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Research article

New record of seed beetles of the genus *Megabruchidius* Borowiec, 1984 (Chrysomelidae: Bruchinae) and associated parasitoids (Hymenoptera: Chalcidoidea) from Bulgaria

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Abstract: The Asian seed beetles *Megabruchidius dorsalis* (Fåhraeus, 1839) and *M. tonkineus* (Pic, 1904) (Chrysomelidae: Bruchinae) are reported from several new localities in Bulgaria. These species successfully established in the country, but *M. dorsalis* appears to be more common and more abundant than *M. tonkineus*. Four parasitoid species of the superfamily Chalcidoidea – *Eupelmus confusus* Al khatib, 2015, *E. urozonus* Dalman, 1820 (Eupelmidae), *Cyrtoptyx lichtensteini* (Masi, 1922) and *Dinarmus acutus* (Thomson, 1878) (Pteromalidae) were reared from pods or seeds of *Gleditsia triacanthos* L. (Fabaceae) inhabited by *M. dorsalis*. The associations of *C. lichtensteini* and *E. urozonus* with *M. dorsalis* are newly recorded. The pteromalid species *C. lichtensteini* is reported for the first time from Bulgaria.

Keywords: alien species, Coleoptera, Eupelmidae, *Gleditsia triacanthos,* host association, Pteromalidae

Introduction

The East Asian genus *Megabruchidius* Borowiec, 1984 (Chrysomelidae: Bruchinae) currently includes three species – *M. dorsalis* (Fåhraeus, 1839), *M. tonkineus* (Pic, 1904) and *M. sophorae* Tuda & Morimoto, 2004 (Yus Ramos, 2009). The first two species were reported in Europe in the 80s of the 20th century, and now occur over large distribution ranges (Yus Ramos, 2009; Šipek et al., 2022; Inan & Hızal, 2023). *Megabruchidius tonkineus* has also been reported from Argentina and Chile (Yus Ramos, 2009; Di Iorio, 2015), South Africa (Klein, 2011; Martin, 2021) and more recently from Australia (Eow et al., 2023).

Species of *Megabruchidius* develop in seed pods of several woody legumes in the family Fabaceae (Tuda & Morimoto, 2004; Yus Ramos, 2009; Di Iorio, 2015). In Europe, *M. dorsalis* and *M. tonkineus* are commonly associated with the introduced North American species *G. triacanthos* L. (honey locust), a widespread ornamental tree (Yus-Ramos et al., 2014; Horvat & Sajna, 2021). Recently, *M. dorsalis* has been reported from seeds of the North American *Gymnocladus dioica* (L.) K. Koch (Fabaceae: Caesalpinioideae) (György & Tuda, 2020).

In Bulgaria, *M. tonkineus* has been recorded from seed pods of *G. triacanthos* in Plovdiv City (Stojanova, 2007), but no other data are available on the species distribution in the country. Recently, *M.*

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Fig. 1. Habitats of *Megabruchidius* spp. from Bulgaria with *Gleditsia triacanthos* trees – (A) Ustrem locality, 5.ix.2022 (B) Gelemenovo locality, 6.ix.2022 (C) Levski locality, 5.ix.2022 (D) Kresna locality, 24.ix.2022.

dorsalis has been recorded from Sofia, also from seed pods of *G. triacanthos* (Gradinarov, 2022).

Hymenopteran parasitoids associated with *Megabruchidius* species in their introduced range have seldom been sampled (Zerova & Fursov, 2015; Pintilioaie et al., 2018; Sajna, 2019). Zerova and Fursov (2015) described a new species of *Eurytoma* (*E. gleditsiae* Zerova & Fursov, 2015) associated with *M. dorsalis* in the seeds of *G. triacanthos* in Ukraine. Pintilioaie et al. (2018) additionally reported *Scambus* sp. (Ichneumonidae) and *Dinarmus acutus* (Pteromalidae) from seeds infested by larvae of *M. dorsalis* in Romania and Sajna (2019) reported unidentified parasitoids from the same host. Recently, *Eupelmus confusus* was reared from seed pods of *G. triacanthos* infested by *Amblycerus robiniae* (Fabricius, 1781), *M. dorsalis* and *M. tonkineus* larvae (Rădac et al., 2021) but without identifying precisely the host-species. No data have yet been acquired on the parasitoids of these seed beetles in Bulgaria.

