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## **Genus *Monacha* FITZINGER 1833 in Bulgaria (Gastropoda, Pulmonata, Hygromiidae)**

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**A b s t r a c t :** The paper discusses the number, the subdivision and the distribution of the Bulgarian *Monacha* species and some of the data has been revised. There are 8 species recognized from Bulgaria and 2 out of them are only provisionally accepted as valid. One of the species is reported for the first time on the territory of Bulgaria. For each taxon there are photographs of shells, genitalia (with measurements of some of the parts) and drawings (for identification). All the synonyms which are based on material from Bulgaria have been listed. The distribution of the species has been summarized and all localities documented in Bulgaria as well the new ones have been listed. The distribution of the species is presented in UTM square network. Some ecological data of the species and of their habitats has been presented. The ecological peculiarities and the zoogeographic origin, as well as the appurtenance of the *Monacha* species from Bulgaria are discussed.

**Key Words :** *Monacha*, Hygromiidae, systematics, distribution, ecology, zoogeography, Bulgaria.

### **Introduction**

The number, the subdivision and the distribution of the species of the genus *Monacha* FITZINGER 1833 in Bulgaria have not yet been fully explained. For 148 years now various *Monacha* species are reported and there is data on them in 41 publications. 11 species are presented and most often *M. cartusiana* (MÜLLER 1774) and *M. carascaloides* (BOURGUIGNAT 1855) are mentioned (Table 1). Yet many of the species are reported without researching their sexual anatomy and are today with uncertain systematic status, while some of them are either incorrectly identified or confused with the twin species.

The publications during the period, from MOUSSON (1859) to HUDEC (1967) do not contain data for the sexual anatomy of the species. The habitats of three species in Bulgaria are reported – *M. cartusiana*, *M. carascaloides* and *M. frequens* (MOUSSON 1859).

Later on, during the period from HUDEC (1967) to KÖRNIG (1983) four new species were described – *M. dissimulans* PINTER L. 1968, *M. venusta* PINTER L. 1969, *M. oschanovae* PINTER I. & L. PINTER 1970 and *M. pilosa* PINTER L. (1969) (the last one is described without anatomical research). BERON (1972), reports *M. haussknechti* (O. BOETTGER 1886) based on the shells found in a cave near Lovech. Some of the above mentioned authors, as well as HUDEC (1967), HUDEC & VASATKO (1971, 1973), DAMJANOV & LIKHAREV (1975) and KÖRNIG (1983) conduct anatomical research and present anatomi-

cal data for the sexual anatomy, yet some of the taxons have been incorrectly identifies, and others are confused with twin species.

During the period from MITOV & RADOSLAVOV (1997) to GEORGIEV (2005) mostly *M. cartusiana* and *M. carascaloides* are mentioned as valid for Bulgaria.

Following anatomical research of material from various areas of the Western Rhodopes, *M. claustralis* is established with certainty in the publication of IRIKOV & MOLLOV (2006).

As a result of the revision of the subdivision of the *Monacha* species in Turkey by HAUSDORF (2000b) light was shed on the *Monacha* species from Bulgaria as well, namely: *M. dissimulans* and *M. pilosa* are synonyms; *M. cartusiana* and *M. carascaloides* were not distinguished and were confused respectively with *M. claustralis* and *M. solidior*. According to the same author due to the confusion of *M. carascaloides* with *M. solidior* the actual distribution of *M. carascaloides* is little known. Similar is the situation with *M. claustralis*, which is confused in most of the cases with *M. cartusiana*.

The general review of the *Monacha* species from Bulgaria demonstrates that most of the reports on *M. carascaloides* are in fact related to *M. solidior* and significantly fewer to the actual *M. carascaloides*. Not infrequently, however, *M. carascaloides* is reported together with *M. cartusiana* in areas (for instance, Plovdiv, Bachkovo, etc.), where this species or its conhiological double are not met. In these habitats only *M. claustralis* is available, reported as *M. cartusiana*. This is how the confusion results as to which results are related to the actual *M. carascaloides* and which to *M. solidior*, *M. claustralis* or to *M. cartusiana*.

As a result of the research during the last few years on the *Monacha* species from Bulgaria, new data was obtained. Initially, they demonstrated that the actual number, subdivision and distribution of the *Monacha* species from Bulgaria are different from all existing conceptions.

The goal of this article is to present summarized information of the *Monacha* genus in Bulgaria, based on all published data till now, as well as based on some new research.

## Methods

A review of all the *Monacha* species in Bulgaria is presented below. The list of synonyms includes only the original description and quotes related to the Bulgarian material for which tests have been conducted of specimens from the habitat and for which there is solid anatomical data explaining their presence in the list of synonyms.

Further, in the distribution of the species, all data related to the respective *Monacha* species documented in the literature have been summarized. The author, the year and the name with which the species was reported is present there, the quoted habitats in Bulgaria and their UTM coordinates. The overall distribution of the separate species in Bulgaria, based on literature and original data, is presented on UTM maps with the goal of facilitating a future verification of the habitats and establishing the authenticity of the respective species and their precise and integral distribution. The UTM squares with localities have been coloured and a UTM code is indicated. Since many of the reports of *M. cartusiana* and *M. carascaloides* are related to other *Monacha* species, a verification of the habitats documented in the literature will be necessary in the future.

In the identification of the species, anatomical research has been conducted and there are drawings of the genitalia for each species. All-important criteria used in HAUSDORF (2000a, b) were taken into account and the measurements of the genitalia are presented for comparative studies and future revisions.

The accepted subdivision of Genus *Monacha* is into three subgenera – *Monacha* proper, *Paratheba* and *Metatheba*.

Some ecological peculiarities and data on the species and the habitats are presented.

In the zoogeographic classification of the species the work of DAMYANOV & LIKHAREV (1975), LIKHAREV (1978), GRUEV & KUZMANOV (1999), GRUEV (1995, 2000, 2002) etc. were used.

Two species – *M. cartusiana* and *M. oshanovae* – are accepted only provisionally in the present study and are therefore not discussed in detail.

## Results

### *Monacha* species from Bulgaria

All *Monacha* species from Bulgaria are classified in the subgenus *Monacha*. In this subgenus the species are classified alphabetically.

#### *Monacha (Monacha) carascaloides* (BOURGUIGNAT 1855)

1855 *Helix carascaloides* BOURGUIGNAT: 561. Locus typicus: "Gallipoli", Turkey.

1957 *Monacha carascaloides* JAECKEL, KLEMM & MEISE: 164.

1973 *Monacha (Monacha) carascaloides* HUDEC & VASATKO: 22, fig. 18-19.

2000b *Monacha (Monacha) carascaloides* HAUSDORF: 79, fig. 16-17, pl. 4, fig 16-17, table 8, map 3.

2005 *Monacha carascaloides* IRIKOV & DEDOV: 788.

2005b *Monacha carascaloides* HUBENOV: 241.

**Literature survey data for *M. carascaloides* in Bulgaria (Map 1):** JAECKEL, KLEMM & MEISE (1957): *M. carascaloides*: Bulgaria; URBANSKI (1960b): *M. (M.) carascaloides*: Tsarevo (= former name Michurin) (NG66-67); URBANSKI (1960c): *M. (M.) carascaloides*: Provadija (NH37-38), Kaspichan (NH19), between Asenovgrad and Narechenski Bani (LG14-24-25), Ropotamo River (? NG58-68); URBANSKI (1964): *M. (M.) carascaloides*: Asenova Krepost Fortress (LG25); HUDEC (1965): *M. carascaloides*: Drujba, north of Varna (NH78); URBANSKI & WIKTOR (1967): *M. carascaloides*: Ropotamo River (? NG58-68); HUDEC (1967): *M. carascaloides*: Black Sea Coast by Varna (NH78-88), Zlatni Pyasatsi (NH89); PINTER L. (1968): *M. (M.) carascaloides*: Varna (NH78), Karlovo (LH12-22), between Asenovgrad and Narechenski Bani (LG14-24-25), Bachkovski Monastery (LG24); DAMJANOV & PINTER L. (1969): the outfall of Ropotamo River, right riverside (NG58-68), from Asenovgrad to Bachkovo (LG24-25); PINTER I. & L. PINTER (1970): *M. (M.) carascaloides*: Aladzha Monastery (NH89), Arkutino (NG58), Balchik (NJ90), Beloslav (NH58), Kamchiya River (? NH66-76), Tsarevo (= former name Michurin) (NG66-67), Ropotamo River (? NG58-68), Sliven (MH42), Zlatni Pyasatsi (NH89); HUDEC & VASATKO (1971): *M. (M.) carascaloides*: Sozopol (NG59), Arkutino (NG58), Ropotamo River (? NG58-68), Emine Foreland (? NH62-63-72-73),

Vratnik Pass in Eastern Stara Planina Mountains (MH34), Trite Bratya in Aitoska Planina Mountain (NH22), Aitoska Planina north of Aitos NH13-23), Sinite Kamani north of Sliven (MH42); HUDEC & VASATKO (1973): *M. (M.) carascaloides*: Prolaz by Targovishte (NH58), Sliven (MH42), Balchik (NJ90), Aladzha Monastery and Zlatni Pyasatsi (NH89), Kamchiya River (? NH66-76), Beloslav (NH58), Sozopol (NG59), Ropotamo River (? NG58-68), Arcutino (NG58), Primorsko and Kiten (NG67), Tsarevo (= former name Michurin) (NG 66-67); DAMJANOV & LIKHAREV (1975): *M. carascaloides*: Black Sea Coast, Trakiya Lowland and north by Stara Planina Mountain; KÖRNIG (1983): *M. carascaloides*: Kranevo (NH89-NJ80), Sozopol (NG59), Arkutino (NG58), meadow by Ropotamo River (NG68), Kiten (NG67), Bosna Upland in Strandza Planina Mountain (NG37), Bachkovo (LG24), Yugovo (LG13), Mostovo (LG23); HAUSDORF (2000b): *M. (M.) carascaloides*: Black Sea Coast; IRIKOV & GEORGIEV (2002): *M. carascaloides*: Stara Zagora (LG89), Sredna Gora Mountains, north of Stara Zagora (LH80); IRIKOV & DEDOV (2005): *M. carascaloides*: Plevun (MF19); HUBENOV (2005b), *M. carascaloides*: Transition area, Trakiiska Nizina Lowland, Black Sea Coast; GEORGIEV (2005): *M. cartusiana*: Surnena Sredna Gora Mountain, Oriahovitsa (MH00), Edrevo (MH01), Kolena and Dalboki (LH90), north from Stara Zagora town (LH80), Ostra Mogila (LH70), Starozagorski Bani resort complex (LH70), wrongly reported with a code (LH79), Stojan Zaimovo (LG69), Rozovets (LH40).

