

ALLOCHTHONOUS INSECTS IN SERBIA: DATA PUBLISHED DURING THE 21ST CENTURY

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Abstract

The increasing globalization of trade and human movement has significantly contributed to the unintentional introduction of alien insect species worldwide, including Serbia. This review summarizes data on alien insects recorded in Serbia between 2000 and 2025, based on published literature and open-access databases. A total of 120 alien species were identified, of which 79 (66%) are considered invasive. Most belong to the order Hemiptera, especially the family Aphididae (24 species). Other significant records include Hymenoptera, Coleoptera, Lepidoptera, Diptera, and several other insect orders. In several cases, specimens collected before 2000 were reported only later, due to previous misidentification or lack of diagnostic tools such as COI barcoding. Climate change and increased planting of ornamental host plants have contributed to the northward spread of Mediterranean species, such as *Tuponia hippophaes* and *Orsillus depressus*. Intentional introductions for biocontrol purposes (e.g., *Perillus bioculatus*, *Ophraella communa*) have also been documented. The discoveries of nine alien species between 2023 and 2024 indicate a continuing trend of introductions. Most species originate from Asia and North America, reflecting global trade patterns. This study underscores the need to enhance monitoring systems, strengthen taxonomic expertise, and implement comprehensive risk assessments as essential steps in effectively addressing the increasing introduction and spread of alien insect species in Serbia.

KEYWORDS: introduction, invasive insects, alien species, non-native species

Introduction

The increasingly frequent movement of goods and people, especially in the 21st century, has significantly contributed to the global spread of non-native animals, plants, and other species. International trade, the intensification of transport routes, and increased human mobility have facilitated the unintentional introduction of numerous insect species into new ecosystems. These organisms may be introduced as accidental stowaways in cargo holds of airplanes, ships, and vehicles or through imported agricultural and horticultural products (Hulme, 2009; Bonnamour *et al.*, 2021). Some of them successfully adapt to local conditions and establish stable populations, while others remain dependent on continuous introductions. Intentional introductions are rare and today primarily involve biological control programs (using entomophagous agents such as bacteria, fungi, nematodes, and insects) or the controlled cultivation of non-native species for scientific research or farming intended for human consumption (Fenn-Moltu *et al.*, 2024). It is assumed that many introduced species do not survive in the new environment and remain undetected. However, some manage to adapt, which in certain cases can lead to escalation, especially when the newly introduced species are polyphagous or lack natural enemies to regulate their populations (Sakai *et al.*, 2001).

Some of the most severe consequences of biological introductions involve insect species that have established rapidly and compromised native ecosystems or agriculture. A notable example is the Asian tiger mosquito *Aedes albopictus* (Skuse, 1894) (Culicidae), native to Southeast Asia. It has spread globally mostly via used tire shipments and other trade routes, and is now a recognized vector of arboviruses, including dengue and chikungunya, across Europe and the Americas (e.g., Rezza, 2014; Kraemer *et al.*, 2015). Another well-known case is the emerald ash borer *Agrilus planipennis* Fairmaire, 1888 (Buprestidae), an Asian wood-boring beetle introduced to North America through infested wood packaging. Since its detection in Michigan in 2002, it has devastated ash tree populations across much of the continent (EPPO Global Database). In Europe, the harlequin ladybird *Harmonia axyridis* (Pallas, 1773) (Coccinellidae), introduced for aphid biocontrol in the 20th century, had become widespread by the early 2000s (Brown *et al.*, 2008). It outcompetes native ladybird species, preys on non-target insects, and contributes to biodiversity decline. Similarly, the brown marmorated stink bug *Halyomorpha halys* (Stål, 1855) (Pentatomidae), native to East Asia, has established invasive populations in North America and Europe, causing extensive damage to fruit and vegetable crops and becoming a nuisance in homes (Leskey & Nielsen, 2018; Bohinc *et al.*, 2024). In Africa and parts of Asia, the fall armyworm *Spodoptera frugiperda* (J. E. Smith, 1797) (Noctuidae) has spread rapidly since its introduction from the Americas, posing a significant threat to maize and other staple crops (Overton *et al.*, 2021). Such cases highlight the ecological and economic risks posed by alien insect species, particularly in the absence of natural enemies or effective regulatory mechanisms.

Due to their small size, insects can often evade entomopathological surveillance, contributing to the near-daily detection of alien species worldwide. However, data on such occurrences in Serbia before 2000 are scarce. One of the main reasons is the limited number of local experts, leaving many insect groups completely unstudied. Fortunately, citizen science initiatives, along with numerous online databases and insect-related forums, provide a wealth of photographic records. Through collaboration between local and international entomologists, species identifications are gradually resolved. While not all data are fully reliable, the exchange of specimens between amateurs and experts significantly improves identification over time.

Even though a few publications on introduced insects appeared before 2000, the number of such studies increased significantly after that year. The main purpose of this review is to assess the literature published between 2000 and 2025 to determine the total number of non-native insect species reported during this period. Additionally, we aim to identify how many of these species have been classified as invasive. Invasive species are defined as non-native organisms that establish self-sustaining populations in new environments and cause, or are likely to cause, negative impacts on ecosystems, economies, or human

health (e.g., Richardson *et al.*, 2000; Simberloff *et al.*, 2013). Determining which species meet these criteria is essential for prioritizing management strategies and understanding the dynamics and impacts of biological invasions.

Materials and Methods

Data on the occurrence of alien insect species in Serbia were compiled from entomological collections, a comprehensive review of relevant scientific literature, and consultation of open-access online databases. The dataset encompasses records published between 2000 and 2025.

Results

Using available literature and open-access databases, we compiled data on 120 alien insect species recorded in Serbia during the 21st century. Primary literature sources documenting the first records of each species in Serbia are listed in Table I, with full bibliographic details provided in the References section.

Table I. List of introduced species detected in Serbia in the last 25 years (2000-2025).

Family	Species	Origin	Year of detection	Status	Refence (year of publishing)
Coleoptera: Polyphaga: Chrysomeloidea					
Chrysomelidae	<i>Acanthoscelides pallidipennis</i> (Motschulsky, 1874)	North America	?	invasive	Gagić <i>et al.</i> (2008)
	<i>Bruchidius siliquastri</i> Delobel, 2007	Eastern and southeastern Asia	2011	invasive	Gavrilović & Savić (2013)
	<i>Bruchus rufimanus</i> Bohemann, 1833	Africa	?	invasive	Beenen & Roques (2010)
	<i>Megabruchidius tonkineus</i> (Pic, 1904)	Eastern and southeastern Asia	2011	invasive	Gavrilović & Savić (2013)
	<i>Ophraella communa</i> LeSage, 1986	North America	2020		Petrović-Obradović <i>et al.</i> (2020)
Coleoptera: Polyphaga: Curculionoidea					
Brentidae	<i>Alocentron curvirostre</i> (Gyllenhal, 1833)	North Africa	2011	invasive	Zatezalo (2014)
Curculionidae	<i>Hypoborus ficus</i> Erichson, 1836	Mediterranean	2022		Vujić & Vesović (2022)
Coleoptera: Polyphaga: Coccinelloidea					
Latridiidae	<i>Cartodere nodifer</i> (Westwood, 1839)	Australia and New Zealand	?	invasive	Zatezalo (2014)
Coleoptera: Polyphaga: Cucujoidea					
Nitidulidae	<i>Carpophilus bifenestratus</i> Murray, 1864	Ethiopia	?	invasive	Denux & Zagatti (2010)
	<i>Carpophilus hemipterus</i> (Linnaeus, 1758)	India, Pakistan	?	invasive	Almaši & Poslončec (2010)
Dermaptera					
Anisolabididae	<i>Euborellia annulipes</i> (H. Lucas, 1847)	possibly originated from East Africa or the Mediterranean.	2022		Vujić <i>et al.</i> (2022)
Diptera: Nematocera: Sciaroidea					
Cecidomyiidae	<i>Obolodiplosis robiniae</i> (Haldeman, 1847)	USA	2006	invasive	Mihajlović <i>et al.</i> (2008)
	<i>Oligotrophus betheli</i> (Martinez & Cibrián, 1960)	North America	2009	invasive	Simova-Tošić <i>et al.</i> (2010)

