Rapid Communication

First record of non-native Asian seed beetle, *Megabruchidius dorsalis* (Fåhræus, 1839) and its parasitoid, in Slovenia

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Abstract

This contribution serves to formally report the first record of the non-native Asian seed beetle *Megabruchidius dorsalis* in Slovenia, found in 2017 and 2018 in Maribor. Within the range known at present in Europe this species has found a new food source – the seeds of the ornamental North American tree species *Gleditsia triacanthos*. From seeds collected in autumn of 2017 adult beetles emerged in the spring of 2018. Later in 2018, seeds in pods, which overwintered and were kept outdoors in summer, were collected in the beginning of autumn. Fully developed beetles were found and the inspection of 500 seeds showed heavy infestation from various life-stages, sometimes co-occurring, indicating that the multivoltine life cycle has been retained in the new range. Additionally, in two of seven locations both live and dead Hymenoptera parasitoids inside the pods with damaged seeds and beetle remains were observed.

Key words: Chrysomelidae, Bruchinae, *Gleditsia triacanthos*, invasive species, Europe

Introduction

The increase in abundance and the rapid range expansion of invasive non-native species urges us to record their spread and to better understand their impact in their new range. The East Asian genus *Megabruchidius* (Borowiec, 1984) comprises four species, two of which have been introduced to and established in Europe (György 2007; Yus Ramos 2009). The first European record of *Megabruchidius dorsalis* (Fåhræus, 1839; Figure 1a) came from Italy (Migliaccio and Zampeti 1989). Since then, the species has been observed in France, Switzerland and Greece (Yus Ramos et al. 2014), Hungary (Bodor 2012), Germany (Rheinheimer 2014), Slovakia (Říha and Bezděk 2015), Austria (Rabitsch 2016), Ukraine (Fursov and Nazarenko 2015), Kazakhstan (Temreshev and Valiyeva 2016), and Romania (Pintilioaie et al. 2018).

In its native range, *M. dorsalis* feeds on the dry, hardened, mature seeds of *Gleditsia japonica* Miq. (Takakura 1999; Kurota and Shimada 2001) and is one of two Asian bruchinae species that develops in the seeds of the

