

## HELICOID LAND SNAILS FROM THE PROVINCE OF MALATYA, TURKEY AND THE SURROUNDING AREA

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**Abstract.** The purpose of this study was to identify and document species belonging to the superfamily Helicoidea (Gastropoda: Pulmonata) found in the province Malatya and the surrounding area. Samples from 43 different localities were collected. A total of 4 genera and 7 species belonging to two families within the superfamily Helicoidea were identified. Of these species, *Monacha melitenensis*, *M. samsunensis*, *Xeropicta krynickii* and *X. derbentina* belong to the family Hygromiidae TRYON 1866 and *Assyriella guttata*, *Helix pathetica* and the Turkish snail *Helix lucorum* to the family Helicidae RAFINESQUE 1815. These are the first records of *X. krynickii* and *H. (P.) pathetica* from the study area; the occurrence of *Helix pathetica* MOUSSON 1854 is quite significant as its distribution area in Turkey.

**Keywords:** *Assyriella*, *Helicoidea*, *Monacha*, *Xeropicta*, Anatolia, Malatya, Turkey.

**Rezumat. Melci helicoizi din provincia Malatya, Turcia și din zona înconjurătoare.** Scopul acestui studiu a fost de a identifica și cunoaște speciile care aparțin suprafamiliei Helicoidea (Gastropoda: Pulmonata) găsite în provincia Malatya și zona înconjurătoare. Au fost colectate probe din 43 localități diferite. Au fost identificate în total 4 genuri și 7 specii aparținând la două familii din cadrul suprafamiliei Helicoidea. Dintre aceste specii, *Monacha melitenensis*, *M. samsunensis*, *Xeropicta krynickii* și *X. derbentina* aparțin familiei Hygromiidae TRYON 1866 și *Assyriella guttata*, *Helix pathetica* și *H. lucorum* familiei Helicidae RAFINESQUE 1815. În zona studiată sunt primele semnalări ale speciilor *X. krynickii* și *H. (P.) pathetica*; prezența lui *Helix pathetica* MOUSSON 1854 este destul de semnificativă pentru arealul din Turcia.

**Cuvinte cheie:** *Assyriella*, *Helicoidea*, *Monacha*, *Xeropicta*, Anatolia, Malatya, Turcia.

### INTRODUCTION

Helicoidea, one of the most studied stylommatophoran groups (MANGANELLI *et al.*, 2005), is a large superfamily with over 2500 species worldwide (SCHILEYKO, 1978). Helicoids make up more than a quarter of land snail species described from Turkey so far (SCHÜTT, 2010).

Helicoid species live in a wide range of habitats. Although the greatest diversity at species level is likely to be seen in warm temperate habitats, they show distribution and speciation in a wide variety of other environments from hot and dry deserts to rain forests (PEAKE, 1978), and hence constitute a significant part of land snail biodiversity worldwide (STEINKE *et al.*, 2004). Thus, helicoid species exhibit a semi-cosmopolitan distribution, being absent only in the south of South America, most of Africa (especially the south of the Sahara Desert) and some Pacific Islands (SCHILEYKO, 1978, 2006a, 2006b; SCOTT, 1997). The shell shape of helicoid snails exhibits considerable variation from flat, depressed to high conical, cylindrical. Shell size is quite variable: shell height may reach 6 cm in species with a globular shape (like the genus *Helix*), or more than 6 cm in species with a high conical, cylindrical shape (SCHILEYKO, 1978). Systematic and taxonomic studies have traditionally focussed mainly on genital anatomy and shell shape. More recently, molecular studies using nuclear ribosomal RNA genes, mitochondrial DNA and nuclear DNA have started to gain an increasing importance (STEINKE *et al.*, 2004; MANGANELLI *et al.*, 2005). Unfortunately, no molecular studies have been yet undertaken on Turkish helicoid land snails.