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Diptera: Nematocera: Culicoidea					
Culicidae	<i>Aedes albopictus</i> (Skuse, 1894)	Southeast Asia	2009	invasive	Kavran <i>et al.</i> (2023)
	<i>Aedes japonicus</i> (Theobald, 1901)	Far East (Japan, China)	2018	invasive	Kavran <i>et al.</i> (2023)
Diptera: Brachycera: Ephydroidea					
Drosophilidae	<i>Drosophila suzukii</i> (Matsumura, 1931)	Southeast Asia	2014	invasive	Toševski <i>et al.</i> (2014)
Diptera: Brachycera: Stratiomyoidea					
Stratiomyidae	<i>Hermetia illucens</i> (Linnaeus, 1758)	Central and South America	2023		Stanković <i>et al.</i> (2024)
Diptera: Brachycera: Tephritoidea					
Tephritidae	<i>Ceratitis capitata</i> (Wiedemann, 1824)	Sub-Saharan Africa	2005	invasive	Jerinić-Prodanović <i>et al.</i> (2021)
	<i>Rhagoletis completa</i> (Cresson, 1929)	North America	2021		Jerinić-Prodanović (2021)
Hemiptera: Sternorrhyncha: Psylloidea					
Calophyidae	<i>Calophia rhois</i> (Löw, 1877)	Mediterranean	2007	invasive	Jerinić-Prodanović (2012)
Homotomidae	<i>Homotoma ficus</i> (Linnaeus, 1758)	Central and southern Europe and the Middle East	2008	invasive	Jerinić-Prodanović (2011)
Psyllidae	<i>Acizzia jamatonica</i> (Kuwana, 1908)	East-Asia	2010	invasive	Jerinić-Prodanović (2012)
	<i>Cacopsylla pulchella</i> (Löw, 1877)	Mediterranean	2010	invasive	Jerinić-Prodanović (2011)
Triozidae	<i>Trioxa neglecta</i> Loginova, 1978	Southeast and Central Asia	2006	invasive	Jerinić-Prodanović (2010)
Hemiptera: Sternorrhyncha: Coccoidea					
Coccidae	<i>Ceroplastes rusci</i> (Linnaeus, 1758)	Afrotropical region	2016	invasive	Dervišević (2019)
	<i>Coccus hesperidus</i> Linnaeus, 1758	Cosmopolitan	2015	invasive	Dervišević (2019)
	<i>Coccus pseudomagnoliarum</i> (Kuwana, 1914)	Asia	2015	invasive	Dervišević <i>et al.</i> (2023)
	<i>Neopulvinaria innumerabilis</i> (Rathvon, 1854)	North America	2016	invasive	Dervišević (2019)
	<i>Parthenolecanium fletcheri</i> (Cockerell, 1893)	North America	2015	invasive	Dervišević (2019)
	<i>Physokermes piceae</i> (Schrank, 1801)	North America	2015	invasive	Dervišević (2019)
	<i>Pulvinaria floccifera</i> Westwood, 1870	Cosmopolitan	2015	invasive	Dervišević (2019)
	<i>Pulvinaria hydrangea</i> Steinweden, 1946	Asia, North America	2015	invasive	Dervišević (2019)
Monophlebidae	<i>Icerya purchasi</i> Maskell, 1878	Australia	2023	invasive	Alciphron database
Pseudococcidae	<i>Planococcus ficus</i> (Signoret, 1875)	Cosmopolitan	2022	invasive	Alciphron database
	<i>Pseudococcus longispinus</i> (Targioni Tozzetti, 1867)	Cosmopolitan	2022	invasive	Alciphron database
	<i>Pseudococcus comstocki</i> (Kuwana, 1902)	Asia	2023	invasive	Alciphron database
	<i>Pseudococcus cryptus</i> Hempel, 1918	Asia	2023	invasive	Alciphron database
	<i>Chrysomphalus aonidum</i> (Linnaeus, 1758)	Oriental region	?	invasive	Zatezalo (2014)
Diaspididae	<i>Chrysomphalus dictyospermi</i> (Morgan, 1889)	Probably southern China	?	invasive	Zatezalo (2014)
	<i>Comstockaspis perniciososa</i> (Comstock, 1881)	Eastern Asia	2005		Glavendekić <i>et al.</i> (2005)
Hemiptera: Sternorrhyncha: Aleyrodoidea					
Aleyrodidae	<i>Aleuroclava aucubae</i> (Kuwana, 1911)	Asia	2020	invasive	Alciphron database
Aleyrodidae	<i>Bemisia tabaci</i> (Gennadius, 1889)	Probably tropical Africa	2016	invasive	Konjević <i>et al.</i> (2018)
	<i>Dialeurodes citri</i> (Ashmead, 1885)	Mediterranean	2020	invasive	Alciphron database

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Hemiptera: Sternorrhyncha: Aphidoidea					
Aphididae	<i>Aphis (Bursaphis) oenotherae</i> Oestlund, 1887	North America	1995	invasive	Petrović-Obradović (2003)
	<i>Aphis spiraecola</i> Patch, 1914	Asia	2007	invasive	Petrović-Obradović <i>et al.</i> (2008)
	<i>Chaitophorus populifolii</i> Essig	USA, Canada, Mexico	1998	invasive	Petrović-Obradović <i>et al.</i> (2010)
	<i>Cinara (Cinara) cedri</i> Mimeur, 1936	Eastern Mediterranean	?	invasive	Glavendekić <i>et al.</i> (2005)
	<i>Cinara (Cinara) curvipes</i> (Patch, 1912)	North America	2001	invasive	Poljaković-Pajnik & Petrović-Obradović (2002)
	<i>Drepanaphis acerifoliae</i> (Thomas, 1878)	North America	2019	invasive	Petrović-Obradović <i>et al.</i> (2021)
	<i>Ericaphis scammelli</i> (Mason, 1940)	North America	2015		Petrović-Obradović <i>et al.</i> (2018)
	<i>Illinoia liriodendri</i> (Monell, 1879)	North America	2015		Petrović-Obradović <i>et al.</i> (2018)
	<i>Macrosiphum albifrons</i> Essig, 1911	North America	2007	invasive	Vučetić <i>et al.</i> (2014)
	<i>Melanaphis bambusae</i> (Fullaway, 1910)	East Asia	2024		Alciphron database
	<i>Melanaphis donacis</i> (Passerini, 1861)	Mediterranean	2023		Alciphron database
	<i>Myzocallis walshii</i> (Monell, 1897)	North America	2006	invasive	Petrović-Obradović <i>et al.</i> (2010)
	<i>Myzus mumecola</i> (Matsumura, 1917)	Asia	2021		Petrović-Obradović (2021)
	<i>Prociphilus (Meliarhizophagus) fraxinifolii</i> (Riley, 1979)	North America	2006		Petrović-Obradović <i>et al.</i> (2007)
	<i>Periphyllus californiensis</i> (Shinji, 1917)	East Asia	2021	invasive	Tomić & Petrović-Obradović (2022)
	<i>Rhopalosiphoninus latysiphon</i> (Davidson, 1912)	North America	2019		Petrović-Obradović <i>et al.</i> (2022)
	<i>Takecallis arundicolens</i> (Clarke, 1903)	East Asia	2014		Petrović-Obradović <i>et al.</i> (2018)
	<i>Takecallis arundinariae</i> (Essig, 1917)	East Asia	2020		Alciphron database
	<i>Tinocallis kahawaluokalan</i> (Kirkaldy, 1907)	East and Southeast Asia	2007		Petrović-Obradović <i>et al.</i> (2010)
	<i>Tinocallis nevskyi</i> (Nevsky, 1929)	Asia	2024		Alciphron database
	<i>Tinocallis saltans</i> (Nevsky, 1929)	Central and East Asia	2020		Tomić & Petrović-Obradović (2022)
	<i>Tinocallis takachihoensis</i> Higuchi, 1972	East Asia	2017		Petrović-Obradović <i>et al.</i> (2018)
	<i>Trichosiphonaphis polygonifoliae</i> (Shinji, 1944)	East Asia	2007	invasive	Petrović-Obradović <i>et al.</i> (2018)
	<i>Wahlgreniella nervata</i> (Gillete, 1908)	North America	2012		Petrović-Obradović <i>et al.</i> (2018)
Hemiptera: Sternorrhyncha: Phylloxeroidea					
Adelgidae	<i>Adelges laricis</i> Vallot, 1836	North Europe, Asia	2021	invasive	Glavendekić & Mihajlović (2004)
	<i>Adelges (Dreyfusia) nordmannianae</i> (Eckstein, 1890)	Caucasus Mountains	2004	invasive	Glavendekić & Mihajlović (2004)
	<i>Adelges (Dreyfusia) piceae</i> (Ratzeburg, 1844)	Europe	1984	invasive	CABI (2012)
Hemiptera: Homoptera: Auchenorrhyncha					
Cicadellidae	<i>Arboridia kakogawana</i> (Matsumura, 1932)	East Asian	2020	invasive	Šćiban <i>et al.</i> (2021)
	<i>Erasmoneura vulnerata</i> (Fitch, 1851)	North America	2019	invasive	Šćiban & Kosovac (2020)
	<i>Neooliturus inscriptus</i> (Haupt, 1927)	Mediterranean	2024		Schlitt <i>et al.</i> (2024)
	<i>Orientus ishidae</i> (Matsumura, 1902)	Asia	2019	invasive	Šćiban & Kosovac (2020)
	<i>Scaphoideus titanus</i> Ball, 1932	North America	?	invasive	Magud & Toševski (2004)

