


ADDITIONAL RECORDS OF *MEGABRUCHIDIUS DORSALIS* (FÄHRÆUS, 1839) (COLEOPTERA, CHRYSOMELIDAE, BRUCHINAE) IN ZAGREB, CROATIA

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Horvat, E., Šipek, M. & Šajna, N.: Additional records of *Megabruchidius dorsalis* (Fähræus, 1839) (Coleoptera, Chrysomelidae, Bruchinae) in Zagreb, Croatia. Nat. Croat., Vol. 31., No. 2, 403-408, 2022, Zagreb.

In this paper, we report two new locations of the alien invasive seed beetle *Megabruchidius dorsalis* in Zagreb, Croatia. Additionally, we confirm for the second time the presence of *M. dorsalis* at one location in the same city. All beetles were reared from mature *Gleditsia triacanthos* pods collected from the ground (three locations) and from trees (one location). These records contribute to the knowledge of the distribution of *M. dorsalis* in Europe.

Key words: new locations, seed beetle, *Gleditsia triacanthos*, Europe, alien species, range expansion, coexistence

Horvat, E., Šipek, M. & Šajna, N.: Dodatni nalazi za *Megabruchidius dorsalis* (Fähræus, 1839) (Coleoptera, Chrysomelidae, Bruchinae) u Zagrebu, Hrvatska. Nat. Croat., Vol. 31., No. 2, 403-408, 2022, Zagreb.

U ovom radu donose se dvije nove lokacije za stranu invazivnu vrstu, štetnika na sjemenu *Megabruchidius dorsalis* u Zagrebu, Hrvatska. Dodatno po drugi puta potvrđujemo prisutnost *M. dorsalis* na jednoj lokaciji u istom gradu. Svi kukci uzgajani su iz zrelih mahuna *Gleditsia triacanthos* sakupljenih s tla (tri lokacije) i sa stabala (jedna lokacija). Ovi nalazi doprinose poznavanju rasprostranjenosti *M. dorsalis* u Europi.

Ključne riječi: novi lokaliteti, štetnik sjemena, *Gleditsia triacanthos*, Europa, strana vrsta, širenje areala, koegzistencija

INTRODUCTION

Currently, two species from the genus *Megabruchidius* have established populations in Europe (ŠIPEK *et al.*, 2022). *Megabruchidius dorsalis* (Fähræus, 1839) and *M. tonkineus* (Pic, 1904) both originate from East Asia but in Europe, they feed and develop inside the seeds of the North American *Gleditsia triacanthos* L. from the Fabaceae family (Yus RAMOS, 2009). Recently, it was confirmed that *M. dorsalis* is able to develop inside the seeds of *Gymnocladus dioicus* (L.) K. Koch, closely related to *G. triacanthos* (CALLOT *et al.*, 2016; TEMRESHEV & VALIYEVA, 2016; GYÖRGY & TUDA, 2019). According to the literature currently published, *M. dorsalis* is present in 22 European countries: Albania, Austria,

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Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, France, Germany, Hungary, Italy, Montenegro, the Netherlands, Poland, Romania, Russia, Slovakia, Slovenia, Spain, Switzerland, Turkey, Ukraine; and *M. tonkineus* in 14 European countries: Bulgaria, Croatia, France, Germany, Greece, Hungary, Montenegro, Romania, Russia, Serbia, Slovakia, Spain, Switzerland, Turkey (NAKLÁDAL, 2018; HORVAT & SAJNA, 2021a; BENNEN, 2022; GRADINAROV, 2022; MAJZLAN & VIDLIČKA, 2022; ŠIPEK *et al.*, 2022; FAGOT & SMETS, 2022; INAN & HIZAL, 2023). Among countries in which both species were confirmed, only in 8 countries were the two species recorded as coexisting in the same micro-location: Paris (France) (FRITZSCHE & DELOBEL, 2012), Manngein-Neckerau (Germany) (Rheinheimer, 2014), Budapest (Hungary) (YUS RAMOS, 2009), Podgorica (Montenegro) (ŠIPEK *et al.*, 2022), Barcelona (Spain) (YUS RAMOS & CARLES-TOLRÁ, 2017) in 10 locations in Romania (PINTILIOAIE *et al.*, 2018), in two locations in Russia (KOROTYAEV, 2015), and in two locations in Turkey (INAN & HIZAL, 2023). What is even more, to date only 4 of these studies recorded both species on the same pod or tree: in Budapest (YUS RAMOS, 2009), Paris (FRITZSCHE & DELOBEL, 2012), Podgorica (ŠIPEK *et al.*, 2022), and Istanbul and Düzce Provinces (INAN & HIZAL, 2023).