Most of the studies contributing to our knowledge of the general distribution of helicoid species in Turkey have been carried out by foreign researchers, starting about 200 years ago. The first Turkish helicoid species, *Assyriella guttata*, was described from Urfa by OLIVIER (1804). The first general review of the species of the genus *Assyriella* was made by BOURGUIGNAT (1863-1868), who described the species *Assyriella escheriana* from Diyarbakır and included in this genus the species “*djulfensis*, *michoniana* and *guttata*” from Eastern and Southeastern Anatolia. MARTENS (1874), who carried out conchological studies in areas including Malatya, Adıyaman, Elazığ, Diyarbakır and Şanlıurfa provinces, collected samples of *Assyriella guttata* from Malatya and Diyarbakır provinces. In his studies of the species of *Assyriella*, GALLAND (1885) described new varieties of *Assyriella guttata* and *A. escheriana* from Malatya and Diyarbakır provinces. HESSE (1915) described *Monacha melitenensis* from near the Euphrates River, Malatya. WAGNER (1937, 1938) collected samples of *Xeropicta derbentina* and *Monacha melitenensis* from Malatya. From samples of Helicidae collected by Dutch students in biological excursions to Turkey in 1959, HUDEC (1973) described new species and subspecies and gave systematic, zoogeographical and taxonomic information about them, making a major contribution to our knowledge of *Monacha melitenensis*, *M. samsunensis*, *Xeropicta derbentina* and *Helix lucorum* near the study area.

Malatya and the surrounding area, one of poorly-known areas in terms of malacological studies, is situated on the Southeastern Taurus – Anatolian Platform in the western part of the Eastern Anatolian Region (37° 56' – 39° 07' N, 37° 16' – 38° 55' E) and has characteristics which are transitional between northern and southern Anatolia. Its elevation ranges from about 700 m to over 2500 m, averaging 1350 m. Its predominant climate is continental, with relatively low rainfall (ATALAY & MORTAN, 2006). The vegetation of the study area consists predominantly of Iran-Turanian phytogeographical steppe elements, which are very common almost everywhere, such as *Bromus*, *Stipa*, *Astragalus*, *Papaver*, *Thymus*, *Euphorbia*, and *Festuca* (ATALAY & MORTAN, 2006). As this suggests, the land snail species recorded so far from the study area are xerophilic or mesophilic; diversity is relatively low, possibly as a result of

widespread volcanic activity, especially of the late Miocene date (ARGER *et al.*, 2000), and a shortage of limestone areas. The aim of the study presented here is to document species belonging to the superfamily Helicoidea (Gastropoda: Pulmonata) from Malatya province and the surrounding area and to add to what is already known.

## MATERIAL AND METHODS

43 sampling sites were chosen to reflect the geographical and ecological characteristics of the study area (Fig. 1, Table 1). Field trips were carried out at 3 different periods between October 2009 and September 2010, on dates chosen to optimise the chances of finding live adults (WIKTOR, 2000). Empty shells and living materials were both collected. Living specimens were killed in a relaxed state by cleaning them of mucus and dirt, placing them in a test tube or a jar so large that they could freely move and their muscles extend, and then drowning in water for 12-14 hours. Once dead, they were rinsed with cold water to remove mucus (WIKTOR, 2000) and preserved in 80% ethyl alcohol with the addition of 5% glycerine to facilitate later dissection.

Empty shells were examined with a dissection microscope (Olympus SZ61); photographs were taken with an Infinity Lite Microscope Camera mounted on the dissection microscope and with digital cameras (Fujifilm FinePix s8000fd and Nikon P90). For the identification of specimens, structural characteristics, such as shell height and shell width (ÖRSTAN, 2003), aperture height and aperture width (FIORENTINO *et al.*, 2008) and whorl number (KERNEY *et al.*, 1983) were examined. The identification of species followed SCHÜTT & SUBAI (1996), HAUSDORF (2000) and SCHÜTT (2010).

Measurements of shell height, shell width, aperture height and aperture width were made using a digital calliper with 0.1 mm accuracy. Measurements of these characteristics were carried out with multi-read method. The following abbreviations have been used in the descriptive text and tables: D, shell width and  $D_{\text{mean}}$ , average shell width; H, shell height and  $H_{\text{mean}}$ , average shell height; AD, aperture width and  $AD_{\text{mean}}$ , average aperture width; AH, aperture height and  $AH_{\text{mean}}$ , average aperture height; mm, millimetre; m, meter; N, North; E, east.