In the present paper, we report new localities in Bulgaria for *Megabruchidius dorsalis* and *M. tonkineus*. Additionally, we also report parasitoids belonging to the superfamily Chalcidoidea, associated with these beetles.

Methods

The material for the present study was collected in 2022 and 2023 from different regions of Bulgaria (Sofia Valley, Sandanski-Petrich Valley, Sredna Gora Mts, Upper Thracian Plain, Sakar Mts, Black Sea Coast and Danubian Plain). *Megabruchidius* beetles

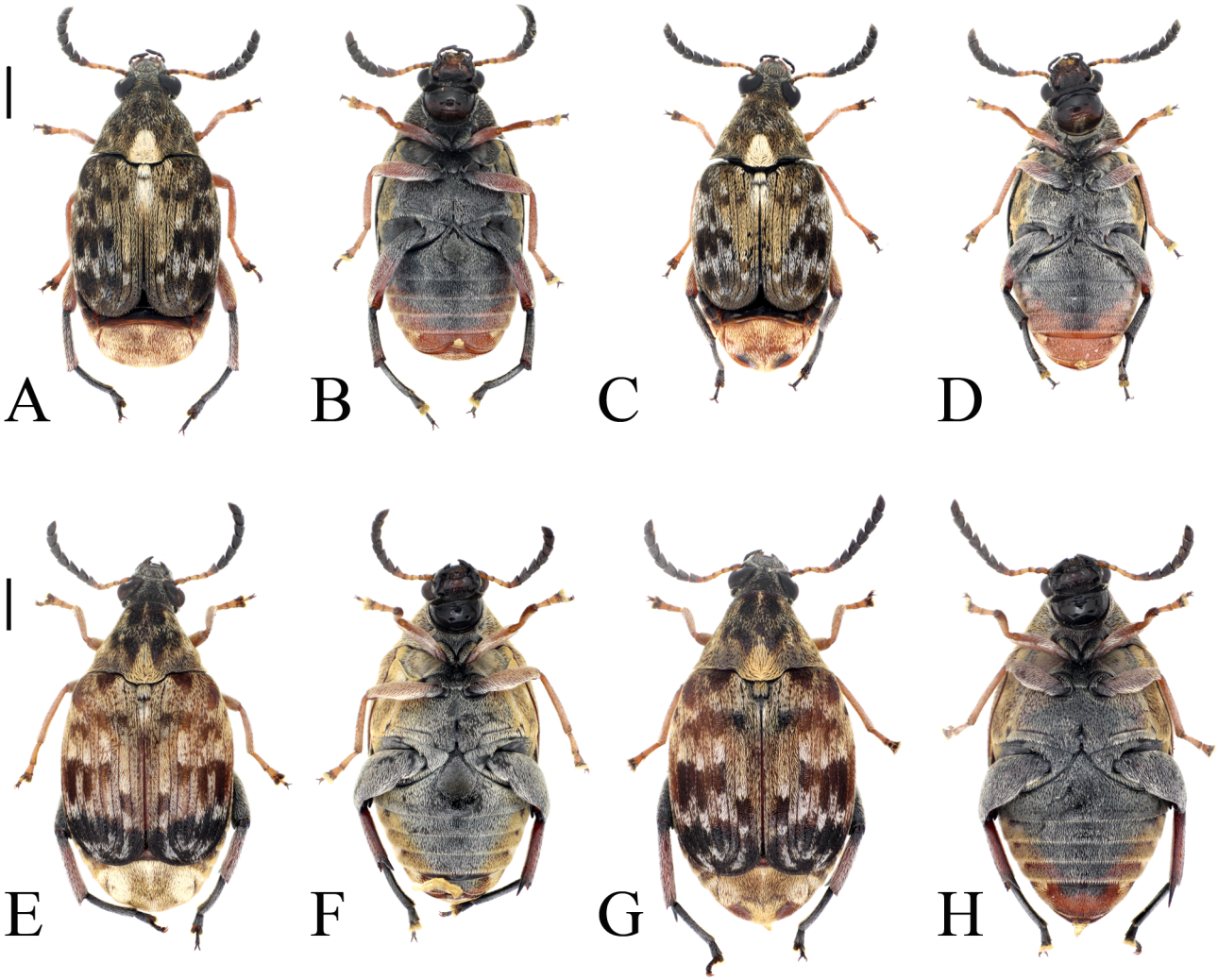

Fig. 2. Adults of *Megabruchidius* spp. from Bulgaria – (A) male of *Megabruchidius dorsalis,* Kresna locality, dorsal view, (B) the same specimen, ventral view, (C) female of *M. dorsalis,* Kresna locality, dorsal view, (D) the same specimen, ventral view, (E) male of *M. tonkineus,* Ustrem locality, dorsal view, (F) the same specimen, ventral view, (G) female of *M. tonkineus,* Ustrem locality, dorsal view, (H) the same specimen, ventral view. Scale bars: 1 mm.

were collected directly from their host plant (*G. triacanthos*) and on the adjacent vegetation or were reared from seed pods and seeds, sampled on the same host plant. All specimens of Chalcidoidea wasps were obtained from seed pods or seeds of *G. triacanthos* after rearing. In January – August, old pods from the previous year were collected on the ground, while in September – December only fresh pods were sampled on the lower tree branches.

After collecting, the seed pods were kept in thick plastic bags at room temperature and regularly examined for emergence of beetles and parasitoids. In some cases, seeds have been removed from the pods and stored in Petri dishes until their inhabitants emerged. Identification of the chalcid wasps was realised using the keys in Graham (1969), Rasplus (1989) and Gibson and Fusu (2016). Systematics of the identified parasitoid species were verified using Gibson and Fusu (2016), Noyes (2019) and Burks et al. (2022). Photographs of the *Megabruchidius* species were taken using digital camera Canon PowerShot SX420 IS (Figs 1, 3 A – C), combination of Canon EOS 2000D digital camera, PRO-CA Camera Adapter, and a microscope Olympus SZ61 (Figs 2, 3 D – F). Photographs of the parasitoid species were taken using digital camera Canon EOS