**Researched material (Map 2):** Eastern Rhodopes Mountains: south and south-western of Ivaylovgrad, Plevun (MF19), Kostilkovo (MF28), Dolno Lukovo (MF28), 200-300 m alt., 25 specimens, 11.11.2001, leg. GEORGIEV; about 30 km north-east of Kardjali, between Silen and Dolno Botevo (LG91), 250-300 m alt., 1 specimen, 20.03.2004 leg. IRIKOV.

The really distribution of *M. carascaloides* in Bulgaria still remain indistinct. All investigated anatomically specimens from Black Sea Coast southerly of Bourgas are found to belong to *M. solidior* (see *M. solidior* researched material and Map 2). Also *M. carascaloides* don't meet in the Chepelarska River Valley in Western Rhodopes Mountains and the all reports concern *M. claustralis* (see *M. claustralis* researched material and Map 2). There is needful anatomical examination of specimens from the all localities reported for north Black Sea Coast and for the central part of the country also. Probably lots of the data concern *M. solidior*, but not *M. carascaloides*. For the time being *M. carascaloides* certainly present in the region of Eastern Rhodopes Mountains in South Bulgaria.

**Shell (Fig. 7):** Measurements (n = 25), D: 14.1-18.7 mm, x 16.68 mm; H: 9.2-13.0, x = 11.08 mm; D/H 1.4-1.7 mm, x = 1.5 mm.

**Genitalia (Fig. 1):** The measurements of some sections of the genitalia are compiled in Table 2 and the variation of the proportions of some sections of the genitalia is represent in Table 3.

**Vertical distribution:** registered in Bulgaria from 0 m alt. to low areas in the Mountains. Probably only occasionally may be found at 600 m alt by reason of the thermophilic characterization.

**Ecological data:** The species distributed in Bulgaria near by the Black Sea region and in the internal areas of the country, with predominance of xerotermal conditions in the summer and soft brief winter.

Xerophilic, thermophilic, drought-resistant species.

**Zoogeography:** Asia Minor subelement, Subiranian element, Soutwestern Asiatic complex.

***Monacha (Monacha) cartusiana* (O. F. MÜLLER 1774)**

1774 *Helix cartusiana* O. F. MÜLLER: 15. Locus typicus: "Gallia", France.

There are not certain anatomical proofs of the presence of this species in Bulgaria yet. Notwithstanding many authors repeatedly reported the species from various regions in the country (see the next species and Map 4) the structure of genitalia and the figures are doubtful and corresponds to *M. claustralis* (see Fig. 2). First HAUSDORF (2000b) distinguish unambiguously the genitalia of *M. cartusiana* from these of *M. claustralis* and emphasize repeatedly confusions and confounds of the first species with the second one. According to the selfsame author more of material from Bulgaria belong to *M. claustralis*, whereas *M. cartusiana* meet in South Bulgaria.

We assume the availability of this species in Bulgaria only conventional for the time being until finding of certain anatomical evidences.

***Monacha (Monacha) claustralis* (MENKE 1828)**

1828 *Helix claustralis* MENKE: 12. Locus typicus: "Prevesa", Greece (MOUSSON 1859: 254).

1911 *Theba carthusiana* HESSE: 143.

1911 *Theba frequens* HESSE: 144.

1911 *Carthusiana carthusiana*: WOHLBEREDT: 198.

1911 *Carthusiana frequens*: WOHLBEREDT: 198.

1957 *Monacha carthusiana* JAECKEL, KLEMM & MEISE: 164.

1960b *Monacha (Monacha) carthusiana* URBANSKI: 72, 80, 92, 93, 99, 100, 103.

1960c *Monacha (Monacha) carthusiana* URBANSKI: 124, 130, 140.

1960c *Monacha (Monacha) carascaloides* URBANSKI: 124, 127, 140.

1964 *Monacha carthusiana* URBANSKI: 27.

1964 *Monacha carascaloides* URBANSKI: 27.

1965 *Monacha carthusiana* HUDEC: 13.

1967 *Monacha cartusiana* URBANSKI & WIKTOR: 57, 90.

1967 *Monacha (Monacha) carascaloides* URBANSKI & WIKTOR: 60.

1967 *Monacha (Monacha) carthusiana* HUDEC: 82, fig. 5 (in fig. 6 wrongly applied text).

1968 *Monacha (Monacha) carthusiana* PINTER L.: 221, fig. 9.

1968 *Monacha (Monacha) carascaloides* PINTER L.: 220.

1968 *Monacha (Monacha) dissimulans* PINTER L.: 221, fig. 5-6, fig. 64-66, fig. 67-69. Locus typicus: "Varna-Kurort", Bulgaria.

1969 *Monacha cartusiana* Urbanski: 234.

1970 *Monacha cartusiana* Urbanski: 67.

1971 *Monacha (Monacha) carthusiana* HUDEC & VASATKO: 29, fig. 16-17.

1973 *Monacha (Monacha) venusta* HUDEC & VASATKO: 20, fig. 16, pl. 5, fig. 1.

1975 *Monacha cartusiana* DAMJANOV & LIKHAREV: 362, fig. 291-292.

1977 *Monacha cartusiana* CLAUSS: 309.

1977 *Monacha carascaloides* CLAUSS: 309.

1983 *Monacha cartusiana* KÖRNIG: 36.

1983 *Monacha carascaloides* KÖRNIG: 36.

1997 *Monacha cartusiana* MITOV & RADOSLAVOV: 107.

2000 *Monacha cartusiana* DEDOV & PENEV: 127.

2000b *Monacha (Monacha) claustralis* HAUSDORF: 80, fig. 19, pl. 4 fig. 19-20, table 8, map 6.

2001 *Monacha cartusiana* ANTONOVA & DEDOV: 41.

- 2002 *Monacha cartusiana* ANTONOVA & DEDOV: 85.  
 2002 *Monacha cartusiana* IRIKOV & GEORGIEV: 12.  
 2002 *Monacha cartusiana* IRIKOV: 96.  
 2005a *Monacha cartusiana* HUBENOV: 782.  
 2005b *Monacha cartusiana* HUBENOV: 241.  
 2005 *Monacha cartusiana* IRIKOV & DEDOV: 789.  
 2005 *Monacha cartusiana* GEORGIEV: 435.  
 2006 *Monacha (Monacha) cartusiana* IRIKOV & MOLLOV: 820.  
 2006 *Monacha (Monacha) claustralis* IRIKOV & MOLLOV: 821.

**Distribution of *M. claustralis* in Bulgaria (Map 3):** MOUSSON (1859): *Helix cartusiana*: Izvor (FM59), Kystendil (FM38), Blagoevgrad (= former name Djumaya) (FM75), Lovech (LH17-18), Sevlievo (LH49), Tarnovo (LH86-87-97), Shumen (MH99); *Helix frequens* (MOUSSON 1859): Blagoevgrad (= former name Djumaya) (FM75), Sevlievo (LH49), Shumen (MH99); JICKELY (1874): *H. cartusiana*: Pleven (LJ00-01), Varna (NH78); KOBELT (1898): *Carthusiana carthusiana*: Bulgaria; KOBELT (1898): *Carthusiana frequens*: Bulgaria; HESSE (1911): *Theba cartusiana*: surroundings by Plovdiv area (? LG16-17); HESSE (1911): *Theba frequens*: surroundings by Plovdiv area (? LG16-17), Sevlievo (LH49), Shumen (MH99), Blagoevgrad (= former name Djumaya) (FM75); HESSE (1916): *T. cartusiana* Varna (NH78); JAECKEL, KLEMM & MEISE (1957): *M. cartusiana*: Bulgaria; URBANSKI (1960a): *M. (M.) cartusiana*: 1.5 kilometer in the north of Burgas (NH30); URBANSKI (1960b): *M. (M.) cartusiana*: Tarnovo (LH86-87-97), Lakatnik (FN96-97), Lozenets (NG67), Tsarevo (= former name Michurin) (NG66-67), Dryanovo (LH75), Bachkovski Monastery (LG24), hills in Plovdiv (LG16-17); URBANSKI (1960c): *M. (M.) cartusiana*: Beloslav (NH58), Provadiya (NH37-38), Kaspichan (NH19), Bachkovski Monastery (LG24), Ropotamo River (? NG58-68); *M. (M.) carascaloides*: between Asenovgrad and Narechenski Bani (LG14-24-25); URBANSKI (1962): *M. (M.) cartusiana*: Balchik (NJ90); URBANSKI (1964): *M. (M.) cartusiana*: between Asenovgrad and Narechen (LG14-24-25); *M. (M.) carascaloides*: Asenova Krepost Fortress (LG25); HUDEC (1965): *M. cartusiana*: hill Tsarevets in Tarnovo (LH87); URBANSKI & WIKTOR (1967): *M. cartusiana*: Bachkovski Monastery (LG24), Berkovitsa (FN78-79), Ropotamo River (? NG58-68); HUDEC (1967): *M. cartusiana*: Varna (NH78), Aladzha Monastery (NH89); PINTER L. (1968): *M. (M.) cartusiana*: Varna (NH78), Veslets (GN19), Gara Lakatnik (FN97), Karlovo (LH12-22), Stoletov Peak, Shipka Pass (LH63), Bachkovski Monastery (LG24); *M. (M.) carascaloides*: Karlovo (LH12-22), between Asenovgrad and Narechenski Bani (LG14-24-25), Bachkovski Monastery (LG24); *M. (M.) dissimulans*: Varna (NH78), ? Kranevo (NH89-NJ90); DAMJANOV & L. PINTER (1969): *M. carascaloides*: from Asenovgrad to Bachkovo (LG24-25); URBANSKI (1969): *M. cartusiana*: Balchik (NJ90), Kaliakra Foreland (PJ10); PINTER I. & L. PINTER (1970): *M. (M.) frequens*: Boboshevo (FM66), Dolna Ribnitsa (FL79), Zlatarevo (FL78); URBANSKI (1970): *M. cartusiana*: Kaliakra Foreland (PJ10); DAMJANOV (1971): *M. cartusiana*: Rezovo (NG84), Silistar River (? NG85), bottom stream of Veleka River (NG75); HUDEC & VASAKO (1971): *M. (M.) cartusiana*: Sozopol (NG59), Arkutino (NG58), Ropotamo River (? NG58-68); Emine Foreland (? NH62-63-72-73), Vratnik Pass in Eastern Stara Planina Mountain (MH34), Trite Bratya in Aitoska Planina Mountain (NH22), Aitoska Planina north from Aitos (NH13-23), Sinite Kamani north of Sliven (MH42), Kardjali (LG61), Bachkovo (LG24); BERON (1972): *M. haussknechti* (O. BOETTGER, 1886): Bankobitsa Cave, near by Lukovit (KN68); HUDEC & VASATKO (1973): *M. (M.) venusta*: the outfall of Ropotamo