## RESULTS AND DISCUSSIONS

### Genus *Monacha* FITZINGER 1833

#### Subgenus *Monacha* FITZINGER 1833

##### *Monacha (Monacha) melitenensis* HESSE 1915

**Description** (Fig. 2): Shell dextral, depressed and conical-globular; with  $4\frac{1}{2}$  -  $6\frac{1}{4}$  convex whorls; teleconch rounded or slightly angular, with last whorl large and more than  $\frac{2}{3}$  of shell height, changing from brownish corneous to grey-white with a lighter peripheral band and becoming paler in lower whorls; protoconch usually darker brownish. Teleconch with more or less strong wrinkled growth-ridges and more or less distinct spiral striae; shell surface covered with hairs 0.5 mm in length, with scattered hair scars on upper whorls in older specimens. Aperture elliptical or almost circular; upper insertion of the peristome slightly or distinctly descending; peristome sharp, hardly expanded, with a strong, pinkish-white internal lip; umbilicus missing or very narrow and largely obscured by the reflected columellar edge.

**Measurements (n=15):** D = 10.53 – 13.09 mm,  $D_{\text{mean}}$  = 11.34 mm; H = 7.15 – 9.85 mm,  $H_{\text{mean}}$  = 7.95 mm; AD = 4.80 – 5.63 mm,  $AD_{\text{mean}}$  = 5.18 mm; AH = 5.64 – 6.67 mm,  $AH_{\text{mean}}$  = 6.05 mm.

**Materials examined:** From localities 1, 18, 19, 24, 25, 26, 27, and 29.

**Distribution:** So far reported from Adana, Malatya, Elazığ, Tunceli, Diyarbakır and Siirt provinces in Turkey. Found under leaf debris and on grass, especially in damp areas with poplar trees.

#### Subgenus *Metatheba* HESSE 1914

##### *Monacha (Metatheba) samsunensis* PFEIFFER 1868

**Description** (Fig. 3): Shell dextral, depressed, conical-globular; teleconch and protoconch with  $5\text{--}6\frac{1}{2}$  and  $\frac{3}{4}\text{--}1\frac{1}{4}$  convex whorls, respectively; spire height close to or slightly smaller than the aperture height; last whorl larger  $\frac{3}{2}$  times or more than penultimate whorl, rounded in adults (but keeled in juveniles); whitish or light corneous with a faintly paler peripheral band. Teleconch with wrinkled growth-ridges, lower whorls with more or less distinctive incised spiral striae; sometimes sculpture with fine, radial striae; lower whorls with sparse hairs about 0.5 mm in length or hair scars. Aperture elliptical or rounded; upper insertion of the peristome usually distinctly descending; peristome sharp, hardly expanded, with a strong whitish internal lip being slightly larger at its edges; umbilicus narrow or very narrow, partly or nearly completely obscured by the reflected columellar edge.

**Measurements (n=15):** D = 8.28 – 12.63 mm,  $D_{\text{mean}}$  = 10.71 mm; H = 5.98 – 9.46 mm,  $H_{\text{mean}}$  = 7.77 mm; AD = 3.23 – 6.06 mm,  $AD_{\text{mean}}$  = 4.74 mm; AH = 4.27 – 7.07 mm,  $AH_{\text{mean}}$  = 5.71 mm.

**Materials examined:** From localities 7, 10, 12, 13, 17, 21, 22, 23, 30, 32, 33, 34, 39, 40, 41 and 43.

**Distribution:** So far reported from Bilecik, Adapazarı, Bolu, Zonguldak, Karabük, Kastamonu, Sinop, Samsun, Ordu, Giresun, Trabzon, Rize, Artvin, Çankırı, Çorum, Amasya, Tokat, Ankara, Sivas, Gümüşhane, Erzurum, Erzincan, Malatya, Tunceli and Van provinces in Turkey. Found under leaf debris and on grass, especially in damp areas with poplar trees.