New locations of both species need to be recorded and published for the better understanding of their distribution, range expansion, and coexistence. Therefore, in this study, we report two new locations in Zagreb, Croatia where *M. dorsalis* was reared from collected pods and one location where the presence of *M. dorsalis*, previously recorded in 2020, was confirmed (HORVAT & SAJNA, 2021b).

MATERIAL AND METHODS

Mature *G. triacanthos* pods were collected at four distinct locations in Zagreb, Croatia (Tab. 1). At "Cvjetni trg" location, the pods were collected from the trees on 30 November 2021, and at the remaining three locations the pods were collected from the ground on 1 December 2021. All collected pods belonged to the 2021 season production. Pods were then transported to the ecology laboratory at the Faculty of Natural Sciences and Mathematics in Maribor, Slovenia, and stored in dark cloth bags until examination. The material inspection was carried out on 25 July 2022. All reared beetles were inspected under a stereomicroscope to distinguish between *M. dorsalis* and *M. tonkineus* and between females and males. The main feature by which we can distinguish the two species is the spiniform extension of the posterior tibia which is longer

Tab. 1. List of location coordinates and description of specimens found in inspected pods in Zagreb, Croatia. Scale bars are 1 mm

Location	Coordinates	No. of pods checked	No. of males (♂) and females (♀), organism found alive (a)/dead (d)	Male: female ratio
Cvjetni trg	45°48'44.2"N, 15°58'27.0"E	26	72♂d, 12♂a 72♀d; 3♀a	1:0.89
Restaurant "Agronomija i Šumarstvo"	45°49'40.3"N, 16°01'44.0"E	84	57♂d; 31♂a 46♀d; 29♀a	1:0.85
Faculty of Agriculture – Pavilion VI	45°49'39.5"N, 16°01'49.7"E	8	0	/
Dabrov Park (park Nessie)	45°49'12.8"N, 16°01'15.6"E	31	121♂d; 11♂a 115♀d, 8♀a	1:0.93

in *M. tonkineus* than in *M. dorsalis* (PINTILIOAIE, 2018). Females of both species are easily distinguished from males by the presence of pygidial pits on the pygidium (Pintilioaie, 2018), therefore females and males were counted and the female: male ratio was calculated for each location.

RESULTS AND DISCUSSION

Together we collected and examined 149 *G. triacanthos* pods. All emerged beetles were identified as *M. dorsalis* (Fig. 1). Beetles emerged from pods collected at three out of four locations and at all locations we counted more males than females (Tab. 1). The highest infestation rate was at Dabrov Park (255 specimens from 31 pods) and the lowest at the Restaurant "Agronomija i Šumarstvo" (163 specimens from 84 pods). Our data indisputably prove the presence of *M. dorsalis*, however, data on abundance are less reliable because of the long incubation of almost 8 months. During this time it could be possible that the second generation of beetles might have developed; because whole pods with seeds were incubated and the first generation could have mated and laid eggs. The beetle has a lifecycle that is either trivoltine (warmer climate) or bivoltine (cooler climate) and the development from egg to adult takes about 50 days (KURITA & SHIMADA, 2002). The distance between the currently published locations of *M.*