River (NG58-68); *M. (M.) frequens*: surroundings by Sandanski area (? FM80-90); DAMJANOV & LIKHAREV (1975): *M. cartusiana*: everywhere in Bulgaria; CLAUSS (1977); *M. cartusiana*: Oreshitsa Reka River Valley between Hvoyna and Orehovo and toward Summit Persenk (LG03), Pavelsko (LG03-13), Pamporovo district (LG01), Chepelarska Reka River Valley, 2-3 km from Chepelare (LG02); KÖRNIG (1983): *M. cartusiana*: Kresna in Mesta River Valley (FM72-81-82), Durankulak Lake (PJ23-24), Lozenets (NG67), Tsarevo (= former name Michurin) (NG66-67), Kranevo (NH89-NJ80); *M. carascaloides*: Bachkovo (LG24), Yugovo (LG13), Mostovo (LG23); MITOV & RADOSLAVOV (1997): *M. cartusiana*: Slavei Hut in Golo Bardo Mountain (FN61), Studena Lake by Varbisha Reka River in Golo Bardo Mountain (FN71); DEDOV & PENEV (2000): *M. cartusiana*: Sofia (FN82-83-92-93); HAUSDORF (2000b): *M. (M.) claustralis*: South Bulgaria; ANTONOVA & DEDOV (2001): *M. cartusiana*: Peio Yavorov Railway Station, nord from Kresna (FM72); ANTONOVA & DEDOV (2002): *M. cartusiana*: Zemenski Prolom Gorge (FN30-40; FM39-49); IRIKOV & GEORGIEV (2002): *M. cartusiana*: Stara Zagora (LG89), Sredna Gora Mountains, north from Stara Zagora (LH80); IRIKOV (2002): *M. cartusiana*: Dobrostan Ridge (LG14-23-24-25); HUBENOV (2005a): *M. cartusiana*: Eastern Rhodopes Mountains; HUBENOV (2005b), *M. cartusiana*: Dunavska Ravnina Lowland, Stara Planina Mountain system, Transition area, Rila-Rodopi Mountains Massif, Black Sea Coast; IRIKOV & DEDOV (2005): *M. cartusiana*: Plevun (MF19), Kostilkovo (MF28), Dolno Lukovo (MF28); GEORGIEV (2005): *M. carascaloides*: Surnena Sredna Gora Mountain, Oriahovitsa (MH00), Edrevo (MH01), Kolena and Dalboki (LH90), north from Stara Zagora (LH80), Ostra Mogila (LH70), Starozagorski Bani resort complex (LH70), wrongly registered by the author with a code (LH79), Stojan Zaimovo (LG69), Rozovets (LH40); IRIKOV & MOLLOV (2006): *M. (M.) cartusiana*: Belitsa (LG23), Dyavolsko Garlo Cave by Trigrad (KG81), Kastrakli Reserve, Chakin Dol River Valley (KG71-72), Between Mostovo and Sini Vrah (LG33), Bistritsa River Valley, 5-km before the flow to Mesta River (GM40); *M. (M.) claustralis*: Chepelarska River Valley, from Narechenski Bani to Hvoyna (LG03-LG14-LG24-LG25), (the last two UTM squares are inexact included in respective locality), Zabardo, Kamaka area (LG03).

**Researched material (Map 3):** Eastern Rhodopes Mountains: about 25 km south-eastern of Krumovgrad, Ribino (LF78), 200-300 m alt., 2 specimens, 20.03.2005, leg. IRIKOV; Ivaylovgrad (MF29), 200 m alt., 2 specimens, 19.03.2005, leg. IRIKOV; Western Rhodopes Mountains: Dobrostan Ridge (LG14-23-24-25), 500-1000 m alt., 19 specimens, 2002-2004, leg. IRIKOV; Hvoyna (LG03), 650 m alt., 12 specimens, 7.08.2005, leg. IRIKOV; Chernatitsa Ridge, 2 km north-east of Zabardo, Kamaka Rock Peak (LG03), 1600 m alt., 3 specimens, 24.09.2005, leg. IRIKOV; Chepelare (LG02), 1100 m alt., 3 specimens, 1.05.2003, leg. Irikov; Trakiiska Nizina Lowland: Plovdiv (LG16-17), 150-200 m alt., 37 specimens, 19.09.2006, leg. IRIKOV; North Black Sea Coast: Kaliakra Foreland (PJ10), 10-15 m alt, 11 specimens, 27.05.1999 leg. IRIKOV; South Black Sea Coast: sand coast Arkutino, near by marsh-reserve Arkutino, between Sozopol and Primorsko (NG58), 2-3 m alt., 5 specimens, 26.06.2006 leg. IRIKOV; outfall of Ropotamo River, south riverside (NG68), 3 m alt., 1 specimen, 4.06.2005, leg. MOLLOV; Kiten (NG67), 3-4 m alt., 3 specimens 7.06.2002, leg. IRIKOV; about 2 km north of Tsarevo, campsite "Arapja" (NG67), 1.5 m alt., 3 specimens, 6.09.2005 and 1 specimen, 7.09.2005, leg. IRIKOV; Tsarevo, beach "Popski plaj" (NG67), 1.5 m alt., 1 specimen, 2.06.2005, leg. MOLLOV; firth of Silistar River (NG85), 1.5 m alt.,

3 specimens, 27.08.2004 and 1 specimen, 8.09.2005, 3 specimens 27.06.2006 and 2 specimens 25.08.2006, leg. IRIKOV; Varvara (NG76), 5-10 m alt., 3 specimens and outfall of Resovska River (NG84), 4 m alt., 1 specimen, 5.06.2005 leg. IRIKOV; Strandja Planina Mountain: reserve "Silkosija", near by Kosti (NG65), ~ 250 m alt., 7 specimens 4.06.2002 leg. IRIKOV; Sredna Stara Planina Mountain: Trjavna, about 23 km western of Gabrovo (LH74), 450-500 m alt., 5 specimens, 5.09.2004, leg. J. Jelev; Veliko Tarnovo (LH86-87-97), 200-300 m alt., 3 specimens, 13.07.2004, leg. JELEV.

**Shell (Fig. 8):** Measurements (n = 20), D: 10.0-16.6 mm, x = 13.7 mm; H: 7.2-11.5 mm, x = 8.8 mm; D/H = 1.41-1.87mm, x = 1.62 mm.

**Genitalia (Fig. 2):** The measurements of some sections of the genitalia are compiled in Table 2 and the variation of the proportions of some sections of the genitalia is represent in Table 3.

**Vertical distribution:** In Bulgaria from 0 m alt. to 1600 m alt. in the Mountains. This is a unique species of Genus *Monacha*, who meet in higher elevation in the Mountains.

**Ecological data:** The species prefer open grassy spaces with high vegetation, but unrarely may be found as synantrophic species in workable areas with agricultures, haymaking meadows and in gardens and courtyards in populated places also. In the towns inhabit in open areas with high grassy vegetation, in abundant number on perennials near by paths.

Mesohydrophilic, mesothermophilic, drought-resistant species.

**Zoogeography:** Easternsubmediterranean subelement, Submediterranean element, European faunistic complex.

### *Monacha (Monacha) ocellata* (ROTH 1839)

1821 *Helix (Helicella) olivieri* FÉRRUSAC: 47 [partim, nomen nudum].

1839 *Helix olivieri* var. *ocellata* ROTH: 14. Locus typicus: "Byzantii", Turkey.

Published for Bulgaria from: present study.

The species is registered in Bulgaria from one locality only (Map 4).

**Researched material and locality (Map 4):** South Black Sea Coast: sand coast Arkutino, near by marsh-reserve Arkutino, between Sozopol and Primorsko (NG58), 2-3 m alt., 72 specimens, 12.09.2005 and 23.06.2006, leg. IRIKOV.

**Shell (Fig. 9):** Measurements (n = 72), D: 10.5-16.2 mm, x = 12.4 mm; H: 7.7-12.0 mm, x = 9.0 mm; D/H = 1.3-1.4 mm, x = 1.38 mm.

**Genitalia (Fig. 3):** The measurements of some sections of the genitalia are compiled in Table 2 and the variation of the proportions of some sections of the genitalia is represent in Table 3.

**Vertical distribution:** In Bulgaria on the Black Sea Coast on several metres of the sea.

**Ecological data:** The species live on Black Sea Coast at xerothermal ecological conditions in the summer and comparatively mild and humid winter. There in the same habitat occur *M. solidior* too, but in difference of her *M. ocellata* inhabit area more distant of the gritty dunes, where the psamophytic grassy vegetation is a quite abundant. Here perennial plants almost entirely cover the gritty coast. In difference of *M. solidior*, which rarely may be found to be active on the plants in summertime (see below *M. solidior*), *M.*



*ocellata* make huge aggregates among the psamophytic vegetation and in determinate periods the animals are active. In the same locality *M. ocellata* form the largest aggregates on artificial planted introduced plants of Genus *Opuncia* sp. These *Opuncia* occurs in large numbers in nearby located island "Zmiyski Ostrov", where are introduced in the beginning of XX century, and subsequently are carried on the Black Sea Coast.