### Genus *Xeropicta* MONTEROSATO 1892

#### *Xeropicta krynickii* KRYNICKI 1833

**Description** (Fig. 4): Shell dextral, with 5-6 convex whorls; small, dome-shaped or more often conical; shell height not more than half of the height of aperture; with 5 to 6 convex whorls; upper whorls slowly increasing and slightly convex; last whorl with pronounced bulge, convex and rounded at periphery and twice as large as penultimate whorl; with white

or dark bands and spots; the number of bands and the degree of their appearance quite variable; in most specimens, firstly the band above the suture passing from last whorl and reaching the suture of the previous and embryonic whorls; secondly only one band shell below. Sculpture with fine and irregular radial striae and spiral grooves, expressed in varying degrees. Aperture slightly descending, relatively large, rounded, oblique and cut off weakly by penultimate whorl; the insertion points of the peristome approaching each other to some extent; peristome fine and distinctive, in some specimens with very fine, distinctive lip; umbilicus characteristic and more than half of penultimate whorl cannot be seen from the umbilicus; umbilical space not large and excentric.

**Measurements (n=15):** D = 11.17 – 14.15 mm,  $D_{\text{mean}} = 12.61$  mm; H = 7.06 – 10.40 mm,  $H_{\text{mean}} = 9.16$  mm; AD = 4.59 – 6.31 mm,  $AD_{\text{mean}} = 5.38$  mm; AH = 5.52 – 7.07 mm,  $AH_{\text{mean}} = 6.27$  mm.

**Materials examined:** From localities 10, 30 and 40.

**Distribution:** Reported mainly from the Black Sea Region in Turkey. Recently reported from other parts of Turkey, presumably introduced in imported soil, natural fertilizers and with landscape plants. Most commonly found in open habitats, arable fields, and sometimes forests and sandy areas.

*Xeropicta derbentina* KRYNICKI 1836

**Description (Fig. 5):** Shell dextral, distinctively depressed to flat; spire height often not more than half of the height of aperture; with 5-5½ convex whorls; whorls rapidly and regularly increasing in size; last whorl rounded and about three times as large as penultimate whorl; chalky-white or with light bands or bands consisting of many spots especially subsuturally. Sculpture with fine, radial striae; spiral grooves indefinite. Aperture slightly descending; very often almost rounded, with a whitish or lighter pinkish-white internal lip and slightly oblique; the insertion points close to each other; peristome edges fine, distinctive and complete, but quite fragile; umbilicus concentric and a whole whorl or 3/2 whorl, albeit rarely, can be seen from the umbilicus.

**Measurements (n=15):** D = 11.78 – 14.51 mm,  $D_{\text{mean}} = 13.19$  mm; H = 7.44 – 10.07 mm,  $H_{\text{mean}} = 8.42$  mm; AD = 4.63 – 6.48 mm,  $AD_{\text{mean}} = 5.63$  mm; AH = 5.05 – 6.92 mm,  $AH_{\text{mean}} = 6.23$  mm.

**Materials examined:** From localities 1, 2, 4, 6, 7, 9, 19, 20, 21, 27, 28, 31, 33, 34, 35, 36, 37, 38, 39, 41, and 42.

**Distribution:** A successful invasive species known from many steppic and xerothermophilic areas in Turkey because of its introduction in imported soil, natural fertilizers, with landscape plants, etc. Prefers all kinds of dry grassy places and forms heaps on walls and trees.

**Genus *Assyriella* HESSE 1908**

*Assyriella guttata* OLIVIER 1804

**Description (Fig. 6):** Shell dextral, small to medium - sized and depressed globular with broad conical spire; teleconch and protoconch with 4 - 4¾ and 1¾ whorls, respectively; embryonic whorls not shouldered but very vaulted; teleconch with regularly increasing whorls, last whorl two times or so larger than penultimate whorl and descending abruptly towards aperture; protoconch slightly vaulted, strong shouldered and with coarse granulation (0.05-0.20 mm) or sculpture with long line existing radial striped; teleconch smooth or with very fine granulation on upper whorls, with very irregular, strong radial striped sculpture; in some specimens, a few spiral grooves visible subsuturally; teleconch dirty white with five brown bands; upper band very narrow and pale, hardly visible; second and third bands often merged, but fourth and fifth bands widely spaced; fourth band wide and quite pronounced; fifth band narrower and hardly visible or missing; bands often interrupted by white, radial zigzag-lines.; Aperture obliquely oval or very rounded, in some specimens dental lamina raised slightly in the centre of the lower aperture; the insertion points of the peristome 8-10,5 mm apart, connected by a thin, distinct callus; aperture edges white, sharp, reflected nearly uniformly but thickened towards the columellar edge; umbilicus completely closed or with a very narrow gap.