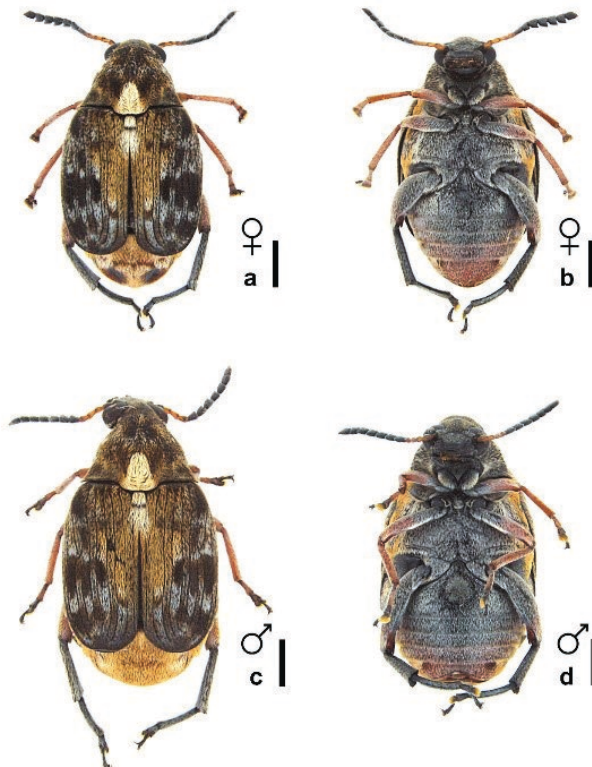


Fig. 1. Adult *Megabruchidius dorsalis* – dorsal (a) and ventral (b) view of female and dorsal (c) and ventral (d) view of male specimen

dorsalis in Zagreb and the locations of *M. tonkineus* near Osijek (KURTEK et al., 2017) is approximately 200km. Interestingly, only *M. dorsalis* was recorded in Maribor, Slovenia (SAJNA, 2019; HORVAT & ŠAJNA, 2022) and Banja Luka, Bosnia and Herzegovina (ŠIPEK et al., 2022), only *M. tonkineus* was recorded on Fruška Gora, Serbia (GAVRILOVIĆ & SAVIĆ, 2013) and both species have been recorded in Budapest, Hungary (YUS RAMOS, 2009), Temišvar, Romania (PINTILIOAIE 2018) and Podgorica, Montenegro (ŠIPEK et al., 2022), to name locations closest to Zagreb and Osijek.

The extent of the interaction between *M. dorsalis* and *M. tonkineus* is still unknown. Some studies have shown evidence of competitive interaction between these two species (RHEINHEIMER, 2014; KOROTYAEV, 2016; ŠIPEK et al., 2022). The recent host switch of *M. dorsalis* to *Gy. dioicus* in Budapest, Hungary (GYÖRGY & TUDA, 2019) could also be a response to the pressure of coexistence. The spread of both *Megabruchidius* species in Europe should continue to be monitored the better to understand their mobility.

The entomological material is deposited in the collection of the Chair of Ecology, Department of Biology, Faculty of Natural Sciences and Mathematics at the University of Maribor, Slovenia.

ACKNOWLEDGEMENTS

The authors acknowledge financial support within the research programs P1-0403 and J1-2457, funded by the Slovenian Research Agency. We are grateful to Miroslav Zuber for pointing out references about occurrences of *Megabruchidius* in the Czech Republic and Slovakia, and to an anonymous reviewer for helpful comments improving our paper. We would like to thank Marijana Vuković for the final editing and Croatian version of the abstract.

Received August 22, 2022

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SUMMARY

Additional records of *Megabruchidius dorsalis* (Fåhræus, 1839) (Coleoptera, Chrysomelidae, Bruchinae) in Zagreb, Croatia

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Currently, there are two alien seed beetle species from the East Asian genus *Megabruchidius* present in Europe, namely *M. dorsalis* and *M. tonkineus*. In Europe, their host is an ornamental, *Gleditsia triacanthos* from North America. Both beetles have already been confirmed in Croatia but at different locations approximately 200km apart. However, they have also been confirmed to coexist in seven European countries, some close to Croatia (Hungary, Romania, and Montenegro). In this study, we collected mature *Gleditsia triacanthos* pods on 30 November and 1 December 2021 at four distinct locations. Three locations were new but at one location *M. dorsalis* had been previously established. The collected material was stored for several months in dark cloth bags in the ecology laboratory at the Faculty of Natural Sciences and Mathematics in Maribor (Slovenia). Bags were examined on 25 July 2022 and all emerged beetles were collected and inspected under a stereomicroscope to accurately determine the species. Next, females and males were counted. Beetles were reared from material collected at three out of four locations and all beetles reared belonged to *M. dorsalis*. At all locations, more males than females were reared. Two locations (Cvjetni trg and Restaurant "Agronomija i Šumarstvo") are new records of *M. dorsalis* in Zagreb and at one location (Dabrov Park) the species is confirmed for the second time. These results contribute to a better understanding of the distribution of *M. dorsalis* in Europe.