We don't find *M. ocellata* nowhere elsewhere in the southern Black Sea Coast. We assume that it is possible the species was carried there from the southern areas together with the plants of Genus *Opuncia*. In the same locality already exist one introduced in the Bulgarian malacofauna species – *Cochlicella acuta*, reported at first by HUDEC & VASATKO (1973). The manner of introduction is still vague and probably transferring was made accidentally, but the species is survivor and formed small stable population.

Xerophilic, thermophilic, drought-resistant species.

**Zoogeography:** Asia Minor subelement, Subiranian element, Southwestern Asiatic complex.

***Monacha (Monacha) ovularis* (BOURGUIGNAT 1855)**

1855 *Helix ovularis* BOURGUIGNAT: 561, pl. 16, fig. 7-9. Locus typicus "alluvions d'une petite riviere à Eski-Baba", Turkey.

1969 *Monacha? pilosa* PINTER L.: 94, pl. 1 fig. 11-14. Locus typicus "Ropotamo-Gegend, am linken Ufer: zwischen dem Dorf Veselie und dem Fluß, entlang der Landstraße Veselie-Jasna Poljana", Bulgaria.

1970 *Monacha (Monacha?) pilosa* PINTER I. & L. PINTER: 87, 97.

1983 *Monacha pilosa* KÖRNIG: 38, fig. 10-11.

1998 *Monacha pilosa* DEDOV: 763.

2000b *Monacha (Monacha) ovularis* HAUSDORF: 96, fig. 29 (according to KÖRNIG 1983), pl. 8 fig. 36.

2005b *Monacha (Monacha) pilosa?* HUBENOV: 241.

**Distribution of *M. ovularis* in Bulgaria (Map 5):** PINTER L. (1969): *M.? pilosa*: the outfall of Ropotamo River, left riverside (NG58-68), near by Veselie (NG58), between Veselie and Yasna Polyana (NG58); PINTER I., L. PINTER (1970): *M. (Monacha?) pilosa*: Ropotamo River (? NG58-68), Veselie (NG58); KÖRNIG (1983): *M. pilosa*: Lozenets (NG67), Tsarevo (= former name Michurin) (NG66-67); DEDOV (1998): *M. pilosa*: Ropotamo River (? NG58-68), Lozenets (LG67), Tsarevo (= former name Michurin) (NG66-67); HAUSDORF (2000b): *M. (M.) ovularis*: Bulgaria near by Turkey; HUBENOV (2005b): *M. pilosa?*: Strandja Mountain and South Black Sea Coast.

**Researched material (Map 5):** South Black Sea Coast: Camping site "Zlatna ribka", at about 5 km southeastern of Chernomotets (NG59), 2-3 m alt., 2 specimens, 30.06.2004, leg. IRIKOV & GEORGIEV; firth of Silistar River (NG85), 1-2 m alt., 20 specimens, 27.08.2004 leg. IRIKOVA & IRIKOV, 87 specimens, 7.06.2005 and 8.09.2005, leg. IRIKOV; Strandja Mountain: Mladejko, about 40 km northwest of Malko Tarnovo (NG26), ~ 200 m alt., 2 specimens, 3.05.2005 leg. IRIKOV;

**Shell (Fig. 10):** Measurements (n = 107 ), D: 6.3-9.3 mm, x = 8.5 mm; H: 5.0-7.3 mm, x = 6.6 mm; D/H = 1.2-1.3 mm, x = 1.25 mm.

The shells collected from the gritty frontage by firth of Silistar River and Black Sea Coast are with average bigger size compared with the shells from inside areas of Strandja Mountain.

**Genitalia (Fig. 4):** PINTER L. (1969) describes *M. pilosa* on shells find in Southeast Bulgaria. The new species remain unclear systematically by reason of lack of animals and anatomical data. Later HUDEC & VASATKO (1973) represent a description of genitalia of *M. pilosa*, but the picture isn't reliable and entirely corresponds to *M. solidior*. The genital anatomy of *M. pilosa* at first is investigated and correct described by KÖRNIG (1983). According to HAUSDORF (2000b), *M. pilosa* is synonyme of *M. ovularis* and therefore the genital anatomy by KÖRNIG (1983) is valid to *M. ovularis*.

In addition to description by Körnig (Fig. 4): The pair of glandulae mucosae inserts at the distal part of vagina at distance one another and not in common ductus. The epiphallus connected to a distal part of vagina by strong muscle bands. The long epiphallus is knee-formed by reason of pull out of its middle section by the vigorous muscle toward to vagina.

The measurements of some sections of the genitalia are compiled in Table 2 and the variation of the proportions of some sections of the genitalia is presented in Table 3.

**Vertical distribution:** In Bulgaria from 0 m alt. to 200 m alt. in Strandja Mountain.

**Ecological data:** The species occurs in xerothermal habitats in Strandja Mountain and southern Black Sea Coast in SouthWestern Bulgaria. He prefer open habitats with grasses and bushes, but he is occurs in sands on the seacoast too.

The specimens we possess are from inside areas of Strandja Mountain near by Mladejko Village and from sand sea coast by the firth of Silistar River also. The species have concealed manner of life and animals are very difficult to be found. PINTER L. (1969) describes *M. pilosa* only by shells – "despite of the long search alive animals not be found". KÖRNIG (1983) found animals on the sea beach and in first time represent figure of genital anatomy. The presence of the species in habitats revealed only by empty shells. The animals there live among sparse psamophytic and halophilic vegetation. We found alive animals deeply in the sand only – from 20 to 40 cm around succulent roots of *Silene euxina* (RUPR.) HAUD.-MAZZ., where the sand is humid and the temperature is comparatively lower. During the beach examination animals on the surface was not found. Only *M. claustralis* is active there. In the summer, in cases of prolonged dry periods with high temperature, probably *M. ovularis* isn't active and is buried deep in more damp sands around the roots of the plants. In the buried animals however is not formed epiphragma, suggesting that they don't stay in the sand for long time. Probably the animals are active in the night and after rainfalls.

Some of others species are able to survive in this extremely during the summer habitat – *M. claustralis*, *Xeropicta krinickii* (KRYNICKI 1833), *Cerņuella virgata variabilis* (DRAPARNAUD 1801), *C. cisalpina* (ROSSMÄSSLER 1837), *Helix pomacella* MOUSSON, 1854. We found only *Helix pomacella* buried around the plant's roots also and all of them have well-developed epiphragma.

Xerophilic, thermophilic, drought-resistant species.

**Zoogeography:** Asia Minor subelement, Subiranian element, Southwestern Asiatic complex.

### ***Monacha (Monacha) oshanovae* PINTER I. & L. PINTER 1970**

1970 *Monacha (Monacha) oshanovae* PINTER I. & L. PINTER 1970: 96, fig. 5-6, fig. 12-

14. Locus typicus, Bulgaria, Skrât, westlich von Petrič (Struma-Gebiet), an der jugoslawisch-griechisch-bulgarischen Grenze. Weiterer Fundort: Petrič, in Gärten in der Stadt.

**Distribution of *M. oshanovae* in Bulgaria by literature data (Map 7):** PINTER I. & L. PINTER (1970): *M. (M.) oshanovae*: Marikostinovo (FL98), Petrich (FL88), Skrat (FL68).

PINTER I. & L. PINTER (1970) describe the species for region of Petrich in South Western Bulgaria. Nevertheless the genital anatomy is investigated the data presented by authors are insufficient to clearly differentiation of the species from others relative *Monacha* species. The drawing of genitalia can't confirm categorically the independence of this species. The picture of the shell "small, like of *Perforatella*" resemble to shells of young animals (subadult) of *M. claustralis*, where appendix initially to some extent is simple (like of *M. oshanovae*) and subsequently form clearly differentiated basal and apical sections.

We consider there is needful investigation of genital anatomy in details and check-up the material of *M. oshanovae* in the future, wherefore we assume the taxon validity only conventional.

#### ***Monacha (Monacha) solidior* (MOUSSON 1863)**

1863 *Helix schuberti* var. *solidior* MOUSSON: 369. Locus typicus "Bursa", Turkey.

1965 *Monacha carascaloides* HUDEC: 14.

1967 *Monacha (Monacha) carascaloides* HUDEC: 82, fig. 6 (wrongly replaced text with fig. 5).

1968 *Monacha (Monacha) carascaloides* PINTER L.: 220, 224, fig. 7-8, fig. 70-72.

1973 *Monacha (Monacha) pilosa* HUDEC & VASATKO. 19, fig. 15, pl. 3, fig. 2.

1975 *Monacha carascaloides* DAMJANOV & LIKHAREV. 364, fig. 293-294.

2000b *Monacha (Monacha) solidior* HAUSDORF: 100, fig. 37, pl. 8 fig. 40, table 8, map.4.