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	<i>Tautoneura polymitusa</i> Oh & Jung, 2016	East Asia	2017	invasive	Kosovac <i>et al.</i> (2020)
	<i>Trifida bilobata</i> (Ohara, 2014)	East Asia	2023	invasive	Poggi <i>et al.</i> (2024)
Acanaloniidae	<i>Acanalonia conica</i> (Say, 1830)	North America	2019	invasive	Šćiban & Kosovac (2020)
Hemiptera: Homoptera: Auchenorrhyncha: Fulgoroidea					
Flatidae	<i>Metcalfa pruinosa</i> (Say, 1830)	North America	2006		Mihajlović (2007)
Hemiptera: Heteroptera: Notonectoidea					
Notonectidae	<i>Anisops sardeus</i> Herrich-Schäffer, 1849	Sahelo-Sindian area	2014	invasive	Šeat <i>et al.</i> (2019)
Hemiptera: Heteroptera: Tingioidea					
Tingidae	<i>Corythucha arcuata</i> Say, 1832	USA, Canada	2013	invasive	Poljaković-Pajnik <i>et al.</i> (2015)
Hemiptera: Heteroptera: Miroidea					
Miridae	<i>Deraeocoris flavilinea</i> (A. Costa, 1862)	Mediterranean (Sicily)	2005		Jerinić-Prodanović & Protić (2011)
	<i>Hypseloecus visci</i> (Puton, 1888)	Euro-Asian	2007		Jerinić-Prodanović & Protić (2011)
	<i>Tuponia hippophaes</i> (Fieber, 1861)	Mediterranean	2002	invasive	Protić & Stojanović (2025)
Hemiptera: Heteroptera: Cimicoidea					
Anthocoridae	<i>Amphiareus obscuriceps</i> (Poppius, 1909)	Eastern Palearctic	1989	invasive	Protić (2009)
Hemiptera: Heteroptera: Lygaeoidea					
Lygaeidae	<i>Arocatus longiceps</i> Stål, 1872	Mediterranean	1993	invasive	Protić (2010)
	<i>Belonochilus numenius</i> (Say, 1832)	Canada, USA, Mexico	2011	invasive	Protić & Šeat (2016)
	<i>Caenocoris nerii</i> (Germar, 1847)	Mediterranean	2018	invasive	Šeat <i>et al.</i> (2019)
	<i>Orsillus depressus</i> (Mulsant & Rey, 1852)	Mediterranean	1897	invasive	Protić & Roganović (2002)
	<i>Oxycarenus lavaterae</i> (Fabricius, 1787)	Mediterranean	1996	invasive	Protić & Stojanović (2001)
Hemiptera: Heteroptera: Coreoidea					
Coreidae	<i>Leptoglossus occidentalis</i> Heidemann, 1910	North America	2007	invasive	Protić (2008)
Hemiptera: Heteroptera: Pentatomoidea					
Pentatomidae	<i>Halyomorpha halys</i> (Stål, 1855)	East Asia	2015	invasive	Šeat (2015)
	<i>Nezara viridula</i> Linnaeus, 1758	Ethiopia	2008	invasive	Protić (2011)
	<i>Perillus bioculatus</i> (Fabricius, 1775)	North America	1996	invasive	Protić & Živić (2012)
Hymenoptera: Symphyta: Tenthredinoidea					
Argidae	<i>Aproceros leucopoda</i> Takeuchi, 1939	East Asia	2012	invasive	Glavendekić <i>et al.</i> (2013)
Tenthredinidae	<i>Nematus tibialis</i> Newman, 1837	North America	2008	invasive	Marković & Stojanović (2008)
Hymenoptera: Apocrita: Parasitica: Chalcidoidea					
Aphelinidae	<i>Ablerus chionaspidis</i> (Howard, 1914)	Asia	2014	invasive	Zatezalo (2014)
	<i>Ablerus perspicuosus</i> Girault, 1916	Asia	2014	invasive	Zatezalo (2014)
	<i>Coccophagus shillongensis</i> Hayat & Singh, 1989	India	2016		Dervišević <i>et al.</i> (2021)
Hymenoptera: Apocrita: Parasitica: Ichneumonoidea					
Braconidae	<i>Aphidius ericaphidis</i> Pike & Stary, 2011	North America	2015		Petrović <i>et al.</i> (2017)
	<i>Lysiphlebus orientalis</i> Stary & Rakhshani, 2010	China	2010		Petrović <i>et al.</i> (2013)
Braconidae	<i>Lysiphlebus testaceipes</i> (Cresson, 1880)	Cuba	2013	invasive	Žikić <i>et al.</i> (2015)

Table I – continued

	<i>Trioxys sunnysidensis</i> Fulbright & Pike, 2007	USA	2019		Tomanović <i>et al.</i> (2021)
	<i>Zombrus bicolor</i> (Enderlein, 1912)	India	2020		Žikić <i>et al.</i> (2023)
Hymenoptera: Apocrita: Aculeata: Vespoidea					
Formicidae	<i>Hypoponera punctatissima</i> (Roger, 1859)	Afrotropical	2004	invasive	Petrov (2004)
Hymenoptera: Apocrita: Aculeata: Apoidea					
Megachilidae	<i>Megachile sculpturalis</i> Smith, 1853	East Asia (Japan, China, Korea)	2017		Bila Dubajić <i>et al.</i> (2021)
Sphecidae	<i>Isodontia mexicana</i> (de Saussure, 1867)	North and Central America	2010	invasive	Četković <i>et al.</i> (2012)
Lepidoptera: Glossata: Pyraloidea					
Crambidae	<i>Cydalima perspectalis</i> (Walker, 1859)	Central and South America	2015		Stojanović <i>et al.</i> (2015)
Lepidoptera: Glossata: Geometroidea					
Geometridae	<i>Charissa onustaria</i> (Herrich-Schäffer, 1852)	Mediterranean (Turkey)	2014		Beshkov (2015)
	<i>Dyscia innocentaria</i> (Christoph, 1885)	Asia (Turkmenistan)*	2014		Beshkov (2015)
Lepidoptera: Glossata: Gracillarioidea					
Gracillariidae	<i>Phyllocnistis vitigenella</i> Clemens, 1859	North America	2019		Simonović & Graora (2019)
	<i>Phyllonorycter issikii</i> (Kumata, 1963)	East Asia	2013		Glavendekić (2014)
Lepidoptera: Glossata: Noctuoidea					
Noctuidae	<i>Egira anatolica</i> (Hering, 1933)	Asia (Turkey)	2014		Beshkov (2015)
Lepidoptera: Glossata: Notodontioidea					
Notodontidae	<i>Thaumetopoea pityocampa</i> (Denis & Schifferrmüller, 1775)	Mediterranean	2015		Glavendekić (2010)
Lepidoptera: Glossata: Tortricioidea					
Tortricidae	<i>Epichoristodes acerbella</i> (Walker, 1864)	South Africa, Kenya, Madagascar	2006	invasive	Glavendekić (2006)
Lepidoptera: Heteroneura: Gelechioidea					
Gelechiidae	<i>Tuta absoluta</i> (Meyrick, 1917)	South America (Peru)	2010		Toševski <i>et al.</i> (2011)
Lepidoptera: Heteroneura: Papilionoidea					
Lycaenidae	<i>Cacyreus marshalli</i> Butler, 1897	South Africa	2020		Miljković <i>et al.</i> (2021)
Mantodea: Eumantodea: Mantoidea					
Mantidae	<i>Hierodula tenuidentata</i> Saussure, 1869	Asia	2020		Vujić <i>et al.</i> (2021)
Thysanoptera: Terebrantia: Thripioidea					
Thripidae	<i>Echinothrips americanus</i> Morgan, 1913	USA	2005		Andjus <i>et al.</i> (2009)
	<i>Frankliniella occidentalis</i> (Pergande, 1895)	USA	2012	invasive	Jović <i>et al.</i> (2012)

Of the total number of species, most belonged to the Hemiptera order, with 75 species recorded. The most diverse family is Aphididae, with 24 species from 17 genera. Coccidae and Cicadellidae are represented with 8 and 7 species, respectively, Heteroptera with 15 species from 7 families, with additional species from 11 other families belonging to various superfamilies. The order Hymenoptera is represented by 13 species belonging to 7 families. These include sawflies, one species of Argidae, and one from the family Tenthredinidae. Additionally, parasitoid wasps from Braconidae (5 species), also Aphelinidae (3 species), pollinating bees such as Megachilidae (1), as well as one species each from families Formicidae and Sphecidae.

The order Coleoptera comprises 10 species from 5 families. Of these, 5 species belong to the family Chrysomelidae, 2 species to Nitidulidae, and 1 species each to Brentidae, Curculionidae, and Latridiidae. The Lepidoptera order is represented by 10 species from 8 families. These encompass both invasive pest species and those introduced unintentionally. Families represented include Crambidae (1 species), Geometridae (2), Gracillariidae (2), Noctuidae (1), Notodontidae (1), Tortricidae (1), Gelechiidae (1), and Lycaenidae (1). From the order Diptera, 8 species from 5 families have been recorded. These include two mosquito species from the family Culicidae, two true fruit flies from Tephritidae, two gall midges from the family Cecidomyiidae, and one species each from soldier flies Stratiomyidae and fruit flies Drosophilidae. The order Thysanoptera is represented by two species from two different genera, both from a single family, Thripidae. Finally, a single alien species was recorded from each of the orders Dermaptera (Anisolabididae) and Mantodea (Mantidae). Of the 120 recorded allochthonous species, 79 are classified as invasive, representing approximately 66% of the overall number.

