

Research Article

First records of the Asian seed beetles *Megabruchidius tonkineus* (Pic, 1904) and *M. dorsalis* (Fähræus, 1839) in TurkeyMuhittin Inan¹ and Erdem Hızal^{2,*}¹Department of Surveying and Cadastre, Faculty of Forestry, Istanbul University-Cerrahpasa, Istanbul, Turkey²Department of Forest Entomology and Protection, Faculty of Forestry, Istanbul University-Cerrahpasa, Istanbul, TurkeyAuthor e-mails: inan@iuc.edu.tr (MI), hizal@iuc.edu.tr (EH)

*Corresponding author

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Abstract

The genus *Megabruchidius* has been recorded recently in many European countries. This study reports the first records of *M. tonkineus* and *M. dorsalis* from Turkey. Both species were detected in the hard seeds of *Gleditsia triacanthos*. *M. tonkineus* emerged from pods collected at all locations, while *M. dorsalis* was found at two locations. Both species were collected in the same trees in Istanbul and Düzce Provinces.

Key words: Bruchinae, *Gleditsia triacanthos*, alien species, invasive insects, Europe**Introduction**

The Bruchinae, or seed beetles, are presently assigned to the family Chrysomelidae. Several seed beetle species are important economically and agriculturally because their larvae develop in the seeds of plants (Anton 2010; György and Germann 2012). There are approximately 1,700 known seed beetle species (Johnson et al. 2004). In Europe, two *Megabruchidius* species originating from East Asia were introduced: the first European record of *M. tonkineus* was from Germany (Wendt 1980), while that of *M. dorsalis* was from Italy (Migliaccio and Zampetti 1989). Both were subsequently reported in many European countries (Delobel and Delobel 2008; Korotyayev 2011, 2015; Šipek et al. 2022; Gradinarov 2022). *Megabruchidius tonkineus* and *M. dorsalis* develop in the seed pods of the honey locust *Gleditsia triacanthos* L. (Yus-Ramos et al. 2014), which is native to eastern North America. *Gleditsia triacanthos* was first brought to Italy in 1700 and deliberately planted all over Europe as a frost-tolerant ornamental tree species. There are some recent records of *G. triacanthos* spreading spontaneously in Europe (Horvat and Sajna 2021a). *Gleditsia triacanthos* is widely planted as a living hedge around vineyards, gardens, and nurseries, and as an ornamental tree in Turkey (Kılıç 2018).



Figure 1. Locations where the study was conducted: 1) Istanbul Technical University Garden and Bahçeköy/Sarıyer; 2) Manyas Bird Paradise; 3) Bursa Forest Nursery; 4) Kırklareli Forest Nursery; and 5) Bahçeşehir.

Here, we report *M. tonkineus* and *M. dorsalis* for the first time in Turkey, where they were detected in *G. triacanthos* seeds. We also review the latest literature on the occurrence of both species in Europe.

Materials and methods

During surveys in 2012–2020, several *G. triacanthos* seed pods, which are emergence sources of insects, were collected in five provinces in Turkey (Figure 1). The seedpods were packed in cardboard boxes, placed at room temperature (22 °C), and checked regularly for emerging adults. The beetles were measured with a Leica S8APO stereomicroscope and photographed with an integrated camera. The specimens are currently preserved in the Collection of Istanbul University-Cerrahpaşa, Faculty of Forestry, Department of Forest Entomology and Protection.