**Distribution of *M. solidior* in Bulgaria (Map 6):** JAECKEL, KLEMM & MEISE (1957): *M. carascaloides*: Bulgaria; URBANSKI (1960b): *M. (M.) carascaloides*: Tsarevo (= former name Michurin) (NG66-67); URBANSKI (1960c): *M. (M.) carascaloides*: Provadija (NH37-38), Kaspichan (NH19), Ropotamo River (? NG58-68); HUDEC (1965): *M. carascaloides*: Drujba, north of Varna (NH78); URBANSKI & WIKTOR (1967): *M. carascaloides*: Ropotamo River (? NG58-68); HUDEC (1967): *M. carascaloides*: Black Sea Coast by Varna (NH78-88), Zlatni Pyasatsi (NH89); PINTER L. (1968): *M. (M.) carascaloides*: Varna (NH78); Damjanov & Pinter L. (1969): the outfall of Ropotamo River, right riverside (NG58-68); PINTER I. & L. PINTER (1970): *M. (M.) carascaloides*: Aladzha Monastery (NH89), Arkutino (NG58), Balchik (NJ90), Beloslav (NH58), Kamchiya River (? NH66-76), Tsarevo (= former name Michurin) (NG66-67), Ropotamo River (? NG58-68), Sliven (MH42), Zlatni Pyasatsi (NH89); HUDEC & VASATKO (1971): *M. (M.) carascaloides*: Sozopol (NG59), Arkutino (NG58), Ropotamo River (? NG58-68), Emine Foreland (? NH62-63-72-73)), Vratnik Pass in Eastern Stara Planina Mountains (MH34), Trite Bratya in Aitoska Planina Mountains (NH22), Aitoska Planina north from Aitos NH13-23), Sinite Kamani north from Sliven (MH42); HUDEC & VASATKO (1973): *M. (M.) pilosa*: Slanchev Bryag (NH52); DAMJANOV & LIKHAREV (1975): *M. carascaloides*: Black Sea Coast, Trakiya Lowland and north by Stara Planina Mountains; KÖRNIG (1983): *M. carascaloides*: Kranevo (NH89-NJ80), Sozopol (NG59), Arkutino (NG58), meadow by Ropotamo River (NG68), Kiten (NG67), Bosna Upland in

Strandza Planina Mountain (NG37); HAUSDORF (2000b): *M. (M.) solidior*: Bulgaria; IRIKOV & GEORGIEV (2002): *M. carascaloides*: Stara Zagora (LG89), Sredna Gora Mountain, north from Stara Zagora (LH80); HUBENOV (2005b), *M. carascaloides*: Transition area, Trakiiska Nizina Lowland, Black Sea Coast; GEORGIEV (2005): *M. carascaloides*: Surnena Sredna Gora Mountain, Oriahovitsa (MH00), Edrevo (MH01), Kolena and Dalboki (LH90), north from Stara Zagora town (LH80), Ostra Mogila (LH70), Starozagorski Bani resort complex (LH70), wrongly noticed by the author with a code (LH79), Stojan Zaimovo (LG69), Rozovets (LH40).

Researched material (Map 6): South Black Sea Coast: sand beach Arkutino, near by marsh-reserve Arkutino, between Sozopol and Primorsko (NG58), 2-3 m alt., 57 specimens, 23.06.2006, leg. IRIKOV; sand beach north from outfall of Ropotamo River (NG58-68), 1-2 m alt., 3 specimens, 26.06.2004, leg. IRIKOV; Tsarevo, beach "Popski plaj" (NG67), 1.5 m alt., 2 specimens, 2.06.2005, leg. MOLLOV.

**Shell (Fig. 11):** Measurements (n = 57), D: 13.5-17.0 mm, x = 15.7; H: 10.0-12.3 mm, x = 11.0 mm; D/H = 1.41-1.53 mm, x = 1.44 mm.

**Genitalia (Fig. 5):** The measurements of some sections of the genitalia are compiled in Table 2 and the variation of the proportions of some sections of the genitalia is presented in Table 3.

**Vertical distribution:** In Bulgaria from 0 m alt. to 400-600 m alt. nearly in the Mountains.

**Ecological data:** In the area of Arcutino the species is occurs on the Black Sea Coast among sands dunes. The ecological conditions during the summer season are extremal, strongly expressed xerothermics around the sand surface, but sometimes there is typical a high aerial humidity over the dunes because of proximity of the sea. The winter is soft with a little snow and relatively high temperatures. The animals are met mostly among microhabitats of psamophytic and halophilic grassy vegetation. During the unactive periods in the summer (at time of a long dry, high temperatures in the day, low aerial humidity) and in the winter, the animals are agregate in the base of the stems, under the leaves of the plants. The leaves with a rosette-form are peculiar umbrellas, ensure more optimal microclimatic conditions under them. The psamophytic plant absorbs minimum amounts of dampness even, creating around the succulent and deeply situated in the sand roots a zone with a higher moisture. There the sand in the base of the stem unseldom remains moist even in prolonged summer dryness and heat. Hereupon the animals are concentrated to the base of stems or are buried around the rooth sometime at a long depth.

The move of animals on the dunes is facilitated by the presence of moss, covering a sizable part of sands.

Xerophilic, thermophilic, drought-resistant species.

**Zoogeography:** Asia Minor subelement, Subiranian element, Soutwestern Asiatic complex.

### ***Monacha (Monacha) venusta* PINTER L. 1969**

1969 *Monacha venusta* PINTER L.: 93, fig. 2, pl. 1 fig. 8-10. Locus typicus: " am rechten Ufer des Flusses Ropotamo, etwa 1.5 km östlich von der unteren Brücke", Bulgaria.

1970 *Monacha (Monacha) venusta* PINTERI. & L. PINTER: 97.

2000b *Monacha (Monacha) venusta* HAUSDORF: 105, fig. 41, pl. 9 fig. 45, table 8, map 10.

**Distribution of *M. venusta* in Bulgaria (Map 7):** PINTER L. (1969): *M. venusta*: the outfall of Ropotamo River, right riverside (NG58-68); PINTER I. & L. PINTER (1970): *M. venusta*: Primorsko (NG67-68), Ropotamo River (? NG58-68); HAUSDORF (2000b): *M. (M.) venusta*: Ropotamo River area in Bulgaria (NG58-68).

**Researched material (Map 7):** South Black Sea Coast: sands coast northerly of the outfall of Ropotamo River (NG58), 1-3 m alt., 5 specimens 26.06.2004, leg. IRIKOV; outfall of Ropotamo River, south riverside (NG68), 3 m alt., 2 specimens, 12.09.2005, leg. IRIKOV; Sea Coast south from firth of Silistar River (NG85), 3-5 m alt., 1 specimen 25.08.2006, leg. IRIKOV.

**Shell (Fig. 12):** Measurements (n = 4), D: 14.2-15.2 mm, x = 14.8; H: 8.3-9.4. x = 9.0 mm; D/H = 1.6-1.7 mm, x = 1.65 mm.

**Genitalia (Fig. 6):** The measurements of some sections of the genitalia are compiled in Table 2 and the variation of the proportions of some sections of the genitalia is presented in Table 3.

**Vertical distribution:** In Bulgaria at some meters from a sea level.

**Ecological data:** Inhabit in open grass spaces in xerothermal habitats near to seacoast in Southwestern Bulgaria. In the summer the animals are concealed under stones and are active only after shower and possibly in the night.

Xerophilic, thermophilic, drought-resistant species.

**Zoogeography:** Asia Minor subelement, Subiranian element, Soutwestern Asiatic complex.

### ***Monacha* sp.**

**Reports in Bulgaria:** GEORGIEV (2005): *Monacha* sp.: 345. Surnena Sredna Gora Mountain, Edrevo (MH01), Kolena and Dalboki (LH90).

## **Discussion**

At present for territory of Bulgaria are known eight species from Genus *Monacha*, all of them belongs to Subgenus *Monacha*. Two of them – *M. cartusiana* and *M. oschanovae* – are only conventionally accepted as valid in the ours work till their belonging to Bulgarian's malacofauna is certainly confirmed or rejected.

Through circumstantial investigations in the future there is possible to be find more species, especially in South Bulgaria – particularly in Strandja Planina Mountain, Sakar Planina Mountain, Eastern Rhodopes Mountains and Slavjanka Mountain, that aren't researched in details still. The shells collected from Eastern Rhodopes display probability that others *Monacha* species are available also, but there anatomical investigations are needful in the future to give a proof.

The distribution of *M. cartusiana* in Bulgaria is vague. *M. carascaloides* occurs more restricted in Bulgaria by comparison with the represent finds in literature till now and the distribution isn't completely clarified. Contrariwise *M. solidior* is vastly wide spread in Bulgaria, especially in the eastern areas nearness to Black Sea Coast.

*M. claustralis* is the most widespread *Monacha*-species in Bulgaria, occurs in all territory

of the country, from sea-level to comparatively high altitude in Mountains. The three of species – *M. ovularis*, *M. venusta* and *M. ocellata* are with restricted spread in southeastern Bulgaria especially in nearness to Black Sea Coast. The localities of these species in Bulgaria are the most northwest border of their completes areals of spread. In ecological relations, excepting *M. claustralis*, all the rest are obvious xerophilics vastly drought-resistant. They inhabit arid habitats from sea-level to not a high in the Mountains (600 m alt.). They prefer open grassy habitats, xerothermal bushes, open slopes within the forest zone, and sands and dunes in seacoast too.

*M. claustralis* in contrast to all the rest is xeromesophilic species, which have traits of drought-resistance as well as cooly-resistance by reason of own eurythermic. These ecological preferences and the ecological tolerance allowed species populate comparatively wide areas and various landscapes. In Bulgaria the species occurs in open grassy habitats in lowlands from sea level to middle parts in the Mountains (1600 m alt.).

In zoogeographical relations, excepting *M. claustralis*, the rest five species come from Asia Minor and are a part of Subiranian element of Southwestern Asiatic faunistic complex. The ancestors of these species most likely are derived in the northern areas in Southwestern Asia with the main centres in Iranian region and Armenia. In contrast to Irano-Turanian species that are spreaded in Turanian and Ural-Caspian areas in Middle-Asia, Eastern Mediterranean and sometimes in Southeastern Europe, the subiranian species are vastly more restricted spreaded in Asia Minor and in a part of Southeast Europe or East Mediterranean. The local spreading of *Monacha*-species in Asia Minor and Southeastern Europe (southeastern part of the Balkan Peninsula) characterize them like Asia Minor-subelement of subiranian species. The species of Asia Minor probably are derivates from initial forms, entered in Asia Minor from the eastern parts of this area that in the Tertiary had been stable land.

In contrast, *M. claustralis* is with east-submediterranean centre of spreading and probably in climatic periods with lowering of the temperature the species is moving in direction of south in the Balkans and south-east in Asia Minor. Similar expansion is known also for other species derived in Southeastern Europe, for instance *Carpathica*-species. In confirmation of east-submediterranean origin of *M. claustralis* are the characteristic ecological requirements that formed present areal of spreading of the species and reflect its historical development. In contrast to the rest xerophilic *Monacha*-species, derived in the continental southwestern Asiatic arid or semi-wilderness areas, *M. claustralis* is characterized with xeromesophilic and moderate thermophilic as results of transitional between typical mediterranean and typical moderate continental climate. The higher ecological plasticity and cool-resistance of this species are the reasons for its more wide-spread and populate in more varied landscapes and habitats from lowlands to middle altitudes in the Mountains.

