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Contribution to the fauna of *Elasmus* Westwood (Hymenoptera: Eulophidae) in Bulgaria

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Abstract. Twelve species of genus *Elasmus* Westwood are presented; eleven of them are new records for Bulgaria. Bulgaria is the second country where *Elasmus bistrigatus* Graham, 1995 and *E. longiclava* Graham, 1995 were collected.

Key words: Hymenoptera, Eulophidae, *Elasmus*, Bulgaria.

Introduction

The genus *Elasmus* is the only member of the tribe Elasmini (Eulophidae, Eulophinae), formerly classified as a separate family Elasmidae (Gauthier *et al.* 2002). The genus contains over 227 species worldwide (Noyes 2009). They are mostly parasitoids or hyperparasitoids of lepidopteran or hymenopteran larvae. Until now only one species of genus *Elasmus* were known to occur in Bulgaria – *Elasmus unicolor* (Rondani 1877) (Ferrière 1947, Herting 1975, Trjapitzin 1978, Noyes 2009).

Materials and methods

This paper is based on 109 specimens collected from 29 localities in Bulgaria by A. Germanov, A. Donev, S. Petrov, T. Ivanova, N. Popova, A. Stojanova, H. Eturska, M. Antov and P. Boyadzhiev during the period 1968, 1982, 1995-2009. For collecting the material the following methods was used: sweeping, yellow traps, Malaise traps and screen-sweeping.

Morphological terminology follows that of Graham (1976, 1995). The abbreviations used in the text listed below: F1-F4 – first to fourth segments of antennal funicle; SMV – submarginal vein; MV – marginal vein; PMV – postmarginal vein; SV – stigmal vein; POL – the minimum distance between the posterior ocelli; OOL – the minimum distance between the eye margin and the adjacent posterior ocellus; OD – the longest diameter of an ocellus. Relative measurements are used for all dimensions.

The material is deposited in the collection of the Department of Zoology, University of Plovdiv, Bulgaria (DZUP) and in the collection of Zoological Institution, Russian Academy of Sciences, St. Petersburg, Russia (ZISP).

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Results

Genus ***Elasmus*** Westwood, 1833

Elasmus Westwood, 1833: 343.

Eulophus flabellatus Fonscolombe, 1832: 298 [Type species by monotypy].

Diagnosis. Fore wing densely setose and wedge-shaped, with elongate marginal vein, short postmarginal, and slightly reduced stigmal; female funicle 3-segmented, male funicle 4-segmented; mesosoma densely setose, metasoma subsessile; and gaster triangular in cross. Metanotum projecting as flat, triangular, often translucent plate over propodeum. Dorsal metanotal lamella projecting posterior over propodeum with partial and complete lateronventral keels. Metacoxa greatly enlarged and flattened plate-like hind tibia with short bristles forming distinct diamond-shaped or undulating pattern.

Biology. Polyphagous attacking several genera of Coleophoridae, Gracillariidae, Tortricidae, Pyralidae, Psychidae, Noctuidae, Coccidae, Ypoomeutidae (Lepidoptera), Braconidae, Bethylidae, Chalcididae, Ichneumonidae, Vespidae (Hymenoptera), Chrysomelidae, (Coleoptera) (Graham 1976, 1995; Noyes 2009).

Distribution. Afrotropical, Australia/Pacific, Nearctic, Neotropical, Oriental and Palearctic Regions.

Identification. The European species are keyed by Graham (1976, 1995) and Ferrière (1947). It is very difficult to identify males of *Elasmus* especially if they were sweeping and not rearing together with females.

Elasmus bicolor (Fonscolombe, 1840)

Eulophus bicolor Fonscolombe, 1840: 190.

Elasmus bicolor Graham, 1976: 294-295.

Diagnosis. Female: forewing with two fuscous clouds: in the basal quarter and large just beyond the middle. Antenna, F1 slightly longer than pedicel, F3 1.8-2.0 times as long as broad. Dorsellum yellow, body marked with reddish-yellow.

Hosts. *Paramictoides febretta* (Fonscolombe) (Lepidoptera: Psychidae) (Graham 1995).

Distribution. Palearctic: Europe (France, Cyprus) (Graham 1995).

Material examined: 6 ♀♀, Bulgaria, Rhodope Mts., 2 km SW of Novo Selo Vill., 250 m, 1.VII.2000 (A. Stojanova); 3 ♀♀, Bulgaria, Rhodope Mts., Novo Selo Vill. 200 m, 24.VII.2000 (A. Stojanova); 1 ♀, Bulgaria, Rhodope Mts., 2 km SW of Novo Selo Vill., 200 m, 17.V.2001 (A. Stojanova) (DZUP, ZISP).

Elasmus bistrigatus Graham, 1995

Elasmus bistrigatus Graham, 1995: 15-16.

Diagnosis. Female: F1 1.5 times as long as F2, clava 3.0 times as long as F3, head extensively yellow with dark marks. Dorsellum yellow. T1-T4 of gaster banded with reddish-yellow.

Hosts. Unknown.

Distribution. Palearctic: Europe (France) (Graham 1995).

Material examined: 1 ♀, Bulgaria, Rhodope Mts., 2 km SW of Novo Selo Vill., 200 m, 17.V.2001 (A. Stojanova) (DZUP).

Elasmus flabellatus (Fonscolombe, 1832)

Eulophus flabellatus Fonscolombe, 1832: 298.

Elasmus flabellatus (Fonscolombe): Westwood, 1833: 343.

Elasmus flabellatus – Graham, 1995: 18.

Diagnosis. Female: POL 2.0-2.6 OOL, antennal finical segment 1.25 times as long as broad, pedicel slightly shorter than or as long as F1, F3 2.0 times as long as broad; forewing

slightly infumate and without isolate cubital and subcubital lines. Male: POL 2.4-2.6 OOL, body black, dorsellum with yellow lamella.

Hosts. Larval-pupal parasitoid of Gelechiidae, Tortricidae, Noctuidae, Yponomeutidae, Heliozelidae, Platellidae, Psychidae, Pyralidae (*Etilia zinckenella*) (Lepidoptera) or hyperparasitoid of Bethylidae, Braconidae, Cephidae, Ichneumonidae (Hymenoptera) (Herting 1975, 1977; Thompson 1954, Trjapitzin 1978).

Distribution. Palearctic: Europe (France, Greece, Germany, Hungary, Italy, Morocco, Romania, Russia, Spain, Sweden, United Kingdom, Yugoslavia) (Thompson 1954, Herting 1975, Trjapitzin 1978, Graham 1995).

Material examined: 1 ♀, Bulgaria, Rhodope Mts., Odnyanovo Vill., 300 m, 2.V.1998 (P. Boyadzhiev); 1 ♀, Bulgaria, Strandzha Mt., Varovnik Vill., 300 m, 29.IX.1999 (P. Boyadzhiev); 1 ♀, Bulgaria, Strandzha Mt., Reserve Silkosiya, near Kosti Vill., 100 m, 7.VII.2000 (A. Stojanova); 1 ♂, Bulgaria, Rhodopi Mts., 2 km SW of Novo Selo Vill., 200 m, 24.VII.2000, (A. Stojanova); 1 ♂, Bulgaria, Rhodopi Mts., v. Surnitsa, 28.VII.2000, (A. Stojanova); 1 ♀, Bulgaria, Rhodope Mts., Byaga Vill., 300 m, 1.VIII.2000 (A. Stojanova); 1 ♀, Bulgaria, Arda Valley, Madzharovo, 200 m, Malaise trap, 26.IX-14.X.2000 (H. Eturska); 1 ♀, Bulgaria, Arda, Valley, Madzharovo, 200 m, Malaise trap., 9.XII.2000-3.I.2001 (H. Eturska); 1 ♀, Bulgaria, Rhodope Mts., Arda Valley, 2 km NE of Madzharovo Vill., 160 m, Malaise trap, 19-29.IV.2001 (H. Eturska); 1 ♀, Bulgaria, Rhodope Mts., Arda Valley, Madzharovo, 160 m, Malaise trap, 29.IV-20.V.2001 (H. Eturska); 1 ♂, Bulgaria, Rhodopi Mts., 2 km SW of Novo Selo Vill., 200 m, 17.V.2001, (A. Stojanova); 1 ♀, Bulgaria, Rhodope Mts., Plevun Vill., 400 m, Malaise trap, 7-17.VI.2001 (A. Stojanova); 1 ♀, 6 ♂, Bulgaria, Rhodope Mts., 2 km SW of Novo Selo Vill., 200 m, 17.VI.2001 (A. Stojanova); 1 ♀, Bulgaria, Rhodope Mts., Lednitsata, 1600 m, 19.VII.2001 (A. Stojanova); 1 ♀, Bulgaria, Struma Valley, Kresna Gorge, Kresna rail road station, 260 m, Malaise trap, 17.IV-3.V.2003 (M. Langurov); 1 ♀, Bulgaria, Cherni Lom Valley, 110 m, Malaise trap, 10-27.VII.2004 (T. Ivanova, N. Popova); 1 ♀, Bulgaria, Sakar Mt., 2 km S Yerusalimovo Vill., 150 m, screen sweeping on dry grass community, 22.VII.2008 (P. Boyadzhiev) (DZUP, ZISP).

Elasmus longiclava Graham, 1995

Elasmus longiclava Graham, 1995: 11-12.

Diagnosis. Female: antenna: pedicel slightly longer than F1, F3 quadrate, clava as long as whole funicle. Body black, dorsellum yellow. Forewing weakly infumate.

Hosts. Unknown.

Distribution. Palearctic: Europe (France) (Graham 1995).

Material examined: 1 ♀, Bulgaria, Rhodope Mts., Novakovo Vill., 450 m, sweeping on grasslands, 5.IX.2001 (P. Boyadzhiev); 1 ♀, Bulgaria, Rhodope Mts., Dascalovo Vill., 550 m, screen sweeping, 23.VIII.2004 (P. Boyadzhiev) (DZUP, ZISP).

Elasmus nowickii Ferrière 1947

Elasmus nowickii Ferrière, 1947: 573.

Diagnosis. Female: antenna, F1 not longer than pedicel and 1.55-1.9 times as long as broad. Gaster much longer than head plus thorax. Head, thorax and gaster yellow or fulvous, legs mainly yellow.

Hosts. Unknown.

Distribution. Palearctic: Europe (France, Yugoslavia) (Graham 1995).

Material examined: 6 ♀♀, Bulgaria, Rhodope Mts., Byaga Vill., 300 m, 1.VIII.2000 (A. Stojanova); 1 ♀, Bulgaria, Rhodope Mts., 2 km SW of Novo Selo Vill., 200 m, 1.VIII.2000 (A. Stojanova); 1 ♀, Bulgaria, Rhodope Mts., Novakovo Vill., 450 m, sweeping on grasslands, 5.IX.2001 (P. Boyadzhiev); 1 ♀, Bulgaria, 3 km W of Sandanski, 195 m, screen sweeping on

grasslands, 06.07.2009; 3 ♀; Bulgaria, Sandanski, 300 m, screen sweeping on grasslands, 07.07.2009 (DZUP, ZISP).

Elasmus nudus (Nees, 1834)

Aneure nuda Nees, 1834: 195.

Elasmus albipennis Thomson, 1878: 206.

Elasmus nudus – Graham, 1995: 9.

Diagnosis. Female: antenna with funicle as long as clava. F3 slightly transverse. Scape 3 times as long as broad. Thorax and dorsellum wholly black. The lamella hyaline.

Host. Larval-pupal parasitoid of Choreutidae, Coleophoridae, Lymantriidae, Pyralidae, Tortricidae, Yponomeutidae, *Simaethis pariana* Cl. (Glyphipterygidae) (Lepidoptera) or hyperparasitoid of Braconidae, Ichneumonidae (Hymenoptera) (Herting 1975, Trjapitzin 1978, Graham 1995).

Distribution. Europe (Great Britain, Finland, Sweden, Germany, France, Italy, Czech Republic, Hungary, Moldova, Poland, Tajikistan, Turkmenistan, Russia) (Herting 1975, Trjapitzin 1978, Graham 1995).

Material examined: 2 ♀♀, Bulgaria, Pirin Mt., 2 km NW of Hadzhidimovo, 700 m, 8.IX.2006 (P. Boyadzhiev) (DZUP, ZISP).

Elasmus platyedrae Ferrière, 1935

Elasmus platyedrae Ferrière, 1935: 368.

Elasmus elongatus Ferrière, 1947: 579-580.

Elasmus platyedrae Ferrière: Bouček, 1977: 120.

Diagnosis. Female: Fore wing with a long wedge-shaped bare strip extending from the base, and with isolated subcubital line of setae. Head and thorax black sometimes with bluish tinge. Metacoxa with short hair. Gaster long and narrow, reddish ventrally in some specimens. Penultimate tergite of gaster 1.2-2.0 times as long as its basal breadth. Antenna: F1 longer than pedicel. Male: POL about 3 times OOL. Body black except for a narrow yellowish lamella on dorsellum.

Hosts. Larval parasitoid of *Pectinophora gossypiella* Saunders, *Pexicopia malvella* (Hubner) (Lepidoptera, Gelechiidae); parasitoid of *Ceroplastes* sp. and CBM = Coffea borer moth (= *Zeurea coffea* Nietner) (Cossidae) (Ferrière 1947, Graham, 1995).

Distribution. Afrotropical, Nearctic, Oriental and Palearctic Regions (Graham 1995).

Material examined: 1 ♀, Bulgaria, Stara Plania Ridge, Jamna Vill., 24.VIII.1968 (A. Germanov); 1 ♀, Bulgaria, Rhodope Mts., Bryanovshtitsa, 1050 m, 17.V.1997 (P. Boyadzhiev); 1 ♀, Bulgaria, Rhodope Mts., Reserve Kormisosh, 1200 m, 4.VII.1997 (A. Stojanova); 3 ♀♀, Bulgaria, Rhodope Mts., 2 km SW of Novo Selo Vill., 250 m, 1.VII.2000 (A. Stojanova); 1 ♀, Bulgaria, Rhodope Mts., Byaga Vill., 300 m, 1.VIII.2000 (A. Stojanova); 1 ♂, Bulgaria, Arda, Valley, 2 km NE Madzharovo, 160 m, Malaise trap., 1-9.XII.2000, (H. Eturska); 1 ♂, Bulgaria, Prin Mt., Sveti Ilia hill, near Kalimantsi maquis, 475 m, Malaise trap, 9-12.V.2002, (M. Langurov); 1 ♀, Bulgaria, Rhodope Mts., Daskalovo Vill., 550 m, screen sweeping on grasslands, 23.VII.2004 (P. Boyadzhiev); 2 ♀♀, Bulgaria, Rhodope Mts., Daskalovo Vill., 550 m, screen sweeping, 15.IX.2004 (P. Boyadzhiev); 1 ♀, Bulgaria, Rhodope Mts., Daskalovo Vill., 550 m, screen sweeping on grasslands, 8.X.2004 (P. Boyadzhiev); 1 ♀, Bulgaria, Sakar Mt., Yerusalimovo Vill., 390 m, screen sweeping, 26.IV.2006 (P. Boyadzhiev); 4 ♀♀, Bulgaria, Kurdzhali region, Rhodope Mts., Daskalovo Vill., 550 m, screen sweeping on boggy grass community, 4.IX.2006 (P. Boyadzhiev); 1 ♀, Bulgaria, Pirin Mt., 2 km W of Hadrhidimovo, 499 m, screen sweeping, 8.IX.2006 (P. Boyadzhiev); 3 ♀♀, Bulgaria, Sakar Mt., Jerusalimovo Vill., 90 m, screen sweeping on boggy grass community,

21.VIII.2008 (P. Boyadzhiev); 1 ♀, Bulgaria, Kjustendil, Gereha District, 575 m, screen sweeping, 22.VIII.2008 (M. Antov) (DZUP, ZISP).