**Measurements (n=15):** D = 26.44 – 37.04 mm,  $D_{\text{mean}} = 32.76$  mm; H = 15.29 – 23.21 mm,  $H_{\text{mean}} = 19.85$  mm; AD = 14.00 – 23.37 mm,  $AD_{\text{mean}} = 19.19$  mm; AH = 13.13 – 19.96 mm,  $AH_{\text{mean}} = 17.31$  mm.

**Materials examined:** From localities 3, 5, 14, 15, and 16.

**Distribution:** So far reported from Adana, Adıyaman, Diyarbakır, Elazığ, Erzincan (in this study), Malatya and Şanlıurfa provinces in Turkey. Found in rocky habitats in crevices, cracks, and rarely in basalt areas.

**Genus *Helix* LINNAEUS 1758**

**Subgenus *Pelasma* HESSE 1908**

*Helix (Pelasma) pathetica* MOUSSON 1854

**Description (Fig. 7):** Shell dextral, small when compared with other *Helix* species; teleconch and protoconch with 4-5 and 1-1¾ whorls, respectively; globular with broad conical spire and pointed apex; thin-walled and translucent, last whorl broader and descending slightly towards the aperture; 4-5 reddish light brown bands. Very fine growth-ridges. Aperture oblique or rounded; inside white, with bands shining through and thin glossy lip; peristome sharp, only below broadened and reflected towards umbilicus; umbilicus almost completely obscured by the reflected columellar edge; the insertion points of peristome distant and connected by a thinner callus.

**Measurements (n=6):** D = 22.15 – 27.85 mm,  $D_{\text{mean}} = 25.25$  mm; H = 24.48 – 29.35 mm,  $H_{\text{mean}} = 26.87$  mm; AD = 14.38 – 18.17 mm,  $AD_{\text{mean}} = 16.81$  mm; AH = 15.20 – 19.30 mm,  $AH_{\text{mean}} = 17.65$  mm.

**Materials examined:** From locality 8

**Distribution:** So far reported from Samsun, Amasya, Tokat, Kahramanmaraş (in this study) and Çorum provinces in Turkey. Prefers gently sloping limestone cliffs and open habitats.

**Subgenus *Helix* LINNAEUS 1758*****Helix (Helix) lucorum* LINNAEUS 1758**

**Description** (Fig. 8): Shell dextral medium to large sized with 4 - 4½ slightly convex whorls; slightly blunt-conical, depressed globose with more or less broad conically elevated spire, nearly as high as it is wide; protoconch smooth and convex; last whorl inflated distinctly, especially in width; usually pale brown, variably striped radially; dark stripes on the upper whorls. Sculpture with prominent radial folds, strong at the sutures; may show some spiral grooving. Aperture oval, rounded or oblique; lip whitish and shiny inside; the edge of the aperture blunt and slightly thickened, white or pale brown, not reflected or only reflected on the columellar edge; umbilicus partly or completely sealed by the columellar edge.

**Measurements (n=15):** D = 35.36 – 47.91 mm, D<sub>mean</sub> = 41.49 mm; H = 35.79 – 47.23 mm, H<sub>mean</sub> = 42.13 mm; AD = 20.01 – 29.07 mm, AD<sub>mean</sub> = 24.52 mm; AH = 21.01 – 27.89 mm, AH<sub>mean</sub> = 25.11 mm.

**Materials examined:** From localities 5, 22, 33, 34, and 41.

**Distribution:** Known from many areas of Turkey because of its introduction into many places by various ways, such as in imported soil, natural fertilizers, with landscape plants, through the consumption of human food, etc. Prefers bushy, forested and grassy areas, as well as gardens.

We found 7 species belonging to Helicoidea. Of these species, 4 are classified in the family Hygromiidae, including the genera *Monacha* and *Xeropicta*, and 3 in the family Helicidae, including the genera *Assyriella* and *Helix*. The species of *Xeropicta krynickii* and *Helix (Pelasga) pathetica* are reported for the first time from the study area.

