

Contribution to the knowledge of Bulgarian seed beetles (Coleoptera: Bruchidae)

К познанию жуков-зерновок Болгарии (Coleoptera: Bruchidae)

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КЛЮЧЕВЫЕ СЛОВА: Bruchidae, зерновки, кормовые растения, *Bruchidius*, *Bruchus*, *Spermophagus*, *Acanthoscelides* Leguminosae, Cistaceae

ABSTRACT. In 2006, 126 samples of seeds or fruits of Leguminosae and Cistaceae, corresponding to 80 plant species, were collected in various regions of Bulgaria. Twenty-two species of *Bruchidius* were obtained from these samples, among which 4 species are new for Bulgaria: *B. astragali*, *B. borowieci*, *B. marginalis* and *B. varipes*. In this process, 12 plants were identified as new *Bruchidius* hosts; among these, *B. lineatus* was reared from seeds of *Lathyrus aphaca*, the only ascertained host of a *Bruchidius* species to belong to the subtribe Viciae. Male genitalia of two *Bruchidius*, *B. astragali* and *B. lineatus*, are figured for the first time. Seven species of *Bruchus* were reared from 21 host plant species (all belonging to subtribe Viciae); in 4 cases, this is the first record of a *Bruchus* on that particular host. The imported *Acanthoscelides pallidipennis* was reared from overwintered seeds of *Amorpha fruticosa*.

РЕЗЮМЕ. В 2006, 126 проб семян или плодов Leguminosae и Cistaceae, соответствующих 80 видам растений, были собраны в различных регионах Болгарии. Двадцать два вида *Bruchidius* были получены из этих проб, среди которых 4 вида являются новыми для Болгарии: *B. astragali*, *B. borowieci*, *B. marginalis* и *B. varipes*. В этом процессе 12 растений были идентифицированы как новые *Bruchidius* хозяева; среди этих, *B. lineatus* был выращен из семян *Lathyrus aphaca*, единственного установленного хозяина вида *Bruchidius* принадлежащего к подтрибе Viciae. Мужские гениталии двух *Bruchidius*, *B. astragali* и *B. lineatus*, изображены впервые. Семь видов *Bruchus* были выращены из 21 вида растений-хозяев (все принадлежащие к подтрибе Viciae); в 4 случаях, это первый рекорд *Bruchus* на том конкретном хозяине. Импортный *Acanthoscelides pallidipennis* был выращен из перезимовавших семян *Amorpha fruticosa*.

Introduction

The taxonomy of Bulgarian seed beetles is mainly known through the works of Borowiec [1980, 1983, 1984, 1986] and Wendt [1984]. Borowiec & Anton [1993], Decelle [1983], Decelle & Lodos [1989], Anton [2001] and Zampetti [1981] also contributed to this knowledge in various ways. Borowiec [1983] showed that the Bulgarian fauna is predominantly composed of circum-Mediterranean elements, completed by a few elements of Euro-Palaearctic, Euro-Siberian and Caucasian origin.

A large majority of European Bruchidae feed in the pods and seeds of Leguminosae, while a few species develop in fruits of Cistaceae and Convolvulaceae [Lukjanovich & Ter-Minassian, 1957]. Since 2001 [Delobel & Delobel, 2003, 2005; Kergoat et al., 2004, 2006], we have been studying host plant relationships among seed beetles in the Western Mediterranean sub region (Spain, Portugal, Corsica and continental France, Italy), and in Greece. Szentesi & Jermy [1995], Szentesi, Jermy & Takacs [1996] and Jermy & Szentesi [2003] performed similar studies in Hungary. The knowledge of true larval hosts in the areas studied so far has allowed us to establish a clearer contour of the strong phylogenetic relationships linking seed beetle species with plant tribes, genera or even species [Delobel & Delobel, 2006b]. Unfortunately, it has not been possible to identify the host plants of a few seed beetles, and also some species are not present in Western Europe. Bulgaria, a country at the crossroads of Western European, Mediterranean and Oriental influences, seemed a perfect location to complete our samplings in order to clarify the complex and intricate framework of bruchid-plant relationships among Western Palaearctic seed beetles.