Elasmus rufiventris Ferrière, 1947

Elasmus rufiventris Ferrière, 1947: 576.

Diagnosis. POL 3.0-3.5 OOL; OOL 1.5-1.6 OD; F1 not longer than pedicel. Gaster with proximal three-quarters or more red. Thorax sometimes more or less red. Dorsellum yellow (Graham 1995). Additional characters: forewing with isolated subcubital line of setae, F1 1.14 as long as F2, F2 about equal to F3.

Hosts. *Luffia lapidella* (Goeze) (Lepidoptera: Psychidae), *Meessia leopoldella* Costa (Lepidoptera: Tineidae).

Distribution. Palearctic: Europe (France, England, Jugoslavia, Hungary) (Ferrière 1947, Graham 1976, 1995).

Material examined: 1 ♀, Bulgaria, Rhodope Mts., Arda Valley, 2 km NE of Madzharovo Vill., 160 m, Malaise trap, 8-22.VI.2001 (H. Eturska) (DZUP).

Elasmus steffani Viggiani, 1967

Elasmus masii Steffan, 1962: 36 [Lectotype, designated by Viggiani & LaSalle 1994: 18].

Elasmus steffani Viggiani, 1967: 158 [Replacement name for *Elasmus masii* Steffan, 1962 nec Ferrière 1929: 415].

Diagnosis. POL 2.0 – 2.5 OOL. All antennal segments longer than broad. F3 1.2 - 1.5 times as long as broad. Forewing with isolated subcubital line of setae. Body black with metallic tint, gaster ventrally reddish. Face dark brown with yellow spots near toruli and on vertex. Antenna pale yellow.

Hosts. Larval parasitoid of Braconidae (Hymenoptera), Tortricidae, Yponomeutidae (Lepidoptera) (Viggiani & LaSalle 1992, Graham 1995).

Distribution. Palearctic: (Italy, France, Spain, Israel, Greece, Turkey) (Viggiani & LaSalle 1992, Noyes 2009).

Material examined: 1 ♀, Bulgaria, Strandzha Mt., Tsarevo, 50 m, Moericke trap, 3-9.X.2001 (A. Stojanova); 1 ♀, Bulgaria, Kurdzhali region, Rhodope Mts., Daskalovo Vill., 550 m, screen sweeping on dry grass community, 4.IX.2006 (P. Boyadzhiev) (DZUP, ZISP).

Elasmus unicolor (Rondani, 1877)

Heptocondyla unicolor Rondani, 1877: 182.

Elasmus unicolor (Rondani): Boucek, 1974: 271, 279.

Elasmus unicolor (Rondani): Graham, 1976: 298.

Diagnosis. Female. POL 2.7-3.2 OOL, OOL1.3-1.4 OD. Hind margin of forewing straight. F1 as long as or slightly shorter than pedicel. F2 1.65-2.25 times, F3 1.45-2.0 times as long as broad. Gaster black, hind tibiae with their posterior edge or whole surface blackish. Male. OOL 1.4-1.5 OD. Body black, dorsellum and lamella yellowish.

Hosts. Larval parasitoid of Coleophoridae, Psychidae, Pyralidae (Lepidoptera) (Herting 1975, Trjapitzin 1978).

Distribution. Palearctic: Europe (France, Italy, Sweden, Germany, Moldova, Switzerland, Hungary, Bulgaria, Russia, Turkmenistan) (Trjapitzin 1978, Myartseva & Dzhanokmen 1989, Graham 1995).

Material examined: 1 ♀, Bulgaria, Rhodope Mts., Hrabrino Vill., 400 m, 1.VII.1995 (P. Boyadzhiev); 1 ♀, Bulgaria, Rhodope Mts., Planinsko Vill., 1300 m, 4.VII.1997 (P. Boyadzhiev); 1 ♀, 2 ♂♂, Bulgaria, Rhodope Mts., 2 km SW of Novo Selo Vill., 200 m, 17.V.2001 (A. Stojanova); 1 ♀, Bulgaria, Rhodope Mts., 2 km SW of Novo Selo Vill., 200 m, yellow trap, 27.V.2001 (A. Stojanova); 1 ♀, Bulgaria, Rhodope Mts., 2 km SE of Novo Selo

Vill., 200 m, yellow trap, 27.V.2001 (A. Stojanova); 1 ♀, 1 ♂, Bulgaria, Rhodope Mts., Plevun Vill., 400 m, Malaise trap, 17.VI.-1.VII.2001 (A. Stojanova); 1 ♀, Bulgaria, Rhodope Mts., Daskalvo Vill., 500 m, 19.VI.2002 (P. Boyadzhiev); 1 ♀, Bulgaria, Rhodope Mts., Daskalovo Vill., 550 m, screen sweeping on grasslands, 23.VII.2004 (P. Boyadzhiev); 1 ♀, Bulgaria, Rhodope Mts., Daskalovo Vill., 550 m, screen sweeping, 15.IX.2004 (P. Boyadzhiev) (DZUP, ZISP).

Elasmus viridiceps Thomson, 1878

Elasmus viridiceps Thomson, 1878: 205-206.

Diagnosis. Female. POL 2.0-2.9 OOL. Head and thorax with strong bluish or greenish-blue metallic tint. Forewing with short irregular bare area at base. Penultimate tergite not longer than its basal breadth. Male. POL 2.0 OOL, head and anterior part of thorax bluish.

Hosts. Pupal parasitoid of Coleophoridae, Gelechiidae, Tortricidae (Lepidoptera) and Bethylidae, Chrysididae (*Goniozus claripennis* Forster) (Hymenoptera) or hyperparasitoid of Pteromalidae (Hymenoptera, Chalcidoidea) (Herting 1975, Trjapitzin 1978, Graham 1976, 1995).

Distribution. Palearctic: Europe (France, Greece, Moldova, Poland, Romania, Sweden) (Herting 1975, Trjapitzin 1978, Graham 1976, 1995).

Material examined: 3 ♀♀, Bulgaria, Rhodope Mts., Hrabrino Vill., 400 m, 1.VII.1995 (P. Boyadzhiev); 1 ♀, Bulgaria, Rhodope Mts., E of Kapitan Dimitrievo Vill., 300 m, 1.VII.2000 (A. Stojanova); 1 ♀, Bulgaria, Rhodope Mts., Glavinitsa Vill., 350 m, 1.VII.2001 (A. Stojanova); 1 ♀, Bulgaria, Rhodope Mts., Daskalovo Vill., 550 m, screen sweeping, 15.IX.2004 (P. Boyadzhiev); 1 ♀, Bulgaria, Kjustendil region, Lelintsi Vill., 700 m, screen sweeping, 2.VIII.2008 (M. Antov); 3 ♀♀, Bulgaria, Sakar Mt., Jerusalimovo Vill., 90 m, screen sweeping on boggy grass community, 21.VIII.2008 (P. Boyadzhiev) (DZUP, ZISP).

Elasmus westwoodi Giraud, 1856

Elasmus westwoodi Giraud, 1856: 185.

Diagnosis. Female POL 2.75-2.9 OOL, OOL 1.0-1.2 OD. F1 as long as pedicel and 2.0-2.2 times as long as broad, F 3 1.75-2.0 times as long as broad. Clava hardly broader than F3 and 3.25 -3.45 times as long as broad. Hind margin of forewing slightly concave. Body black, gaster reddish ventrally at base. Male. POL 2.7 OOL, OOL equal to OD. Dorsellum with yellow lamella.

Hosts. Larval-pupal parasitoid of Gracillariidae, Psychidae (Lepidoptera) (Herting 1975, Graham 1995).

Distribution. Palearctic: Europe (France, Germany, Slovakia, Hungary, Yugoslavia, Bulgaria, Turkey, Italy, Austria, Finland, Switzerland) (Herting, 1975; Graham, 1976, 1995).

Material examined: 1 ♂, Bulgaria, Rhodopi Mts., Krichim, 10.V.1982, (S. Petrov); 1 ♀, Bulgaria, Rhodope Mts., Odnyanovo Vill., 300 m, 2.V.1998 (P. Boyadzhiev); 1 ♀, Bulgaria, Rhodope Mts., 2 km SW of Novo Selo Vill., 250 m, 1.VII.2000 (A. Stojanova); 1 ♀, 3 ♂♂, Bulgaria, Rhodope Mts., 2 km SW of Novo Selo Vill., 200 m, 17.V.2001 (A. Stojanova); 1 ♀, Bulgaria, Rhodope Mts., m. h. Chernatitsa, 1369 m, sweeping on grasslands, 18.V.2001 (P. Boyadzhiev); 2 ♀♀, Bulgaria, Rhodope Mts., 2 km SW of Novo Selo Vill., 200 m, 27.V.2001 (A. Stojanova); 1 ♂, Bulgaria, Rhodopi Mts., 2 km SW of Novo Selo Vill., 200 m, 17. VI.2001, (A. Stojanova) (DZUP, ZISP).

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New localities of four Bulgarian endemic Hydrobiidae species (Mollusca: Gastropoda: Risooidea)

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Abstract. New localities of *Belgrandiella pussila* Angelov, 1959, *Belgrandiella angelovi* Pintér, 1968, *Bythiospeum copiosus* (Angelov, 1972), and *Grossuana thracica* Glöer & Georgiev, 2009 were reported in Bulgaria. Some notes on the generic position of *Belgrandiella angelovi* and *Bythiospeum copiosus* were done.

Key words: spring, cave, snail.

Introduction

Most of the Bulgarian minute freshwater gastropods of Hydrobiidae Troschel 1857 are endemics and are known only from their type localities, and some of them were described only by their shell morphology (Angelov 2000). In this paper we report some new localities of four species from the genera *Belgrandiella* (Wagner, 1927), *Bythiospeum* Bourguignat, 1882 and *Grossuana* Radoman, 1973 with some notes on the systematic position of two of them.

Material and Methods

The shells were collected by sieving river deposits with two sieves of 1x1 and 2x2 mm mesh width. Living molluscs were collected by hand and the specimens were preserved in 75% ethanol. The dissections and measurements of the shell were carried out by means of CETI stereo microscope and an eye-piece micrometer; the photographs were made with camera system with a digital adapter. The material was deposited in the collection of the author.

Results and Discussion

Belgrandiella pussila Angelov, 1959

Distribution in Bulgaria: Species known only from the type locality – the source of Petreska River, near Lakatnik town, Stara Planina Mts. (Angelov 1959, 2000).

Material examined: 6 shells (1 fresh, 5 old), 07.03.2010, Temnata Dupka cave, Lakatnik town, UTM FN96, D. Georgiev leg.

Diagnosis: The distinctive characters of this species discerning it from the rest of the Bulgarian *Belgrandiella* are the cylindrical shell with obtuse apex and the oval small aperture (Angelov 1959). Its shell is smaller and its morphology is very different from these ones of the two other freshwater snails found in this cave (Wagner 1927): *Belgrandiella hessei* Wagner, 1927 and *Bythiospeum bureschi* (Wagner, 1927) (= *Paladilhiopsis bureschi* Wagner, 1927). From the first species it differs by the smaller aperture having a simple lip, cylindrical shell, obtuse apex, and flatter whorls, and from the second – by the smaller

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number of whorls, having not so deep suture, its cylindrical shell, and simple aperture lip (Fig. 1).

Other associated molluscs: In the deposits of the river in Temnata Dupka cave studied we also collected and one juvenile shell of a freshwater mussel from the genus *Pisidium* Pfeiffer, 1821.

Fig. 1. Shells of the stygobite snails of the Temnata Dupka cave (Lakatnik): **1** – the newly recorded *Belgrandiella pussila*, **2** – *Belgrandiella hessei*, **3** – *Bythiospeum bureschi*. The shells are displayed in respective proportions.

***Belgrandiella angelovi* Pintér, 1968**

Material examined: 24 adults, 20.09.2009, Stara Planina Mts., west of Gabrovo town, near village of Zeleno Darvo, two springs in *Fagus sylvatica* forest, UTM LH53, D. Georgiev leg.

Diagnosis: The main characters discerning this species from the similar *Belgrandiella zagoraensis* Glöer & Georgiev 2009 living in Sarnena Sredna Gora Mt are the opaque shell, the ovally broad aperture with louvered outer margin (versus non opaque shell, oval aperture with vertical outer margin) (Fig. 2).

Discussion: The anatomy of *B. angelovi* was not known till now (Pintér 1968). Here we can note down that our specimens had white mantle and a simple regularly broad penis (1 spec. dissected), sharply tapered at its distal part (which also discerns this species from the similar *B. zagoraensis* which distal penis part is tapered) (Fig. 2). The last character surely puts this species into the genus *Belgrandiella*.

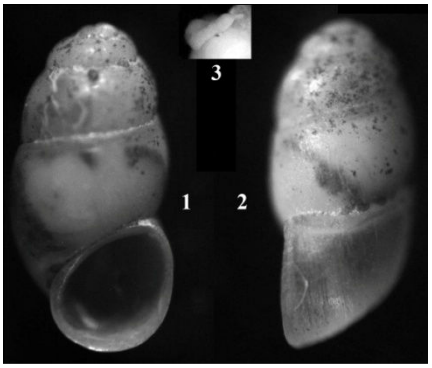

Fig. 2. *Belgrandiella angelovi* from the new locality: **1** – shell, front view, **2** – shell, side view, **3** - penis.

***Bythiospeum copiosus* (Angelov, 1972)**

Distribution in Bulgaria: Known only from its type locality, the Izvora cave near Polaten, Teteven district, Stara Planina Mts. (Angelov 1972).

Material examined: 2 shells, 03.12.2010, Glava Panega spring, near village of Zlatna Panega, Stara Planina Mts., North Bulgaria, UTM KH67, D. Georgiev leg.

Diagnosis: The shell is conical, the whorls are 4 ½ - 5, the aperture has not well developed lip which discerns this species from *B. bureschi* which shell is more cylindrical, has 4 ½ - 5 ½ whorls and its aperture has well developed lip (Fig 1, 3).

Discussion: Firstly this species was described as a subspecies of *B. bureschi* as *Paladilhiopsis bureschi copiosus* Angelov, 1972. The genus *Paladilhiopsis* Pavlović, 1913 is considering Boeters (1998), a synonym of *Bythiospeum* Bourguignat. Both *B. copiosus* and *B. bureschi* stat. nov. have quite different shell morphology and their localities are very far from each other so we consider *B. copiosus* as a separate species.

Fig. 3. *Bythiospeum copiosus* from Glava Panega spring, front (left) and back (right) side view of the shell.

***Grossuana thracica* Glöer & Georgiev, 2009**

Distribution in Bulgaria: Species known only from the type locality – the source of a small river emerging from Chirpan Bunar cave near village of Bolyarino, Upper Thracian Lowland (Glöer & Georgiev 2009).

Material examined: 17 adults (2 males dissected) and 2 juveniles, 11.06.2010, and 8 adults, 19.12.2009, spring at Tri Voditsi fish farms near the base station of the farms, near village of Hadzievo, water temperature 14°C, oxygen 6 mg/l, UTM KG96 Angel Tsekov leg.; 4 shells, 08.06.2010, deposits of the stream inside the Chirpan Bunar cave, D. Georgiev leg.