Discussion

As seen in Table I, there are cases where non-native species were detected before the year 2000, but their records were published later. This is partly because these taxa were either previously misidentified or stored in collections without examination, often labelled as 'suspected' pending verification due to overcrowding. In the first case, the species belonged to a complex or cryptic taxon that could only be detected after the COI barcoding method became available to local experts.

For example, specimens of *Chaitophorus populifolii* Essig, 1912 (Aphididae) were collected as early as 1998, but were identified and published only later (Petrović-Obradović *et al.*, 2010). The same applies to the aphid *Aphis oenotherae*, collected in 1995 and first published in 2003 (Petrović-Obradović, 2003). In Protić & Milenković (1999), the species *Amphiareus obscuriceps* (Poppius, 1909) (Anthocoridae) was originally identified as *Cardiastethus fasciventris* (Garbiglietti, 1869) (Anthocoridae). A subsequent re-examination confirmed that the collections of Heteroptera at the Natural History Museum in Belgrade contain only *A. obscuriceps* (Protić, 2010). *A. obscuriceps* is native to the Sino-Japanese region and occurs in Eastern Asia, Nepal, Kazakhstan, Kirgizia, Iran, and Georgia. It has more recently spread as an alien species in Europe and North America.

Analysis of all specimens of *Tuponia* collected in Serbia indicates that the most abundant species is *T. hippophaes*, an invasive species that has spread northwards over the last several decades. This Mediterranean species has likely spread across Europe, driven largely by climate warming. One factor contributing to its range expansion is its host plant, *Tamarix* spp., which is increasingly common in parks and private gardens. In Serbia, it was first recorded in 2002 and has since been found in several localities (Protić & Stojanović, 2025). Populations are abundant, and *T. elegans* is often observed alongside it on *Tamarix* spp.

Increasing average temperatures associated with global climate change have enabled many Mediterranean species to expand their ranges northward. Examples include *Arocatus longiceps* Stål, 1872, and *Oxycarenus lavatae* (Fabricius, 1787) (Lygaeidae). *Arocatus longiceps* is a Ponto-Mediterranean species currently undergoing range expansion and is now distributed across nearly all European countries. It is typically associated with *Platanus* spp., but in Serbia, it has also been recorded on the Euro-American poplar hybrid (*Populus* × *euramericana* (Dode) Guinier). The alien species *O. lavatae*, originally native to the Mediterranean region, has spread across the Balkan Peninsula, continued northward into Central Europe, and has since been recorded in parts of Asia and North Africa. This phytophagous species commonly forms large

populations on linden trees (*Tilia* spp.) in natural habitats, causing no significant damage (Protić & Stojanović, 2001; Protić, 2010).

Another example of a Mediterranean species expanding its range northward due to rising temperatures is *Orsillus depressus* (Mulsant & Rey, 1852) (Lygaeidae). This circum-Mediterranean species primarily inhabits trees of the family Cupressaceae, feeding on seeds from cones, and reproducing on various host genera, in particular *Juniperus* spp. In recent years, it has extended its distribution beyond its native range into other parts of Europe and Africa and has even been recorded in both South and North America. *O. depressus* has been known in Serbia since 1897, with the first record from Grebenac in the Deliblato Sands region (unpublished). After a 50-year gap, it was recorded again in the same area. Over the past two decades, however, sightings have become increasingly frequent across many locations in Serbia (unpublished). In addition to feeding and reproducing on *Juniperus* spp., *O. depressus* is also known to transmit spores of the pathogenic fungi *Seiridium cardinale* (W.W. Wagener) B. Sutton & I.A.S. Gibson, and *Gibberella* spp.

Deraeocoris flavilinea (A. Costa, 1862) (Miridae) is a Mediterranean species originally described from Sicily. Now it is an invasive species that is currently spreading throughout Europe. In Serbia, it was first found in 2005 in Belgrade on *Rhamnus cathartica* (L.) (Jerinić-Prodanović & Protić, 2011).

Perillus bioculatus (Fabricius, 1775) (Pentatomidae) is a North American predatory species known for its efficiency in preying on the Colorado potato beetle (*Leptinotarsa decemlineata* Say). It was intentionally introduced into Europe during the second half of the 20th century as a biological control agent against this notorious pest. In recent decades, *P. bioculatus* has notably expanded its range across Europe and Asia. In Serbia, it has recently been recorded on common ragweed (*Ambrosia artemisiifolia* L.), where it preys on *Ophraella communa* LeSage, 1986 (Coleoptera: Chrysomelidae), another North American species introduced for the control of ragweed (Petrović-Obradović *et al.*, 2020).

Petrić *et al.* (2001) reported the presence of *Aedes albopictus* (Skuse, 1894), the Asian tiger mosquito (Culicidae), in Serbia, although the species had actually been present since 1999. Alongside *A. albopictus*, they also documented *Aedes aegypti*, the yellow fever mosquito, and four additional mosquito species that had established themselves in the region even earlier (Petrić *et al.*, 2011). Their early establishment highlights the impact of climate change on the distribution of disease vectors, with potential public health implications.

Callosobruchus chinensis (Linnaeus, 1758) (Coleoptera: Chrysomelidae) is another notable invasive species, primarily known as a post-harvest pest of legumes, where it causes significant losses in storage. Similarly, *Megabruchidius tonkineus* (Pic, 1904), an invasive chrysomelid beetle in Europe, targets black locust (*Robinia pseudoacacia* L.), although its full economic and ecological impacts remain insufficiently studied.

Egg parasitoids of the genus *Trissolcus* Ashmead, 1893 have been reported for both *Nezara viridula* and *Halyomorpha halys* (Peverieri *et al.*, 2018); however, these species continue to be significant agricultural pests. Their broad host range and highly polyphagous feeding behaviour enable them to damage a wide variety of crops. The persistence of their populations despite natural parasitism underscores the limitations of biological control alone and highlights the need for integrated pest management (IPM) strategies to mitigate their impact.

Notably, parthenogenetic species, such as *Lysiphlebus orientalis* Stary & Rakhshani, 2010 (Braconidae), have an even greater invasive potential than sexually reproducing parasitoid species. Native to Asia (China), it was accidentally introduced to Europe (Petrović *et al.*, 2013). The only European records are from Serbia, where it was first found in 1995 near the Hungarian border, from where it quickly spread throughout the country (Tomanović *et al.*, 2021).

It should be emphasized that some taxa among invasive species exhibit particularly high invasive potential. Notable examples include *N. viridula* (L., 1758) and *H. halys* (Stål, 1855) (Hemiptera: Pentatomidae), *Tuta absoluta* (Meyrick, 1917) (Lepidoptera: Gelechiidae), and *Ophraella communa* LeSage, 1986 (Coleoptera:

Chrysomelidae). *O. communis* is a highly invasive leaf beetle that primarily feeds on species of the genus *Ambrosia*, particularly on common ragweed (*A. artemisiifolia* L.) (Petrović-Obradović *et al.*, 2020). While its presence may significantly aid in the biological control of ragweed, its rapid and uncontrolled spread raises concerns about potential ecological consequences.

During the last two years (2023-2024), nine non-native species were recorded for the first time in Serbia from the families Aphididae, Cicadellidae, Monophlebidae, Pseudococcidae, and Stratiomyidae. Recently, and in general, members of the order Hemiptera are the most frequently introduced species. Furthermore, nearly half of these newly introduced species are classified as invasive, indicating an ongoing and taxonomically diverse influx of alien species into the region.

A well-known and popular species from the Stratiomyidae family is the black soldier fly (BSF), *Hermetia illucens* (L., 1758), which has been recently reported in this region (Stanković *et al.* 2024). Although *H. illucens* originates from Central and South America, it has achieved an almost global distribution, now occurring on all continents (Demetriou *et al.*, 2022). This cosmopolitan spread is largely attributed to its broad ecological tolerance, including adaptability to diverse climatic conditions and dietary flexibility. In recent years, BSF has become one of the most widely cultivated insect species for entomophagy, primarily as a sustainable alternative to fishmeal and as a protein source in conventional livestock feed. Despite its native association with warm and humid environments, BSF has successfully established populations in temperate regions (Sprangers *et al.*, 2017). While considered an allochthonous and potentially invasive species in many areas, BSF is generally regarded as beneficial due to its role in biowaste conversion and its value as a high-protein feed and food source (Wang & Shelomi, 2017).

Examining the origins of the introduced species, approximately half originate from Asia and North America, making these two continents the primary sources of alien species. Considering that China and the USA are the largest exporters of goods (Tong & Roberts, 2014; Miloslavskaya *et al.*, 2019), they have likely contributed significantly to the global spread of many allochthonous species.