Material and Methods

Fruits of Leguminosae and Cistaceae were collected at the end of Spring and in early Summer 2006 in the following Bulgarian provinces: Stara Zagora (Koprinka and Kalofer areas, 21–22 June), Burgas (Lozenets, Velika, Rezovo, Sinemorets, Gramatikova, Malko Tarnovo and Banya areas, 23–27 June), Dobrich and Varna (Banya, Balgarevo, Balchik, Zlati Piasatsi and Kamen Bryag areas, 28 June–1st July), Ruse (Cherven and Mechka areas, 3–4 July), Blagoevgrad (Melnik, Rozen, Hotovo, Lilyanovo, Petrich and Kalimanci areas, 6–9 July). The choice of these regions was influenced by the study of available literature on plant distribution [Jordanov, 1976; Stoyanov, 2006; Peev et al., 1998; Kaiser et al., 1998]. A total of 126 samples belonging to 80 plant species were collected and identified. Plant identifications were performed using Jordanov [1976], and botanic nomenclature followed that of ILDIS [2006]. Samples collected were composed of sufficient material to take into account occasionally low infestation levels [see Delobel & Delobel, 2003]. They were maintained at room temperature in aerated plastic bags for 6 months with regular checking and collection of emerged seed beetles. The complete list of samples (including samples that did not yield any seed beetle) with precise locations and dates of collection, is available upon request to the authors. Males were dissected and their genitalia compared with identified material; in a single case (*Bruchus* specimens reared from *Vicia cassubica*) only females were available, and the corresponding identification (as *B. libanensis*) remains somewhat questionable.

Adults were also collected on various plants, often on flowers; in this case the relationship between plant and insect is unknown: the plant may constitute a simple resting place, or a source of food for the adult, or an oviposition site in the case of females. A simple hand-held suction device was used to collect these adults.

Results and Discussion

Seed beetles reared from field-collected hosts.

In this section are listed seed beetles that were reared from larval to adult stage in host seeds or fruits collected in the field. It includes 4 new records for Bulgaria and 16 hitherto unknown hosts (in bold letters).

Acanthoscelides pallidipennis (Motschulsky, 1874).

Amorpha fruticosa bushes were abundant in the dense vegetation on the banks of Danube River (Mechka). In early July, *A. fruticosa* was in bloom, but pods of the preceding year were still attached (by spider webs) to some plants. A lot of adults emerged rapidly from these seeds. Both the plant and the insect are of north American origin and the first records of *A. pallidipennis* in Europe were in Bulgaria (East Rodopi, Black Sea coast, Pirin) [Borowiec, 1980].

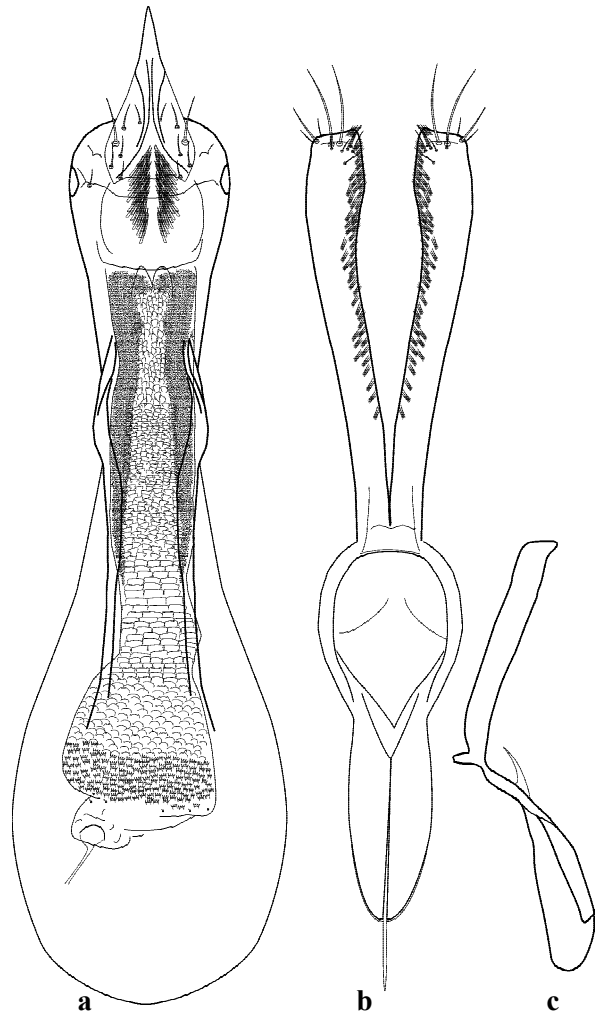


Fig. 1. Male genitalia of *Bruchidius astragali*, a: median lobe, ventral view; b: lateral lobes and tegminal strut, ventral view; c: lateral lobes and tegminal strut, lateral view (not to scale).