Diagnosis: According to Glöer & Georgiev (2009) *G. thracica* differs from *G. codreanui* (Grossu, 1946) and *G. angeltsekovi* Glöer & Georgiev, 2009 in the penis morphology (the penis of the first species is not strongly tapered as it is in *G. thracica*, and in the second the penis is more tapered than it) and the shell of *G. codreanui* is glossy vs. silky in *G. thracica*. The aperture of *G. codreanui* is rounded oval and not angled at the top, as it is in *G. thracica*.

Discussion: The species *G. thracica* was described from the area where the water emerging from Chirpan Bunar cave. Our finding of shells into the cave stream deposits indicates that there is cave population of this species or at least part of the cave waters are coming from surface where other populations live.

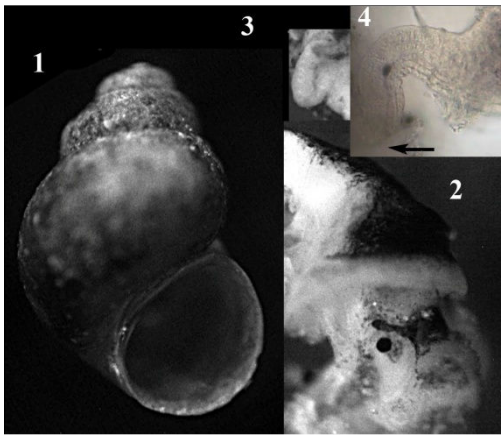

Fig. 4. *Grossuana thracica* from the spring at the Tri Voditsi fish farms near village of Hadzievo: **1** – shell, **2** – soft body (the snout, eye, tentacle and mantle pigmentation are visible) with penis (up on right), **3** – penis, **4** – the louvered distal part of the penis, penis tip was showed with an arrow (light microscope photography).

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Изследване върху популацията на Езерния рак *Astacus leptodactylus* Eschscholtz, 1823 (Crustacea: Decapoda: Astacidae) в кариерен водоем в района на с. Бошуля (Горнотракийска низина, България)

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Study on the narrow-clawed crayfish *Astacus leptodactylus* Eschscholtz, 1823 (Crustacea: Decapoda: Astacidae) population in a sand-pit Lake near the village of Boshulya (Upper Thracian Lowland, Bulgaria)

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Abstract. The paper represents the results of investigation on the narrow-clawed crayfish population in the sand-pit Lake near village of Boshulya (Upper Thracian Lowland, Bulgaria). The number of crayfish (925) caught showed a high density of their population (mean CPUE=14.69). Individuals with a body weight between 20.1 and 30.0 g predominated the sample. They were 38% of the total catch. With the lowest percent (1%) were the groups with body weight 70.1 – 80.0 g and this one over 80 g. The average ovarian eggs number (absolute fecundity) was 228.85 (min. 144, max. 294).

Key words: narrow-clawed crayfish, population, CPUE, size, sand-pit Lake.

Увод. Разпространението на Езерния рак (*Astacus leptodactylus* Esch.) в България е сравнително добре проучено. Данни за негови находища се посочват в публикациите на Булгурков (1961), както и на Събчев и Станимирова (1998). Подробно са изследвани популациите на раците в яз. Кърджали и яз. Пясъчник, както и на култивирани популации (Zaikov & Hubenova 2007).

В настоящата статия са представени резултатите от извършено проучване върху популацията на Езерния рак в кариерен водоем, разположен в близост до с. Бошуля, Пазарджишка област.

Материал и методи. Изследвания водоем (Фиг. 1) е с площ от 280 дка и надморска височина от 220 m (координати за местоположение: N 420 13.071'; E 0240 12.564'). Средната му дълбочина е около 20 m, дъното е песъчливо, а бреговата ивица слабо обраснала с растителност. Нивото се поддържа от вода, извираща от дъното му.

Уловът на раци е извършен в района на съществуващото садково стопанство през месеците април и септември с помощта на винтери със следните размери: дължина 34 cm, диаметър 23 cm, размер на окото 4 mm. За стръв е използвана

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каракуда. Винтерите са залагани вечер с престой във водата от 12 часа на дълбочина до 18 m (Westman *et al.* 1999).

Хидрохимичните проби са вземани в деня на провеждане на уловите. Температурата на водата, количеството на разтворения кислород, процентът на насищане и водородният показател (pH) са определяни с микропроцесорен оксиметър тип WTW 315i/SET.

Относителната численост на популацията (улов за единица усилие – CPUE), е изчислявана по формулата CPUE = брой на уловените раци за една нощ/брой на винтерите (Westman *et al.* 1999).

Отделните индивиди са разделяни по пол и масата им е установявана чрез индивидуално измерване на електронна везна KERN 440-33. Раците от всеки улов са разделени в 8 тегловни групи, като за всяка от тях е установен броя на екземплярите.

На базата на проведените улови по описаните методики е извършена тегловна характеристика на популацията и е определен CPUE. Проучена е абсолютната плодовитост (брой на зрелите овоцити в яйчника) на извадка от 24 полово зрели езерни раци (Hubenova *et al.* 2002). Гонадосоматичният индекс (GSI, %) е определян като съотношение между масата на раците и масата на гонадите, изразено в проценти. От популацията общо са уловени 925 индивида, 456 през месец април и 469 през септември.

Фиг. 1. Район на проучване - кариерен водоем до с. Бошуля.
Fig. 1. The study area – the sand-pit lake near village of Boshlya.

Резултати и дискусия. Данните от химичния анализ на водата (Таблица 1) показват, че тя се характеризира с високо съдържание на разтворен кислород (7.8 – 11.3 mg/l) и висок процент на насищане (89.0 – 122.0%). Водородният показател (pH) е с алкални стойности (7.55 – 7.70).

След определяне на пола на уловените екземпляри е установено, че броят на мъжките раци е 1.52 пъти по-голям от този на женските, като през април уловените женски са значително по-малко (6.6 пъти).

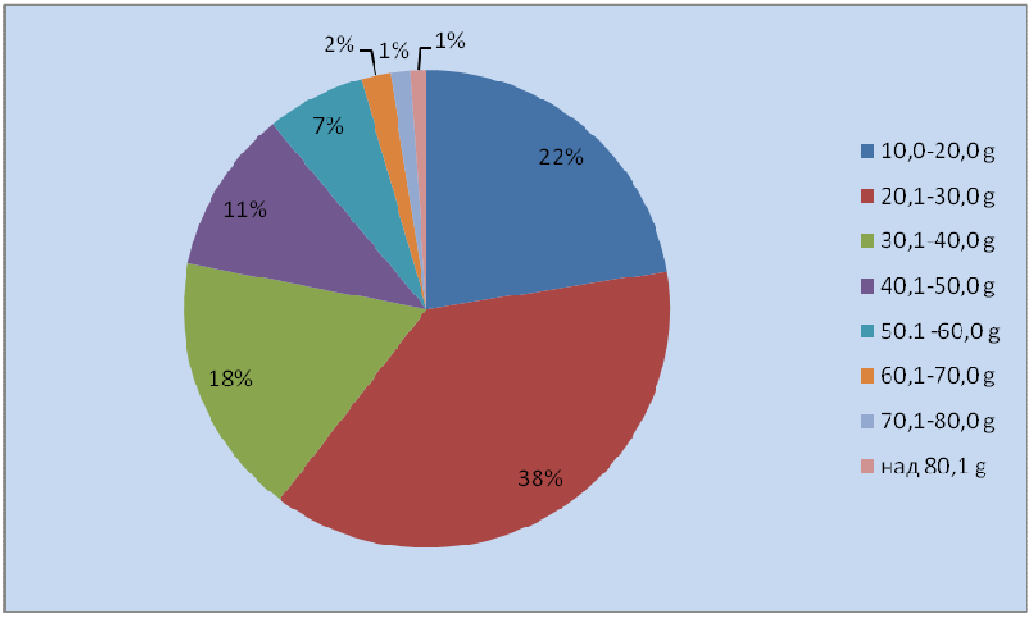
На базата на проведените два улова на езерните раци е установена висока относителна численост на тяхната популация. При първия от тях CPUE е 13.78, а при

втория 15.60. Тези данни показват, че популацията е със стопански потенциал и може да се използва за промишлен улов.

На Фиг. 2 е посочено разпределението на раците по тегловни групи. С най-голям дял – 38% са индивидите с маса между 20.1 – 30.0 g. Под тези стойности са 22% от извадката. С относително голям дял са и индивидите с по-високо тегло: от 30.1 до 40.0 g (18%), от 40.1 до 50.0 g (11%) и тези от 50.1 до 60.0 g (7%).

Таблица 1. Хидрохимични показатели на водата в кариерен водоем до с. Бошуля.
Table 1. Hydro-chemical indices of the water from the sand-pit Lake near the village of Boshulya.

Показатели Parameters	Дата Data	
	21.04.2010	24.09.2010
T°C	18.3	20.8
O_2, mg/l	11.3	7.8
O_2, %	122	89.0
pH	7.55	7.7



Фиг. 2. Разпределение на уловените езерни раци (*Astacus leptodactylus* Esch.) по тегловни групи (в %).
Fig. 2. Distribution of the caught narrow-clawed crayfish (*Astacus leptodactylus* Esch.) individuals in weight groups (in %).

Данните от изследване на абсолютната плодовитост на популацията са посочени на Таблица 2. Средната маса на полово зрелите раци от представителната извадка е 29.41 g при средна дължина от 10.28 cm. Установено е, че броят на зрелите овоцити в яйчниците е със средна стойност от 228.25 броя, при минимални и максимални стойности съответно 144 и 294 бр. Гонадосоматичния индекс (GSI, %) за изследваната извадка е 3.92%.

Таблица 2. Абсолютна плодовитост и гонадо-соматичен индекс (GSI, %). Легенда: BW – маса на раците; TL – дължина на раците; CL – дължина на карапакса; GSI – гонадо-соматичен индекс. **Table 2.** Absolute fecundity and gonado-somatic index (GSI, %).

Показатели Parameters	BW, g	TL, cm	CL, cm	Овоцити, n Ovocites, n	GSI, %
x	29.41	10.28	5.09	228.25	3.92
SD	10.44	1.07	0.57	43.66	1.15
Sx	2.05	0.21	0.11	8.56	0.23
Cv,%	35.51	10.44	11.28	19.13	29.32
min	19.60	9.00	4.50	144.00	0.68
max	72.00	13.80	7.00	294.00	5.42

Заключение. Относителната численост на популацията на езерните раци в кариерния водоем на с. Бошуля е висока (средно CPUE 14.69), което показва, че тя е със значителен стопански потенциал и може да се използва за промишлен улов. С най-голям относителен дял от общия брой уловени раци – 38 % са тези с маса между 20.1-30.0 g. Установено е, че средната абсолютна плодовитост на популацията е 228.25 броя зрели овоцити при минимални и максимални стойности съответно 144 и 294 бр.

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Study on the Stone crayfish *Austropotamobius torrentium* (Schrank, 1803) (Crustacea: Decapoda: Astacidae) population in the Dospat Dam (Western Rhodope Mountains, Bulgaria)

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Abstract. In present paper the results from a study on the Stone crayfish in the Dospat Dam were represented. During the study period a total of 551 stone crayfish were caught (328 males and 223 females) by traps. The size-weight characteristics of the population were established, as well as the determination of its relative density (CPUE), and the ratio between the males and the females.

Key words: Stone crayfish, population, CPUE, body size, Dospat Dam.

Introduction

The distribution of Stone crayfish *Austropotamobius torrentium* (Schrank, 1803) is mainly in the Central and South-Eastern countries of the European continent. It was found in 20 European countries, including and Bulgaria. As a species that needs a special preservation measures, it was included in the Annex II of the Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora (Souty-Grosset *et al.* 2006).

The information on the Stone crayfish *A. torrentium* distribution and population status published in Bulgaria is insufficient. Data on its habitats established in different regions of Bulgaria are mentioned in the studies of Bulgurkov (1961) and Sabchev & Stanimirova (1998) which works were engaged in a research of the epibiontic Branchiobdelidae (Annelida, Oligochaeta) on the crayfish. Zaikov *et al.* (2010) conducted a research on the population of the Stone crayfish in the Sarnena River (Western Rhodope Mountains). Hubenova *et al.* (2010) investigated fecundity of its population in Dospat Dam and reported on an average of 29 pleopodal eggs per female.

In present paper the results from a study on the Stone crayfish in the Dospat Dam were represented. The size-weight characteristics of the population were established, as well as the determination of its relative density (CPUE), and the ratio between the males and the females.

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Material and methods

The Dospat Dam (Fig. 1) is one of the largest dams in the country with an area of over 2260 ha and water holding capacity of about 446 400 thousand m^3. It is located on the territory of Smolyan and Pazardzhik Districts, Dospat and Velingrad Municipalities.

Fig. 1. Views from the collection sites at the area of the Dospat Dam during present study.

The crayfish catch was done at about 1 km away from the dam wall in the months of May, July and August with the use of crayfish traps with the following dimensions: length 34 cm, diameter 23 cm, size of the mesh eye 4 mm. Prussian carps *Carassius gibelio* (Bloch, 1782) were used for bait. The traps were set at evening and stayed in the water for 12 hours at depth to 5 m (Westman *et al.* 1999).

The relative density of the population is determined by the formula CPUE = the caught crayfish number per one night divided to the number of the traps (Westman *et al.* 1999).

The crayfish were separated by sex and their body weight was determined individually with a KERN 440-33 electronic scale, and the length (from the top of the rostrum to the top of the telson) with a caliper.

The crayfish of each catch-sample were divided into five weight groups: up to 10 g, 10.1 – 20 g, 20.1 –30 g, 30.1 – 40 g, and 40.1 – 50 g. For each group the number of specimens, body weight and length and the length of the carapace (average value, standard deviation and the variation coefficient) were represented.

The hydro-chemical parameters of the water (Table 1) in the Dospat Dam - temperature (^{0}C), dissolved oxygen (mg/l), oxygen saturation (%), pH were measured by using a transportable unit WTW 315i/SET.

Results and discussion

The hydro-chemical parameters of the water investigated are represented in Table 1. The values were within the normal ranges for all the stone crayfish habitats studied. The dissolved oxygen amount was within the ranges of 4.4 to 7.4 mg/l, as the lowest values were recorded in July when the water temperature was at its highest level. The pH values were in the ranges of 8.5 – 7.3.

Table 1. The hydro-chemical indices of the water from the Dospat Dam studied.

Parameters	Data		
	15.05.09	**23.07.09**	**24.09.09**
T°C	20.2	23.6	16.5
O_2, mg/l	6.8	4.4	7.4
O_2, %	87.0	57.3	88.4
pH	8.5	7.4	7.3

During the study period a total of 551 Stone crayfish were caught as their number was highest in September. Data regarding the relative density (CPUE) showed an average value of 4.65 for the three catches made (Table 2). Higher relative density was recorded for the males – 2.95 versus 1.70 for the females, e.g. in the catches the male crayfish were predominant. This was expressed very clearly in May, and was probably related with the fact that in this period females, who were still carrying eggs, were not active and stayed in their burrows. As a whole from all the 551 caught crayfish, 328 were males and 223 females.

Table 2. Catch Per Unit Effort (CPUE) calculated from the Stone crayfish studied in Dospat Dam.