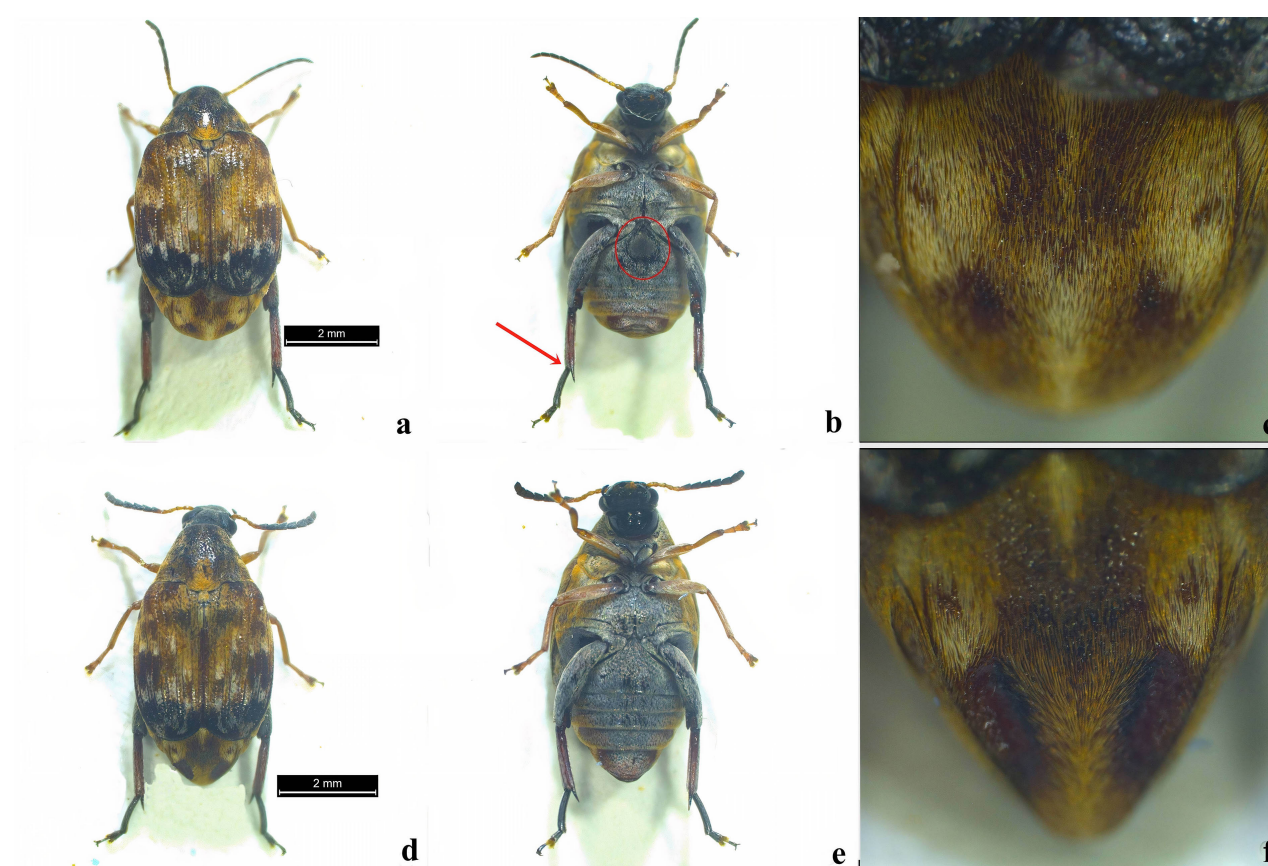
Results and discussion

We collected 195 seed pods and 663 beetle specimens. We found that *M. tonkineus* and *M. dorsalis* co-occurred in the same trees at two locations (Table 1).

In *M. tonkineus*, the pronotum is subconical and the elytra are reddish yellow to reddish brown with blackish apices, while in *M. dorsalis*, the pronotum is campaniform and the elytra are dark grey (Figures 2a, d, 3a, d). The main morphological difference between our specimens was the distinctly shorter tooth on the apex of the hind tibia in *M. dorsalis* compared to *M. tonkineus*, which had a large tooth exceeding the first tarsal segment (Figures 2b, e, 3b, e).

Table 1. List and description of research areas, species and specimens.