Bruchidius astragali (Boheman, 1829).

This species is new for Bulgaria and belongs to the *B. astragali* species group, which was reviewed by Borowiec in 1985. In this very difficult group, integument and dorsal vestiture coloration varies among individuals of the same species. Specimens obtained in Bulgaria belong to the variety *fisheri* Hummel 1827 because of the black colour of posterior legs and of anterior and middle tarsi, and also because elytra lack clearly defined whitish stripes. In order to give a precise account of the beetle identity we propose a drawing of the genitalia of a male (Fig. 1) grown from seeds of *Astragalus onobrychis* (**new host**) collected at the foot of Balchik limestone cliffs. Three insects were obtained from 498 seeds. *B. astragali* is known to predate on various *Astragalus*: *A. ponticus*, *boeticus*, *mollis*. In addition, *A. testiculatus* is the host of *B. atbasaricus* [Lukjanovich & Ter-Minassian, 1957], which is considered as a synonym of *B. astragali* by Anton [1998b].

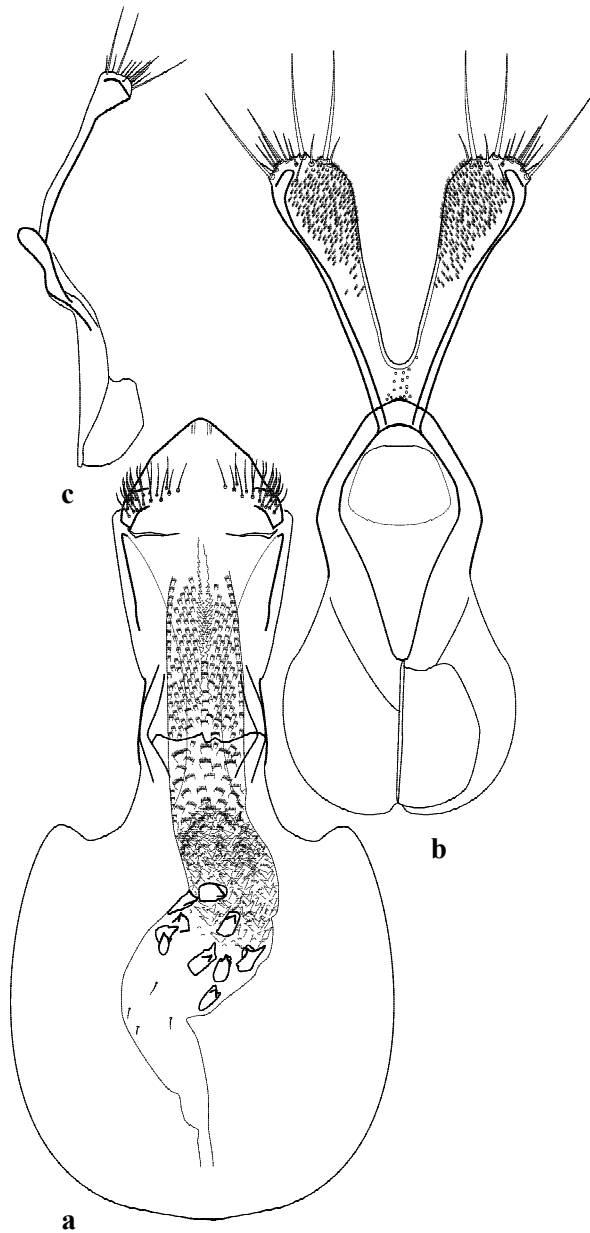


Fig. 2. Male genitalia of *Bruchidius lineatus*, a: median lobe, ventral view; b: lateral lobes and tegminal strut, ventral view; c: lateral lobes and tegminal strut, lateral view (not to scale)

Bruchidius biguttatus (Olivier, 1795).