A significant number of the species listed in the table are classified as invasive; however, several non-invasive species are also present, at least for now. One such example is *Antheraea yamamai* Guérin-Ménéville, 1861, commonly known as the Japanese oak silk moth. Native to East Asia, this species was introduced to Europe in the 19th century for silk production. In Serbia, *A. yamamai* was first reported in the 20th century by Živojinović & Vasić (1963). Since then, its populations have stabilized and gradually expanded across much of the country, although it has not yet been recorded in eastern Serbia.

Another case is the bronze geranium butterfly, *Cacyreus marshalli* Butler, 1897, which originates from southern Africa, including Zambia, Mozambique, Zimbabwe, Botswana, and South Africa. It was recorded in Serbia only once, on October 1, 2020, in the city of Niš (Milojković *et al.*, 2021). This individual was likely introduced via pelargonium (*Pelargonium* spp.) seedlings or cuttings from Africa, as many Dutch flower producers cultivate pelargoniums in that region. The species was first observed in Europe in the late 20th century and has since spread to numerous countries, including Spain, France, Italy, Portugal, Belgium, the Netherlands, Germany, Switzerland, Greece, Malta, Croatia, Slovenia, and Turkey (EPPO Global Database). However, it has not yet exhibited invasive characteristics. Given its presence in neighbouring regions, further records of *C. marshalli* in Serbia are expected. With ongoing global warming, the potential expansion of the oriental hornet, *Vespa orientalis* L. 1771, into Serbia is anticipated. This species is native to tropical and temperate regions of Central Asia and the Middle East, as well as Mediterranean countries such as Albania, Greece, Italy, Malta, and Montenegro.

Since introduced species often go unnoticed when their populations are still small, early detection can be particularly challenging. However, based on recent findings in neighbouring countries, it is reasonable to expect that several non-native true bugs may soon establish populations in Serbia. Notably, many of these potential

newcomers belong to the order Hemiptera: Heteroptera, and include *Taylorilygus apicalis* (Fieber, 1861), *Nesidiocoris tenuis* (Reuter, 1895), and *Brachyartrum limitatum* Fieber, 1858 from the family Miridae; *Derephysia sinuatocollis* Puton, 1879 from the family Tingidae; *Zelus renardii* (Kolenati, 1856) from the family Reduviidae; and *Dybowskyia reticulata* (Dallas, 1851) from the family Pentatomidae. Their presence in nearby regions and ecological adaptability suggest that their arrival and establishment in Serbia are highly probable in the near future.

Additionally, non-native aphid species (Aphididae) are likely to arrive in Serbia soon, given their recent appearance in neighbouring countries. For example, *Acyrtosiphon kondoi* Shinji, 1938, has been recorded in Hungary (Ripka *et al.*, 2021), while *Aphis illinoisensis* Shimer, 1866, an important pest of grapevines, is already present in Croatia and Montenegro, and was recently confirmed in mainland Italy (Casiraghi *et al.*, 2021). This aphid was first recorded in Montenegro in September 2007, in vineyards near Podgorica (Petrović-Obradović *et al.*, 2010). *Aphis catalpae* Mamontova, 1953, has been observed in Romania (Osiadacz & Halaj, 2015), and *Cinara laportei* (Remaudière, 1954) was reported from Bulgaria (Observation.org, 2024). *Neomyzus circumflexus* (Buckton, 1876) has been documented in both Romania and Croatia (GBIF, 2024). Confirmed records of *Illinoia azaleae* currently exist in several European countries neighbouring Serbia (Coeur d'Acier *et al.*, 2010a,b). Because of its strong association with ornamental azaleas and rhododendrons, the international trade in horticultural plants is a likely pathway for its introduction. The species has already been reported in horticultural centers such as the Netherlands, Europe's leading importer and exporter of flowers. Subsequent occurrences in Denmark and England further indicate demonstrate its capacity for long-distance dispersal via commercial plant shipments (Coeur d'Acier *et al.*, 2010a). Given extensive trade connections and the popularity of *Rhododendron* species in ornamental horticulture, it is plausible that *I. azaleae* may soon establish populations in the Balkans, including Serbia.

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References

- Alciphron (2014). Šeat, J. (ed.), database on insects of Serbia (Heteroptera), HabiProt. <https://alciphron.habiprot.org.rs> [Accessed June 25, 2025]
- Almaši, R., & Poslončec, D. (2010). Razviće najvažnijih štetočina uskladištenog suvog voća. *Zaštita bilja*, 38(4-5), 376-381.
- Andjus, L., Jović, M., & Trdan, S. (2009). First record of *Echinothrips americanus* in Serbia. *Hellenic Plant Protection Journal*, 2(2), 71-73.
- Beenen, R., & Roques, A. (2010). Leaf and seed beetles (Coleoptera, Chrysomelidae). In A. Roques *et al.* (Eds.), *Alien terrestrial arthropods of Europe*. *BioRisk*, 4, 267-292.
- Beshkov, S. (2015). Some new for Serbia and rare Lepidoptera species collected at light in eastern Serbia. *The entomologist's record and journal of variation*, 127, 127-134.
- Bila Dubaić, J., Raičević, J., Plečaš, M., Lanner, J., Nikolić, P., Žikić, V., Stanislavljević, Lj., & Četković, A. (2021). Further range expansion of the sculptured resin bee (*Megachile sculpturalis*) in Serbia and Bosnia & Herzegovina. *Acta Entomologica Serbica*, 26(2), 37-63.

- Bohinc, T., Batistič, L., & Trdan, S. (2024). Seasonal dynamics of the brown marmorated stink bug (*Halyomorpha halys* [Stål]) in an urban landscape. *Acta Agriculturae Scandinavica, Section B-Soil & Plant Science*, 74(1), art. 2396983.
- Bonnamour, A., Gippet, J. M., & Bertelsmeier, C. (2021). Insect and plant invasions follow two waves of globalisation. *Ecology Letters*, 24(11), 2418-2426.
- Brown, P. M. J., Adriaens, T., Bathon, H., Cuppen, J., Goldarazena, A., Hägg, T., Kenis, M., Klausnitzer, B. E. M., Kovář, I., Loomans, A. J. M., Majerus, M. E. N., Nedved, O., Pedersen, J., Rabitsch, W., Roy, H. E., Ternois, V., Zakharov, I. A., & Roy, D. B. (2008). *Harmonia axyridis* in Europe: spread and distribution of a non-native coccinellid. In: Roy, H. E., & Wajnberg, E. (Eds). *From Biological Control to Invasion: the Ladybird Harmonia axyridis as a Model Species*, 5-21.
- CABI (2012). *Adelges piceae* (balsam woolly adelgid). In Distribution Maps of Plant Pests, April 2012 (Map No. 325). Wallingford, UK: CABI.
- Campolo, O., Malacrino, A., Laudani, F., Maione, V., Zappalà, L., & Palmeri, V. (2014). Population dynamics and temperature-dependent development of *Chrysomphalus aonidum* (L.) to aid sustainable pest management decisions. *Neotropical Entomology*, 43(3), 453-464.
- Casiraghi, A., Poggi, F., & Sanna, F. (2021). First record of the invasive grapevine aphid *Aphis illinoisensis* (Shimer, 1866) (Hemiptera: Aphididae) in mainland Italy. *Bonn Zoological Bulletin*, 70(2), 373-375.
- Četković, A., Čubrilović, B., Plečaš, M., Popović, A., Savić, D., & Stanisavljević, Lj. (2012). First records of the invasive American wasp *Isodontia mexicana* (Hymenoptera: Sphecidae) in Serbia. *Acta Entomologica Serbica*, 17(1/2), 63-72.
- Coeur d'Acier, A., Jousset, E., Villa, M., Bouchon, D., & Cruaud, C. (2010a). Phylogeny of the genus *Illinoia* (Hemiptera, Aphididae): Evidence for widespread occurrence of symbiont replacements and patterns of host plant specialization. *Molecular Phylogenetics and Evolution*, 57(2), 450-460.
- Coeur d'Acier, A., Pérez-Hidalgo, N., & Petrović-Obradović, O. (2010b). Aphids (Hemiptera, Aphididae). In A. Roques et al. (Eds.), *Alien terrestrial arthropods of Europe* (Chapter 9.2, pp. 435-474). *BioRisk*, 4(1), 435-474.
- Demetriou, J., Kalaentzis, K., Kazilas, C., Kunz, G., Muller, B., Mostovski, M.B., & Koutsoukos, E. (2022). An „alien” species on the loose: new records and updated distribution of the black soldier fly *Hermetia illucens* in the Western Palearctic. *Bulletin of Insectology*, 75(1), 125-130 European and Mediterranean Plant Protection Organization (EPPO) (2025). EPPO Global Database. Retrieved [20 March 2025], from <https://gd.eppo.int>
- Denux, O., & Zagatti, P. (2010). Coleoptera families other than Cerambycidae, Curculionidae sensu lato, Chrysomelidae sensu lato, and Coccinellidae. *BioRisk*, 4, 315-406.
- Dervišević, M. (2019): Diverzitet i bionomija štitastih vaši familije Coccidae (Hemiptera: Coccoidea) u Srbiji (Doctoral dissertation). Faculty of Agriculture, University of Belgrade, Serbia, 174 pp.
- Dervišević, M., Stojanović, A., & Graora, D. (2021). First record and new hosts of *Coccophagus shillongensis* Hayat and Singh, 1989 (Hymenoptera: Aphelinidae) in Serbia. *Phytoparasitica*, 49(4), 547-551.
- Dervišević, M., Stojanović, A., & Graora, D. (2023). Bionomija *Coccus pseudomagnoliarum* (Kuwana) (Hemiptera: Coccidae), nove vrste u fauni Srbije. *Pesticidi i fitomedicina*, 38(2), 55-63.
- Fenn-Moltu, G., Liebhold, A. M., Weber, D. C., & Bertelsmeier, C. (2024). Pathways for accidental biocontrol: The human-mediated dispersal of insect predators and parasitoids. *Ecological Applications*, 34(8), e3047.
- Gagić, R., Mihajlović, R., & Glavendekić, M. (2008). *Acanthoscelides pallidipennis* (Coleoptera: Bruchidae), a spermatophagous insect of indigo bush (*Amorpha fruticosa* L.) and its natural enemies in Serbia. *Acta Herbológica*, 17(2), 195-201.
- Gavrilović, B., & Savić, D. (2013). Invasive Bruchid species *Bruchidius siliquastris* Delobel, 2007 and *Megabruchidius tonkineus* (Pic, 1914) (Insecta: Coleoptera: Chrysomelidae: Bruchinae) new in the fauna of Serbia: Review of the distribution, biology and host plants. *Acta Entomologica Serbica*, 18(1/2), 129-136.
- GBIF (2024). *Neomyzus circumflexus* (Buckton, 1876). Global Biodiversity Information Facility. <https://www.gbif.org/species/2078062>