Date	CPUE total	CPUE male	CPUE female
15.05.2009	5.41	4.41	1.00
23.07.2009	2.40	1.40	1.00
24.09.2009	6.14	3.04	3.10
Total:	4.65	2.95	1.70

The average weight of crayfish up to 10 g is equal for both females and males – 8.39 g, as the female crayfish are with higher length 65.17 mm against 62.92 mm for the males (Table 3). With the increasing body weight, the trend that the weight of males was higher, and the body length was lower than those of the females was clearly visible from the results. The possible main reason was that the males had better developed claws, which reflects on their body weight. In the last group – crayfish with weight from 40.1 to 50.0 g, only males (n=24) were caught in the traps.

The largest percent of crayfish caught were those with weight from 10.1 to 20.0 g (41%). The second biggest group was this one in the range of 20.1 – 30.0 g (31%). The smallest group was represented by crayfish with body weight from 40.1 to 50.0 g (4%), as there were no females.

Table 3. Size-weight structure of Stone crayfish population estimated from the samples taken in the Dospat Dam. Legend: TL=total length; CL=carapace length; BW=body weight.

Weight group, g	Parameter	Male				Female				Total			
		n	TL, mm	CL, mm	BW, g	n	TL, mm	CL, mm	BW, g	n	TL, mm	CL, mm	BW, g
up to 10.0	x	12	62.92	30.25	8.39	41	65.17	30.85	8.39	53	64.66	30.72	8.39
	SD		3.40	1.86	1.17		4.66	1.88	1.10		4.48	1.87	1.10
	Cv%		5.40	6.16	13.95		7.16	6.09	13.08		6.93	6.10	13.14
from 10.1 to 20.0	x	86	73.17	36.07	15.33	139	76,52	36.64	14.52	225	75.24	36.42	14.82
	SD		4.74	2.65	3.01		4.89	2.54	2.87		5.09	2.59	2.95
	Cv%		6.48	7.35	19.66		6.39	6.94	19.74		6.77	7.12	19.87
from 20.1 to 30.0	x	129	82.72	40.93	24.41	37	86.57	41.43	22.48	166	83.58	41.04	23.98
	SD		3.37	1.84	2.89		4.21	1.92	2.16		3.91	1.86	2.86
	Cv%		4.08	4.49	11.86		4.87	4.64	9.61		4.68	4.54	11.92
from 30.1 to 40.0	x	77	90.38	44.74	34.03	6	96.67	46.67	32.56	83	90.83	44.88	33.92
	SD		3.17	2.20	2.97		5.50	2.42	2.69		3.72	2.26	2.96
	Cv%		3.51	4.92	8.72		5.69	5.19	8.25		4.10	5.04	8.71
from 40.1 to 50.0	x	24	95.63	47.96	44.02	-	-	-	-	24	95.63	47.96	44.02
	SD		2.46	1.33	2.84		-	-	-		2.46	1.33	2.84
	Cv%		2.58	2.78	6.46		-	-	-		2.58	2.78	6.46
total	x	328	82.23	40.67	25.14	223	76.64	36.64	15.20	551	79.97	39.04	21.11
	SD		8.81	4.68	9.43		8.60	4.26	5.66		9.14	4.93	9.47
	Cv%		10.71	11.50	37.51		11.22	11.62	37.27		11.43	12.62	44.85

Conclusion

The population of Stone crayfish in the Dospat Dam is with relatively high density (CPUE 4.65), as crayfish with body weight from 10.1 to 20.0 g were predominant. The percentage of this group was 41% of the total number of crayfish caught; while the smallest share (4%) was for the group 40.1 – 50.0 g. Males had larger body weight (25.14 g) in comparison to this one of the females (15.20 g).

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Comparison of the eggs size between two subspecies of the Kotschy's Gecko *Mediodactylus kotschyi* (Steindachner, 1870) (Reptilia: Gekkonidae) in Bulgaria

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Abstract. The current study compares the egg size (length, width, egg volume and clutch size) between two subspecies of the Kotschy's Gecko – *Mediodactylus kotschyi rumelicus* and *Mediodactylus kotschyi daniliewskii* from Bulgaria. Our results showed that *M. k. rumelicus* from Plovdiv has bigger eggs, compared to *M. k. daniliewskii* from Sozopol, The South Black Sea Coast and Ukraine, regarding length, width and egg volume. The clutch size between the two subspecies both from Bulgaria and Ukraine is very similar and contains average of 2 eggs.

Key words: *Mediodactylus kotschyi*, eggs size, reproduction, Bulgaria, Ukraine.

Introduction. The Kotschy's Gecko - *Mediodactylus kotschyi* (Steindachner, 1870) is the only representative from the Gekkonidae family, occurring in Bulgaria, which is considered to be a synanthrope (Beshkov & Nanev 2002). Because of the fact that it is mainly nocturnally active animal and inhabits predominantly human settlements some aspects of its biology and ecology are still poorly studied. One such aspect is reproduction. The Kotschy's Gecko is the only lizard occurring in Bulgaria, which lays eggs with calcareous shell (Undjian, 2000). So far data about the eggs size is quite scares in the herpetological literature. Partial data about the eggs size, incubation period, growth rates etc. can be found in the works of Shterbak (1960, 1961, 1965), Shterbak & Golubev (1986), Valakos & Vlachopanos (1989), Undjian (2000), Beshkov & Nanev (2002) and others. Currently there is only one study giving data about the eggs size of *Mediodactylus kotschyi daniliewskii*, conducted in Bulgaria (Undjian 2000).

The aim of the current study is to supplement the knowledge about the eggs sizes and breeding ecology of the Kotschy's Gecko (*Mediodactylus kotschyi*) in Bulgaria.

Material and Methods. We examined 9 gecko eggs from four clutches – two from Danov halm Hill and two from Mladezhki halm Hill in Plovdiv, Bulgaria. The material was collected in 25.VIII.2008 from Mladezhki halm Hill and 23.IV.2008 and 05.VIII.2008 from Danov halm Hill. Both hills are located in the center of the city and are declared as "nature monuments" by the Bulgarian legislation (Mollov 2005).

Egg data (length and width) were measured by means of digital caliper with 0,01 mm accuracy. Egg volume was calculated as an ellipsoid: $V = 4/3\pi a^2 b$, with a and b being half of the width and length of the egg, respectively (Arribas & Galàn 2005). Total clutch volume is the sum of all egg volumes. Data from the available literary sources was statistically processed and used to compare with the results from the current study.

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Literary data about the Kotschy's geocko egg sizes of *M. k. daniliewskii* from Bulgaria are given by Unjian (2000) based on 11 eggs from the South Black Sea Coast. We were able to take more precise measurements of another 15 *M. k. daniliewskii*'s eggs from a photograph with a size marker, from the same author (Undjian 2000, fig. 40) from Sozopol (Bulgaria). For the analysis we also used data given by Shterbak (1961, 1965) for the same subspecies from Sevastopol (Ukraine) and by Shterbak & Golubev (1986) from Hersones, Sevastopol (Ukraine) and for *M. kotschyi* (unknown subspecies) from Naxos Island, Greece (Valakos & Vlahopanos 1986).

Statistical calculations were performed with the software package "Statistica 7.0" (StatSoft Inc. 2004). The results were statistically processed using descriptive statistics and all values are presented as means ± standard error of means (S.E.) for each egg characteristic (length, width and volume). A cluster analysis (Bray-Curtis index, Group average link) using the minimum and maximum value of the egg volume was used based on literary data to group the available data from different localities and find similarities between the egg sizes of the subspecies. The cluster analysis was calculated using "Biodiversity Professional" software package (McAleece et al. 1997)

Results and Discussion. Egg characteristics are presented in Table 1. Apparently *M. k. rumelicus* lays eggs that are longer and wider than *M. k. daniliewskii* from Bulgaria and Ukraine. In terms of egg volume, *rumelicus* also exhibits the biggest eggs (Table 1). The two subspecies have a relatively similar egg sizes, but the differences in the egg volume are more clearly visible. The mean clutch size for *M. k. rumelicus,* recorded in this study is 2,3 eggs, for *M. k. daniliewskii* from Sevastopol (Ukraine) – 2 eggs (Shterbak 1961), 1,67 eggs (Shterbak 1965) and for the same subspecies from Hersones, Sevastopol (Ukraine) – 1-2 eggs (Shterbak & Golubev 1986). Valakos & Vlahopanos (1986) give a mean clutch size of 2,25 eggs for *M. kotschyi* from Naxos Island (Greece).

Table 1. Egg and clutch characteristics of the two subspecies of *M. kotschyi* from the current study and comparison with literary data.

Egg characteristics	*M. k. rumelicus* Plovdiv, Bulgaria (current study)	*M. k. daniliewskii* Sozopol, Bulgaria (Undjian, 2000)	*M. k. daniliewskii* South Black Sea Coast, Bulgaria (Undjian, 2000)	*M. k. daniliewskii* Sevastopol, Ukraine (Shterbak 1961, 1965)	*M. k. daniliewskii* Hersones, Sevastopol, Ukraine (Shterbak & Golubev 1986)	*M. kotschyi* Naxos Island, Greece Valakos & Vlahopanos (1986)
Egg length (mm)						
Mean±SE	9,87±0,25	7,55±0,09	9,55	8,75±0,24	8,60	7,05
SD	0,74	0,37	—	0,80	—	—
Range (min-max)	9,30-11,50	7,00-8,10	9,30-9,80	7,50-9,70	7,50-9,70	7,00-7,10
Egg width (mm)						
Mean±SE	8,35±0,11	6,11±0,09	7,55	7,60±0,17	6,95	4,49
SD	0,34	0,34	—	0,57	—	—
Range (min-max)	7,90-8,80	5,20-6,90	7,30-7,80	6,60-8,20	5,80-8,10	4,48-4,50
Egg volume (mm³)						
Mean±SE	361,80±15,02	147,53±3,60	361,41	268,20±16,85	284,94	116,85
SD	45,08	13,93	—	55,88	—	—
Range (min-max)	307,17-424,87	113,26-174,50	330,58-392,23	171,06-334,46	170,82-399,05	115,45-118,25
Total clutch volume (mm³)						
Mean±SE	814,05±100,05	—	—	491,71±49,41	—	—
SD	200,12	—	—	121,02	—	—
Range (min-max)	646,11-1099,68	—	—	334,46-604,85	—	—
Number of eggs studied	9	15	11	11	—	—
Number of clutches	4	—	—	6	—	—
Mean clutch size	2,25	—	—	1,67-2,00	1,00-2,00	2,25

The cluster analysis of the egg volume size showed that *M. k. rumelicus* from Plovdiv shows closer values to the volume size of *M. k. daniliewskii* from the Black Sea Coast (Bulgaria) at about 80% similarity. The egg volume size of *M. k. daniliewskii* from Sevastopol

(Ukraine) clusters with the one of *M. k. daniliewskii* from Herones, Sevastopol (Ukraine) at about 90% similarity. *M. k. daniliewskii* from Sozopol (Bulgaria) shows closest similarity (about 80%) to *M. kotschyi* from Greece (Fig. 1).

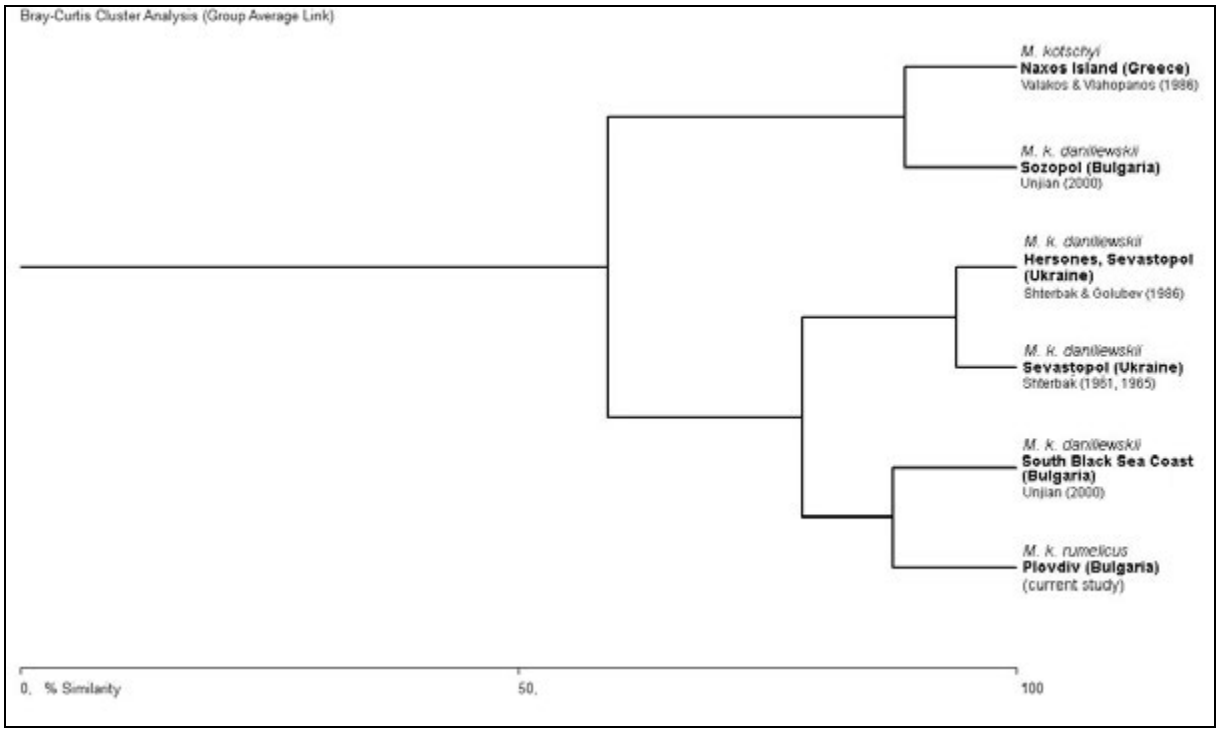

Fig. 1. Cluster analysis of the egg volume sizes of three subspecies of *M. kotschyi* from the current study and comparison with literary data.

The Kotschy's Gecko is a small lizard species, which caries and lays only one or two (rarely three) eggs with hard calcareous shell during the reproduction period similar to other primitive geckos (Kratochvíl & Lukáskubicka 2007). Clutch size in the two studied subspecies is very similar, but they differ concerning the eggs size and volume. Since the current study is just a short note, based on a small number of studied eggs and available literary data, generalized conclusions about the egg size differences between the two subspecies cannot be made. However, based on the data given by Muller (1939), who reports that *M. k. rumelicus* is slightly bigger than *M. k. daniliewskii* ($SVL_{rumelicus}$ = 48-52 mm, $SVL_{daniliewskii}$ = 45-49 mm) it is fare to assume that the bigger egg size in that subspecies is due to the bigger size of the females. We also suppose that in some extend the larger size of the eggs in *M. k. rumelicus* can be partially explained with the urban heat island effect (Camilloni & Barros 1997). Perhaps the higher environmental temperatures in the centre of the big city (Plovdiv), where the studied sites are situated, influence the size of the hatched eggs.

In our opinion further studies on the egg sizes and reproduction of the Kotschy's gecko are needed. Interesting results could be obtained from comparison of the sizes between the three subspecies of *M. kotschyi* that occur in Bulgaria, based on larger samples of eggs. As well as comparison of the egg sizes and the shell structure of populations from different climatic regions in Bulgaria in order to determine any differences based on the climatic conditions or the taxonomical affiliation.

Conclusions.