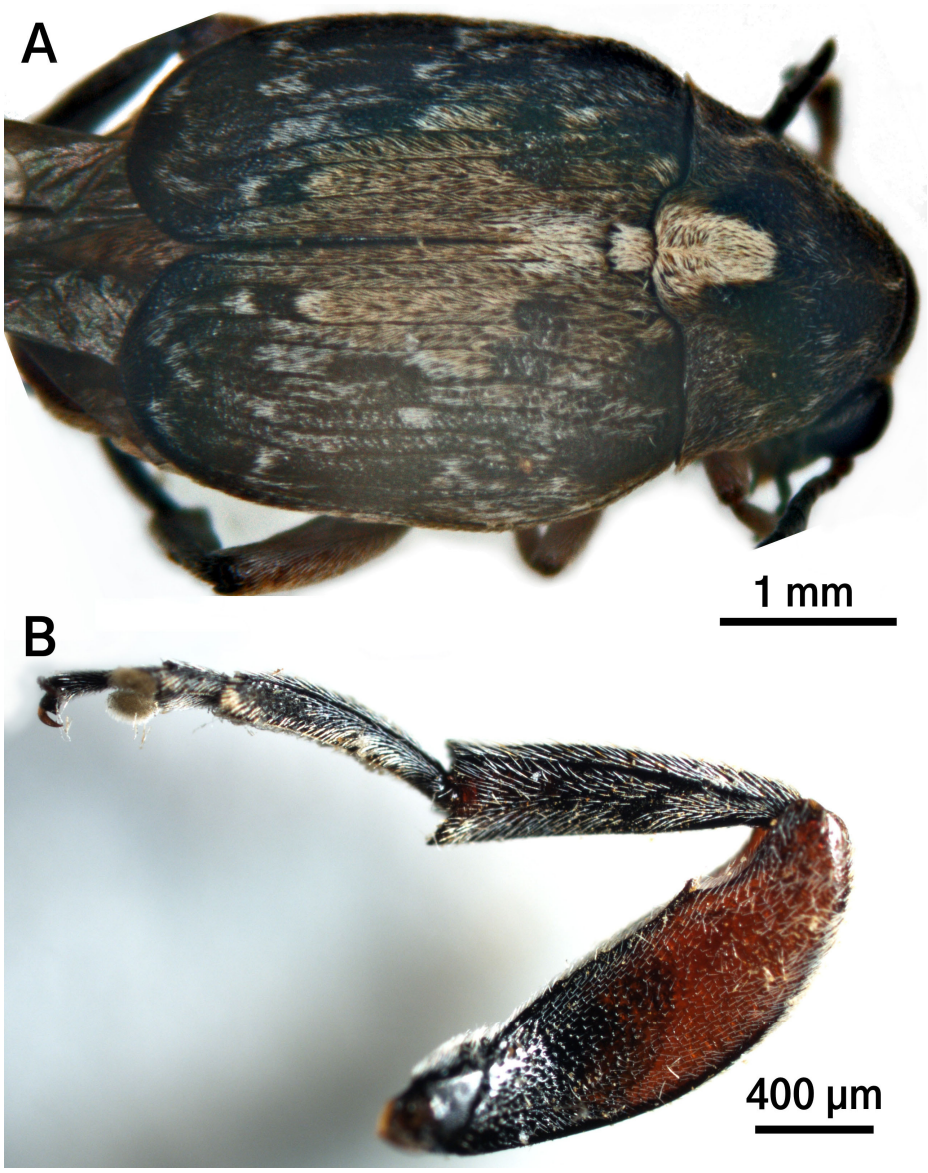

Figure 1. Adult male *Megabruchidius dorsalis* (a) and hind leg (b).

ornamental tree species *Gleditsia triacanthos* L., a deciduous tree native to central North America and belonging to the Fabaceae subfamily Caesalpinioideae. The close relationship of *G. triacanthos* with *G. japonica* most likely allowed the host switching of the seed beetle in the new range. However, laboratory experiments showed that also other species of *Gleditsia* might be accepted (György 2007).

The second Asian bruchid species in Europe – *M. tonkineus* (Pic, 1904), which feeds on the same host plant, was recorded for the first time indoors in Germany in 1980 (Wendt 1980). Its current distribution includes Hungary (Jermy et al. 2002), Bulgaria (Stojanova 2007), Switzerland (György and Germann 2012), France, Germany and Greece (Yus Ramos et al. 2014), southern Russia (Korotyaev 2011), Slovakia (Majzlan 2011), Serbia (Gavrilović and Savić 2013), and Croatia (Kurtek et al. 2017). Both bruchinae are recognized as invasive, currently increasing their ranges and

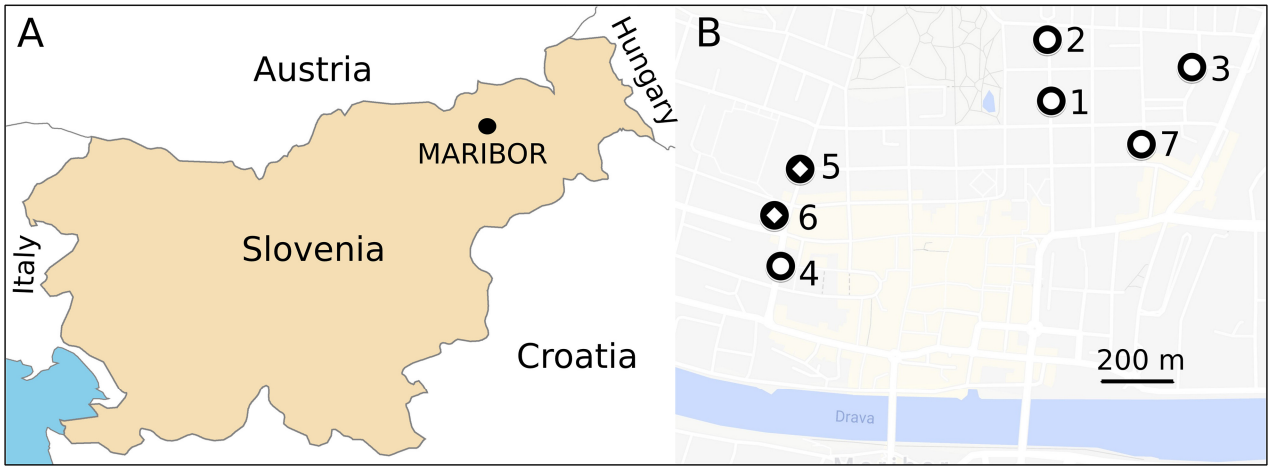

Figure 2. The city of Maribor [46°33′27.4″N; 15°38′43.8″E] (a) and studied locations (b) in the town center.

both may occasionally co-exist (Bodor 2012), whereby *M. dorsalis* is likely to outcompete *M. tonkineus* (Rheinheimer 2014; Korotyaev 2016).

Megabruchidius dorsalis and *M. tonkineus* are similar in size; both species can reach 4 mm or more. The main morphological difference is the distinctly shorter tooth on the apex of the hind tibia in *M. dorsalis* (Figure 1b), the length of which does not exceed that of the neighboring teeth (Korotyaev 2015). Additionally, differences in the longitudinal depressions on the female pygidium, and the respective length/width relation of the pygidium (longer and narrower in females, shorter and broader in males) allow for successful separation between males and females of *M. dorsalis*.

Materials and methods

In Slovenia, the introduction of the host plant *G. triacanthos* happened around 1800, slightly later than in Western Europe (Brus and Gajšek 2015). The trees are planted in urban environments, usually in clusters along roads and occasionally single ones. I observed damaged *G. triacanthos* pods with damaged seeds on the ground in the town of Maribor (Slovenia, Figure 2) in November 2016, when I first checked for the presence of fruit and seed predation signs. I collected ripe pods from the ground in autumn 2017 and stored these in plastic bags in a dry, warm (22 °C) place with medium light. Adult *M. dorsalis* (2 females, 1 male) emerged at the end of May 2018.