- Glavendekić, M. (2006). *Epichoristodes acerbella* (Walker) (Lepidoptera: Tortricidae): a new species in the fauna of Serbia. *Acta Entomologica Serbica*, 11(1-2), 77-81.
- Glavendekić, M. (2010). Expansion of *Thaumetopoea pityocampa* Schiff. (Lepidoptera: Thaumetopoeidae), an urticating pest with regard to climate change in Serbia and Montenegro. In *International Scientific Conference on Forest Ecosystems and Climate Changes*, 9-10 March 2010. p. 133.
- Glavendekić, M. (2014). New alien insects in forests and urban green spaces in Serbia. In: Kirichenko, N., Roques, A., Augustin, S., Lopez-Vaamonde, C. (Eds.), "Invasive insects in a changing world" Abstracts of the International Le Studium conference Invasive insects in a changing world, p. 15. Orléans, France. Le Studium Loire Valley Institute for Advanced Studies.
- Glavendekić, M., & Mihajlović, M. (2004). Introduction and spread of invasive mites and insects in Serbia and Montenegro. *Acta Entomologica Serbica*, 9(1-2), 23-32.
- Glavendekić, M., Mihajlovic, L., & Petanović, R. (2005). Introduction and spread of invasive mites and insects in Serbia and Montenegro. Plant Protection and Plant Health in Europe: Introduction and Spread of Invasive Species. *BCPC Symposium Proceedings no. 81*, 229-230.
- Glavendekić, M., Petrović, L., & Petaković, M. (2013). Strana invazivna vrsta *Aproceros leucopoda* Takeuchi (Hymenoptera: Argidae) – štetočina brestova u Srbiji. *Šumarstvo*, 1-2, 47-56.
- Hulme, P. E. (2009). Trade, transport and trouble: managing invasive species pathways in an era of globalization. *Journal of Applied Ecology*, 46(1), 10-18.
- Jerinić-Prodanović, D. (2010). Checklist of jumping plant-lice (Hemiptera: Psylloidea) in Serbia. *Acta Entomologica Serbica*, 15(1), 29-59.
- Jerinić-Prodanović, D. (2011). First record of *Cacopsylla pulchella* (Löw, 1877) (Hemiptera: Psyllidae) in Serbia. *Acta Entomologica Serbica*, 16(1-2), 139-142.
- Jerinić-Prodanović, D. (2011). The first finding of the fig psylla *Homotoma ficus* L. (Hemiptera, Psylloidea, Homotomidae) in Serbia. *Pesticidi i fitomedicina*, 26(3), 205-212.
- Jerinić-Prodanović, D. (2012). Alien species of jumping plant lice (Hemiptera: Psylloidea) in Serbia. *International Symposium on Current Trends in Plant Protection, Proceedings*, 553-560.
- Jerinić-Prodanović, D. (2021). First record of the walnut husk fly *Rhagoletis completa* (Cresson, 1929) (Diptera: Tephritidae) in Serbia. In *Proceedings of the 16th Conference on Plant Protection*, Zlatibor, Serbia, Book of Abstracts, pp. 22-23.
- Jerinić-Prodanović, D., & Protić, Lj. (2011). New data on true bug predators (Heteroptera: Miridae) of jumping plant-lice (Sternorrhyncha: Psylloidea) in Serbia. *Acta Entomologica Serbica*, 16(1-2), 143-146.
- Jerinić-Prodanović, D., Radonjić, A., Smiljanić, D., & Čkrkić Matijević, M. (2021). First record of the Mediterranean fruit fly *Ceratitis capitata* (Wiedemann, 1824) (Diptera: Tephritidae) in Serbia. In *Proceedings of the 16th Conference on Plant Protection*, Zlatibor, Serbia, Book of Abstracts, pp. 53-54.
- Jović, J., Mitrović, M., Cvrković, T., Krstić, O., & Toševski, I. (2012). Occurrence and molecular identification of western flower thrips, *Frankliniella occidentalis* (Pergande), in Serbia. *International Symposium: Current Trends in Plant Protection Proceedings*, 520-525.
- Kavran, M., Konjević, A., Petrić, D., & Čupina, A. I. (2023). The introduction and establishment of four invasive insect species in Serbia. *Insects*, 14(9), 728.
- Konjević, A., Milovac, Ž., Kontsedalov, S., Kanakala, S., & Ghanim, M. (2018). First interception of *Bemisia tabaci* Mediterranean (Q biotype) in Serbia. *Journal of Applied Entomology*, 142(6), 627-631.
- Kosovac, A., Šćiban, M., Pančić, I., Toth, M., Ronkay, L., & Orosz, A. (2020). Revealing the presence of the East Asian leafhopper *Tautoneura polymitusa* (Hemiptera: Auchenorrhyncha: Cicadellidae: Typhlocybinae) in Serbia through DNA barcoding. *Acta Entomologica Serbica*, 25(1), 83-86.
- Kraemer, M. U., Sinka, M. E., Duda, K. A., Mylne, A., Shearer, F. M., Brady, O. J., Messina, J. P., Barker, C. M., Moore, C. G., Carvalho, R. G., Coelho, G. E., Bortel, W. V., Hendrickx, G., Schaffner, F., William Wint, G. R., Elyazar, I.

