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Expansion of some native or alien species of seed beetles and true bugs in Romania (Insecta: Coleoptera, Heteroptera)

SUMMARY

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Introduction

The history of heteropterological research in Romania

Heteroptera, also popularly called true bugs, are a large group of insects that includes about 42,000 species worldwide and over 1,000 species in Romania (Kis 1984; Schuh & Slater1995; Henry 2009), and their number continues to grow as new studies describe species including on the continent of Europe. At the same time, the number of species in Central Europe is increasing due to climate change, vegetation and transport development (Rabitsch 2008a, 2008b). In our country, new species for the country's fauna are reported more and more often, being identified a number of about 30 true bugs (23 terrestrial and 8 aquatic) new to the Romanian fauna from 1990 until now (Kis 1990; Kis & Davidescu 1994; Stănescu 1997; Stănescu 2001; Stănescu 2002; Davideanu & Ilie 2002; Kment et al. 2005; Heiss 2006; Kment 2009; Ruicănescu 2009; Berchi 2011; Berchi et al. 2012; Grozea et al. 2012; Berchi 2013; Berchi & Kment 2015; Macavei et al. 2015; Don et al. 2016; Berchi et al. 2018; Carapezza & Rădac 2021; Rădac & Teodorescu 2021), while at least four species have been excluded from recent studies, reports in the country being based on misidentifications or taxonomic uncertainty (Berchi & Kment 2015; Berchi et al. 2016; Berchi et al. 2018).

Regarding the diversity and distribution of native true bugs in Romania, several researchers have been active in our country over time, among them, with notable contributions were Fuss, Horváth, Montandon, Sienkiewicz, Kis and Stanescu, and more recently Davideanu, Ilie, Osultean and Berchi. In addition to these, there were also researchers who focused on particular aspects of some species or agronomic studies on the impact of native or allogeneic species on various crops. However, in recent years, studies that present the biodiversity of heteropteran entomofauna or that solve taxonomy problems are deficient, being increasingly rare in Romania. This is especially true for terrestrial heteroptera, in the case of aquatic and semi-aquatic ones, significant progress has been made in recent years in the study of the families Notonectidae (Berchi 2013), Veliidae (Berchi & Kment 2015), Mesoveliidae (Berchi et al. 2016) and Gerridae (Berchi et al. 2018).

Current status of alien true bugs species at national and international level

In order to discuss about alien species, we must first delimit the term alien species. The term is usually used for all species that reach other geographical areas than those in which they evolved as species. In this thesis, the term alien species is used only for species from outside Europe or European species for which there is clear evidence of introduction. Although expanding Mediterranean or Pontic species are considered allogeneic species by some authors, in this thesis they are considered simple native species in natural expansion, except for species clearly introduced or which survive in our country only through humans (by cultivating allogeneic plants). This principle applies because the data on the distribution of insects in the country are very few and extremely recent (1800s – present) compared to the time scale in which their speciation took place. Variations in the range of species exist naturally and continuously and are observed even in the contemporary period. They are caused by various biotic or abiotic conditions and often take the form of a pulsation with years in which some species become very numerous and widespread, followed by periods in which the same taxa become rare or narrow their range (Hemala et al. 2022). In Europe, more than 30 alien species have been reported so far (Table 1). To this number are added about 25 other species of cryptogenic or native origin in the southern part of Europe, about which it is not known for sure whether are introduced species, overlooked or recently expanding species. Also, due to the lack of data for certain taxa, it is not certain whether their recent expansion is facilitated by humans or is a natural pulsation of the areal.

In Romania, so far six alien species are reported. The first report of an allogeneic heteropteran species in the country's fauna was made in 1990 in Craiova, where the species *Corythucha ciliata* (Kis 1990) was reported. In 2008 the species *Leptoglossus occidentalis* (Ruicănescu 2009) is reported in Transylvania and in the same period *Oxycarenus lavaterae* is reported in the south of the country (Kment 2009; Bărbuceanu & Nicolaescu 2012;). Subsequently, after 2010, the species *Corythucha arcuata*, *Halyomorpha halys* and *Nezara viridula* were reported (Grozea et al. 2012; Macavei et al. 2015; Don et al. 2016). Through the research carried out in this study, five new allogeneic species for the Romanian fauna are reported in addition to those mentioned in Table 1 (see subchapter 2.1).