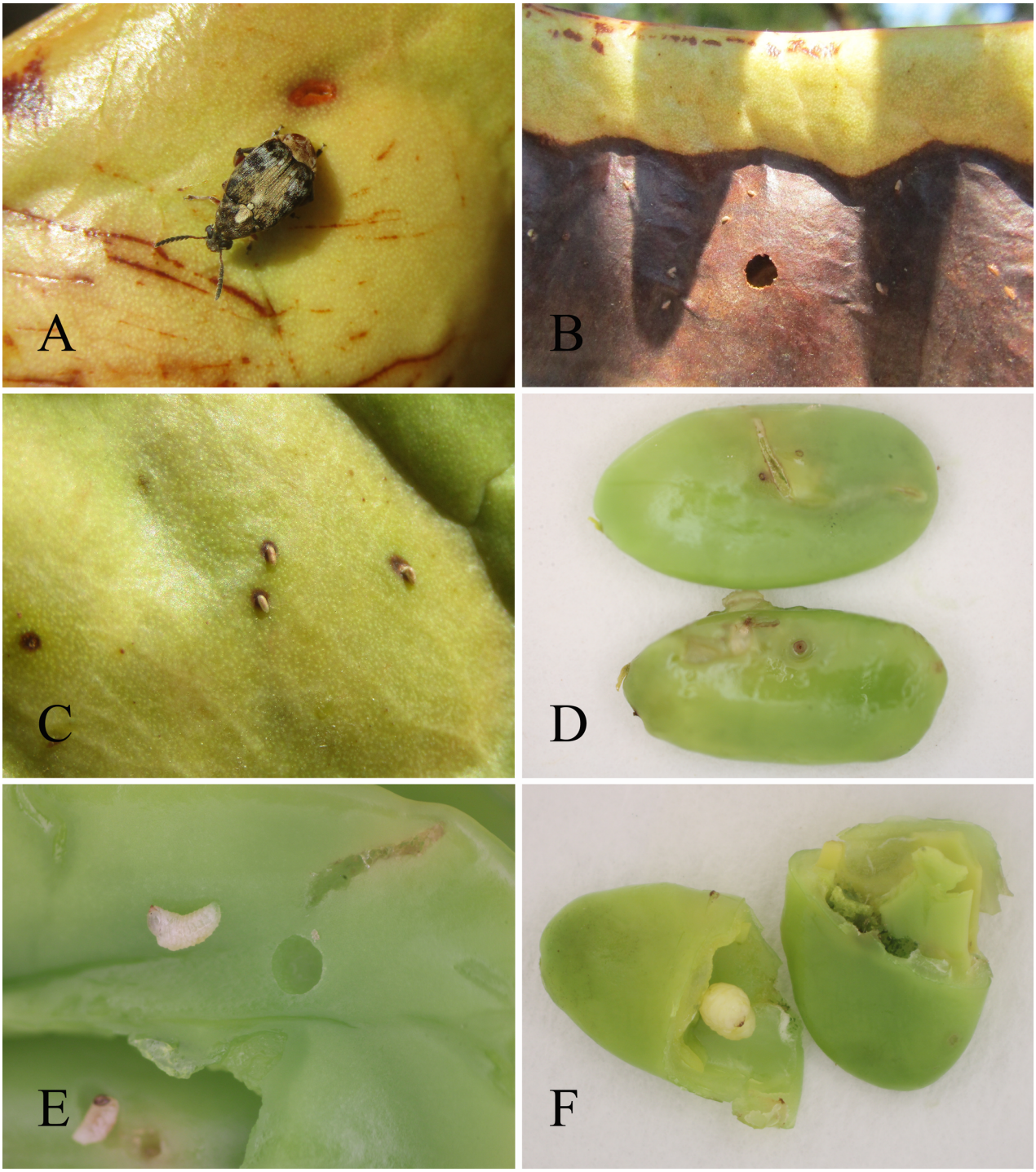

Fig. 3. Developmental stages of *Megabruchidius dorsalis* on *Gleditsia triacanthos* – (A) female beetle on a seed pod, Ustrem locality, 5.ix.2022, (B) emergence holes of beetles from the first generation and empty eggshells, Gelemenovo locality, 6.ix.2022, (C) eggshells on the seed pod surface after penetration of the beetle larvae in the pod, Levski locality, 6.ix.2022, (D – F) seeds of *G. triacanthos* from Levski locality with larvae of *Megabruchidius,* 8.ix.2022.

200D attached to Zeiss Stemi 508 doc stereo-microscope. The stacking process was performed through Helicon Focus v. 7.5.8 Pro. The material is deposited in the Zoological Collection of Sofia University, Faculty of Biology, Sofia (BFUS), the Collection of the Institute of Biodiversity and

Ecosystem Research, Bulgarian Academy of Sciences, Sofia (IBER-BAS) and in the collection of the Department of Zoology, University of Plovdiv (PU).

Results

A total of 226 adults of *M. dorsalis* (125 males and 101 females) and 30 adults of *M. tonkineus* (12 males and 18 females) were collected in the field or reared from pods of *G. triacanthos* during the present study. Twenty-three parasitoid specimens (Hymenoptera: Chalcidoidea) also emerged from the pods. Four species of the families Eupelmidae and Pteromalidae were identified and two species of *Cyrtoptyx* Delucchi, 1956 (Pteromalidae) possibly represent new species.

Order Coleoptera

Family Chrysomelidae

Megabruchidius Borowiec, 1984

Megabruchidius dorsalis (Fåhraeus, 1839)
(Fig. 2: A – D)