1. *M. k. rumelicus* from Plovdiv has bigger eggs, compared to *M. k. daniliewskii* from Bulgaria and Ukraine, regarding length, width and egg volume.

2. The clutch size between the two species both from Bulgaria and Ukraine is very similar and contains average of 2 eggs.

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Case of alarm vocalization in a colony of *Microtus guentheri* (Danford & Alston, 1880) (Mammalia, Rodentia, Arvicolidae) from Southern Bulgaria

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Abstract. The main frequency characteristics of alarm vocalization in Guenter's vole *Microtus guentheri* (Danford & Alston, 1880), expressed by single whistle signal are presented. The alarm call was recorded in a colony of Guenter's vole in the valley of Byala reka River in Eastern Rhodopes Mountains, Sothern Bulgaria. The start of the call is explosive and marked frequency modulated, followed by uniform frequency plateau with narrow bandwidth of 2.3 KHz and maximum energy at 15.4 KHz.

Key words: *Microtus*, alarm call, spectrogram, Eastern Rhodopes Mountain.

Introduction

On encountering a predator, many rodent species emit potentially risky vocalizations known as alarm calls. The alarm vocalization is a phenomenon in a variety of ground-dwelling, social rodents and she is often species-specific and can therefore be used to distinguish between closely related species (Bradbury & Vehrencamp 1998; le Roux *et al.* 2002).

In Bulgaria the Guenter's vole *Microtus guentheri* (Danford & Alston, 1880) inhabits mainly south-eastern part of the country and the population from Strandzha Mountain is described as *M. guentheri strandzensis* (Markov, 1960). The individuals from recently reported localities of the species in Eastern Rhodopes Mountains (Minkova 2004) differ cytogenetically from the population in Strandzha Mountain regarding the morphology and distribution of heterochromatin in the autosomes and sex chromosomes (Chassovnikarova *et al.* 2008). According to molecular phylogeny for six species of social voles, Kryštufek *et al.* (2009) consider *M. guentheri* as paraphyletic and consisting of two allopatric sibling species: *M. guentheri* (Syria, Israel) and *M. hartingi* Barrett-Hamilton, 1903 (Anatolia and the Balkans).

The goal of the present communication is to give the main frequency characteristics of alarm vocalization in Guenter's vole in the Eastern Rhodope Mountains, expressed by single whistle signal, in regard to future comparative analysis of inter-population variability of alarm calls in social voles.

Material and Methods

The alarm call was recorded in a colony of Guenter's vole in the valley of Byala reka River in Eastern Rhodopes, Sothern Bulgaria (41^0 22′ 11.68″ N and 26^0 03′ 14.14″ E, altitude 114 m a.s.l.) on 18.09.2005 at 8.10 PM using a portable Pettersson D240 ultrasound detector and

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audio-tape recorder Sony VM-D6C. The alarm vocalization was displayed in response to an observer walking among colony members. The computer analysis was performed using BatSound 3.1 software for Windows in time expansion (10 X). The frequency components of the call were measured from the Fast Fourie Transform (FFT) power spectrum, size 512, Hanning window. The following call parameters are considered: total call duration (ms), frequency with the most energy and highest and lowest frequencies (KHz) of the fundamental component respectively.

For the purpose of correct species determination, five individuals were captured by live traps type "Hartmann", disposed among the studied colony (Popov, personal communication).

Results

The registered alarm call consists of a single phase with total duration of 167 ms (Fig. 1). The fundamental component has maximum energy at 15.4 KHz. More than three harmonics are expressed. The highest and the lowest frequencies are 17.2 KHz and 11.9 KHz respectively. The start of the call is explosive and marked frequency modulated, reaching the maximum frequency and bandwidth of 5.3 KHz. This part of the call has duration of approximately 9.3 ms. The rest of the spectrogram (157.7 ms) of the alarm whilst represents uniform frequency plateau with maximum energy at 15.4 KHz and narrow bandwidth of 2.3 KHz.

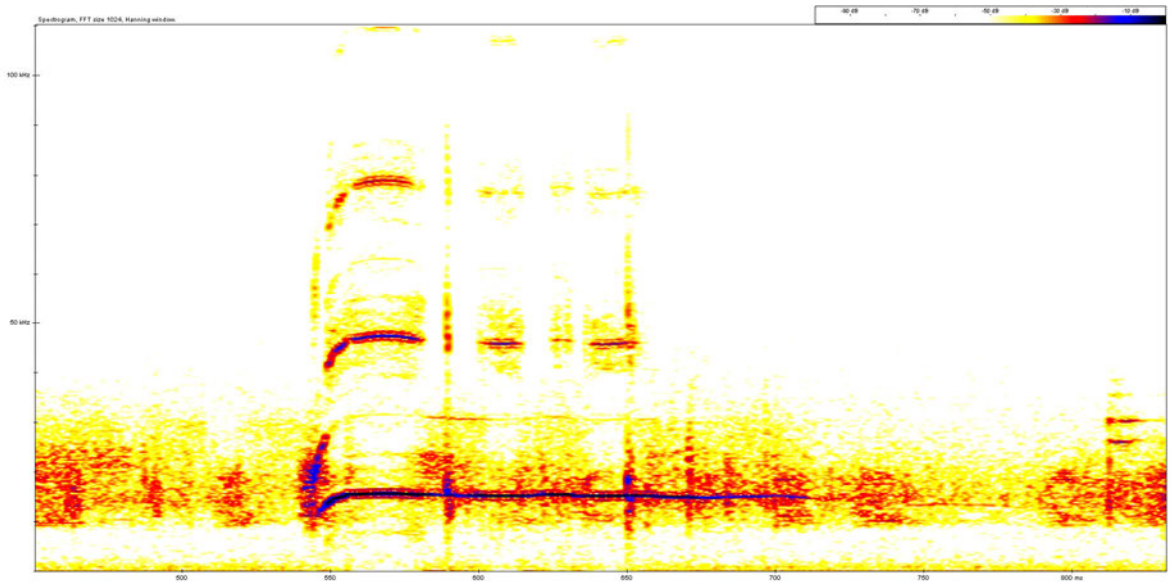

Fig. 1. Spectrogram of the alarm whilst of Guenter's vole *Microtus guentheri.*

Discussion

Up to now the alarm call characteristics and display of vocalizations in many rodent species are still not well studied.

The fundamental frequency of the alarm calls in these mammals vary from audible (3-18 KHz) to ultrasonic (25-60 KHz) produced by infants of a number of myomorph rodent species (Mandelli & Sales 2004), but apparently the ultrasonic vocalizations have not been detected from other rodents. For the most of the North American voles species studied by Colvin (1973), the frequency of the fundamental component decreased with age.

In the present communication we give for the first the main characteristics of registered alarm vocalization in Guenter's vole in response to the presence of human among

colony members. According to other studies (le Roux *et al.* 2002) the rodents can emit variable alarm calls depending on microhabitat preferences. In this context we must expect individual and inter-population variability of alarm vocal activity in Guenter's vole with relation to environmental factors.

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New records of myrmecophilous beetle *Paussus turcicus* (Coleoptera, Carabidae) in Southeastern Balkans

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Abstract. The rare myrmecophilous beetle *Paussus turcicus* I. Frivaldszky von Frivald, 1835 (Coleoptera, Carabidae) is reported in three new localities in Bulgaria and one in the European part of Turkey. It has been found in nests of the typical ant host *Pheidole pallidula* (Nylander, 1849) (Hymenoptera, Formicidae). It is reported for first time from Sakar and Eastern Rhodope Mountains in Bulgaria.

Key words: *Paussus turcicus*, Bulgaria, Turkey, new records.

Introduction

Subfamily Paussinae (with common names “ant nest beetles” and ”flanged bombardier beetles”) is represented by almost 800 species with range predominantly in tropical regions (Nagel 2009). Most of the species live obligatory together with ants and form close symphilic relationships with them. There are glandular hairs on the enlarged antennas of these beetles, secreting substances, which ants lick.

From genus *Paussus*, two species occur in Europe – *Paussus favieri* Fairmaire, 1851 and *Paussus turcicus* I. Frivaldszky von Frivald, 1835, the first of them occurs mainly in the Western Mediterranean.

Paussus turcicus was recorded in Bulgaria (Selimno, today’s Sliven) (I. Frivaldszky von Frivald 1835), at that time still part of the Ottoman Turkish empire. Until now the species has been recorded in several locations in South Bulgaria: Maslen nos, Strandzha Mountain, Sliven, Krichim, Sandanski (Guéorguiev & Guéorguiev 1995). It is known in Central Asia, the Middle East, Asia Minor, the Balkans (Nagel 2003). Besides the data for general distribution from Fauna Europaea (Vigna Taglianti 2004), particular locations of the species in the European part of Turkey have not been found. Typical host is the ant *Pheidole pallidula* (Nylander, 1849), but it was also recorded together with *Tetramorium semilaeve* André, 1883 and *Messor barbarus* (Linnaeus, 1767) (Nagel 1982) – they all are representatives of subfamily Myrmicinae.

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Material and methods

The material consists of 5 male and 4 female mature specimens of *Paussus turcicus*, collected by hand under stones from nests of *Pheidole pallidula*. Besides, one specimen was found out of a nest. The species is recorded in two localities on the territory of the Eastern Rhodopes, one in Sakar Mountain (Bulgaria) and one in the south-eastern part of Strandzha Mountain in Turkey in close proximity to the Black Sea coast. All four habitats have typical xerophytic features of the terrain where ant host occurs. Investigated specimens are kept in personal collections of authors, as well as in the collection of the National Museum of Natural History, BAS.

Results

New data of *P. turcicus* in Bulgaria and European part of Turkey are presented in this study:

***Paussus turcicus* I. Frivaldszky von Frivald, 1835**

New records: **Bulgaria**: Sakar Mt., Topolovgrad district, Ustremski manastir, 22-23.05.1995, 1 specimen, leg. I. Stoyanov & B. Guéorguiev (NMNH); East Rhodopes, Ivaylovgrad district, Meden buk, N41°23'01" E26°01'16", 125 m a.s.l., 04.05.2009, 2 males, 2 females), leg. A. Lapeva-Gjonova; East Rhodopes, Ivaylovgrad district, Svirachi, N41°28'38" E26°06'33", 298 m a.s.l., 04.05.2009, 1 male, 2 female, leg. A. Lapeva-Gjonova; **Turkey**: Vize district, N of Kıyıköy, N41°39'25" E28°05'08", 22 m a.s.l., 24.05.2010, 1 male, leg. A. Lapeva-Gjonova, 1 male, leg. R. Kostova.

These are first data about recording of this rare myrmecophilous species on the territory of Sakar Mountain and Eastern Rhodopes (Fig. 1) and it is a second report from the Rhodopes Massif. The first known finding (Krichim) is at the northern foot of the Rhodopes on the border with the Thracian Plain (Hieke & Wrase 1988).

New data supplements the information about the species range on the territory of South Bulgaria and European part of Turkey.

Fig. 1. *Paussus turcicus* with ant host *Pheidole pallidula* licking the glandular hairs.

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First records of Laboulbeniales (Ascomycota) on ants (Hymenoptera: Formicidae) in Bulgaria

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Abstract. The myrmecophilous fungi *Rickia wasmannii* Cavara, 1899 and *Laboulbenia camponoti* S. W. T. Batra, 1963 (Ascomycota: Laboulbeniales) are reported for the first time from Bulgaria. *Rickia wasmannii* was found on *Myrmica scabrinodis* Nylander, 1846 ant workers (Hymenoptera: Formicidae) in South-eastern Bulgaria near to the Black Sea coast. This is the easternmost record of *Rickia wasmannii* in Europe. *Laboulbenia camponoti* was found in six different localities in Bulgaria on the carpenter ants *Camponotus aethiops* (Latreille, 1798), *C. universitatis* Forel, 1890 and *C. pilicornis* (Roger, 1859). *Camponotus aethiops* and *C. universitatis* are new hosts for the fungus. For both fungi species the known distribution and host ranges summarized. This is the first record of the ant species *Camponotus pilicornis* for the Bulgarian fauna.

Key words: ants, ant-associated fungi, Bulgaria, Laboulbeniales, *Laboulbenia*, *Rickia.*

Introduction

The ascomycetous order Laboulbeniales is a large group comprising about 2 000 species of obligatory ectoparasites whose basic body (thallus) develops on the integument of living arthropods (Santamaria 2001). Among the hosts of these fungi are mites (Acarina), millipedes (Diplopoda) and species of 10 different insect orders, 80% of which are terrestrial beetles (Coleoptera) of various families, 10% are flies, and the rest belong to other groups such as mole crickets (Orthoptera), termites (Isopoda), and ants (Formicidae) (Weir 1998, Santamaria 2001, Henk *et al.* 2003). The fungi form a rather inconspicuous haustorium under the host integument, through which they receive nutrients without seriously harming the insects. They spread via direct contact of individual hosts with mature thalli or through parasitic mites. Among the hymenopterans only ants are known as hosts of these fungi. Three species associated with ants belonging to order Laboulbeniales have been reported in Europe – *Rickia wasmannii* Cavara, 1899, *Laboulbenia formicarum* Thaxter, 1902 and *Laboulbenia camponoti* S.W.T. Batra, 1963 (Espadaler & Santamaria 2003, Herraiz & Espadaler 2007).

The genus *Rickia* comprises more than 145 species, distinguished by a multiseriate thallus in one layer (Weir 1998). *Rickia wasmannii* is a specialised ectoparasite related to ant species of the genus *Myrmica* Latreille: *M. rubra* (Linnaeus, 1758), *M. scabrinodis* Nylander, 1846, *M. sabuleti* Meinert, 1861, *M. specioides* Bondroit, 1918, *M. slovaca* Sadil,

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1952 and *M. vandeli* Bondroit, 1920 (Thaxter 1926; Espadaler & Suñer 1989; Tartally *et al.* 2007). The species was described by Cavara (1899) based on specimens collected in Lenz (Germany) on *Myrmica laevinodis* Nylander, 1846 (=*M. rubra* (Linnaeus, 1758)). Up to date, it has been reported mainly from Western and Central European countries, such as Austria, France, Germany, Italy, Spain, Switzerland, United Kingdom, Yugoslavia, Hungary and Romania (Santamaria *et al.* 1991, Tartally *et al.* 2007).

The genus *Laboulbenia* is the richest in species (near 600) of all Laboulbeniales. *Laboulbenia formicarum* infests different ant genera in North America and ant species of the genus *Lasius* (*L. neglectus* Van Loon, Boomsma & Andrásflvy, 1990 and *L. grandis* Forel, 1909) in Europe (Espadaler & Santamaria 2003, Herraiz & Espadaler 2007). The other species associated with ants *Laboulbenia camponoti* is known from three countries in the world: India (Batra 1963) where the type locality is (on *Camponotus* sp.), Spain (Balazuc *et al.* 1982; Espadaler & Blasco 1990) and Turkey (Espadaler & Lodos 1983). All identified ant hosts of *Laboulbenia camponoti* in Europe are carpenter ants from subgenus *Tanaemyrmex* – *Camponotus sylvaticus* (Olivier, 1792) and *C. pilicornis* (Roger, 1859) in Spain and *C. baldaccii* Emery, 1908 in Turkey.