For a more detailed study, sampling of pods from the ground was carried out on the 6.IX.2018 at 3 locations. These pods have survived winter conditions outdoors and have most likely fallen to the ground in spring, not autumn, since pods from autumn are often removed by regular sweeping of city streets. Additionally, pods were collected on 20.IX.2018, when a distinction was made between old black pods and shiny reddish pods, both found on the ground. I also separated the early pods from this season, which still had green and fleshy upper parts, from the older, dryer

Table 1. List and description of *Megabruchidius dorsalis* specimen found in pods collected in September 2018 in Maribor [46°33′27.4″N; 15°38′43.8″E] from seven locations. Geo-referenced record data is available in Table S1.

Location	Nr. of pods checked, nr. of specimen found, nr. of males (♂), females (♀)	Gender	Organism alive (a) / dead (d)	Organism found outside (f) / inside seed (s)
1	14 pods, 6 specimen,	1♀	a	f
	0♂,1♀	1?	d	s
		5 larvae		
2	11pods, 11 specimens	1♀	a	f
	1♂, 4♀	1♀	d	f
		2♀	d	s
		1♂	d	s
		2?	d	s
		1 pupa/3 larvae		
3	16 pods, 11 specimens,	2♀	a	f
	1♂, 6♀	1♂	a	f
		2♀	a	s
		1♀	d	f
		1♀	d	s
		4 larvae		
4	8 pods, 12 specimen,	1♀	a	f
	3♂, 3♀	3♂	d	s
		2♀	d	s
		1 pupa/5 larvae		
5	6 pods, 30 specimen,	1♂	a	f
	2♂, 6♀	2♀	a	f
		1♂	d	f
		3♀	d	f
		1♀	d	s
		1?	d	s
		1 pupa/20 larvae		
6	4 pods, 15 specimen,	2♀	a	f
	0♂, 6♀	2♀	a	s
		2♀	d	f
		3?	d	s
		2 pupae/3 larvae		
7	5 pods, 7 specimen,	2♂	d	s
	2♂, 1♀	1♀	d	s
		4 larvae		

pods of the previous season, even though these could still be shiny. The pods collected on 6.IX.2018 were inspected for adult beetles on 18.IX.2018, and pods collected on 20.IX.2018 were inspected the next day. To check for the presence of *M. dorsalis* life-stages in the seeds, I imbibed those seeds without damage visible to the naked eye for at least 3 days and then dissected them.

Results and discussion

Altogether, 7 locations with several *G. triacanthos* trees were checked (Figure 2b).

Infestation of the pods was high (Table 1). Fully developed beetles were found outside the pod or in the pod, with some still in the seed, in the latter case usually dead. Live adult beetles were found on each occasion, except one, among which females were more frequent. Seven dead animals were damaged, eaten by syrphids or mites to such an extent that gender determination was not possible. Altogether, I identified 27 females and 9

males. The observed sex ratio in favor of higher numbers of females has been previously reported from studies of wild populations in the native range (Takakura 1999) and is here confirmed in the new range. Similarly to the native range (Kurota and Shimada 2001), I observed that *M. dorsalis* can reproduce without feeding immediately after emergence from the seed.

I inspected a total of 500 seeds and dissected imbibed seeds for *M. dorsalis* presence. Various life-stages were observed within the same pod. At each location, adult life-stages and larvae coincided; at 4 locations, pupae were also found. In its native range, *M. dorsalis* has a multivoltine life cycle, with three to four generations reported and can overwinter in all larval instars and in the adult stage (Kurota and Shimada 2001). It seems that the multivoltine life cycle and the flexibility of its overwintering stages have been retained in the new range. Observations reported by Kurota and Shimada (2001) showed that more than two larvae seldom entered one seed, and intraspecific competition within the seed was expected to result in one adult emerging from one seed. However, on several occasions I found more than one individual feeding inside one seed. The variability of incidents included 2 fully developed beetles; 2 larvae differing in size; 2 larvae of similar size; 4 larvae of similar size; and secondary larval infestation of an already drilled half-empty seed.

At two neighboring locations (location 5 and 6, Figure 2b), one characterized by a group of large trees, I observed both live and dead Hymenoptera parasitoids inside the pods with damaged seeds. Their determination still needs to be undertaken; however, there is a known *M. dorsalis* parasitoid in the new range belonging to the genus *Eurytoma* (Hymenoptera, Chalcidoidea, Eurytomidae), which was recently described as a new species *Eurytoma gleditsiae* (Zerova et Fursov, 2015) from Kyiv, Ukraine (Zerova and Fursov 2015).

The collected 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.

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Supplementary material

The following supplementary material is available for this article:

Table S1. Geo-referenced record data of *Megabruchidius dorsalis* presence in *Gleditsia triacanthos* seed pods in Maribor, Slovenia.

This material is available as part of online article from:
http://www.reabic.net/journals/bir/2019/Supplements/BIR_2019_Sajna_Table_S1.xlsx