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No	List of the authors	<i>M. cartusiana</i>	<i>M. carascaloides</i>	<i>M. frequens</i>	<i>M. dissimulans</i>	<i>M. venusta</i>	<i>M. pilosa</i>	<i>M. oshanovae</i>	<i>M. haussknechti</i>	<i>M. claustralis</i>	<i>M. solidior</i>	<i>M. ovularis</i>
32	HAUSDORF (2000)	+	+			+				+	+	+
33	ANTONOVA & DEDOV (2001)	+										
34	ANTONOVA & DEDOV (2002)	+										
35	IRIKOV & GEORGIEV (2002)	+	+									
36	IRIKOV (2002)	+										
37	HUBENOV (2005A)	+										
38	HUBENOV (2005B)	+	+				+?					
39	IRIKOV & DEDOV (2005)		+									
40	GEORGIEV (2005)	+	+									
41	IRIKOV & MOLLOV (2006)	+	+							+		

**Table 2.** Measurements of some sections of the genitalia of some *Monacha* (*Monacha*) species (in mm). Abbreviations: ap<sub>a</sub> = apical section of the appendicula; ap<sub>b</sub> = basal section of the appendicula; ep = epiphallus; fl = flagellum; p = penis; v<sub>ap</sub> = vagina up to the base of the appendicula; v<sub>gm</sub> = vagina up to the glandulae mucosae; v<sub>t</sub> = total length of the vagina.

	p	ep	fl	ap <sub>b</sub>	ap <sub>a</sub>	v <sub>ap</sub>	v <sub>gm</sub>	v <sub>t</sub>
<b><i>M. claustralis</i></b>								
Kamaka Rock Peak by Zabardo	2.3	4.0	2.4	2.0	2.7	0.2	0.7	4.2
Kamaka Rock Peak by Zabardo	3.5	5.0	4.0	2.4	4.3	0.3	1.1	4.8
Kamaka Rock Peak by Zabardo	2.7	4.1	3.6	2.6	4.5	0.1	1.0	4.9
Tsarevo, campsite Arapyra	3.0	4.0	3.0	2.0	-	0.1	0.5	6.0
Tsarevo, campsite Arapyra	3.5	5.5	2.0	3.5	2.5	0.1	0.6	6.0
Tsarevo, campsite Arapyra	3.0	4.0	1.5	2.0	2.0	0.2	0.8	4.0
Tsarevo, campsite Arapyra	3.5	4.0	2.0	3.0	1.5	0.2	1.0	6.0
Kaliakra Foreland	2.5	5.0	3.0	1.0	2.5	0.2	1.3	4.5
<b><i>M. carascaloides</i></b>								
Between Silen and Dolno Botevo	4.0	5.0	4.5	1.1	3.0	1.4	0.7	3.0
<b><i>M. solidior</i></b>								
Arkutino sand beach	4.0	4.5	2.0	1.5	1.8	2.2	0.9	4.3
<b><i>M. venusta</i></b>								
Riverside of Ropotamo River	1.7	3.4	1.5	2.5	1.6	0.2	0.5	5.5
<b><i>M. ovularis</i></b>								
Firth of Silistar River	0.8	7.5	1.5	1.6	4.2	1.0	1.2	2.0
<b><i>M. ocellata</i></b>								
Sand beach Arkutino	2.0	5.0	3.0	4.5	2.1	0.0	1.1	2.0

**Table 3.** Comparison of the ratios of some sections of the genitalia of the *Monacha (Monacha)* species. Abbreviations; ap = appendicula; ap<sub>a</sub> = apical section of the appendicula; ap<sub>b</sub> = basal section of the appendicula; ep = epiphallus; fl = flagellum; p = penis; v<sub>ap</sub> = vagina up to the base of the appendicula; v<sub>gm</sub> = vagina up to the glandulae mucosae; v<sub>t</sub> = total length of the vagina.

	ep:p	ep:fl	ep:ap	ep: v <sub>t</sub>	ap <sub>a</sub> :	v <sub>t</sub> : v <sub>ap</sub>	v <sub>t</sub> : v <sub>gm</sub>
<i>M. claustralis</i>							
Kamaka Rock Peak by Zabardo	1.4-1.7	1.1-1.7	0.6-0.9	0.8-1.0	1.4-1.8	16.0-49.0	4.4-6.0
Tsarevo, campsite Arapyta	1.1-1.6	1.3-2.8	0.9-1.0	0.6-1.0	0.1-0.4	10.0-60.0	6.0-30.0
Kaliakra Foreland	1.8-2.1	1.6-2.0	1.0-1.4	0.9-1.1	1.8-2.5	22.5-25.0	3.5-11.0
<i>M. carascaloides</i>							
Between Silen and Dolno Botevo	1.3	1.1	1.3	1.7	2.7	2.1	4.3
<i>M. solidior</i>							
Arkutino sand beach	1.1	2.3	1.4	1.1	1.2	2.0	4.8
<i>M. venusta</i>							
Riverside of Ropotamo River	2.0	2.3	0.8	0.6	0.6	27.5	11.0
<i>M. ovularis</i>							
Firth of Silistar River	9.4	5.0	1.3	3.8	2.6	2.0	1.7
<i>M. ocellata</i>							
Sand beach Arkutino	2.5	1.7	0.8	2.5	0.5	0.0	1.8

**Fig. 1.** Genitalia. *Monacha (Monacha) carascaloides* (BOURGUIGNAT 1855), Eastern Rhodopes Mountains: Kardjali area, between Silen and Dolno Botevo.

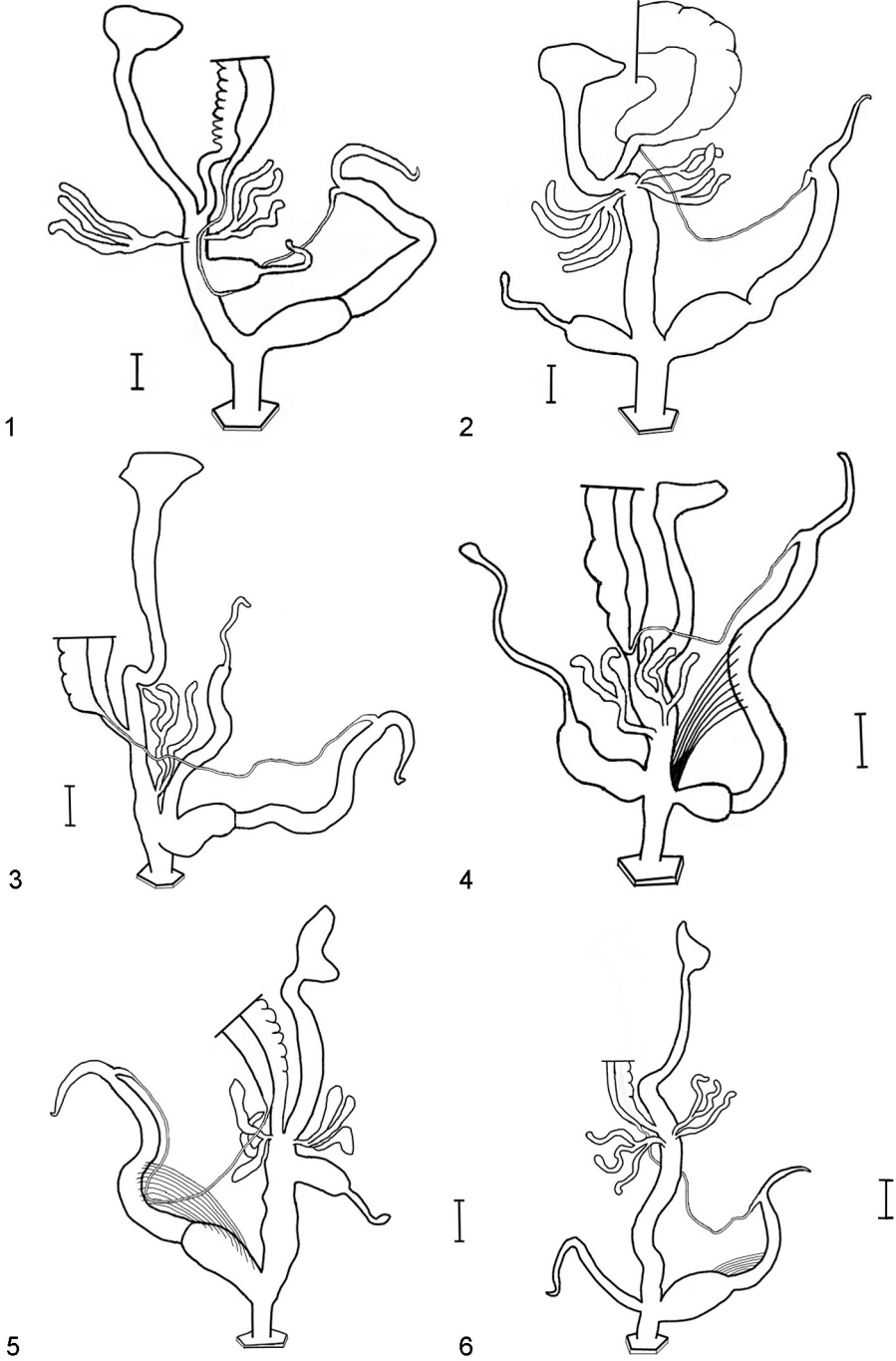
**Fig. 2.** Genitalia. *Monacha (Monacha) claustralis* (MENKE 1828) Western Rhodopes Mountains: Chernatitsa Ridge, 2 km northeast of Zabardo, Kamaka Rock Peak.