Material: Bulgaria: Sofia Valley, Sofia City, Borisova Gradina Park, 42°41′08.2″N 23°20′00.5″E, 560 m a.s.l., 15.i.2022, 3 ♂♂, 2 ♀♀, em. 16–23.ii.2022 from seed pods of *G. triacanthos,* D. Gradinarov leg. (BFUS); Sofia Valley, Sofia City, Lyulin Residential area, Slivnitsa metro station, 42°43′36.5″N 23°15′39.1″E, 553 m a.s.l., 5.iii.2022, 3 ♂♂, 4 ♀♀, em. 5.iii.–11.iv.2022 from seed pods of *G. triacanthos,* D. Gradinarov leg. (BFUS); Sakar Mts, S of Ustrem Village, 42°00′46.6″N 26°27′51.5″E, 154 m a.s.l., 5.ix.2022, 7 ♂♂, 5 ♀♀, on seed pods of *G. triacanthos,* D. Gradinarov & Y. Petrova leg. (BFUS); Upper Thracian Plain, Gelemenovo Village, 42°16′13.4″N 24°18′54.7″E, 242 m a.s.l., 6.ix.2022, 1 ♂, on seed pods of *G. triacanthos,* D. Gradinarov & Y. Petrova leg. (BFUS); Sashtinska Sredna Gora Mts, NW of Levski Village, 42°22′08.9″N 24°16′23.3″E, 450 m a.s.l., 6.ix.2022, 3 ♂♂, 4 ♀♀, on seed pods of *G. triacanthos,* D. Gradinarov & Y. Petrova leg. (BFUS); Upper Thracian Plain, Gelemenovo Village, 42°16′13.4″N 24°18′54.7″E, 242 m a.s.l., 6.ix.2022, 3 ♂♂, 5 ♀♀, em. 6–7.ix.2022 from seed pods of *G. triacanthos,* D. Gradinarov & Y. Petrova leg. (BFUS); the same data, 1 ♂, 3 ♀♀, em. 7–8.ix.2022; the same data, 2 ♂♂, 1 ♀, em. 8–11.ix.2022; the same data, 1 ♂, 1 ♀, em. 11–15.ix.2022; the same data, 4 ♂♂, em. 15–19.ix.2022; the same data, 1 ♂, 3 ♀♀, em. 19–23.ix.2022; the same data, 2 ♂♂, 1 ♀, em. 23–26.ix.2022; the same data, 1 ♂, 1 ♀, em. 26.ix–10.x.2022; the same locality, 14.ix.2022, 4 ♂♂, 3 ♀♀, em. 14–16.ix.2022 from seed pods of *G. triacanthos,* D. Gradinarov & Y. Petrova leg. (BFUS); the same data, 1 ♂, 4 ♀♀, em. 16.ix.–19.ix.2022; the same data, 1 ♂, em. 19.ix.–23.ix.2022; the same data, 4 ♂♂, em. 23.ix.–26.ix.2022; the same data, 1 ♂, em. 26.ix.–29.ix.2022; the same data, 1 ♂, 2 ♀♀, em. 29.ix–10.x.2022; Sandanski-Petrich Valley, Kresna, 41°42′32.5″N 23°10′23.5″E, 160 m a.s.l., 24.ix.2022, 1 ♂, on leaves of *Robinia pseudoacacia* L. near a tree of *G. triacanthos,* D. Gradinarov & Y. Petrova leg. (BFUS); the same locality, 25 ♂♂, 22 ♀♀, em. 24.ix.–25.x.2022 from seed pods of *G. triacanthos,* D. Gradinarov & Y. Petrova leg. (BFUS); Sakar Mts, S of Ustrem Village, 42°00′46.6″N 26°27′51.5″E, 154 m a.s.l., 27.xi.2022, 5 ♂♂, 1 ♀, em. 27.xi.2022–17.i.2023 from seed pods of *G. triacanthos,* Y. Petrova leg. (BFUS); the same data, 34 ♂♂, 28 ♀♀, em. 17.i–6.ii.2023; Upper Thracian Plain, Gelemenovo Village, 42°16′13.4″N 24°18′54.7″E, 242 m a.s.l., 4.xii.2022, 6 ♂♂, 4 ♀♀, em. 4.xii.2022–17.i.2023 from seed pods of *G. triacanthos,* Y. Petrova leg. (BFUS); the same locality, 28.v.2023, 1 ♂, on inflorescence of Apiaceae near a tree of *G. triacanthos,* D. Gradinarov leg. (BFUS); Danubian Plain, Knezha, Maize Research Institute, 43°28′50.0″N 24°02′17.4″E, 154 m a.s.l., 8.vi.2023, 1 ♂, 1 ♀, em. vii.–viii.2023 from seed pods of *G. triacanthos,* I. Todorov & T. Toshova leg. (BFUS); Black Sea Coast, Primorsko, next to Dyavolska Reka River Mouth, 42°15′56.0″N 27°45′13.3″E, 15 m a.s.l., 7.viii.2023, 1 ♀, em. 7–8.viii.2023 from seed pods of *G. triacanthos,* D. Gradinarov leg. (BFUS); Black Sea Coast, Varna, City Garden, 43°12′14.5″N 27°54′38.0″E, 30 m a.s.l., 22.viii.2023, 1 ♀, em. 22–31.viii.2023 from seed pods of *G. triacanthos,* D. Gradinarov leg. (BFUS); Danubian Plain, N of Brenitsa Village, 43°27′24.5″N 24°06′52.9″E, 157 m a.s.l., 7.xi.2023, 1 ♀, em. 7.xi.2023–6.i.2024 from seeds of *G. triacanthos,* T. Toshova leg. (BFUS); the same data, 3 ♂♂, 1 ♀, em. 25–27.ii.2024; the same data, 5 ♂♂, 2 ♀♀, em. 3–7.iii.2024.