Table 1. The list of alien species in Europe and their status in Romania and neighboring countries.

Species	Origin of the species	Present in	
		Romania	Neighboring countries
Alloeoglypta pretiosa Kiritshenko, 1952	Asia	No	Yes
Amnestus pusillus Uhler, 1876	North America	No	No
Amphiareus obscuriceps (Poppius, 1909)	East palearctic	No	Yes
Anthocoris butleri Le Quesne, 1955	South Europe	No	No
Arocatus longiceps Stål, 1872	east Europe	No	Yes
Belonochilus numenius (Say, 1831)	North America	No	Yes
Blissus insularis Barber, 1918	North America	No	No
Campylomma miyamotoi Yasunaga, 2001	Asia	No	No
Corythauma ayyari (Drake, 1933)	Oriental	No	No
Corythucha arcuata (Say, 1832)	North America	Yes	Yes
Corythucha ciliata (Say, 1832)	North America	Yes	Yes
Erthesina fullo (Thunberg, 1783)	Asia	No	No
Fulvius borgesi Chérot, Ribes & Gorczyca, 2006	South America	No	No
Halyomorpha halys (Stål, 1855)	East Asia	Yes	Yes
Leptoglossus occidentalis Heidemann, 191	North America	Yes	Yes
Macroscytus subaeneus (Dallas, 1851)	Asia	No	No
Nariscus spinosus (Burmeister, 1835)	Africa	No	No
Nemausus inornatus (Stål, 1858)	Africa	No	No
Nezara viridula (Linnaeus, 1758)	North Africa	Yes	Yes
Nysius huttoni F.B.White, 1878	New Zealand	No	No
Oxycarenus lavaterae (Fabricius, 1787)	West Mediteranean	Yes	Yes
Pentacora sphacelata (Uhler, 1877)	North America	No	No
Perillus bioculatus (Fabricius, 1775)	North America	No	Yes
Stephanitis oberti (Kolenati, 1857)	North palearctic	No	No
Stephanitis pyrioides (Scott, 1874)	Japan	No	No
Stephanitis rhododendri Horváth, 1905	North America	No	No
Stephanitis takeyai Drake & Maa, 1955	Japan	No	No
Thocorixa verticalis (Fieber, 1851)	North America	No	No
Tropidosteptes pacificus Van Duzee, 1921	North America	No	No
Tupiocoris rhododendri (Dolling, 1972)	North America	No	No
Zelus renardii (Kolenati, 1856)	America	No	No

After: Rabitsch (2008, 2010), Davranoglou (2011), Grozea et al. (2012), Macavei et al. (2015), Protić & Šeat (2016), Don et al. (2016), Lis & Whitehead (2019), van der Heyden (2020) Dioli et al. (2021a, 2021b, 2021c), Goula & Mateos (2021), Lima et al. (2021), Lupoli et al. (2021), Mishustin (2021), Aukema (2022).

Brief history of coleopterological research on seed beetles in Romania

Bruchins, also known as seed beetles, are a small group of beetle insects that are widespread, with the exception of the Arctic (Borowiec 1987). The group comprises around 1,400 species worldwide that grow mainly in seeds, of which over 30 species are considered crop pests (Borowiec 1987; Kingsolver 2004). For this reason, most recent studies focus on the impact or control of species that cause economic damage or alien species. Among the entomologists with a notable recent contribution are: Teodor, Perju, Rogojanu, Săvescu, and among the first