*Monacha* is a widely-distributed hygromiid genus with many species. The Anatolian *Monacha* species are conchologically very similar, but ecologically rather diverse, being found in a wide range of habitats such as arid habitats, marshy meadows, woods, etc. from coastal areas to alpine altitudes (HAUSDORF, 2000). Their habitats are so diverse that they can be considered as one of the most successful groups of land snails. In the present study, *Monacha melitenensis* and *Monacha samsunensis* were found in semi-arid and in humid habitats. But at none of the sample sites were both species present; as in *Albinaria* (GITTENBERGER, 1991), two *Monacha* species rarely occur in the same place (HAUSDORF, 2000). *Monacha (Metatheba) samsunensis* has one of the largest distributions of the genus *Monacha*, occurring over a large area of the Anatolian Plateau from Bilecik in the west to Van in the east, and from Samsun in the north to Malatya in the south (HAUSDORF, 2000). In this study, *M. (M.) samsunensis* is reported for the first time from Elbistan, but this has not been confirmed anatomically. The other *Monacha* species from the present study area, *Monacha melitenensis*, is endemic to Anatolia and has a narrower distribution area from Adana to Siirt.

Of the two species of *Xeropicta* in the study area, *X. derbentina* is more commonly found in Turkey than *X. krynickii*. These two species are often confused; they can best be distinguished by the ratio between of their epiphallus and flagellum, which is less than or almost equivalent to one fourth in *X. derbentina* (SCHILEYKO, 1978). In this study, *X. derbentina* was found in arid habitats while *X. krynickii* was found in humid habitats, indicating that the heat tolerance of *X. derbentina* is probably higher than *X. krynickii*. Because, some invasive species, such as *Xeropicta derbentina* and *Theba pisana*, have high phenotypic plasticity and their juveniles can have interrupted their growth when climatic conditions, such as humidity and temperature, become unfavourable (COWIE, 1984; BAKER & VOGELZANG, 1988).

*Assyriella guttata* belongs to a genus which had originated from an ancestral stock in the Syrian or South Anatolian area together with such genera as *Levantina* and *Isaurica*, and spread northwards and eastwards from that area (NEUBERT, 1998). In the present study, it was found in rocky habitats from Arapgir and Ağın towards Kemaliye (Erzincan), an area without many other helicoid species; this is the northernmost report of this species. It is the *Assyriella* species with the largest distribution; this is the first report of its occurrence in Kemaliye. It, however, is likely it could be found near Kahramanmaraş and Kayseri in the northwest of Southeast Taurus (BAYNDIR, 2006).

*Helix* is the largest-sized land snail genus in the western Palaearctic region, as well as in the Anatolia. *Helix (Pelasga) pathetica*, reported for the first time from the present study area, is endemic to Anatolia. It shows a sparse distribution on the Anatolian plateau and occurs in the northern parts of Inner Anatolian Region (SCHÜTT, 2010); this is its southernmost known occurrence. Unlike *H. (P.) pathetica*, *Helix lucorum* is a widespread adventive there is plenty of evidence indicating that some species of *Helix*, as well as other edible snails, had been consumed as human food throughout circum-Mediterranean countries in prehistoric times (LUBELL, 2004).

**CONCLUSIONS**

Of the species found in the present study, *Monacha samsunensis*, *M. melitenensis*, *Assyriella guttata* and *Helix (Pelasga) pathetica* can be stated to be native to the study area. But, the remaining species, *Xeropicta derbentina*, *X. krynickii* and *Helix (H.) lucorum*, may have been transported into the study area in various ways, because, these species are often found in areas with intensive human activity. Snail eggs or juveniles can hardly ever or rarely be seen without special equipment, so they are easily introduced in imported soil, natural fertilizers, with landscape plants, and in other ways.

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Table 1. List of the sampling sites of the present study.  
Tabel 1. Lista siturilor de prelevare a probelor studiate.