One adult obtained from 111 capsules of *Cistus salvifolius* (Cistaceae) collected near Rezovo. This insect is known from different *Cistus* and one *Halimium*. Because of the small size of the seeds (0.3 mg), the larva has to live in the capsule, outside of the seeds, and not as an internal feeder like most Bruchidae.

Bruchidius borowieci (Anton, 1998).

This species, which belongs to the *B. seminarius* species group was recently separated by Anton [1998a] from the close *B. pusillus* and *B. taorminensis*. Insects were obtained in Spain and Southern France from seeds

of *Coronilla glauca* and *C. juncea* [Delobel & Delobel, 2006a]. We obtained three adults from 592 seeds of *C. scorpioides* (**new host**) collected near Kalimanci. This record is **new for Bulgaria** and extends to the north the distribution of the species. Moreover this host could be the larval food in dry areas in the Middle East where the previously known hosts *C. juncea* and *C. glauca* are absent.

Bruchidius bimaculatus (Olivier, 1795)

= *B. varipictus*

This species develops on various *Medicago*; it was grown from seeds of *M. arabica* (**new host**) (Malko Tarnovo) and *M. rigidula* (Hotovo). Respectively eight and two adults from 372 and 254 pods.

Bruchidius cisti (Fabricius, 1775).

Adults of this species are often collected as adults in a wide geographical range. Nevertheless, very little is known of their biology. We obtained it from capsules of *Helianthemum nummularium* (**new host**) collected in Kalofer. Previously it has been obtained only from *H. aegyptiacum* in Irak [Decelle & Lodos, 1989].

Bruchidius dispar (Gyllenhal, 183).

This species develops on numerous *Trifolium* species; we obtained it from seeds of *T. angustifolium* (Hotovo, one adult from 1607 seeds), *T. striatum* (Banya, three adults from 4378 seeds), and also from a **new host** plant, *T. trichopterum* (Melnik, 2 adults for 329 seeds).

Bruchidius lineatus (Allard, 1868).

This apparently rare species is present in the Central-Eastern Mediterranean region, from Corsica to Turkey and Lebanon. So far, nothing was known of its biology; a sample of 1289 seeds of *Lathyrus aphaca* (**first known host**) collected in Malko Tarnovo yielded three *B. lineatus* adults, together with seven *Bruchus laticollis*. As stressed by Allard [1968] in his original description, *B. lineatus* shows much external similarity with *B. villosus*. Its male genitalia (Fig. 2) are however quite distinctive, without obvious affinity with any other known *Bruchidius* species. *B. lineatus* is a unique example of a member of the genus *Bruchidius* feeding on a plant belonging to the Viciaeae tribe.

Bruchidius lutescens (Blanchard, 1844).

A sample of 1114 seeds of *Onobrychis caput-galli* from Hotovo gave 4 specimens; this is the only known host plant of *B. lutescens*.

Bruchidius marginalis (Fabricius, 1776).

A sample of 4984 seeds of *Astragalus hamosus* collected end of June at Kaliakra Cape yielded 21 specimens of *B. marginalis*. This species is known from various countries from Spain and Latvia to Caucasus, but is **new for Bulgaria**.

Bruchidius murinus (Boheman, 1829).

One specimen emerged from a sample of 160 seeds of its only known host, *Trifolium subterraneum*, in Malko Tarnovo.

Bruchidius nanus (Germar, 1824).

Five specimens emerged from 374 pods of *Medicago orbicularis* collected in Lozenets.

Bruchidius pauper (Boheman, 1829).

Two specimens were reared from 592 seeds of *Coronilla scorpioides* collected in Kalimanci, together with *B. borowieci*.

Bruchidius picipes (Germar, 1824).

It is an exclusive *Trifolium* feeder; it was obtained in Bulgaria from three different host species: two specimens from 4378 seeds of *Trifolium striatum* (Banya), one from 3430 seeds of *Trifolium incarnatum* (Rozen), three from 1607 seeds of *Trifolium angustifolium* (Hotovo), and one from 1764 seeds in Grammatikovo.

Bruchidius poupillieri (Allard, 1868).

One specimen was reared from 50 pods of *Onobrychis gracilis* (**new host**) in Balchik.