Material and methods

The material of *Rickia wasmannii* was collected in the Strandzha Mountain (South-eastern Bulgaria). On 26.09.2009 and 19.04.2010 workers from one and the same nest found under a stone were collected manually, while on 19.04.2010 infested ants were additionally collected by a modified suction sampler (Partner GBV 325) in the investigated area. *Laboulbenia camponoti* was found in 5 localities in Southern Bulgaria where the Mediterranean climatic influence is enhanced and in 1 locality on the Northern Black Sea coast. The infested ants were preserved in 75% ethanol and a part of them were dry stuffed. A fine entomological needle was used to isolate fungal thalli which were later included in glycerol and observed under a microscope.

Results

***Rickia wasmannii* Cavara, 1899**: Malpighia 13: 182 (1899)

Material examined. Bulgaria: Strandzha Mountain, near Bliznak Village. (42°10'19"N, 27°18'34"E, 300 m), 26.09.2009, 19.04.2010, leg. A. Lapeva-Gjonova, host *Myrmica scabrinodis* (127 infested workers).

Fig. 1. Heavy infested worker of *Myrmica scabrinodis*.

Fig. 2. A mature thallus of *Rickia wasmannii.* Scale bar: 0.025 mm.

***Laboulbenia camponoti* S. W. T. Batra, 1963**: Amer. Jour. Bot. 50(10): 991 (1963).

Material examined. Bulgaria: Northern Black Sea coast, cape Kaliakra (43°22'2"N, 28°27'57"E, 25 m), 22.06.2008, leg. A. Lapeva-Gjonova, host *Camponotus aethiops* (Latreille, 1798) (4 infested workers); East Rhodopes Mountain, Avren Village (41°19'39"N, 25°43'6"E, 570 m), 22.07.2009, leg. A. Lapeva-Gjonova, host *Camponotus pilicornis* (5 workers); Ograzhden Mountain, near Gjurgevo Village. (41°28'58" N, 23° 8'59"E, 580 m), 6.04.2010, leg. A. Lapeva-Gjonova, host *Camponotus aethiops* (7 infested workers); Struma valley, Mikrevo Village (41°38'31"N, 23°9'51"E, 292 m), 12.02.2011, leg. A. Lapeva-Gjonova, host *Camponotus aethiops* (6 workers); Strandzha Mountain, Malko Tarnovo district, Propada locality (41°58'54" N, 27°29'32"E, 385 m), 27.04.2011, leg. A. Lapeva-Gjonova, hosts: *Camponotus aethiops* (2 infested workers) and *Camponotus universitatis* Forel (3 infested workers); Sakar Mountain, Svilengrad district, Matochina Village (41°51'6.67"N, 26°32'48.21"E, 167 m), 30.04.2011, leg. A. Lapeva-Gjonova, host: *Camponotus aethiops* (1 infested worker).

Fig. 3. Mature pairs of *Laboulbenia camponoti* on the head and pronotum of *Camponotus universitatis.*

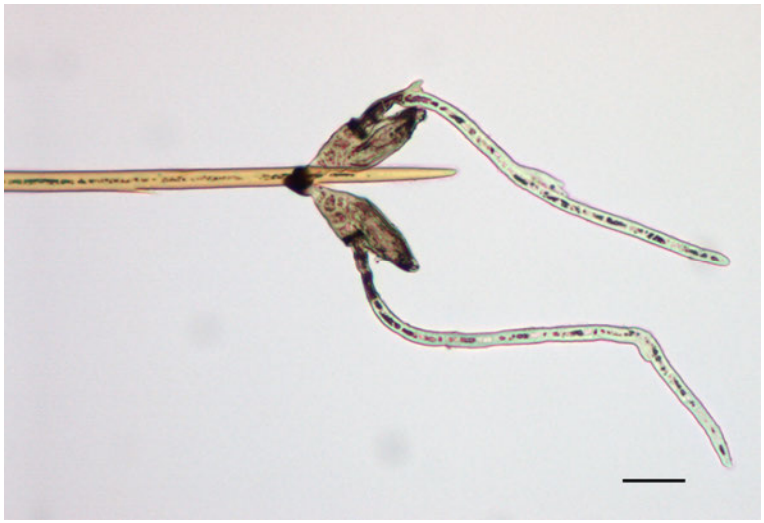

Fig. 4. A mature pair of *Laboulbenia camponoti* on an abdominal seta of *Camponotus aethiops* . Scale bar: 0.025 mm.

Discussion

In a study of the myrmecofauna of Strandzha Mountain the parasitic fungus *Rickia wasmannii* was found on *Myrmica scabrinodis* workers in the Bulgarian part of the mountain. This is the first such report for Bulgaria and the easternmost point in Europe where *Rickia wasmannii* is distributed. It is possible that the fungus is also found in the Turkish part of the mountain where the ant host having Transpalaearctic distribution is also spread. The habitat has the traits of areas typically inhabited by the host – in close proximity to marshy terrain with hygrophilous vegetation, which corroborates the other observations (Santamaria 2001) on the preferences of this group of parasitic fungi. Ants were heavily infested on the head, thorax and legs and less so on the abdomen (Figs 1 and 2). Not all collected workers were infested with fungi. The fungus was absent on lightly pigmented workers which were probably recent imagined. Other ant species were also collected in the area, but *Rickia wasmannii* was found only on *Myrmica scabrinodis* workers. No impact of the fungus on the state of the nest has been observed over a period of nearly 7 months. It is expected that the fungus will be found on other ant species in Bulgaria as well, since all of its known hosts are present in the country.

The ectoparasitic fungus *Laboulbenia camponoti* S.W.T. Batra is reported for the first time in Bulgaria. It has been previously known only from Spain in Europe. All six findings of *Laboulbenia camponoti* on ants in the country are from regions where the Mediterranean climatic influence is strongly expressed – Southern Bulgaria and the Black Sea coast. The nests of the hosts *Camponotus aethiops* and *C. pilicornis* were under stones in areas with xerophytous vegetation. The third established host for *Laboulbenia camponoti* in Bulgaria is a social parasitic ant *Camponotus universitatis* from a nest of *C. aethiops.* Strandzha Mountain (Propada) is an only known locality for this rare and threatened ant species (included in IUCN Red list; status: VU D2) in Bulgaria (Lapeva-Gjonova & Kiran, unpublished). Only workers were found infested with the ectoparasitic fungus and the thalli were located on all parts of the ant bodies (Figs 3 and 4). In comparison with *Rickia wasmannii* the thalli were not so abundant. *Camponotus aethiops* and *Camponotus universitatis* are new hosts of *Laboulbenia camponoti.*

Camponotus pilicornis is a new record for the ant fauna in Bulgaria and its locality in the Rhodopes is the easternmost point of its distribution in Europe. It has been previously reported from Southern European countries – Spain, Portugal, France, Italy,

Macedonia (Radchenko 2007, Karaman 2009, Casevitz-Weulersse & Galkowski 2009). The studied material includes 1 gyne and 6 workers. Thus, there are already a total of 17 species of the genus *Camponotus* recorded for the territory of Bulgaria (Lapeva-Gjonova *et. al.* 2010, Lapeva-Gjonova 2011, Lapeva-Gjonova & Kiran, unpublished).

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Ricania japonica Melichar, 1898 – a representative of family Ricaniidae (Homoptera, Fulgoromorpha), new to the fauna of Bulgaria

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Abstract. For first time there is a new record of a representative of family Ricaniidae on the territory of Bulgaria. The species *Ricania japonica* Melichar, 1898 was collected in Southeast Bulgaria near to the Black Sea coast.

Key words: Bulgaria, Ricaniidae, new record.

Introduction

Family Ricaniidae Amyot et Serville, 1843 includes approximately 400 species in over 40 genera, occurring predominantly in tropics and subtropics of eastern hemisphere (Gnezdilov 2009).

Two species of the family are known in Europe, both from the nominate genus *Ricania* Germar, 1818. *Ricania hedenborgi* Stal, 1865, is spread in the Palaearctic and Afrotropic regions. In the Palaearctic it occurs in North Africa and the Mediterranean, reaching up to Armenia to the east. It is known in the northern Aegean islands of Greece and Southeast Anatolia (Demir 2009, Nast 1987).

The second species from the genus and family in Europe is *R. japonica* Melichar, 1898. According to Nast (1987), the species has been introduced as a pest on cultivated plants in Georgia and Ukraine (Crimea). The species has been found along the eastern Black Sea coast of Turkey (Rize) (Demir 2009).

The species is a polyphage on shrub and tree vegetation and is often recorded on agricultural crops (*Vitis vinifera* L., *Rubus* sp., *Camelia sinensis* (L.), *Ficus carica* L., *Phaseolus vulgaris* L., *Cucumis sativus* L., *Lycopersicum esculentum* L.) (Demir 2009).

A representative of family Ricaniidae – *Ricania japonica* is recorded for the first time on the territory of Bulgaria.

Material and methods

The investigated mature specimens were collected at the mouth of Veleka river in the most Southeastern part of Bulgaria, nearly 200 m from the Black Sea coast. Two ♀ and two ♂ were collected on a light tower and another 1 ♀ on automatic light trap during the night.

For collecting at light trapping two types of devices were used: "light tower" and light traps. The tower consists of large white sheet (3x3 m) on the ground and transparent cylinder containing 160 W MBFT fluorescent bulb and 8 W "blacklight" tube supplied by generator. The light trap has two blacklight 8 W tubes attached to vertical transparent plastics supplied by a battery. All devices have run during the whole night.

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Results

***Ricania japonica* Melichar, 1898**

Material examined: Bulgaria, South Black Sea coast, Veleka river mouth, N42°03'52" E27°58'15", 14.08.2010, 2♀, 2♂ leg. I. Gjonov, 1♀ leg. B. Zlatkov.

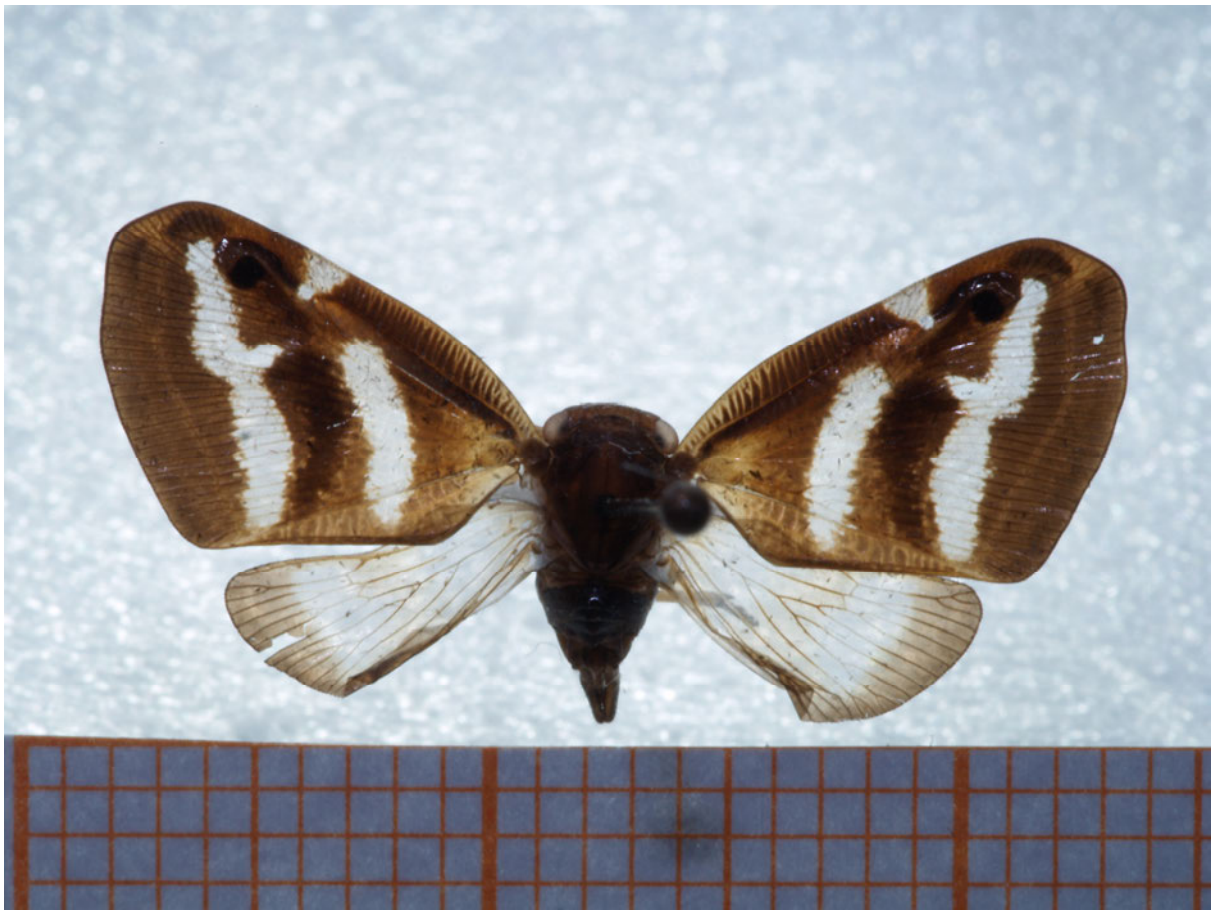

Fig. 1. *Ricania japonica*, female.

Discussion

After adding of Ricaniidae to the list of families of Bulgarian Fulgoromorpha, all 12 families represented in continental Europe are known in Bulgaria as well.

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Check list of the Bulgarian minor freshwater snails (Gastropoda: Risooidea) with some ecological and zoogeographical notes

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Abstract. A synopsis and critical overview of all the literature on the freshwater minor snails (Gastropoda: Risooidea) of Bulgaria was made. A check list of 49 species known till now in the country with the ecological and zoogeorgraphical categories to which the species belong was provided.
Key words: Hydrobiidae, species, diversity, Bulgaria, Balkans.

Introduction

The beginning of the research on the freshwater minor snails in Bulgaria (Gastropoda: Risooidea: *Hydrobiidae*: *Tateinae*, *Belgrandiinae*, *Amnicolinae*, *Hydrobiinae*) started with the work of Wagner (1927). It continued till present with the papers of Glöer & Georgiev (2011), Georgiev & Glöer (2011), Georgiev (2011a, 2011b, 2011c) when it was evident that the country is a hot spot of species radiation, having a lot of endemic species and even few endemic genera.

The aim of this study was to collect all the information on the Bulgarian genera and species of the minor freshwater snails published, and to provide an adequate check list of species known till now occurring in the country which will help the future studies.

The check list was made with a critical overview on all the published papers for Bulgaria (Wagner 1927, Angelov 1959, 1965, 1967, 1972, 1976, 2000, Pinter 1968, Radoman 1983, Hubenov 2005, 2006, Glöer & Pešić 2006, Irikov & Georgiev 2008, Glöer & Georgiev 2009, 2011, Georgiev & Glöer 2011, Georgiev 2009, 2011a, 2011b, 2011c) and also a few summary works considering this group of aquatic snails on larger areas (Radoman 1983, Hershler & Ponder 1984, Kabat & Hersler 1993, Glöer 2002, Arconada & Ramos, 2003). The classification of Glöer (2002) was accepted for this paper.

As it was known that all the Bulgarian species from this taxonomic group are rheophilic species we divided the ecological groups considering the habitats: rivers and streams (RS), springs (SP), and cave running waters (CA). The zoogeographical categories were as follows: invasive (IN), European (EU), endemic for a particular geographic region (EG), local endemic (EL).