	Location	Collected date	Emerged dates	No. of Trees/No. of seed pods / No. of specimens found	♂ / ♀	<i>M. t.</i>	<i>M. d.</i>
1	Istanbul Technical University Garden (European part of Turkey)	14.02.2012	15–26.02.2012	1/28 / 54	30 / 24	●	–
		15.12.2013	17–29.12.2013	1/15 / 27	17 / 10	●	–
	Bahçeköy/Sarıyer (European part of Turkey)	13.12.2018	02–06.01.2019	2/39 / 128	55 / 58 6 / 4*	●	●
2	Manyas Bird Paradise (Asian part of Turkey)	19.12.2013	20–30.12.2013	1/6 / 9	4 / 5	●	–
3	Bursa Forest Nursery (Asian part of Turkey)	30.12.2013	04–07.01.2014	3/63 / 240	126 / 114	●	–
4	Kırklareli Forest Nursery (European part of Turkey)	16.11.2017	03–12.01.2018	2/3 / 16	5 / 11	●	–
5	Bahçeşehir (Asian part of Turkey)	14.11.2020	02–23.02.2021	3/41 / 189	11 / 16 68 / 94*	●	●

 * *M. dorsalis*

Figure 2. *Megabruchidius tonkineus*. a – male, b – male ventrite I, showing the large setiferous patch and third leg tooth, c – male pygidium, d – female, e – female third leg tooth, f – female pygidium. Photographs by Erdem Hizal.

In both species, males had large setiferous patches, while females lacked such patches on the first ventrite (Figures 2b, e, 3b, e). Females had a longer, narrower pygidium than males (Figures 2c, f, 3c, f). The female pygidium had two long dark oval depressions (Figures 2f, 3f). These differences distinguished males from females.

Megabruchidius tonkineus and *M. dorsalis* were similar in size. Our specimens were ≥ 5 mm. No significant size difference was found between the males and females of either species (Table 2).