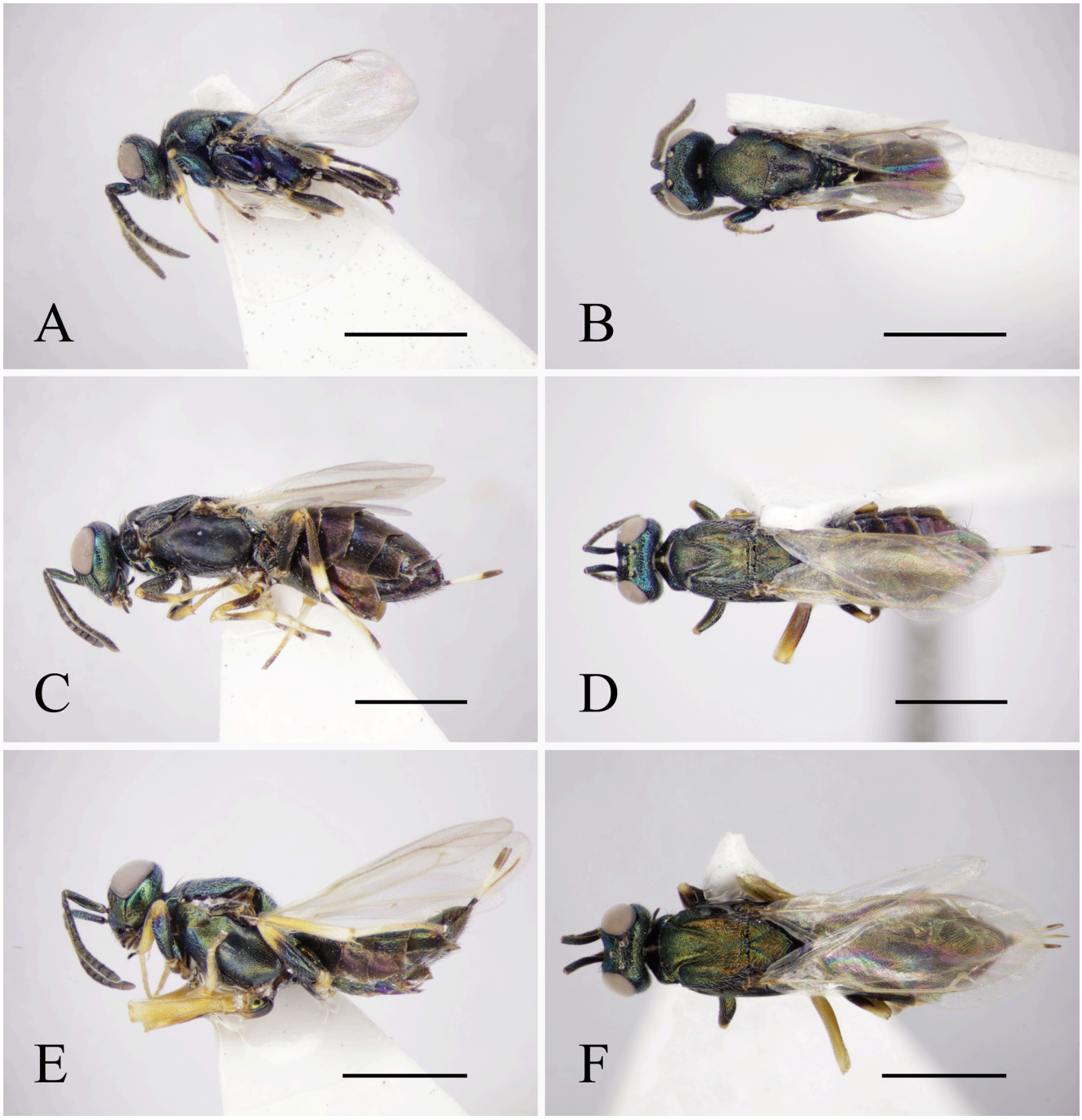

Fig. 4. Species belonging to the genus *Eupelmus* from Gelemenovo locality, Bulgaria – (A) male of *E. confusus,* habitus, (B) male of *E. confusus,* dorsal view, (C) female of *E. confusus,* habitus, (D) female of *E. confusus,* dorsal view, (E) female of *E. urozonus,* habitus, (F) female of *E. urozonus,* dorsal view. Scale bars: 1 mm.

Megabruchidius tonkineus (Pic, 1904)
(Fig. 2: E – H)

Material: Bulgaria: Sakar Mts, S of Ustrem Village, 42°00′46.6″N 26°27′51.5″E, 154 m a.s.l., 5.ix.2022, 3 ♀♀, on seed pods of *G. triacanthos,* D. Gradinarov & Y. Petrova leg. (BFUS); the same locality, 27.xi.2022, 2 ♂♂, 4 ♀♀, em. 27.xi.2022–17.i.2023 from seed pods of *G. triacanthos,* Y. Petrova leg. (BFUS); the same data, 8 ♂♂, 10 ♀♀, em. 17.i–6.ii.2023; Danubian Plain, Knezha, Maize Research Institute, 43°28′50.0″N 24°02′17.4″E, 154 m a.s.l., 8.vi.2023, 2

♂♂, 1 ♀, em. vii–viii.2023 from seed pods of *G. triacanthos,* I. Todorov & T. Toshova leg. (BFUS).

Order Hymenoptera

Superfamily Chalcidoidea

Family Eupelmidae

Eupelmus Dalman, 1820

Eupelmus confusus Al khatib, 2015 (Fig. 4: A – D)