- R. F., Teng, H.-J., & Hay, S. I. (2015). The global compendium of *Aedes aegypti* and *Ae. albopictus* occurrence. *Scientific data*, 2(1), 1-8.
- Leskey, T. C., & Nielsen, A. L. (2018). Impact of the invasive brown marmorated stink bug in North America and Europe: history, biology, ecology, and management. *Annual Review of Entomology*, 63(1), 599-618.
- Magud, B., & Toševski, I. (2004). *Scaphoideus titanus* Ball. (Homoptera: Cicadellidae) nova štetočina u Srbiji. *Biljni lekar*, 32(5), 348-352.
- Marković, C., & Stojanović, A. (2008). Nalaz bagremove lisne ose *Nematus tibialis* (Newman)(Hymenoptera, Tenthredinidae) u Srbiji. *Biljni lekar*, 36(2), 131-135.
- Mihajlović, Lj., Glavendekić, M., Jakovljević, I., & Marjanović, S. (2008). *Obolodiplosis robiniae* (Haldeman)(Diptera: Cecidomyiidae): A new invasive insect pest on black locust in Serbia. *Glasnik Šumarskog fakulteta*, 97, 197-207.
- Mihajlović, Lj. (2007). *Metcalfa pruinosa* (Say) (Homoptera: Auchenorrhyncha) nova štetna vrsta za entomofaunu Srbije. *Glasnik šumarskog fakulteta*, 95, 127-134.
- Milojković, S., Vujić, M., Đurić, M., & Tot, I. (2021). Geranium bronze, *Cacyreus marshalli* Butler, 1897–new butterfly species for fauna of Serbia (Papilionidea: Lycaenidae). *Acta Entomologica Slovenica*, 29(1), 121-124.
- Miloslavskaya, S., Panychev, A., Myskina, A., Kurenkov, P., & Rudakova, E. (2019). Organization of export transportation of goods from Russia to China. In *IOP Conference Series: Materials Science and Engineering* (Vol. 698, No. 6, p. 066065). IOP Publishing.Observation.org. (2024). *Cinara laportei*. <https://observation.org/species/159030/relations/>
- Osiadacz, B., & Halaj, D. (2015). Checklist of aphids (Hemiptera: Aphididae) of Romania. *Acta Zoologica Bulgarica*, 67(2), 205–216.
- Overton, K., Maino, J. L., Day, R., Umina, P. A., Bett, B., Carnovale, D., Ekesi, S., Meagher, R., & Reynolds, O. L. (2021). Global crop impacts, yield losses and action thresholds for fall armyworm (*Spodoptera frugiperda*): A review. *Crop Protection*, 145, 105641.
- Petrić, D., Pajović, I., Ignjatović, Č. A., & Zgomba, M. (2001). *Aedes albopictus* (Skuse, 1894), a new mosquito species (Diptera: Culicidae) in entomofauna of Yugoslavia. *Biljni lekar*, 29(6), 547-548.
- Petrić, D., Zgomba, M., Ignjatović Čupina, A., Marinković, D., Romeo, B., Francis, S., & Pajović, I. (2011). Invasive mosquito species in Europe and Serbia (1979-2011). *Proceedings: Current trends in plant protection*, 496-505.
- Petrov, I. Z. (2004). A list of currently known ant species (Formicidae: Hymenoptera) of Serbia. *Archives of Biological Sciences*, 56(3-4), 121-125.
- Petrović, A., Črkić, J., Jamhour, A., Petrović-Obradović, O., Mitrović, M., Starý, P., Nedstam, B., & Tomanović, Ž. (2017). First record of *Aphidius ericaphidis* (Hymenoptera, Braconidae) in Europe: North American hitchhiker or overlooked Holarctic citizen? *Journal of Hymenoptera Research*, 57, 143-153.
- Petrović, A., Mitrović, M., Starý, P., Petrović-Obradović, O., Žikić, V., Tomanović, Ž., & Vorburger, C. (2013). *Lysiphlebus orientalis* (Hymenoptera, Braconidae), a new invasive aphid parasitoid in Europe – evidence from molecular markers. *Bulletin of Entomological Research*, 103, 451-457.
- Petrović-Obradović, O. (2003): *Aphids (Aphididae, Homoptera) of Serbia*. Belgrade: Faculty of Agriculture, University of Belgrade, 153 pp. [in Serbian]
- Petrović-Obradović, O. (2021): Asian apricot aphid, *Myzus mumecola* (Matsumura, 1917) (Hemiptera: Aphididae), found in Serbia. *Acta Entomologica Serbica*, 26(2), 19-26.
- Petrović-Obradović, O., Čurčić, Ž., Milovac, Ž., & Radonjić, A. (2022). First record of alien bulb-and-potato aphid *Rhopalosiphoninus latysiphon* (Hemiptera: Aphididae) in Serbia. *Acta Entomologica Serbica*, 27(2), 1-6.
- Petrović-Obradović, O., Poljaković-Pajnik, L., Radonjić, A., Jovičić, I., & Tomanović, Ž. (2018). Alien and invasive aphid species (Hemiptera: Aphididae) found in Serbia. *8th European Hemiptera Congress*, pp. 118. Katowice-Zawiercie, Poland.

- Petrović-Obradović, O., Radonjić, A., Jovičić, I., Petrović, A., Kocić, K., & Tomanović, Ž. (2018). Alien species of aphids (Hemiptera: Aphididae) found in Serbia, new to the Balkan Peninsula. *Phytoparasitica*, 46, 653-660.
- Petrović-Obradović, O., Šćiban, M., & Tomić, M. (2021). Presence of North American Aphid *Drepanaphis acerifoliae* (Thomas, 1878) (Hemiptera: Aphididae: Drepanosiphinae) in Serbia. *Acta Entomologica Serbica*, 26(1), 9-15.
- Petrović-Obradović, O., Smiljanić, D., & Čkrkić Matijević, M. (2020). *Ophraella communis* (Coleoptera: Chrysomelidae) has arrived in Serbia. *Acta Entomologica Serbica*, 25(2), 101-104. <https://doi.org/10.5281/zenodo.4230314>
- Petrović-Obradović, O., Tomanović, Ž., Poljaković-Pajnik, L., & Vučetić, A. (2007). An invasive species of aphid, *Prociphilus fraxinifolii* (Hemiptera, Aphididae, Eriosomatinae), found in Serbia. *Archives of Biological Sciences*, 59(1), 9-10.
- Petrović-Obradović, O., Tomanović, Ž., Poljaković-Pajnik, L., Hrnčić, S., Vučetić, A., & Radonjić, S. (2010). New invasive species of aphids (Hemiptera, Aphididae) in Serbia and Montenegro. *Archives of biological sciences*, 62(3), 775-780.
- Petrović-Obradović, O., Vukašinović, D., Vučetić, A., Milovanović, P., & Krnjaić, S. (2008): *Aphis spiraeicola* Patch, nova štetočina jabuke u Srbiji. IX Savetovanje o zaštiti bilja, 24-28. novembar, Zlatibor, Zbornik rezimea, pp. 124-125.
- Peverieri, G. S., Talamas, E., Bon, M. C., Marianelli, L., Bernardinelli, I., Malossini, G., Benvenuto, L., Roversi, P. F., & Hoelmer, K. (2018). Two Asian egg parasitoids of *Halyomorpha halys* (Stål) (Hemiptera, Pentatomidae) emerge in northern Italy: *Trissolcus mitsukurii* (Ashmead) and *Trissolcus japonicus* (Ashmead) (Hymenoptera, Scelionidae). *Journal of Hymenoptera Research*, 67, 37-53.
- Poggi, F., Sanna, F., Casiraghi, A., Šćiban, M., & Kunz, G. (2024). First record from Europe and of the Asian bamboo-feeding leafhopper *Trifida bilobata* Ohara, 2014 (Hemiptera: Cicadellidae: Typhlocybinae). *Zootaxa*, 5433(1), 144-150.
- Poljaković-Pajnik, L., & Petrović-Obradović, O. (2002). Bow-legged fir aphid *Cinara curvipes* (Patch) (Aphididae, Homoptera) new pest of *Abies concolor* in Serbia. *Acta Entomologica Serbica*, 7(1/2), 147-150.
- Poljaković-Pajnik, L., Drekić, M., Pilipović, A., Nikolić, N., Pap, P., Vasić, V., & Marković, M. (2015). Pojava velikih šteta od *Corythucha arcuata* (Say) (Heteroptera: Tingidae) u šumama hrasta u Vojvodini. *Zbornik radova XIII savetovanja o zaštiti bilja*, 63, 179-181.
- Protić, Lj. (2008). *Leptoglossus occidentalis* Heidemann (Heteroptera: Coreidae) in Serbia. *Acta Entomologica Serbica*, 13(1-2), 81-84.
- Protić, Lj. (2009). *Amphiareus obscuriceps* (Poppius) (Heteroptera: Anthocoridae) in Serbia since 1989. *Acta Entomologica Serbica*, 14(2), 237-239.
- Protić, Lj. (2010). Changes in range and increase of heteroptera in Serbia. *Zaštita prirode*, 61(1), 93-104.
- Protić, Lj. (2011). New Heteroptera for the fauna of Serbia. *Bulletin of the Natural History Museum*, 4, 119-125.
- Protić, Lj., & Milenković, M. (1999). True bugs (Heteroptera) on mistletoes *Viscum album* L. and *Loranthus europaeus* Jacq. *Protection of Nature*, 51(2), 111-116.
- Protić, Lj., & Roganović, D. (2002). Heteroptera on *Cupressus sempervirens* (Linnaeus) in Montenegro (State community of Serbia and Montenegro). *Acta Entomologica Serbica*, 7(1), 2.
- Protić, Lj., & Šeat, J. (2016). First records of the alien sycamore seed bug *Belonochilus numenius* in Serbia (Heteroptera: Lygaeidae). *Acta Entomologica Serbica*, 21, 13-19.
- Protić, Lj., & Stojanović, A. (2001). *Oxycarenus lavaterae* (Fabricius 1787) (Heteroptera: Lygaeidae): Another new species in the entomofauna of Serbia. *Zaštita prirode*, 52(2), 61-63.
- Protić, Lj., & Stojanović, A. (2025). New data of *Tuponia* (Heteroptera: Miridae) in the collections of the Natural History Museum in Belgrade. *Acta Entomologica Serbica*, 30(1).
- Protić, Lj., & Živić, N. (2012). *Perillus bioculatus* (Fabricius) (Heteroptera: Pentatomidae) in Serbia. *Acta Entomologica Serbica*, 17(1/2), 23-28.
- Rezza, G. (2014). Dengue and chikungunya: long-distance spread and outbreaks in naïve areas. *Pathogens and global health*, 108(8), 349-355.