entomologists who made among the first contributions on diversity and distribution of the group are worth mentioning Bielz, Flek, Fuss, Montandon, Méhelÿ and Perri. However, many other entomologists or zoologists have made occasional contributions to various works of fauna, especially those concerning the beetle fauna of certain areas of the country. For example, Ieniștea (1975) mentions 10 species of Bruchinae in the volume of fauna dedicated to the Iron Gates area, and Teodor & Zaharia (2005) mentions 17 species from 13 locations in Transylvania. Such reports are due to the fact that the group has relatively few representatives in Europe (about 150 species), and as many taxa overwinter in seeds, there are many species with a more southern area that do not live in Romania due to cold winters, here being reported only about 43 of species (Teodor & Zaharia 2005). However, even such reports are now increasingly rare in the case of the native fauna of seed beetles. The same applies to alien species that develop on plants that are not of economic interest. Thus, despite the fact that insects of the order Coleoptera are relatively easy to collect and are well preserved over time due to the strong chitinized exoskeleton and the wings that acts as a protective shield, there is a real shortage of faunistic data regarding native species or allogeneic of seed beetles from Romania.

Current status of alien seed beetles species at national and international level

About 43 alien species of bruchinae are reported in Europe (Table 2). Of these, five are considered non-established species because, although they can grow in shore houses, they do not tolerate environmental conditions in the wild (Yus-Ramos et al. 2014), which is why once the food source is depleted or depleted, they disappear from the area. Another 22 species are occasionally reported on the basis of imported seeds and there is no information on their establishment in the wild (Yus-Ramos et al. 2014).

In Romania, the first alien seed beetle detected was *Acanthoscelides obtectus*, but regarding the date of the first report, there are two mentions: 1926 in Bucharest, report published by Săvescu (1959–1960) and 1946 in Timișoara, published by Rogojanu (1964) (Teodor & Perju 2009). Given that the species was first reported in 1889 in Europe, Italy (Yus-Ramos et al. 2014), it is very likely that the species arrived in Romania by 1926, so this year it will be considered the first record of the species. Subsequently, in 1982, the species *Acanthoscelides pallidipennis* was detected in Bucharest (Teodor & Perju 2009). Additionally, Yus-Ramos et al. (2014) mention as allogeneic taxa in Romania also the species *Bruchus rufimanus*, *Bruchus pisorum* and *Callosobruchus chinensis*. However, *B. rufimanus* was already present in Romania (Stana & Ghizdavu 1990), but

was not mentioned in the list of alien species of alien species by Teodor & Perju (2009). In addition, through the research conducted in this study, five other allogeneic species have been reported in Romania (see subchapter 4.1).

Table 2. The list of alien species in Europe and their status in Romania and neighboring countries.