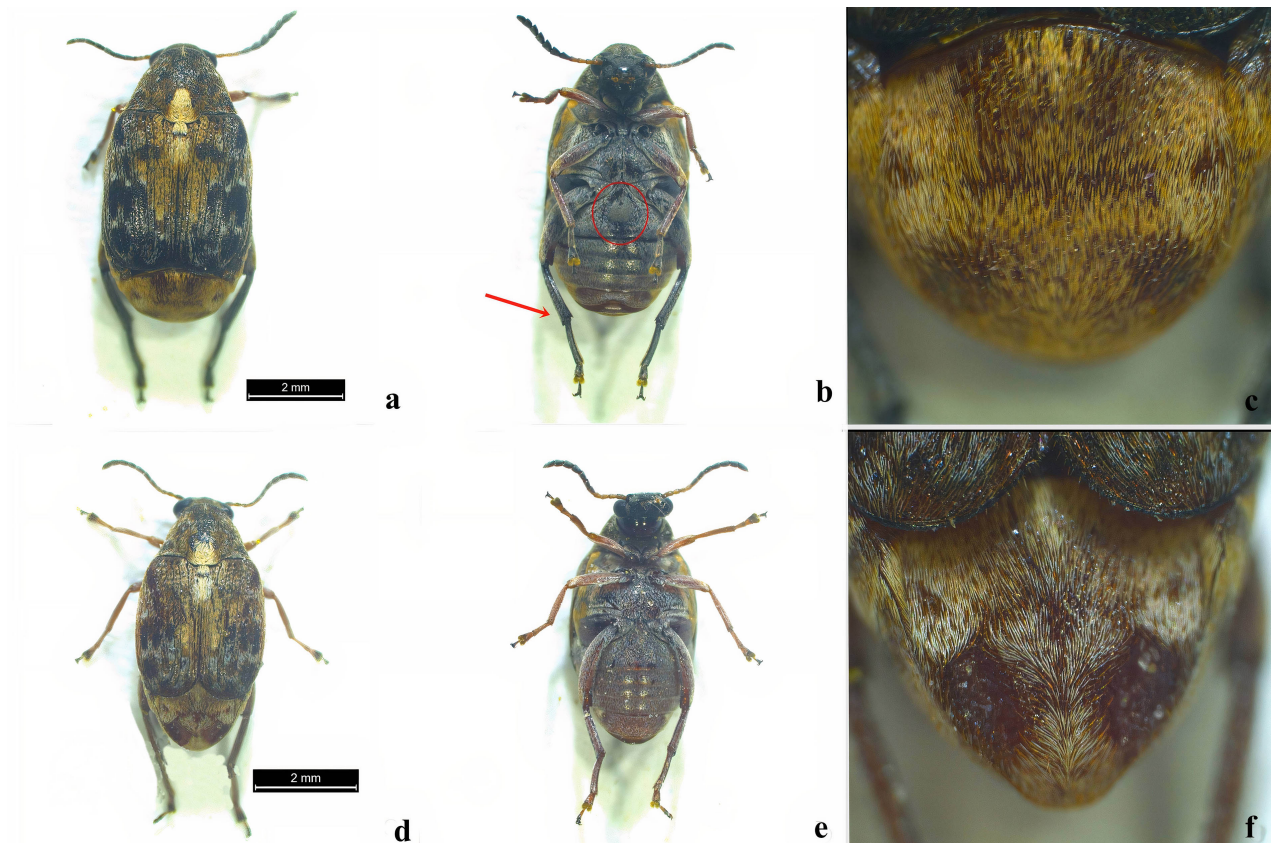


Figure 3. *M. dorsalis*. a – male, b – male ventrite I, showing the large setiferous patch and third leg tooth, c – male pygidium, d – female, e – female third leg tooth, f – female pygidium. Photographs by Erdem Hızal.

Table 2. Body length (mm) of collected specimens.

Species	♂♂ (N:30)			♀♀ (N:30)		
	Min.	Max.	Mean ± SD	Min.	Max.	Mean ± SD
<i>M. tonkineus</i>	4.72	5.87	5.36 ± 0,23	5.00	5.76	5.37 ± 0.21
<i>M. dorsalis</i>	4.06	5.80	5.40 ± 0,31	4.07	5.68	5.39 ± 0.28

Table 3 and Figure 4 show the temporal and spatial distributions of these species in Europe according to the latest studies.

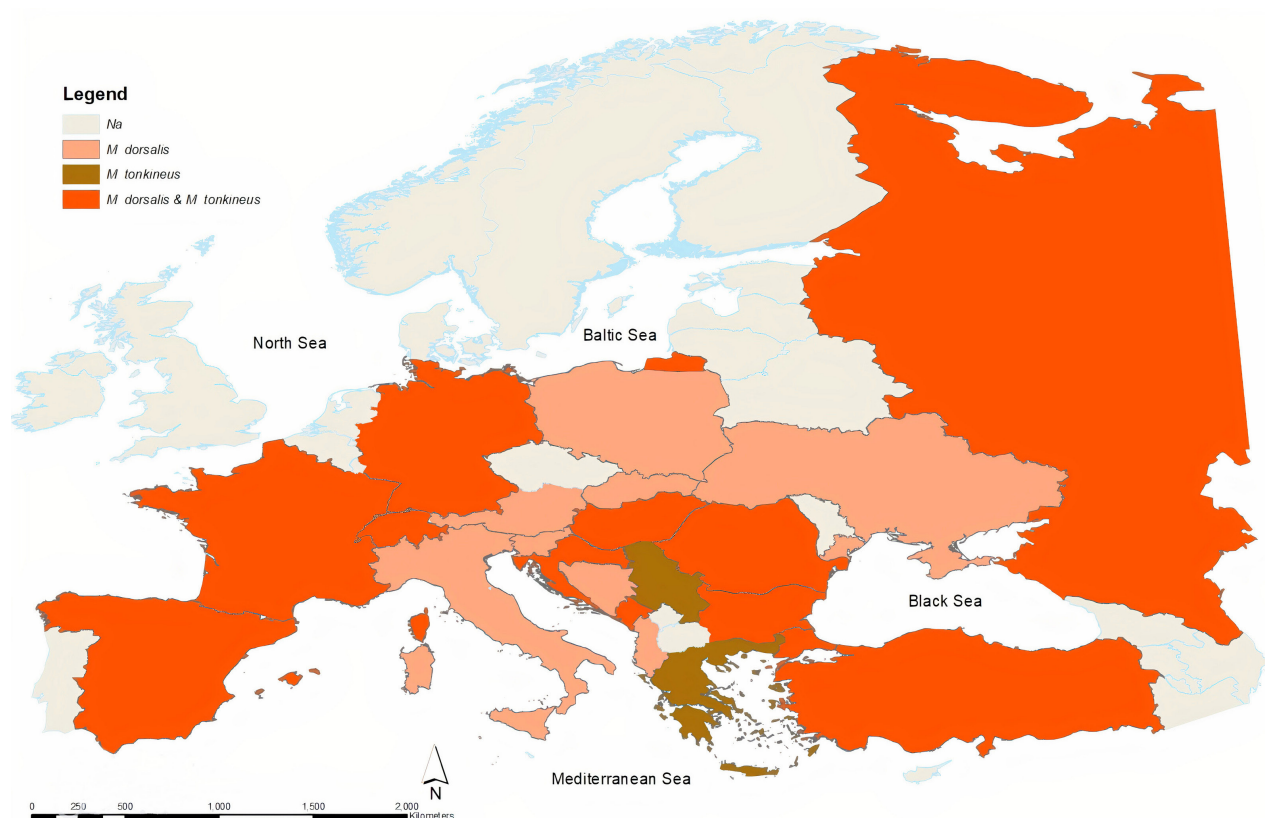
Our results confirmed the presence of established populations of *M. tonkineus* and *M. dorsalis* in Turkey. Each set of collected material included both male and female beetles. The male and female specimens differed from each other morphologically.