No	Locality	Coordinate	Altitude (m)
1	Şahaplı Köyü – Baskil / Elazığ	38° 32' N; 38° 47' E	1042
2	Kaşpınar - Ağın / Elazığ	38° 55' N; 38° 40' E	866
3	Yedibağ – Ağın / Elazığ	38° 53' N; 38° 37' E	957
4	Kömürhan / Elazığ	38° 26' N; 38° 50' E	700
5	Dutluca / Kemaliye – Erzincan	39° 06' N; 38° 33' E	1115
6	Özbek – Elbistan / Kahramanmaraş	38° 13' N; 37° 23' E	1302
7	Büyük Yapalak-Elbistan-Darende Yolu 25. km / Elbistan	38° 23' N; 37° 17' E	1345
8	Yeşilkent – Kullar Beldesi / Kahramanmaraş	37° 57' N; 37° 30' E	1298
9	Ören – Dedeyazı Arası / Akçadağ	38° 14' N; 37° 53' E	1215
10	Sultansuyu / Akçadağ	38° 25' N; 38° 08' E	747
11	Yukarı Kozluca / Akçadağ	38° 23' N; 37° 42' E	1446
12	Kozluk – Darıca / Akçadağ	38° 20' N; 37° 40' E	1545
13	Mollauşağı – Tohma Çayı / Akçadağ	38° 30' N; 37° 49' E	918
14	Arapgir Yolu 67. km / Arapgir	38° 45' N; 38° 27' E	740
15	Karayolları 85. Şube Şefliği Örtülü Bakım Evi Karşısı / Arapgir	38° 55' N; 38° 31' E	1377
16	Arapgir Yolu 110. km / Arapgir	38° 58' N; 38° 30' E	1390
17	Kemaliye Yolu / Arapgir	39° 04' N; 38° 30' E	934
18	Asmaca / Arguvan	38° 46' N; 38° 12' E	1014
19	Mollaibrahim – Arguvan Çayı / Arguvan	38° 44' N; 38° 05' E	960
20	Battalgazi / Malatya	38° 25' N; 38° 23' E	801
21	Tohma Çayı – Çatakkaya / Darende	38° 28' N; 37° 41' E	950
22	Aşağıulupınar / Darende	38° 26' N; 37° 34' E	1175
23	Günpınar / Darende	38° 33' N; 37° 25' E	1263
24	Sürgü Yol Ayrımı / Doğanşehir	38° 03' N; 37° 54' E	1319
25	Kasımlar Köyü / Malatya – Adıyaman İl Sınırı	37° 59' N; 38° 10' E	1328
26	Elmalı Köyü Çıkışı / Doğanşehir	38° 03' N; 37° 44' E	1379
27	Çığlık / Doğanşehir	38° 07' N; 37° 55' E	1213
28	Suçatı Köyü – Demiryolu İstasyonu / Doğanşehir	38° 11' N; 37° 58' E	1014
29	Fındık Köyü / Doğanşehir	38° 07' N; 37° 48' E	1348
30	Hekimhan Çıkışı / Hekimhan	38° 50' N; 37° 54' E	1098
31	Erenli Köyü / Kale	38° 20' N; 38° 40' E	1149
32	Malatya Köy Hizmetleri Bahçesi	38° 20' N; 38° 15' E	936
33	Beyler Deresi / Malatya	38° 19' N; 38° 12' E	919
34	Dilek / Malatya	38° 22' N; 38° 17' E	893
35	Pınarbaşı / Malatya	38° 20' N; 38° 22' E	1023
36	Pütürge Çıkışı / Pütürge	38° 11' N; 38° 52' E	1187
37	Yazihan Karayolu 15. km / Yazihan	38° 29' N; 38° 13' E	740
38	Hekimhan Karayolu, Demiryolu Tüneli Kuzeyi / Yazihan	38° 39' N; 38° 09' E	793
39	Gözene Köyü / Yeşilyurt	38° 10' N; 38° 02' E	1291
40	Sultansuyu Çayı Doğusu / Yeşilyurt	38° 12' N; 37° 59' E	970
41	Gündüzbey'in 2 km Güneyi / Yeşilyurt	38° 15' N; 38° 16' E	1190
42	Görgü Köyü / Yeşilyurt	38° 16' N; 38° 07' E	1168
43	Gürün / Sivas	38° 43' N; 37° 17' E	1378