Species	Origin of the species	Present in	
		Romania	Neighboring countries
Acanthoscelides macrophthalmus (Schaeffer, 1907)	North America	No	No
Acanthoscelides obtectus Say, 1831	America	Yes	Yes
Acanthoscelides pallidipennis (Motschulsky, 1874)	North America	Yes	Yes
Amblycerus robiniae (Fabricius, 1781)●	North America	No	Yes
Borowiecius varicolor (Boheman, 1833) ●	Tropical Africa	No	No
Bruchidius atrolineatus (Pic, 1921) ●	Tropical Africa	No	No
Bruchidius radiannae Anton & Delobel, 2003	Africa	No	No
Bruchidius siliquastri Delobel, 2007	Asia (?)	No	Yes
Bruchidius terrenus (Sharp, 1886)	Asia	No	Yes
Bruchus lentis Froelich, 1799	Africa (?)	No	Yes
Bruchus pisorum (Linnaeus, 1758)	Asia	Yes	Yes
Bruchus rufimanus Boheman, 1833	Africa	Yes	Yes
Callosobruchus analis (Fabricius, 1781)*	Asia	No	No
Callosobruchus chinensis (Linnaeus, 1758)*	Asia	Yes	Yes
Callosobruchus maculatus (Fabricius, 1775)*	Africa	No	Yes
Callosobruchus phaseoli (Gyllenhal, 1833)*	Africa	No	No
Callosobruchus rhodesianus (Pic, 1902) ●	Africa	No	No
Caryedon acaciae (Gyllenhal, 1833)	Africa	No	Yes
Caryedon angeri (Semenov, 1896) ●	Africa	No	No
Caryedon gonagra (Fabricius, 1798) ●	Africa	No	No
Caryedon longipennis (Pic, 1898) ●	Africa	No	No
Caryedon pallidus (Olivier, 1790) ●	Africa	No	No
Caryedon serratus (Olivier, 1790)	Africa	No	No
Caryedon sudanensis Southgate, 1971●	Africa	No	No
Caryobruchus gleditsiae (Linnaeus, 1763) ●	North America	No	No
Caryopemon cruciger (Stephens, 1839) ●	Africa	No	No
Caryopemon lholstei Pic, 1924●	Africa	No	No
Conicobruchus albopubens (Pic, 1931) ●	Africa	No	No
Megabruchidius dorsalis (Fahraeus, 1839)	Asia	No	Yes
Megabruchidius tonkineus (Pic, 1904)	Africa	No	Yes
Merobruchus julianus (Horn, 1894) ●	North America	No	No
Mimosestes mimosae (Fabricius, 1781)	Central America	No	Yes
Pachymerus cardo (Fåhraeus, 1839) ●	America	No	No
Penthobruchus germaini (Pic, 1894) ●	South America	No	No
Pseudopachymerina spinipes (Erichson, 1833)	South America	No	No
Specularius albus (Pic, 1928) ●	Africa	No	No
Specularius erythraeus (Pic, 1908) ●	Africa	No	No
Specularius impressithorax (Pic, 1932) ●	Africa	No	No
Spermophagus abdominalis (Fabricius, 1781) ●	Africa	No	No
Spermophagus latithorax (Boheman, 1829) ●	Africa	No	No
Sulcobruchus natalensis (Pic, 1903) ●	Africa	No	No
Stator limbatus (Horn, 1873)	America	No	No
Zabrotes subfasciatus (Boheman, 1833)*	Central America	No	Yes

*not established, ● occasional species (probably not established). After: Yus-Ramos et al. (2014), Cocco et al. (2021).

The aim, objectives and structure of the thesis

In recent years, there has been a significant development of the means of communication and trade, so that at present, various goods can be relocated in a very short time from one region to another or even from one continent to another. As a result, many insect species end up being introduced to new areas, where some of them end up settling. Analyzing the situation of alien seed beetles and true bugs at national and international level, it can be observed that there are a small number of alien species reported in the country compared to neighboring countries such as Bulgaria or Hungary (Rabitsch 2010; Yus-Ramos et al. 2014). Thus, it appears that there is a real deficit of data on these groups of species in Romania.

At the same time, climate change in recent years has shortened and softened the cold season in Romania. This favors the establishment of allogeneic species by increasing the chances of survival over the winter of introduced individuals that tolerate low temperatures and also provides a more favorable environment for thermophilic species. The same applies to other more thermophilic species, native to Europe and until recently confined to the south of the continent. Thus, there is a phenomenon called "Mediterraneanization of Central Europe" which involves an expansion of southern species (Rabitsch 2008a). Therefore, there is a need for studies to investigate potential expansions of some southern species.

On top of that, certain taxonomic uncertainties, misidentifications or the use of old bibliographic sources make it difficult to research both the native species already reported in the country and the expanding or allogeneic species.

Based on the current situation and the needs listed above, the purpose of this paper is to contribute to a better understanding of the current situation of allogeneic or native seed beetles and true bugs expanding in Romania and to clarify certain taxonomic uncertainties regarding certain taxa in within these groups of insects.

This thesis consists of six chapters and their related bibliography. The first chapter contains a general introduction divided into two subchapters, one for each taxonomic group concerned (true bugs and seed beetles). Chapters 2–6 contain their own results and have the following structure: introduction, materials and methods, results and discussions. Chapter 5 presents an updated list of alien species of seed beetles and true bugs in Romania, using both bibliographic and own data, and Chapter 6 presents the conclusions of this thesis.

In order for the thesis to achieve its proposed purpose, each subchapter that presents its own results has individual **objectives**, these are briefly described in the list below.