Since 2000, increasing numbers of *Megabruchidius* specimens have been recorded in Europe. To date, *M. dorsalis* has been recorded in 19 European countries, while *M. tonkineus* has been found in 13 (Šipek et al. 2022 and our results; Table 3). The simultaneous occurrence of both species has now been recorded from 11 countries (Table 3, Figure 4).

We observed the co-occurrence of *M. tonkineus* and *M. dorsalis* in the same trees. As previously mentioned, both species were recorded in 10 European countries. Until now, however, only three studies (Yus-Ramos 2009; Fritzsche and Delobel 2012; Šipek et al. 2022) have provided evidence of the coexistence of both species in the same pods.

Table 3. Distribution records of both species in Europe.

Country	<i>M. tonkineus</i>	<i>M. dorsalis</i>	References
Germany	1980	2012	Wendt 1980; Rheinheimer 2014
Italy	–	1989	Migliaccio and Zampetti 1989
Hungary	2001	2009	Jermy et al 2002; Yus-Ramos 2009
Greece	2005	–	Yus-Ramos 2009
Russia	2005	2005	Korotyayev 2011; 2015
Bulgaria	2006	2022	Stojanova 2007; Gradinarov 2022
France	2007	2011	Delobel and Delobel 2008; Fritzsche and Delobel 2012
Switzerland	2011	2008	Yus-Ramos 2009; György and Germann 2012
Serbia	2012	–	Gavrilović and Savić 2013
Ukraine	–	2014	Martynov and Nikulina 2014
Slovakia	–	2014	Říha and Bezděk 2015
Romania	2015	2015	Pintilioaie et al. 2018
Austria	–	2016	Rabitsch 2016
Poland	–	2017	Ruta et al. 2017
Slovenia	–	2018	Sajna 2019
Croatia	2016	2020	Kurtek et al. 2017; Horvat and Sajna 2021b
Spain	2017	2017	Yus-Ramos and Carles-Tolrá 2017
Albania	–	2021	Šipek et al. 2022
Bosnia and Herzegovina	–	2021	Šipek et al. 2022
Montenegro	2021	2021	Šipek et al. 2022
Turkey	2012	2018	This study


Figure 4. Map of *M. tonkineus* and *M. dorsalis* distributions in Europe.

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Authors' contribution

MI: Wrote the draft manuscript, created the map, reviewed and edited the original manuscript.
EH: Managed the survey planning and design, analysis and beetle identification of the specimens and wrote the draft manuscript and reviewed the original manuscript.

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