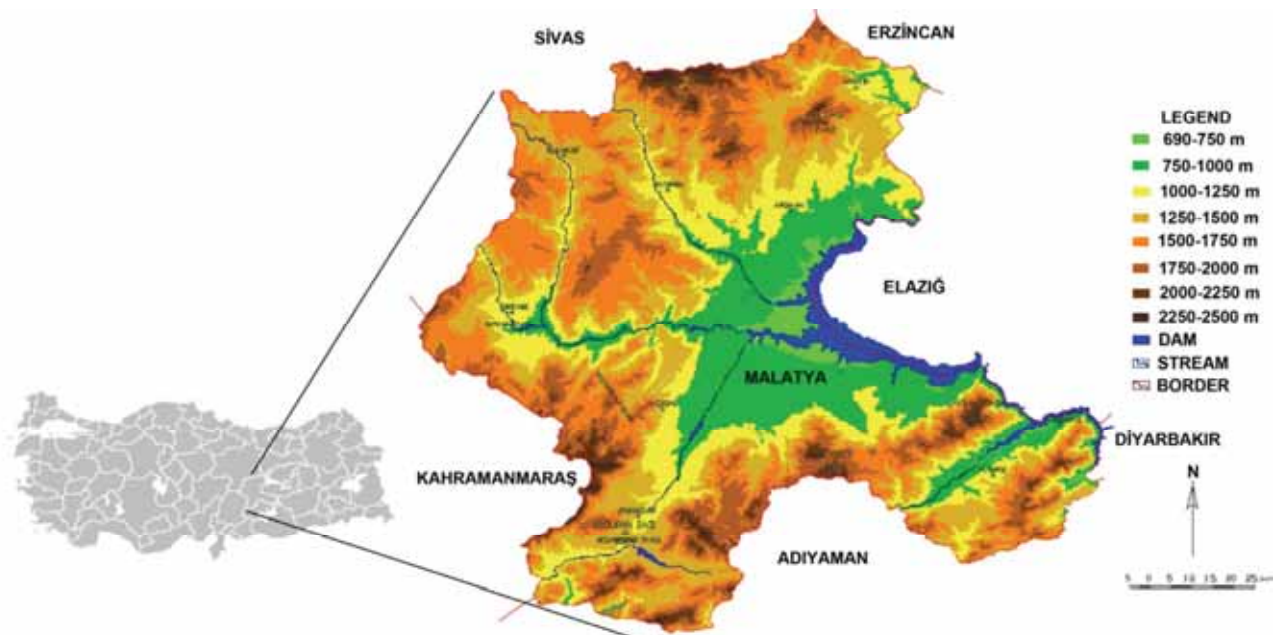


Figure 1. Map of the study area (after BAYINDIR, 2006). / Figura 1. Harta zonei studiate (după BAYINDIR, 2006).



Figure 2. The view of *Monacha (M.) melitenensis* from three directions (Scale 10 mm).  
 Figura 2. Vedere *Monacha (M.) melitenensis* din trei direcții (Scala 10 mm) (original).



Figure 3. The view of *Monacha (Metatheba) samsunensis* from three directions (Scale 10 mm).  
 Figura 3. Vedere *Monacha (Metatheba) samsunensis* din trei direcții (Scala 10 mm) (original).



Figure 4. The view of *Xeropicta krynickii* from three directions (Scale 10 mm).  
 Figura 4. Vedere *Xeropicta krynickii* din trei direcții (Scala 10 mm) (original).



Figure 5. The view of *Xeropicta derbentina* from two directions (Scale 10 mm).  
 Figura 5. Vedere *Xeropicta derbentina* din două direcții (Scala 10 mm) (original).



Figure 6. The view of *Assyriella guttata* from three directions (Scale 10 mm).  
 Figura 6. Vedere *Assyriella guttata* din trei direcții (Scala 10 mm) (original).



Figure 7. The view of *Helix (Pelasga) pathetica* from three directions (Scale 10 mm).  
 Figura 7. Vedere *Helix (Pelasga) pathetica* din trei direcții (Scala 10 mm) (original).



Figure 8. The view of *Helix (H.) lucorum* from three directions (Scale 10 mm).  
 Figura 8. Vedere *Helix (H.) lucorum* din trei direcții (Scala 10 mm) (original).

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