Chapter 2. Alien Heteroptera in Romania:

Subchapter 2.1 – documentation of new alien true bugs species in Romania;

Subchapter 2.2 – contribution with new information on the distribution, biology and status of alien true bugs species already reported in Romania;

Chapter 3. Contributions to the knowledge of cryptic or in expansion true bugs species

Subchapter 3.1 – revision of the genus *Tuponia* in Romania, investigation of a potential introduction of species and clarification of the taxonomic situation of the species *Tuponia montandoni*;

Subchapter 3.2 – revision of the genus *Agramma* in Romania by checking published reports and museum material, and contributions on species biology and ecology;

Subchapter 3.3 – confirmation of the presence *of Kleidocerys privignus* in Romania and contribution to the knowledge of the biology and taxonomy of *Kleidocerys* species in the country;

Subchapter 3.4 – recording the detected expanding species, clarifying the taxonomic situation of certain cryptic taxa and establishing the status of the identified species in Romania;

Chapter 4. New alien and native seed beetles for the Romanian fauna

Subchapter 4.1 – documentation of new alien seed beetles species in Romania;

Subchapter 4.2 – confirmation of *Bruchidius glycyrhizae* in Romania and contributions regarding its biology, taxonomy and status in this country;

Chapter 5. The updated list of alien species of true bugs and seed beetles recorded in Romania

It aimed to update the list of alien seed beetles and true bugs species reported so far in Romania.

The updated list of alien species of true bugs and seed beetles recorded in Romania

In process of updating the list of alien seed beetles and true bugs reported in Romania (Table 7), I started from the main papers on this subject for these two groups of species in Europe (Rabitsch 2008b, 2010; Yus-Ramos et al. 2014). To this data, information was added from the research conducted in this thesis and partially published in: Carapezza & Rădac (2021), Pintilioaie et al. (2018), Rădac et al. (2021, in press), Rădac & Petrovici (2016), Rădac & Teodorescu (2021) as well as other published works that targeted alien species such as: Ciceoi et al. (2016, 2017), Grozea et al. (2012), Kurzeluk et al. (2015), Macavei et al. (2015), Don et al. (2016) or Tomescu et al. (2018).

The updated list does not include cryptogenic species or expanding Mediterranean species, except for the species *Arocatus longiceps* and *Anthocoris butleri* being related to plant species (*Platanus* and *Buxus*) that are introduced in Romania, and implicitly, although they are European species, they are certain species that are outside their natural range. *Oxycarenus lavaterae* is also excluded from the list of allogeneic species, being considered an expanding Mediterranean species. The species *Lyctocoris campestris* (Fabricius, 1794) is mentioned in Adam et al. (2022) and Aukema (2022) as a species that is probably present in Romania, but so far we have not identified a publication that clearly mentions the location and data of the species in Romania. Moreover, in the reviews on allogeneic species in Europe, Rabitsch (2008b, 2010) does not mention Romania in the range of this species. At the same time, Péricart (1972) mentions that the species is Euro-Mediterranean, being described from Denmark in 1794, but until 1900 other taxa are described in Italy, USA, Sweden, and Russia, later being synonymous with *L. campestris*. Thus, the species is either probably native to Europe or was introduced by trade from America in the 1700s and later spread rapidly. Based on the above, the species is excluded from the list of allogeneic species, until new data on this taxon.

In terms of current status of the recorded species, it has been determined depending on ecological, economic and health impact of the species. Allogeneic species that have a significant impact have been classified as invasive. Recently reported species, for which there is insufficient data or are at risk of having a significant impact in the future, are considered potentially invasive,

and species that grow on allogeneic plant species and have no economic impact are considered non-invasive species.