Check list of the species

Family ***Hydrobiidae*** Troschel, 1857

Subfamy ***Tateinae*** Thiele, 1925

Potamopyrgus Stimpson, 1865

Potamopyrgus antipodarum (J. E. Gray, 1843) – IN, RS

Subfamily ***Belgrandiinae*** De Stefani, 1877

Belgrandiella (A. Wagner, 1927)

Belgrandiella hessei A. Wagner, 1927 – EL, CA

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Belgrandiella angelovi Pinter, 1968 – EG, SP
Belgrandiella pussila Angelov, 1959 – EL, CA
Belgrandiella bulgarica Angelov, 1972 – EL, CA
Belgrandiella bureschi Angelov, 1976 – EL (EG?), SP (CA?)
Belgrandiella zagoraensis Glöer & Georgiev, 2009 – EG, SP
Belgrandiella dobrostanica Glöer & Georgiev, 2009 – EG, SP
Belgrandiella bachkovoensis Glöer & Georgiev, 2009 – EL (EG?), SP
Belgrandiella pandurskii Georgiev, 2011 – EG, SP and CA
Belgrandiella stanimirae Georgiev, 2011 – EL (EG?), CA (SP?)

Pontobelgrandiella Radoman, 1978
Pontobelgrandiella nitida (Angelov, 1972) – EL, CA

Bythiospeum Bourguignat, 1882
Bythiospeum bureschi (A. Wagner, 1927) – EL, CA
Bythiospeum copiosus (Angelov, 1972) – EG, CA
Bythiospeum schniebsae Georgiev, 2011 – EL, CA

Devetakia Georgiev & Glöer, 2011
Devetakia krushunica Georgiev & Glöer, 2011 – EL, CA
Devetakia pandurskii Georgiev & Glöer, 2011 – EL, CA

Cavernisa Radoman, 1978
Cavernisa zaschevi (Angelov, 1959) – EL, CA

Iglica Wagner, 1927
Iglica acicularis Angelov, 1959 – EL, CA

Hauffenia Pollonera, 1898
Hauffenia lucidula (Angelov, 1967) – EL, CA

Insignia Angelov, 1972
Insignia macrostoma Angelov, 1972 – EL, CA

Plagigeyeria Tomlin, 1930
Plagigeyeria procerula (Angelov, 1965) – EL, CA

Radomaniola Szarowska, 2006
Radomaniola bulgarica Glöer & Georgiev, 2009 – EG, SP
Radomaniola rhodopensis Glöer & Georgiev, 2009 – EG, SP

Grossuana Radoman, 1973
Grossuana cordeanui (Grossu, 1946) – EG, SP
Grossuana thracica Glöer & Georgiev, 2009 – EG, SP
Grossuana angeltsekovi Glöer & Georgiev, 2009 – EG, SP

Balkanica Georgiev, 2011
Balkanica yankovi Georgiev, 2011 – EL, CA

Sadleriana Clessin, 1890
Sadleriana virescens bulgarica (Wagner, 1927) ? – EL, SP

Remark: this species was not proven anatomically and is with unclear taxonomical status.

Subfamily ***Amnicolinae*** Tryon, 1862

Bythinella Moquin-Tandon, 1856
Bythinella hansboetersi Glöer & Pešić, 2006 – EL, SP
Bythinella markovi Glöer & Georgiev, 2009 – EL, CA
Bythinella srednogorica Glöer & Georgiev, 2009 – EL, SP
Bythinella ravnogorica Glöer & Georgiev, 2009 – EL, SP
Bythinella walkeri Glöer & Georgiev, 2009 – EL, SP
Bythinella gloeeri Georgiev, 2009 – EL, CA
Bythinella stoychevae Georgiev, 2011 – EL, CA
Bythinella aneliae Georgiev & Stoycheva, 2011 – EL, SP

Bythinella valkanovi Glöer & Georgiev, 2011 – EL, SP
Bythinella smolyanica Glöer & Georgiev, 2011 – EL, SP
Bythinella elenae Glöer & Georgiev, 2011 – EL, SP
Bythinella dedovi Glöer & Georgiev, 2011 – EL, SP
Bythinella izvorica Glöer & Georgiev, 2011 – EL, SP
Bythinella margritae Glöer & Georgiev, 2011 – EL, SP
Bythinella kleptuzica Glöer & Georgiev, 2011 – EL, SP
Bythinella rhodopensis Glöer & Georgiev, 2011 – EL, SP
Bythinella dierckingi Glöer & Georgiev, 2011 – EL, SP
Bythinella slaveyae Glöer & Georgiev, 2011 – EL, SP
Bythinella angelovi Glöer & Georgiev, 2011 – EL, SP

Subfamily ***Hydrobiinae*** Troschel, 1857

Hydrobia Hartman, 1821

Hydrobia acuta Draparnaud, 1805 – EU, RS

As a result of the synopsis made we register a total of 49 species of minor freshwater snails, and one species with unclear taxonomical status. The dominate genera were *Bythinella* and *Belgrandiella* with 19 (39% from all) and 10 (20% from all) species respectively. All the rest of the genera were only with 1 to 3 known species.

From all species 96% were endemics, with 5 endemic genera (*Pontobelgrandiella*, *Cavernisa*, *Insignia*, *Devetakia*, and *Balkanica*), one species was with European distribution and one was invasive (2% each).

Most of the species known till now inhabit spring waters (28; 57%), and cave running waters (20; 41%) from which some representatives of the genus *Belgrandiella* inhabit both habitats. Only two species occur in rivers and streams (4%).

On the basis of the current knowledge of this group of snails we consider that if future studies continued in detail the list of species could double or triple as many of the caves and springs are still not investigated in large territories as Stara Planina, Kraishte, Vitosha, Rila, and Pirin mountains.

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Checklist of the Bulgarian Bruchinae (Coleoptera: Chrysomelidae)

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Abstract. Checklist of Bulgarian Bruchinae (Coleoptera: Chrysomelidae) based on published data till 2011 is presented. Eighty-five species belonging to nine genera are listed.

Key words: Bruchinae, Coleoptera, Bulgaria, checklist.

Introduction

The seed-beetles (subfamily Bruchinae) are recently placed in the family Chrysomelidae (Coleoptera), though they have been treated as a separate family for a long time.
The subfamily has a worldwide distribution, with the highest species diversity in tropical and subtropical zones (Borowiec 1987a). Bruchines are of a great economic importance, because several species are serious agricultural and stored products pests. A great majority of the known species feed in their larval stage on pods and seeds of Fabaceae; only about 15% of seed-beetles develop in fruits of plants of other 32 families (Lukjanovitch & Ter-Minassian 1957; Borowiec 1987a; Delobel & Delobel 2007).
The first data on Bulgarian Bruchinae, mostly agricultural pests, could be found in entomological journals, annual reports and bulletins from the beginning of the 20th century, most of which are cited by Buresh & Lazarov (1956). More intensive investigations on taxonomy and biology of Bulgarian seed-beetles were carried out in the recent 50 years (Popov 1968; Borowiec 1980, 1983, 1984, 1986, 1987b; Wendt 1984; Decelle & Lodos 1989; Borowiec & Anton 1993; Delobel & Delobel 2007). Staneva (1982), Chochev (1988), Chochev & Chochev (1991), Stojanova (2007, 2010), Tomov *et al.* (2007), Guéorguiev (2001), Guéorguiev & Ljubomirov (2009) also contributed to this knowledge with some regional studies.

Material and Methods

The published information on Bruchinae of Bulgarian fauna till 2011 is summarized. The checklist comprises the following data: valid taxa name, published records, synonyms in records. Valid names are given according to Anton (2010) and Fauna Europaea (Audisio 2004).

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Checklist of Bulgarian Bruchinae

The checklist presents 85 species belonging to nine genera.

Chrysomelidae Latreille, 1802
Subfamily **Bruchinae** Latreille, 1802
Tribe **Amblycerini** Bridwell, 1932
Subrtibe **Spermophagina** Borowiec, 1987

Spermophagus Schönherr, 1833

S. calystegiae (Lukjanovitsh et Ter-Minassian, 1957): Borowiec (1983, 1987b), Decelle (1983), Delobel & Delobel (2007), Anton (2010)

S. confusus Borowiec, 1986: Borowiec (1986, 1987b), Decelle & Lodos (1989), Delobel & Delobel (2007), Anton (2010)

S. kuesteri (Schilsky, 1905): Popov (1968), Borowiec (1983, 1987b), Wendt (1984), Chochev (1988), Chochev & Chochev (1991), Borowiec & Anton (1993), Delobel & Delobel (2007), Gueorguiev & Ljubomirov (2009), Anton (2010)

S. sericeus (Geoffroy, 1785): Popov (1968), Borowiec (1983, 1987b), Wendt (1984), Chochev (1988), Chochev & Chochev (1991), Guéorguiev (2001), Delobel & Delobel (2007), Anton (2010)

S. variolosopunctatus Gyllenhal, 1833: Borowiec (1983, 1986), Decelle (1983), Wendt (1984)

Zabrotes Horn, 1885

Z. subfasciatus (Boheman, 1833): Anton (2010)

Tribe **Bruchini** Latreille, 1802
Subtribe **Acanthoscelidina** Bridwell, 1946

Acanthoscelides Schilsky, 1905

A. obtectus (Say, 1831): Stanev (1958), Popov (1968), Wendt (1984), Borowiec (1983, 1987b), Tomov *et al.* (2007), Delobel & Delobel (2007), Anton (2010)

A. pallidipennis (Motschoulski, 1874): Decelle (1979), Borowiec (1980, 1983, 1987b), Wendt (1981, 1984), Borowiec & Anton (1993), Delobel & Delobel (2007), Anton (2010)

Bruchidius Schilsky, 1905

Br. annulicornis Allard, 1868: Anton (2010)

Br. astragali (Boheman, 1829): Delobel & Delobel (2007), Anton (2010)

Br. biguttatus (Olivier, 1795): Borowiec (1983, 1987b), Wendt (1984), Chochev (1988), Delobel & Delobel (2007), Anton (2010)

Br. bimaculatus (Olivier, 1795): Markovitch (1909: as *Bruchus variegates*), Popov (1968), Borowiec (1983, 1987b), Wendt (1984), Chochev & Chochev (1991), Borowiec & Anton (1993), Guéorguiev (2001), Delobel & Delobel (2007), Anton (2010)

Br. borowieci (Anton, 1998): Delobel & Delobel (2007), Anton (2010)

Br. calabrensis Blanchard, 1844: Anton (2010)

Br. canescens Motschulsky, 1874: Anton (2010)

Br. caninus (Kraatz, 1869): Wendt (1984), Borowiec (1987b), Delobel & Delobel (2007), Anton (2010)

Br. canus (Germar, 1824): Borowiec (1987b), Borowiec & Anton (1993)

Br. cinerascens (Gyllenhal, 1833): Borowiec (1983, 1987b), Wendt (1984), Delobel & Delobel (2007), Anton (2010)

Br. cisti (Fabricius, 1775): Wendt (1984), Borowiec (1987b), Chochev (1988), Chochev & Chochev (1991), Borowiec & Anton (1993), Delobel & Delobel (2007), Anton (2010)

Br. corsicus Baudi di Selve, 1890: Anton (2010)

Br. dispar (Gyllenhal, 1833): Popov (1968), Borowiec (1983, 1987b), Wendt (1984), Chochev (1988), Chochev & Chochev (1991), Guéorguiev (2001), Delobel & Delobel (2007), Anton (2010)

Br. foveolatus (Gyllenhal, 1833): Joakimov (1904), Borowiec (1983: *as Bruchidius grandicornis*; 1987b), Wendt (1984), Chochev (1988), Chochev & Chochev (1991), Borowiec & Anton (1993), Guéorguiev (2001), Delobel & Delobel (2007), Anton (2010)

Br. holosericeus (Schönherr, 1832): Popov (1968), Borowiec (1983, 1987b), Wendt (1984), Chochev (1988), Chochev & Chochev (1991), Delobel & Delobel (2007), Anton (2010)

Br. imbricornis (Panzer, 1795): Popov (1968), Borowiec (1983, 1987b), Wendt (1984), Chochev (1988), Delobel & Delobel (2007), Anton (2010)

Br. lineatus (Allard, 1868): Wendt (1984), Borowiec (1983, 1984, 1987b), Borowiec & Anton (1993), Delobel & Delobel (2007), Anton (2010)

Br. lividimanus Gyllenhal, 1833: Anton (2010)

Br. lutescens (Blanchard, 1844): Borowiec (1984, 1987b), Decelle & Lodos (1989), Borowiec & Anton (1993), Delobel & Delobel (2007), Anton (2010)

Br. marginalis (Fabricius, 1776): Delobel & Delobel (2007), Anton (2010)

Br. martinezi (Allard, 1868): Borowiec (1983, 1987b), Borowiec & Anton (1993)

Br. mordelloides (Baudi, 1886): Wendt (1984), Borowiec (1987b), Borowiec & Anton (1993), Delobel & Delobel (2007), Anton (2010)

Br. mulsanti (Brisout, 1863): Borowiec (1983, 1987b), Wendt (1984), Chochev (1988), Borowiec & Anton (1993), Delobel & Delobel (2007), Anton (2010)

Br. murinus (Boheman, 1829): Borowiec (1983, 1987b), Wendt (1984), Chochev (1988), Chochev & Chochev (1991), Borowiec & Anton (1993), Delobel & Delobel (2007), Anton (2010)

Br. nanus (Germar, 1824): Joakimov (1904), Borowiec (1983, 1987b), Wendt (1984), Chochev (1988), Delobel & Delobel (2007), Anton (2010)

Br. nudus (Allard, 1868): Borowiec (1983, 1987b), Wendt (1984), Delobel & Delobel (2007)

Br. obscuripes (Gyllenhal, 1839): Wendt (1984), Borowiec (1987b), Delobel & Delobel (2007), Anton (2010)

Br. olivaceus Germar, 1824: Anton (2010)

Br. pauper (Boheman, 1829): Wendt (1984), Borowiec (1987b), Delobel & Delobel (2007)

Br. perparvulus (Boheman, 1839): Wendt (1984), Guéorguiev (2001)

Br. picipes (Germar, 1824): Delobel & Delobel (2007), Anton (2010), Borowiec (1983: as *Bruchidius tarsalis*; 1987b)

Br. poecilus (Germar, 1824): Borowiec (1983, 1987b), Wendt (1984), Chochev (1988), Delobel & Delobel (2007), Anton (2010)

Br. poupillieri (Allard, 1868): Delobel & Delobel (2007), Anton (2010)

Br. pusillus (Germar, 1824): Borowiec (1987b), Borowiec & Anton (1993), Delobel & Delobel (2007), Anton (2010)

Br. pygmaeus (Boheman, 1833): Borowiec (1983, 1987b), Delobel & Delobel (2007), Anton (2010)

Br. quinqueguttatus (Olivier, 1795): Borowiec (1983, 1987b), Wendt (1984), Chochev (1988), Decelle & Lodos (1989), Borowiec & Anton (1993), Guéorguiev (2001), Delobel & Delobel (2007), Anton (2010)

Br. seminarius (Linnaeus, 1767): Borowiec (1983, 1987b), Wendt (1984), Chochev (1988), Chochev & Chochev (1991), Delobel & Delobel (2007), Anton (2010)

Br. sericatus (Germar, 1824): Borowiec (1983, 1987b), Wendt (1984), Chochev (1988), Delobel & Delobel (2007), Anton (2010)

Br. siliquastri Delobel, 2007: Stojanova *et al.* (2011)

Br. stylophorus (Daniel, 1904): Borowiec (1983), Wendt (1984), Chochev (1988)