Bruchidius pusillus (Germar, 1824).

This specialist, linked to *Coronilleae sensu stricto*, was recovered from 2 samples: 24 specimens from 1340 seeds of *Hippocrepis emerus* (Zlatni Plassatsi), and 14 specimens from 1517 seeds of *Securigera varia* (Mechka).

Bruchidius pygmaeus (Boheman, 1833).

A single specimen was obtained from 1607 seeds of *Trifolium angustifolium* (Hotovo), and three from 3430 seeds of *Trifolium incarnatum* (Rozen).

Bruchidius seminarius (Linnaeus, 1767).

Two specimens from 1390 seeds of *Lotus corniculatus* in Melnik.

Bruchidius sericatus (Germar, 1824).

We recovered 15 specimens from 1607 seeds of *Trifolium angustifolium* in Hotovo, and 10 specimens from 1797 seeds of *Trifolium hybridum* (**new host**) in Rezovo.

Bruchidius varipes (Boheman, 1839).

This uncommon species was hitherto recorded in Czechia, Croatia and Hungary only [Zampetti, 1981; Anton, 1998b]. It is probably often erroneously identified as *B. astragali* [Anton, 1998b]. We obtained seven specimens of this species from a sample of 255 seeds of *Astragalus onobrychis* (**new host, new record for Bulgaria**) collected near Kalimanci, and two from a sample of 592 seeds collected in Balchik. Male genitalia are almost identical with those of *B. astragali*, but adults are of a much smaller size (less than 2mm long instead of 3mm for *B. astragali*). All legs are black, with anterior and medium tibiae reddish, elytra black with almost uniform vestiture.

Bruchidius varius (Olivier, 1795).

We obtained five specimens from 612 seeds of *Trifolium pratense* (Koprinka), 2 specimens from 1681 seeds of *T. resupinatum* (Sinemorets), 2 from 2140 seeds of *Trifolium hirtum* (**new host**) in Melnik, 4 from 1797 seeds of *Trifolium hybridum* (**new host**) in Rezovo.

Specimens identified by previous authors as *B. martinezi* [Allard, 1998b] belong in fact to *B. varius*, and *B. martinezi* does not belong to the Bulgarian fauna.

Bruchidius villosus (Fabricius, 1792).

Six specimens of this beetle with a wide diet breadth among Genisteae were recovered from 445 seeds of *Cytisus eriocarpus* (**new host**) in Melnik.

Bruchus brachialis (Fahraeus, 1839).

14 specimens emerged from a sample of 180 seeds of *Vicia peregrina* (Lozenets); 12 specimens from a sample of 493 seeds of *Vicia sativa* (Cherven); 341 specimens from a sample of 1889 seeds of *Vicia villosa varia* (Lozenets), and 102 specimens from a sample of 760 seeds of *Vicia villosa varia* (Rozen).

Bruchus emarginatus (Allard, 1868).

This uncommon beetle emerged from *Vicia peregrina* in Balgarevo (25 specimens from a sample of 406 seeds).

Bruchus laticollis (Boheman, 1833).

Seven specimens were obtained from 1289 seeds of *Lathyrus aphaca* sampled in Malko Tarnovo. This insect seems mainly linked to *Lathyrus aphaca*, although it was also obtained from *Vicia benghalensis* [De Luca, 1962].

Bruchus libanensis (Zampetti, 1993).

Three female specimens from 360 seeds of *Vicia cassubica* (**new host**) in Petrich.

Bruchus luteicornis (Illiger, 1794).

Five adults were reared from 256 seeds of *Vicia barbazitae* (**new host**) collected in Koprinka, 10 from 61 seeds of *V. barbazitae* (Petrich), 22 from 416 seeds of *V. sativa* (Koprinka), three from 987 seeds of *V. sativa cordata* (Koprinka), 64 from 373 seeds of *V. sativa cordata* (Sinemorets), 7 from 422 seeds of *V. sativa incisa* (Grammatikovo).

Bruchus pisorum (Linnaeus, 1758).

A small sample of 47 seeds of *Pisum sativum elatius* (Balgarevo) yielded four adults of this very harmful species.

Bruchus rufimanus (Boheman, 1833).