Table 7. The updated list of alien species of true bugs and seed beetles recorded in Romania

Species	Origin	Host species	Status
HETEROPTERA			
Amphiareus obscuriceps (Poppius, 1909)	East palearctic	Predator	Potential invasive species
Anthocoris butleri Le Quesne, 1955	South Europe	Predator on *Buxus sempervirens*	Non-invasive species
Arocatus longiceps Stål, 1872	East Europe	*Platanus* spp.	Non-invasive species
Belonochilus numenius (Say, 1831)	North America	*Platanus* spp.	Not established
Corythucha arcuata (Say, 1832)	North America	*Quercus* spp., *Castanea*, *Crataegus*, *Rosa*	Invasive species
Corythucha ciliata (Say, 1832)	North America	*Platanus* spp.	Invasive species
Halyomorpha halys (Stål, 1855)	East Asia	Polyphagous, frequent on *Hibiscus*, *Prunus*, *Malus*, *Althea*	Invasive species
Leptoglossus occidentalis Heidemann, 1910	North America	*Pinus* spp., *Abies*, *Jenuperus*, *Picea*, *Pseudotsuga*	Potential invasive species
Nezara viridula (Linnaeus, 1758)	North Africa	Polyphagous, frequent on *Althea*, *Hibiscus*, *Malus*, *Lycopersicum*.	Invasive species
Perillus bioculatus (Fabricius, 1775)	North America	Predator	Potential invasive species
Podisus maculiventris (Say, 1832)	North America	Predator	Not established
BRUCHINAE			
Acanthoscelides obtectus Say, 1831	America	*Phaseolus* spp.	Invasive species
Acanthoscelides pallidipennis (Motschulsky, 1874)	North America	*Amorpha fruticosa*	Non-invasive species
Amblycerus robiniae (Fabricius, 1781)	North America	*Gleditsia triacanthos*	Potential invasive species
Bruchidius siliquastri Delobel, 2007	Asia (?)	*Cercis* spp., frequent on *Cercis siliquastrum*	Potential invasive species
Bruchidius terrenus (Sharp, 1886)	Asia	*Albizia julibrissin*	Potential invasive species
Bruchus pisorum (Linnaeus, 1758)	Asia	*Pisum sativum*, *Lathyrus* sp., *Vicia* sp.	Invasive species
Bruchus rufimanus Boheman, 1833	Africa	*Lathyrus*, *Phaseolus*, *Vicia*, *Cicer*, *Lens*, *Lupinus*, *Pisum*	Invasive species
Callosobruchus chinensis (Linnaeus, 1758)	Asia	*Cajanus*, *Cicer*, *Dolichos*, *Lens*, *Nelumbo*, *Vicia*, *Vigna*	Not established
Megabruchidius dorsalis (Fahraeus, 1839)	Asia	*Gleditsia triacanthos*	Potential invasive species
Megabruchidius tonkineus (Pic, 1904)	Africa	*Gleditsia triacanthos*	Potential invasive species
Zabrotes subfasciatus (Boheman, 1833)	Central America	*Phaseolus* spp.	Not established

Conclusions

Given the diversity of topics covered, the final conclusions are presented according to the objectives of each subchapter:

Chapter 2. Alien Heteroptera in Romania:

Subchapter 2.1: Four alien species (*Amphiareus obscuriceps*, *Anthocoris butleri*, *Arocatus longiceps*, *Belonochilus numenius* and *Perillus bioculatus*) are reported for the first time in Romania. Their presence is not unexpected, as they were previously reported in countries neighboring Romania. Of the reported taxa, only *Amphiareus obscuriceps* and *Perillus bioculatus* are potentially invasive species, and *Belonochilus numenius* does not appear to be currently established in Romania

Subcapitolul 2.2: The new faunistic data regarding the alien species already reported in Romania, show that they have continued their expansion and are largely widespread. *Oxycarenus lavaterae*, previously considered a alien species, receives a new status as an expanding native species due to its European origin.

Chapter 3. Contributions to the knowledge of cryptic or in expansion true bugs species

Subchapter 3.1: Following the collection of a large number of individuals belonging to the genus *Tuponia*, three species are reported for the first time in Romania (*Tuponia arcufera, T. elegans* and *T. hippophaes*). At the same time, the information in the material collected together with the verification of the *Tuponia montandoni* type specimens from the "Grigore Antipa" Museum of Natural History showed that *Tuponia macedonica* is a synonym of the *Tuponia montandoni* species, therefore the latter is not an endemic species but widespread species in Europe.