- Richardson, D. M., Pyšek, P., Rejmánek, M., Barbour, M. G., Panetta, F. D., & West, C. J. (2000). Naturalization and invasion of alien plants: concepts and definitions. *Diversity and Distributions*, 6(2), 93-107.
- Ripka, G., Skuhrovec, J., Trýzna, M., & Mifsud, D. (2021). Checklist of alien insects in Hungary. *NeoBiota*, 66, 25–46.
- Sakai, A. K., Allendorf, F. W., Holt, J. S., Lodge, D. M., Molofsky, J., With, K. A. & Weller, S. G. (2001). The population biology of invasive species. *Annual review of ecology and systematics*, 32(1), 305-332.
- Schlitt, B. P., Horvath, A., & Orosz, A. (2024). A Mediterranean gatecrasher: *Neoaleturus inscriptus* (Haupt, 1927) new to the Carpathian Basin (Hemiptera: Auchenorrhyncha: Cicadellidae). *Folia Entomologica Hungarica*, 85, 159-165.
- Šćiban, M., & Kosovac, A. (2020). New records and updates on alien Auchenorrhyncha species in Serbia. *Pesticides and Phytomedicine*, 35(1), 9-17.
- Šćiban, M., Mirić, R., & Kosovac, A. (2021). First record of the Japanese grape leafhopper *Arboridia kakogawana* (Hemiptera: Auchenorrhyncha: Cicadellidae: Typhlocybinae) in Serbia. *Acta Entomologica Serbica*, 26(1), 71-74.
- Šeat, J. (2015). *Halyomorpha halys* (Stål, 1855) (Heteroptera: Pentatomidae), a new invasive species in Serbia. *Acta Entomologica Serbica*, 20, 167-171.
- Šeat, J., Vujić, M., & Nadaždin, B. (2019). New faunal data on true bugs (Heteroptera) in Serbia. *Acta Entomologica Serbica*, 24(1), 95-99.
- Simberloff, D., Martin, J. L., Genovesi, P., Maris, V., Wardle, D. A., Aronson, J., Courchamp, F., Galil, B., García-Berthou, E., Pascal, M., Pyšek, P., Sousa, R., Tabacchi, E., & Vilà, M. (2013). Impacts of biological invasions: what's what and the way forward. *Trends in Ecology & Evolution*, 28(1), 58-66.
- Simonović, M., & Graora, D. (2019). American grape leafminer, *Phyllocnistis vitegenella* Clemens (Lepidoptera: Gracillariidae): New species in Serbia. *Biljni lekar*, 47(5), 337-344.
- Simova-Tošić, D., Graora, D., Spasić, R., & Smiljanić, D. (2010). *Oligotrophus betheli* Felt (Diptera: Cecidomyiidae), a new species in the fauna of Europe. *Archives of Biological Sciences*, 62(4), 1219-1222.
- Sprangers, T., Noyez, A., Schildermans, K., & De Clercq, P. (2017). Cold hardiness of the black soldier fly (Diptera: Stratiomyidae). *Journal of Economic Entomology*, 110(4), 1501-1507.
- Stanković, S. S., Trajković, A., & Žikić, V. (2024). New records of the black soldier fly *Hermetia illucens* (Diptera: Stratiomyidae) in Serbia and Montenegro. *Biologica Nyssana*, 15(1), 47-51.
- Stojanović, D. V., Konjević, A., Marković, M., & Kereši, T. (2015). Nalazi šimširovog moljca *Cydalima perspectalis* (Walker, 1859) (Lepidoptera, Crambidae) u Vojvodini. *Biljni lekar*, 43(4).
- Tomanović, Ž., Žikić, V., & Petrović, A. (2021). *Fauna of parasitoid wasps (Hymenoptera, Braconidae, Aphidiinae) of Serbia*. Serbian Academy of Sciences and Arts (SANU), Department of Chemical and Biological Sciences, Special Editions 15: 697.
- Tomić, M., & Petrović-Obradović, O. (2022). *Periphyllus californiensis* (Shinji, 1917) and *Tinocallis saltans* (Nevsky, 1929) (Hemiptera: Aphididae), two alien aphid species new to the fauna of Serbia. *Acta Entomologica Serbica*, 27(2), 7-17.
- Tong, T., Yu, E., & Roberts, R. K. (2014). Dynamics of transport infrastructure, exports and economic growth in the United States. In *Journal of the Transportation Research Forum* Vol. 53, No. 1, pp. 65-81.
- Toševski, I., Jović, J., Mitrović, M., Cvrković, T., Krstić, O., & Krnjajić, S. (2011). *Tuta absoluta* (Meyrick, 1917) (Lepidoptera, Gelechiidae): a new pest of tomato in Serbia. *Pesticidi i fitomedicina*, 26(3), 197-204.
- Toševski, I., Milenković, S., Krstić, O., Kosovac, A., Jakovljević, M., Mitrović, M., Cvrković, T., & Jović, J. (2014). *Drosophila suzukii* (Matsumura, 1931) (Diptera: Srosophilidae): A new invasive pest in Serbia. *Zaštita bilja*, 65(3), 99-104.
- Vučetić, A., Jović, I., & Petrović-Obradović, O. (2014). Several new and one invasive aphid species (Aphididae, Hemiptera) caught by yellow water traps in Serbia. *Phytoparasitica*, 42, 247-257.
- Vujić, M. D., & Vesović, N. (2022). The fig bark beetle *Hypoborus ficus* Erichson, 1836 (Coleoptera: Curculionidae: Scolytinae) in Serbia: First records for more than a century. *Acta Entomologica Serbica*, 27(2), 91-96.

- Vujić, M. D., Ivković, S., Rekecki, T., Krstić, D., Stanković, V., Đurić, M., & Tot, I. (2021). A first record of the alien mantis species *Hierodula tenuidentata* (Mantodea: Mantidae) in Serbia. *Acta Entomologica Serbica*, 26(1), 1-7.
- Vujić, M., Vesović, N., Šević, M., Maričić, M., & Tot, I. (2022). A new greenhouse invader: the first report of the alien ring-legged earwig, *Euborellia annulipes* (Dermaptera, Anisolabididae) in Serbia, with the first checklist of earwigs of the country. *Travaux du Muséum National d'Histoire Naturelle "Grigore Antipa"*, 65(2), 27-38.
- Wang, Y. S., & Shelomi, M. (2017). Review of black soldier fly (*Hermetia illucens*) as animal feed and human food. *Foods*, 6(10), 91.
- Zatezalo, A. (2014). Invazivne vrste beskičmenjaka u Srbiji. *Nature Protection*, 64(1), 1-50.
- Žikić, V., Stanković, S. S., Ilić Milošević, M., Petrović-Obradović, O., Petrović, A., Stary, P., & Tomanović, Ž. (2015). First detection of *Lysiphlebus testaceipes* (Cresson)(Hymenoptera: Aphidiinae) in Serbia: an introduced species invading Europe. *North-Western Journal of Zoology*, 11(1), 97-101.
- Žikić, V., Stanković, S. S., Radeka, B., Vesović, N., & Petrović, A. (2023). *Zombrus bicolor* (Enderlein) (Hymenoptera: Braconidae: Doryctinae), a new allochthonous species for the fauna of Serbia. *North-Western Journal of Zoology*, 19(2), 193-196.
- Živojinović, S., & Vasić, K. (1963). First contribution to the knowledge of a new pest of our oak forests – *Antherea yamami* Guer. (Lepidoptera, Saturnidae). *Plant protection*, 75, 491-508.

АЛОХТОНИ ИНСЕКТИ У СРБИЈИ: ПОДАЦИ ОБЈАВЉЕНИ ТОКОМ 21. ВЕКА

ВЛАДИМИР ЖИКИЋ, ОЛИВЕРА ПЕТРОВИЋ-ОБРАДОВИЋ, САША С. СТАНКОВИЋ,
МАРИЈАНА ИЛИЋ МИЛОШЕВИЋ, МАРКО ШЋИБАН И ЉИЉАНА ПРОТИЋ

Извод

Растућа глобализација трговине и кретања људи значајно је допринела ненамерном уношењу страних врста инсеката широм света, укључујући и Србију. Овај преглед сумира податке о страним инсектима забележеним у Србији између 2000. и 2025. године, на основу објављене литературе и база података отвореног приступа. Укупно је идентификовано 120 страних врста, од којих се 79 (66%) сматра инвазивним. Већина припада породици Hemiptera, посебно породици Aphididae (24 врсте). Други значајни записи укључују Hymenoptera, Coleoptera, Lepidoptera, Diptera и неколико других редова. У неколико случајева, примерци су сакупљени пре 2000. године, али су формално пријављени касније, због претходне погрешне идентификације или недостатка дијагностичких алата као што је COI баркодирање. Климатске промене и повећана садња украсних биљака домаћина допринели су ширењу медитеранских врста ка северу, као што су *Toponia hippophaes* и *Orsillus depressus*. Намерно уношење у сврху биоконтроле (нпр. *Perillus bioculatus*, *Ophraella communa*) такође је документовано. Открића девет страних врста између 2023. и 2024. године указују на континуирани тренд уношења. Већина врста потиче из Азије и Северне Америке, што одражава глобалне обрасце трговине. Ова студија наглашава неопходност унапређења система мониторинга, јачања таксономске експертизе и спровођења свеобухватних процена ризика, као кључних корака у ефикасном одговору на све учесталији унос и ширење алохтоних инсеката на територији Србије.

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