart, I. 1994. Caracterisation du marché des escargots. Agricontact (Belgium). Courrier du Ministere de l'Agriculture, No. 260: 11-13.
- Kerney, M.P. and Cameron, R.A.D., 1979: A Field Guide to the Land Snails of Britain and NW Europe. London, William Collins Sons & Co. Ltd., 288 pp.
- Licharew, I.M. and Rammelmeier, E.S. 1962. Terrestrial Mollusks of the Fauna of the U.S.S.R., Jerusalem, Israel Prog. Sci. Translations, 574 pp.
- Schütt, H. 2001. Die Türkische Landschnecken 1758-2000. Acta Biologica Benrodis, Suppl. 4: 550 pp.
- Seçer, S. and Eken, İ. 1993. Bursa Bölgesi Kara Salyangozlarından Bağ Salyangozunun (*Helix pomatia* L. 1758) Et Verimi ve Etinin Kimyasal Yapısı. Su Ürünleri Sempozyumu 23-25 Haziran. Erzurum.
- Welter-Schultes, F.W. 1998. Human-dispersed land snails in Crete, with special reference to Albinaria (Gastropoda: Clausiliidae). *Biologia Gallo-hellenica* 24 (2): 83-106.
- Yıldırım, M. Z., Özen, M.R., Ünlüsayın, M. and Gülyavuz, H. 1999. Eğirdir Civarında *Helix lucorum* Linnaeus, 1758' un Et Verimi Ve Toplama Standartı Üzerine Bir Çalışma. Tr. J. of Zoology 23: Ek sayı 2, 747-750.
- Zilch, A. 1952. Die Typen und Typoide des Natur-Museums Senckenberg. 8: Mollusca, Helicinae (2). Arch. Moll., 81(4/6): 135-173. Taf. 5-6.

Acknowledgements

Thanks to Dr. F.WELTER-SCHULTES (Germany), who allowed us to use his beautiful pictures of *Theba pisana* and *Cantareus apertus*.