Subchapter 3.2: The information from the field as well as the revision of the material from the collection of the Museum of Natural History "Grigore Antipa", reveals that the species *Agramma confusum* is present in Romania, while most of the reports of *Agramma laetum* in Romania have been not confirmed. As a result, *Agramma laetum* is excluded from the list of species present in the country. At the same time, during the research, *Agramma ruficorne* is reported for the first time in Romania, but it is not clear which species of Cyperaceae it uses for its development. From the point of view of species ecology, the data show that *Agramma*

confusum prefers plants from the genus *Eleocharis* in Romania, *Agramma minutum* prefers xerophilous species of *Carex*, and *Agramma atricapillum* prefers *Bolboschoenus*, *Carex* and *Schoenoplectus*.

Subchapter 3.3: The presence of *Kleidocerys privignus* in Romania is confirmed. The data shows that the species grows exclusively on *Alnus glutinosa*, but also on this plant can grow the polyphagous species *Kleidocerys resedae*. As a result, the identification of the two taxa should be treated with caution when dealing with *Alnus* material. This is more important as not all individuals of *K. privignus* have the typical color, and the existing keys of determination do not cover the morphological variation of the species.

Subchapter 3.4: Four species are reported for the first time in Romania (*Artheneis wagneri*, *Caenocoris nerii*, *Paromius gracilis* and *Mustha spinosula*). Faunistic data show that the species *Artheneis wagneri* is most likely a cryptic species omitted so far, while the rest of the reported species are recently expanding species.

Chapter 4. New alien and native seed beetles for the Romanian fauna

Subchapter 4.1: The species *Amblycerus robiniae*, *Bruchidius siliquastri*, *B. terrenus*, *Megabruchidius dorsalis*, *Megabruchidius tonkineus* and *Zabrotes subfasciatus* are reported for the first time in the country. The signaling of the species *Amblycerus robiniae* in several locations in Romania also represents the confirmation of its establishment in Europe, previously being considered an occasional unstable species (reported only in Hungary). All individuals of *Zabrotes subfasciatus* collected were found dead, probably due to species control measures. For these reasons, *Zabrotes subfasciatus* is considered not established in Romania, and the rest of the species are considered established and potentially invasive alien species.

Subchapter 4.2: The presence of the species *Bruchidius glycyrhizae* in Romania is confirmed, from the data so far, this is most likely an overlooked native species. Taxonomically, the correct name of the species is *Bruchidius glycyrhizae* (Gyllenhal, 1839).

Chapter 5. The updated list of alien species of true bugs and seed beetles recorded in Romania

Currently, the list of alien true bugs recorded in Romania includes 6 invasive species, 2 potentially invasive and 2 reported but not established in the country. The list of allogeneic seed beetles recorded in Romania includes 5 potentially invasive species, 3 invasive species, 2 non-established species and one non-invasive species.

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2. Rădac I.A., Manci C.O., Pintilioaie A.M. (2021). *Amblycerus robiniae* (Fabricius, 1781) (Chrysomelidae: Bruchinae), an alien species established in Europe. *BioInvasions Records*, 10: 57–64. https://doi.org/10.3391/bir.2021.10.1.07

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3. Pintilioaie A.-M., Manci C.-O., Fusu L., Mitroiu M.-D., Rădac A.I. (2018). New invasive bruchine species (Chrysomelidae: Bruchinae) in the fauna of Romania, with a review on their distribution and biology. *Annales de la Société entomologique de France (N.S.)*, 54: 401–409. https://doi.org/10.1080/00379271.2018.1506265.

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Other results

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1. Ianovici N., Latiș A., Rădac I.A. (2017). Foliar traits of *Juglans regia, Aesculus hippocastanum* and *Tilia platyphyllos* in urban habitat. *Romanian Biotechnological Letters*, 2(2): 12400–12408.
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