Two samples of *Lathyrus laxiflorus* (**new host**) yielded this species: 5 specimens from 460 seeds collected in Petrich, 6 specimens from 789 seeds in Velika; 17 specimens emerged from a sample of 448 seeds of *Lathyrus venetus* (Petrich); 2 specimens from 14 seeds of *Vicia bithynica* (Lozenets); 20 adults from 875 seeds of *Vicia hybrida* (Kamen Bryag), and 9 from 219 seeds (Balgarevo); 18 adults from 214 seeds of *Vicia lutea* (Lozenets); 18 adults from 659 seeds of *Vicia pannonica* (Mechka); 7 adults from 180 seeds of *Vicia peregrina* (Lozenets).

Bruchus tristiculus (Fahraeus, 1839).

Four samples of *Lathyrus hirsutus* yielded this species: nine specimens emerged from 572 seeds in Mechka, 45 specimens from 1695 seeds in Cherven, three

specimens from 397 seeds and 16 specimens from 327 seeds in Lozenets.

Bruchus venustus (Fahraeus, 1839).

A sample of 752 seeds of *Vicia cracca* collected in Rezovo yielded 152 specimens.

Bruchus viciae (Olivier, 1795).

A single specimen emerged from 519 seeds of *Lathyrus sphaericus* (Mechka), five specimens from 493 seeds of *Lathyrus sphaericus* (Koprinka), and two specimens from 448 seeds of *Lathyrus venetus* (**new host**) collected in Petrich.

Seed beetles caught as adults on vegetation

A few species that we were unable to rear from their host plant were caught in various parts of Bulgaria. They were mainly found on flowers of *Daucus carota*, *Cistus salvifolius* or unidentified Convolvulaceae. This is the case of the very common *Bruchidius holosericeus* (Sch.) and *B. cinerascens* (Gyll.), as well as of *Spermophagus calystegiae* Luk. & Ter-Min., *S. kuesteri* Schil., and *S. sericeus* (Geoffr.).

Conclusion

Among the 80 plant species sampled, some were not present in previously visited countries of Western Europe, or were present only as localized and limited populations. A number of them harboured one or several seed predators and are listed above, but some did not yield any bruchid. Such was the case of *Astragalus australis*, *Astragalus spruneri*, *Cytisus agniphilus*, *Cytisus jankae*, *Genista carinalis*, *Trifolium constantinopolitanum*, *Cicer monbretii*, and *Vicia narbonensis*. These "negative" results are almost as important as positive ones to understand the mechanisms of insect-plant relationships.

The Bulgarian seed beetle fauna now comprises 34 indigenous species of *Bruchidius*: in addition to the 22 species collected in 2006 and listed above, the following 12 species are present in Bulgaria according to earlier authors: *B. caninus* (Kraatz), *foveolatus* (Gyll.), *fulvicornis* (Motsch.), *imbricornis* (Panz.), *mordelloides* (Baudi), *mulsanti* (Brisout), *nudus* (All.), *obscuripes* (Gyll.), *poecilus* (Germ.), *quinqueguttatus* (Ol.), *tuberculatus* (Hochh.), *unicolor* (Ol.). In the genus *Bruchus*, we reared 10 species from their host plant, and 9 additional species are present in Bulgaria: *B. affinis* Fröh., *atomarius* (L.), *hamatus* Mill., *lentis* Fröh., *loti* Payk., *occidentalis* Luk. & Ter-Min., *rufimanus* Boh., *signaticornis* Gyll., *tristis* Boh. The Bulgarian fauna also comprises an additional species of Convolvulaceae-feeding *Spermophagus*, *S. confusus* Bor. (Borowiec, 1986). *Paleoacanthoscelides gilvus* (Gyll.) and two imported species, *Acanthoscelides obtectus* (Say) and *A. pallidipennis*, must be added to this list. The host plant(s) of most of these species is now known. To the best of our knowledge however, the host range of eight species

belonging to the Bulgarian fauna, namely *Bruchidius holosericeus* (Schönherr), *mordelloides* (Baudi), *mulsanti* (Brisout), *nudus* (Allard), *obscuripes* (Gyllenhal), *quinqueguttatus* (Olivier), *tuberculatus* (Hochhut), and *Bruchus hamatus* Miller, remains unknown or needs to be reappraised.

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