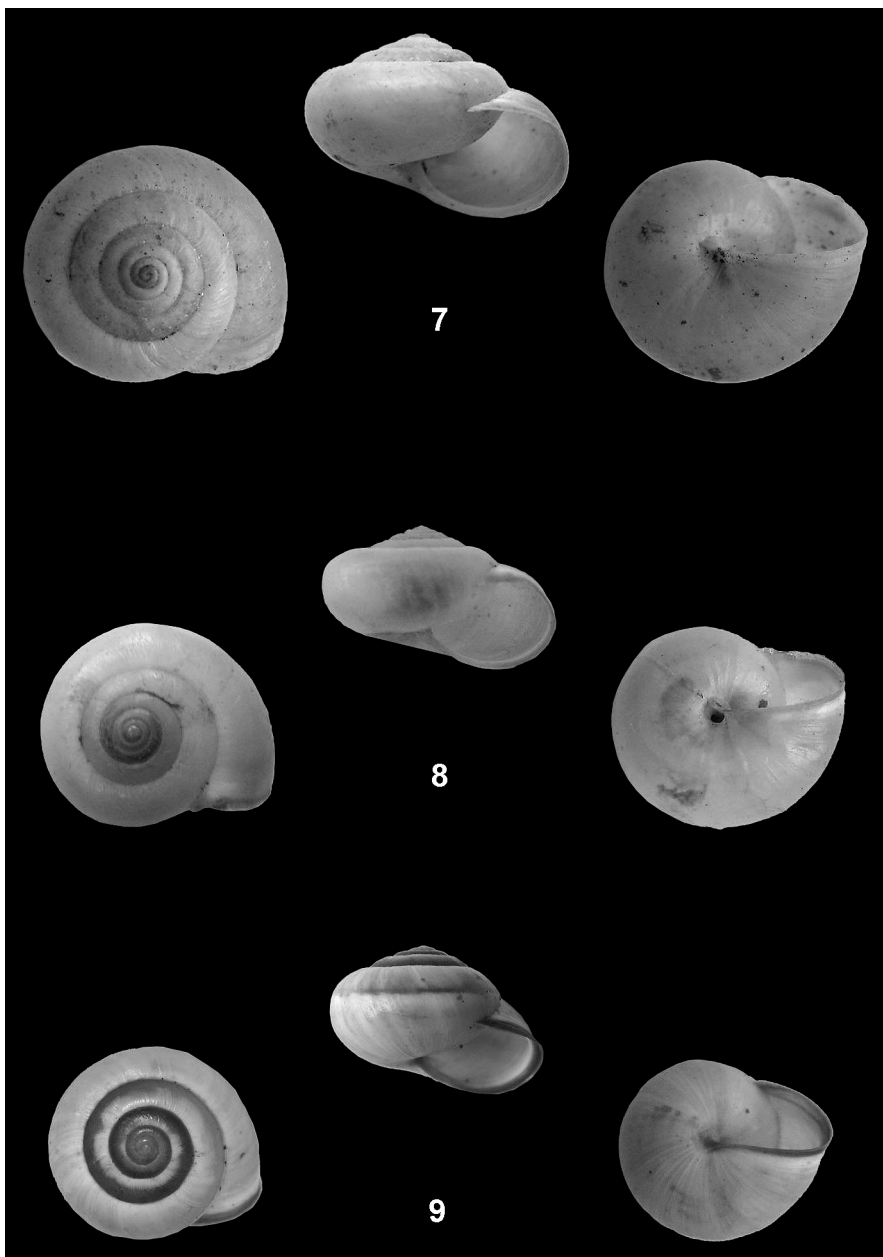
**Fig. 3.** Genitalia. *Monacha (Monacha) ocellata* (ROTH 1839) South Black Sea Coast: sand beach Arkutino, near by marsh-reserve Arkutino, between Sozopol and Primorsko.

**Fig. 4.** Genitalia. *Monacha (Monacha) ovularis* (BOURGUIGNAT 1855) South Black Sea Coast: firth of Silistar River.

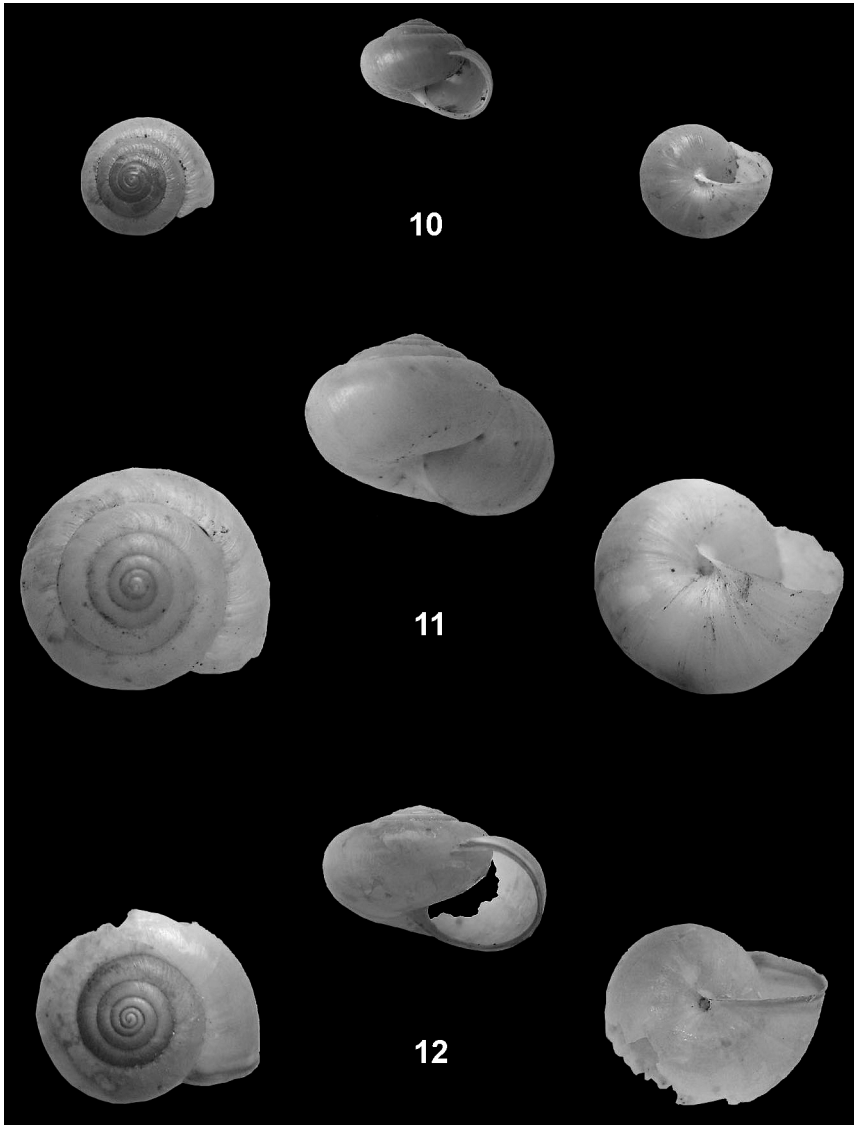
**Fig. 5.** Genitalia. *Monacha (Monacha) solidior* (MOUSSON 1863) South Black Sea Coast: sand beach Arkutino, near by marsh-reserve Arkutino, between Sozopol and Primorsko.

**Fig. 6.** Genitalia. *Monacha (Monacha) venusta* PINTER L. 1969 South Black Sea Coast: outfall of Ropotamo River, south riverside.

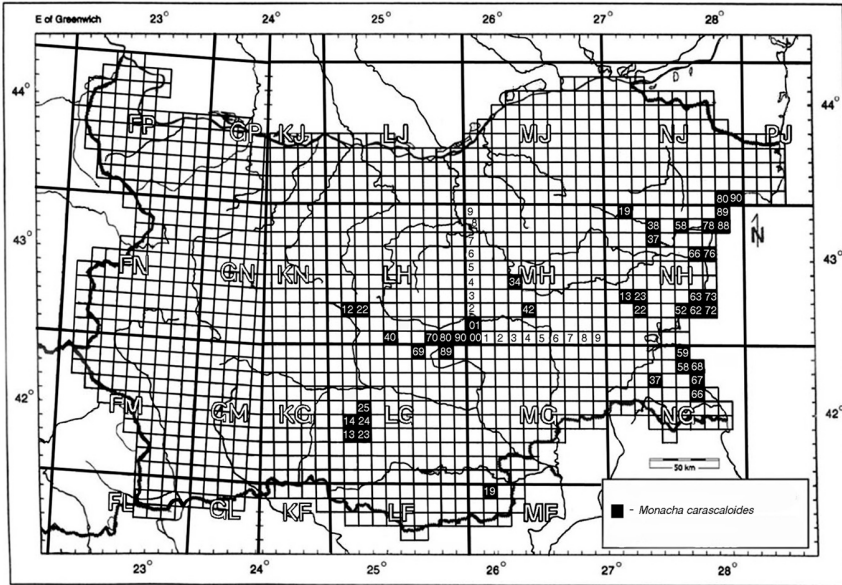




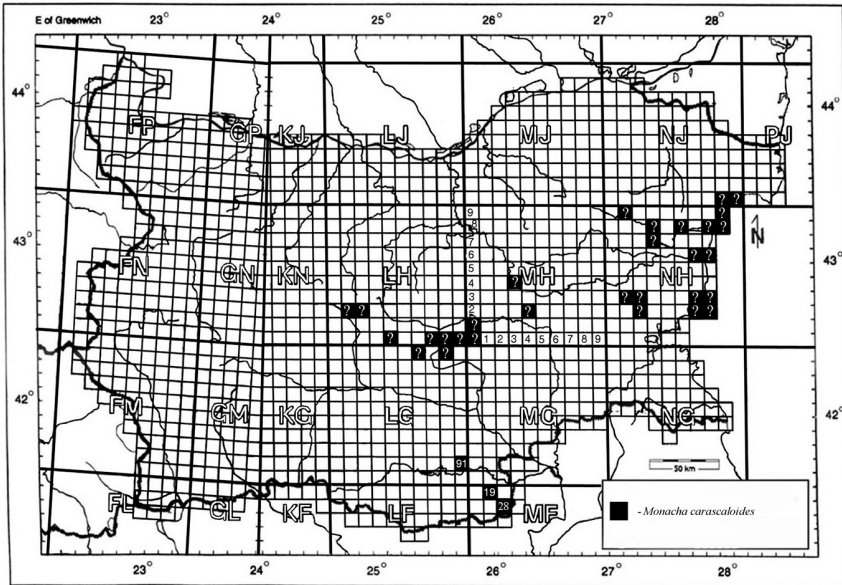
**Fig. 7.** *Monacha (Monacha) carascaloides* (BOURGUIGNAT 1855) (x 2). Eastern Rhodopes Mountains: about 30 km north-east of Kardjali, between Silen and Dolno Botevo. **Fig. 8.** *Monacha (Monacha) claustralis* (MENKE 1828) (x 2). Western Rhodopes Mountains: Chernatitsa Ridge, 2 km north-east of Zabardo, Kamaka Rock Peak. **Fig. 9.** *Monacha (Monacha) ocellata* (ROTH 1839) (x 2). South Black Sea Coast: sand coast Arkutino, near by marsh-reserve Arkutino, between Sozopol and Primorsko.