Br. terrenus (Sharp, 1886): Stojanova (2010)
Br. trifollii (Motschulsky, 1874): Anton (2010)
Br. tuberculatus (Hochhut, 1847): Hoffmann (1945), Borowiec (1983, 1987b), Wendt (1984), Chochev (1988), Decelle & Lodos (1989), Borowiec & Anton (1993), Delobel & Delobel (2007), Anton (2010)
Br. unicolor Olivier, 1795: Delobel & Delobel (2007), Anton (2010)
Br. varipes (Boheman, 1839): Delobel & Delobel (2007), Anton (2010)
Br. varipictus Motschulsky, 1874: Borowiec (1987b), Anton (2010)
Br. varius (Olivier, 1795): Joakimov (1904), Wendt (1984), Borowiec (1983: as *Br. fulvicornis*; 1987b, also as *Br. fulvicornis*), Chochev (1988), Borowiec & Anton (1993), Delobel & Delobel (2007), Anton (2010)
Br. villosus (Fabricius, 1792): Popov (1968), Borowiec (1983, 1987b), Wendt (1984), Chochev (1988), Chochev & Chochev (1991), Borowiec & Anton (1993), Delobel & Delobel (2007)**,** Anton (2010)
Br. virescens (Boheman, 1839): Popov (1968), Borowiec (1983)

Callosobruchus Pic, 1902
C. chinensis (Linnaeus, 1758): Tomov *et al.* (2007)
C. maculatus (Fabricius, 1775): Stanev (1958: as *Callosobruchus quadrimaculatus*), Staneva (1982), Egorov & Ter-Minassian (1983), Tomov *et al.* (2007)

Megabruchidius Borowiec, 1984
M. tonkineus (Pic, 1904): Stojanova (2007), Yus Ramos (2009)

Paleoacanthoscelides Borowiec, 1984
P. gilvus (Gyllenhal, 1839): Borowiec (1983: as *Acanthoscelides gilvus*; 1987b), Wendt (1984: as *Bruchidius gilvus*), Borowiec & Anton (1993), Delobel & Delobel (2007), Anton (2010)

Subtribe **Bruchina** Latreille, 1802

Bruchus Linnaeus, 1767
B. affinis Frölich, 1799: Wendt (1984), Borowiec (1983, 1987b), Chochev (1988), Chochev & Chochev (1991), Delobel & Delobel (2007), Anton (2010)
B. atomarius (Linnaeus, 1761): Markovitch (1909: as *Bruchus granarius*), Buresh & Lazarov (1956), Popov (1968), Borowiec (1983, 1987b), Wendt (1984), Chochev & Chochev (1991), Delobel & Delobel (2007), Anton (2010)
B. brachialis Fahraeus, 1839: Popov (1968), Borowiec (1983, 1987b), Wendt (1984), Chochev (1988), Delobel & Delobel (2007), Anton (2010)
B. emarginatus Allard, 1868: Borowiec (1983, 1987b), Wendt (1984), Chochev (1988), Chochev & Chochev (1991), Delobel & Delobel (2007), Anton (2010)
B. ervi Frölich, 1799: Audisio (2004)
B. griseomaculatus Gyllenhal, 1899: Audisio (2004)
B. hamatus Miller, 1881: Borowiec (1983, 1987b), Wendt (1984), Chochev (1988), Decelle & Lodos (1989), Delobel & Delobel (2007), Anton (2010)
B. laticollis Boheman, 1833: Joakimov (1904), Popov (1968), Borowiec (1983, 1987b), Wendt (1984), Chochev (1988), Delobel & Delobel (2007), Anton (2010)
B. lentis Frölich, 1799: Joakimov (1904), Markovitch (1909), Buresh & Lazarov (1956), Borowiec (1983, 1987b), Wendt (1984), Delobel & Delobel (2007), Anton (2010)
B. libanensis (Zampetti, 1993): Delobel & Delobel (2007), Anton (2001, 2010)
B. loti Paykull, 1800: Popov (1968), Borowiec (1983, 1987b), Wendt (1984), Chochev (1988), Chochev & Chochev (1991), Delobel & Delobel (2007), Anton (2010)

B. luteicornis Illiger, 1794: Buresh & Lazarov (1956), Popov (1968), Borowiec (1983, 1987b), Wendt (1984), Chochev (1988), Delobel & Delobel (2007), Anton (2010)

B. occidentalis Lukjanovitsh et Ter-Minassian, 1957: Delobel & Delobel (2007), Anton (2001, 2010)

B. pisorum (Linnaeus, 1758): Joakimov (1904: as *Bruchus pisi*), Markovitch (1909: as *Bruchus pisi*), Buresh & Lazarov (1956: as *Bruchus pisi*), Angelov (1960: as *Bruchus pisi*), Grigorov (1960: as *Bruchus pisi*), Popov (1968), Borowiec (1983, 1987b), Wendt (1984), Chochev (1988), Chochev & Chochev (1991), Borowiec & Anton (1993), Delobel & Delobel (2007), Anton (2010)

B. poupillieri (Allard, 1868): Anton (2001)

B. rufimanus Boheman, 1833: Buresh & Lazarov (1956), Popov (1968), Borowiec (1983, 1987b), Wendt (1984), Chochev (1988), Borowiec & Anton (1993), Delobel & Delobel (2007), Anton (2010)

B. rufipes Herbst, 1783: Joakimov (1904), Markovitch (1909), Borowiec (1983, 1987b), Wendt (1984), Chochev (1988), Chochev & Chochev (1991), Anton (2001, 2010)

B. signaticornis Gyllenhal, 1833: Wendt (1984), Borowiec (1987b), Delobel & Delobel (2007), Anton (2010)

B. tristiculus Fahraeus, 1833: Joakimov (1904), Popov (1968), Borowiec (1983, 1987b), Wendt (1984), Chochev (1988), Chochev & Chochev (1991), Delobel & Delobel (2007), Anton (2010)

B. tristis Boheman, 1833: Borowiec (1983, 1987b), Wendt (1984), Chochev (1988), Chochev & Chochev (1991), Delobel & Delobel (2007), Anton (2010)

B. ulicis Mulsant et Rey, 1858: Anton (2010)

B. venustus Fahraeus, 1839: Wendt (1984), Borowiec (1987b), Delobel & Delobel (2007), Anton (2001, 2010)

B. viciae Olivier, 1795: Popov (1968), Wendt (1984), Borowiec (1983, 1987b), Chochev (1988), Chochev & Chochev (1991), Borowiec & Anton (1993), Guéorguiev (2001), Delobel & Delobel (2007), Anton (2010)

Tribe **Pachymerini** Bridwell, 1929

Subtribe **Caryedontina** Bridwell, 1929

Caryedon Schönherr, 1823

C. germari Küster, 1845: Decelle & Lodos (1989), Anton (2010)

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First report of *Idiopterus nephrelepidis* Davis, 1909 (Hemiptera: Aphididae) from Bulgaria

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Abstract. *Idiopterus nephrelepidis* (Hemiptera: Aphididae) is reported for the first time in Bulgaria on ornamental ferns in four greenhouses in Sofia and Varna. Dense colonies of apterous viviparous females and larvae were observed. The established host plants are *Nephrolepis exaltata*, *Asplenium nidus* and *Pteris cretica*. Infested ferns exhibit leaf deformation. The aphids were reared in laboratory conditions for four months. A morphometric study of apterae was carried out. Taking into account the presence of host plants of *I. nephrelepidis* in Bulgaria which are native to the local flora and the reports of the aphid from the Balkan area, it may spread in the country outdoors.

Key words: *Idiopterus nephrelepidis*, Aphididae, greenhouse, alien pest, Bulgaria.

Introduction

Aphids are among the most important pests on greenhouse ornamentals. In recent years, Bulgaria has intensively imported exotic ornamental plant species from countries in Europe, the Near and Middle East, South America and Africa. Alien pests enter the country on their hosts. One particular example is the species *Idiopterus nephrelepidis*.

Materials and Methods

The aphids were collected in 2009 and 2010 on ornamental ferns in greenhouses in Varna and Sofia, Bulgaria. The insects were fixed in 70% ethanol. Permanent microscope slides were prepared, using 10% KOH for maceration, chloralphenol for brightening, and Berlese's medium for mounting. The slides are deposited in the collections of the Department of Zoology and Anthropology of Sofia University and the Department of Plant Pathology and Chemistry of University of Forestry.

The following length measurements were taken from 28 apterous viviparous females, collected form *Asplenium nidus* L., in a greenhouse in Varna: body (LB); body width (WB); third (III), fourth (IV), and fifth (V) antennal segment; basal part of antennal segment VI (bVI) and processus terminalis (PrT); siphunculus (LSI); siphuncular width (WSI); last rostral segment (LRS); second joint of hind tarsus (IIHT); hind femur (HF); and cauda (CA). Descriptive statistics were carried out.

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Results

Idiopterus nephrelepidis was first detected in Bulgaria in a private greenhouse in Sofia on 13.03.2009 on *Nephrolepis exaltata* (L.) Schott. and on 13.07.2009 in a greenhouse in Varna on *Asplenium nidus* L. Both plants were imported from the Netherlands. Dense colonies of apterous females and larvae were observed on the youngest and most tender leaves. In the habitat in Varna, single specimens were also found on *Platycerium bifurcatum* (Cav.) C. Chr. In 2010 the species was also detected at two more locations in Sofia – on August 6th in a private greenhouse on *Nephrolepis exaltata* and on November 11th in a garden center for ornamental plants on *Pteris cretica* L.

Apterous viviparous females (Fig. 1) are black in colour, with pale antennae, legs and dorsal hairs. The first two antennal segments, the cauda and the basal part of the siphunculi are dark. The brief description below follows Heie (1994). Morphometric data of the main features (Table 1) are included. Body length 1 – 1.3 mm. Antennae six segmented, longer than body. Usually 2 – 3 rhinaria on proximal half of III. PrT 3.9 – 5.3 x bIV, longer than III. Head with small spinules. Antennal tubercles well developed, with almost parallel inner sides. LRS 1.7 – 2.4 x IIHT, with 6 accessory hairs. Dorsal abdominal cuticle is wrinkled, with indistinct reticulation formed by small spinules. Dorsal hairs with fan-shaped apices, arising from tuberculate bases. Siphunculi cylindrical, with flange. SI 1.7 – 2.5 x CA. Cauda is triangular, slightly constricted in the middle, with 5 hairs.

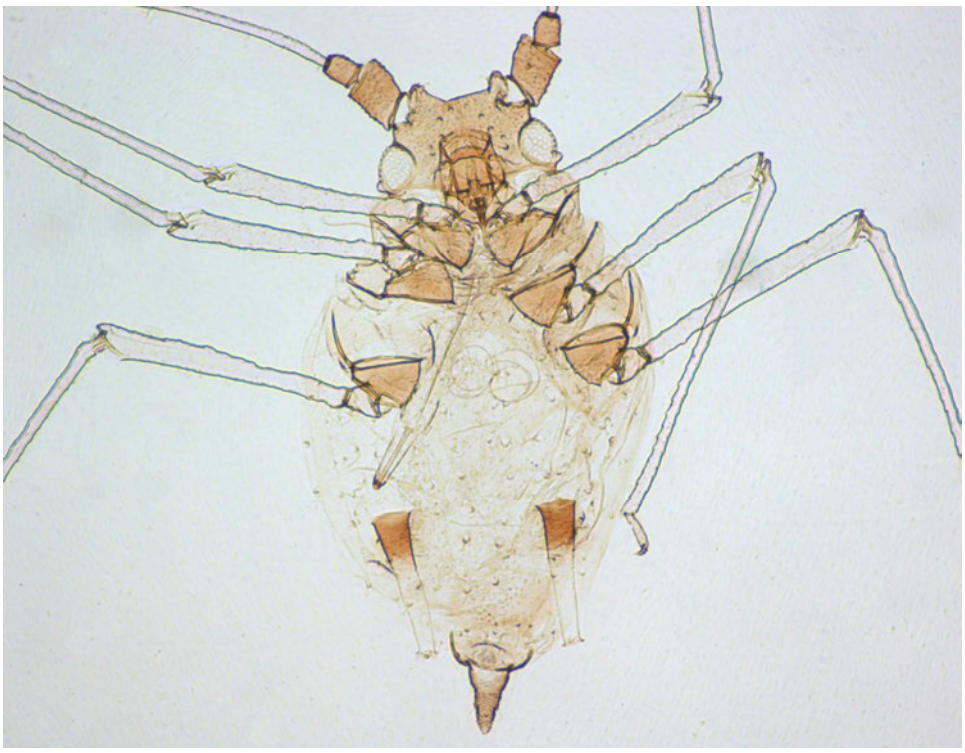

Fig. 1. Apterous viviparous female of *Idiopterus nephrelepidis*.

Table 1. Base sample statistics of the metric characters of apterae.

	Min	Max	Mean	Std. error	Std. Dev.	CV
LB	0.980	1.340	1.177	0.019	0.088	7.5
WB	0.580	0.770	0.659	0.012	0.062	9.3
III	0.290	0.450	0.353	0.005	0.034	9.6
IV	0.195	0.310	0.242	0.004	0.026	10.9
V	0.200	0.330	0.253	0.004	0.028	11.0
bVI	0.105	0.150	0.120	0.001	0.010	8.2
PrT	0.470	0.610	0.543	0.005	0.035	6.4
LSI	0.230	0.320	0.272	0.003	0.023	8.4
WSI	0.048	0.083	0.068	0.001	0.007	10.3
LRS	0.117	0.140	0.129	0.001	0.006	4.5
IIHT	0.055	0.073	0.067	0.001	0.004	5.9
HF	0.420	0.630	0.507	0.007	0.048	9.5
CA	0.100	0.158	0.133	0.003	0.014	10.5

Disscusion

Idiopterus nephrelipidis is considered to be of Neotropic origin (Holman 1974). Currently it is widespread. In Europe it has been detected in Denmark (Heie 1994), Switzerland (Wittenberg 2005), the Czech Republic (Šefrová & Laštůvka 2005), Spain (Hidalgo *et al.* 2001), Portugal (Pita & Ilharco 2004), and others. *I. nephrelipidis* has also been reported from neighboring countries of Bulgaria - Macedonia (Steffan 1962) and Greece (Tsitsipis *et al.* 2007). In North and Central Europe, the species is restricted to greenhouses only (Heie, 1994). In southern regions and warmer climates the species can breed in the wild.

The host plants are many fern species (Blackman & Eastop 2006, Holman 2009). Among them, species native to Bulgaria are *Adiantum capillus-veneris* L., *Asplenium adiantum-nigum* L., *A. ceterach* L., *A. scolopendrium* L., *A. trichomanes* L., *Gymnocarpium dryopteris* (L.) Newm., *Pteridium aquilinum* (L.) Kuhn. Taking into account the presence of host plants of *I. nephrelepidis* in Bulgaria which are native to the local flora and the reports of the aphid from the Balkan area, it may spread in the country outdoors.

The species is entirely anholocyclic. Both apterous and alate females which are reproducing parthenogenetically, are known. In an experiment, aphids were reared under laboratory conditions on *Asplenium nidus* L. for four months. No winged aphids were observed.

The conditions in greenhouses are favourable for the development of the aphids and they form dense colonies. The damages caused by *I. nephrelipidis* result in leaf deformation and wilting, slower growth and even death of the infested fern. The species is also shown to be a vector of certain plant pathogenic viruses, such as Alfalfa Mosaic Virus, and Beet Mosaic Virus, (Edwardson & Christie 1991).

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