**Fig. 10.** *Monacha (Monacha) ovularis* (BOURGUIGNAT 1855) (x 2). South Black Sea Coast: firth of Silistar River. **Fig. 11.** *Monacha (Monacha) solidior* (MOUSSON 1863) (x 2). South Black Sea Coast: sand beach Arkutino, near by marsh-reserve Arkutino, between Sozopol and Primorsko. **Fig. 12.** *Monacha (Monacha) venusta* PINTER L. 1969 (x 2). South Black Sea Coast: sands coast northerly of the outfall of Ropotamo River.

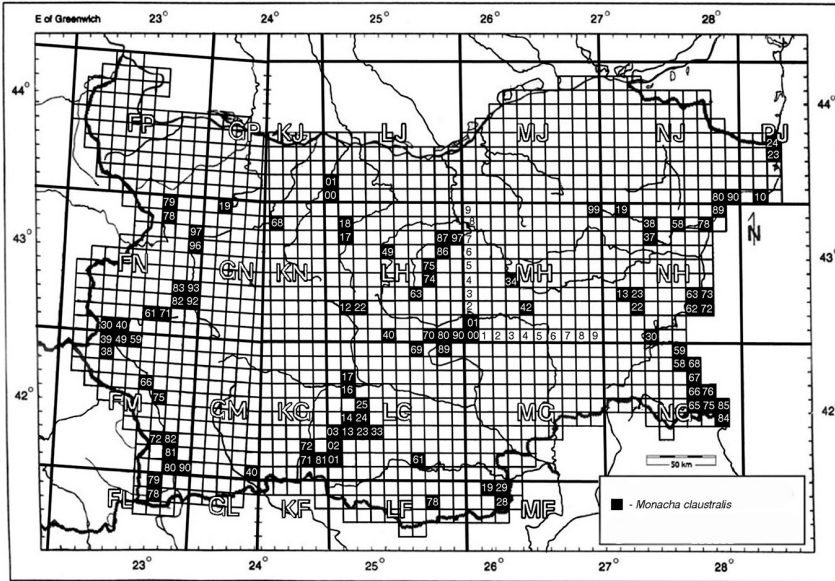


**Map 1.** Distribution of *Monacha (Monacha) carascaloides* (BOURGUIGNAT 1855) in Bulgaria according to literature data (UTM-grid, 10 km-squares).

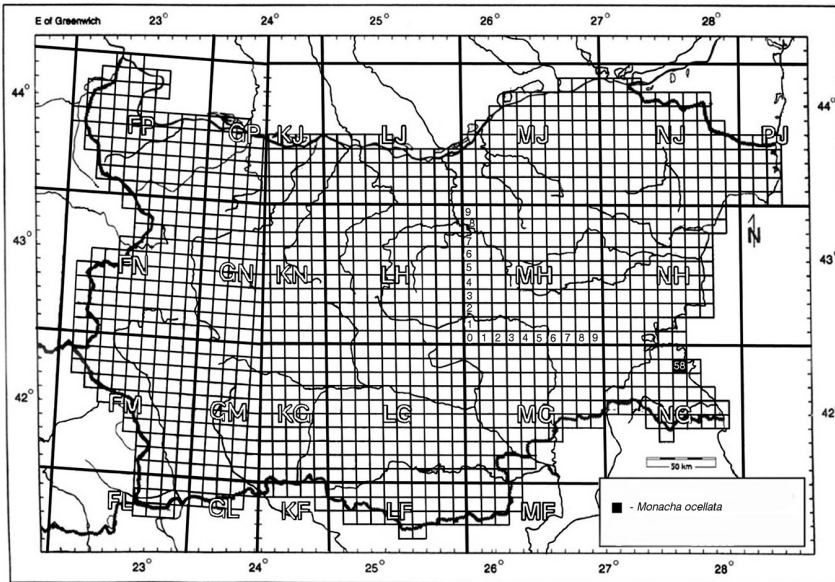


**Map 2.** Probably distribution of *Monacha (Monacha) carascaloides* (BOURGUIGNAT 1855) in Bulgaria (UTM-grid, 10 km-squares).

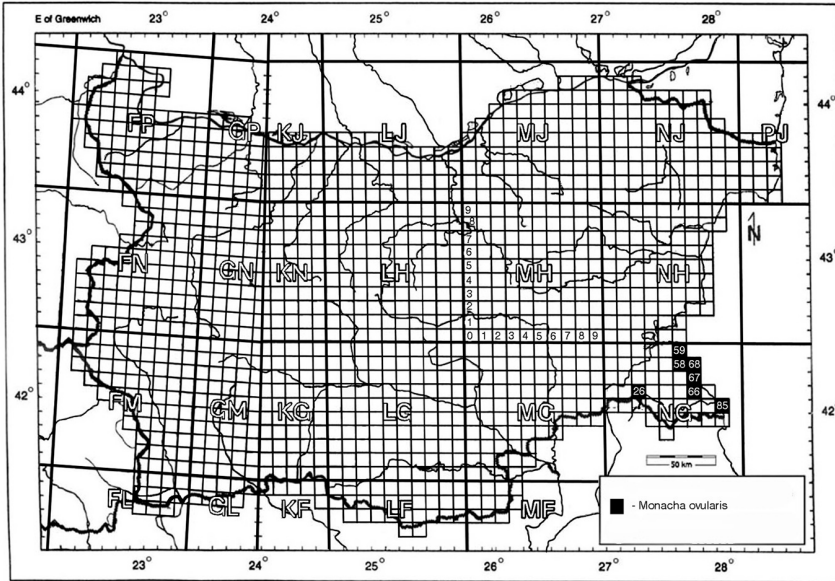




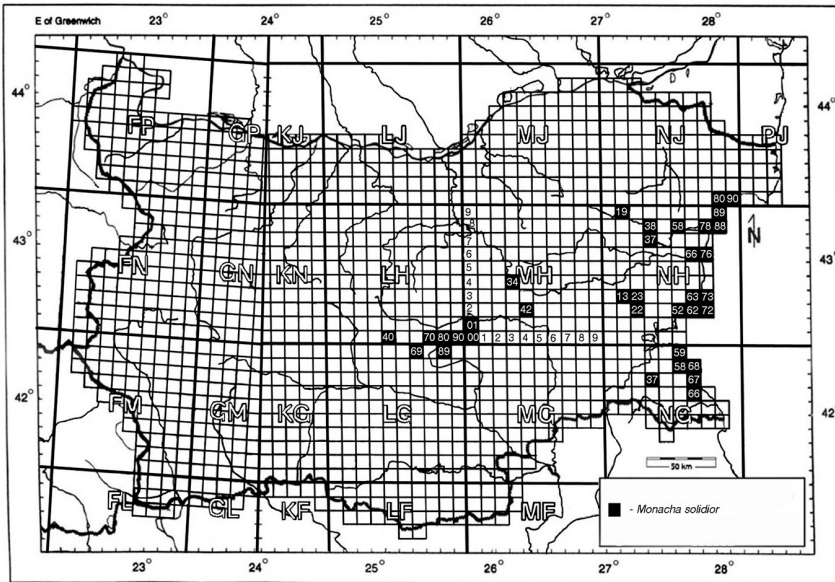
Map 3. Distribution of *Monacha (Monacha) claustralis* (MENKE 1828) (UTM-grid, 10 km-squares).



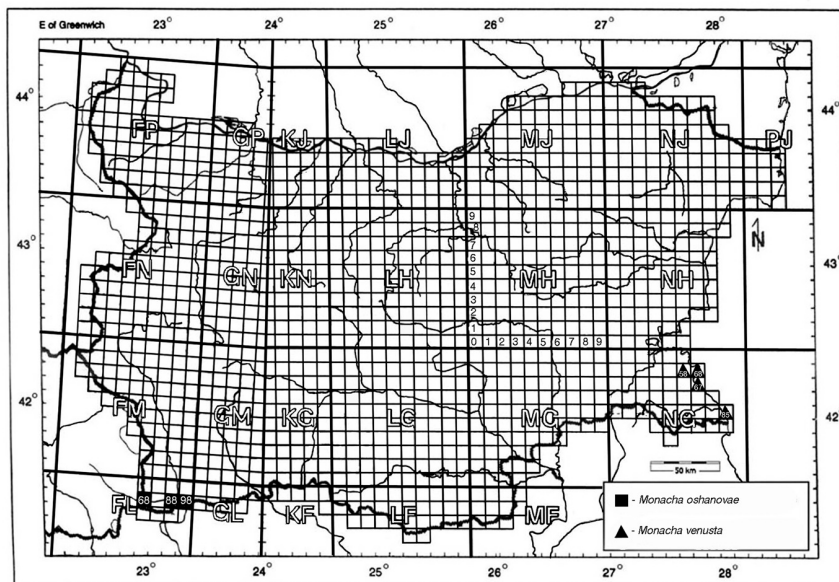
Map 4. Distribution of *Monacha (Monacha) ocellata* (ROTH 1839) (UTM-grid, 10 km-squares).



**Map 5.** Distribution of *Monacha (Monacha) ovularis* (BOURGUIGNAT 1855) (UTM-grid, 10 km-squares).



**Map 6.** Distribution of *Monacha (Monacha) solidior* (Mousson 1863) (UTM-grid, 10 km-squares).



**Map 7.** Distribution of *Monacha (Monacha) oshanovae* (PINTER I. & L. PINTER 1970) and *Monacha (Monacha) venusta* PINTER L. 1969 (UTM-grid, 10 km-squares).

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