Material: Bulgaria: Upper Thracian Plain, Gelemenovo Village, 42°16′13.4″N 24°18′54.7″E, 242 m a.s.l., 6.ix.2022, 2 ♀♀, em. 6.ix–3.x.2022 from seed pods of *G. triacanthos,* D. Gradinarov & Y. Petrova leg. (PU); the same locality, 14.ix.2022, 1 ♂, em. 19–23.ix.2022 from seed pods of *G. triacanthos,* D. Gradinarov & Y. Petrova leg. (PU); the same data, 1 ♂, 1 ♀, em. 23–26.ix.2022; the same data, 1 ♀, em. 26–29.ix.2022; the same data, 1 ♀, em. 29.ix–3.x.2022; the same data, 1 ♀, em. 3–10.x.2022.

Eupelmus urozonus Dalman, 1820 (Fig. 4: E, F)

Material: Bulgaria: Sofia Valley, Sofia City, Borisova Gradina Park, 42°41′08.2″N 23°20′00.5″E, 560 m a.s.l., 16.i.2022, 1 ♀, em. 16.i–14.ii.2022 from seed pods of *G. triacanthos,* D. Gradinarov leg. (PU); Upper Thracian Plain, Gelemenovo Village, 42°16′13.4″N 24°18′54.7″E, 242 m a.s.l., 14.ix.2022, 2 ♀♀, em. 23–26.ix.2022 from seed pods of *G. triacanthos,* D. Gradinarov & Y. Petrova leg. (PU).

Notes: Our findings represent new host association with *M. dorsalis* and *G. triacanthos* for *E. urozonus*.

Family Pteromalidae

Cyrtoptyx Delucchi, 1956

Cyrtoptyx lichtensteini (Masi, 1922) (Fig. 5)

Material: Bulgaria: Upper Thracian Plain, Gelemenovo Village, 42°16′13.4″N 24°18′54.7″E, 242 m a.s.l., 6.ix.2022, 2 ♀♀, 1 ♂, em. 6–8.ix.2022 from seed pods of *G. triacanthos,* D. Gradinarov & Y. Petrova leg. (IBER-BAS); the same data, 1 ♂, em. 8–9.ix.2022; the same data, 1 ♀, em. 11–15.ix.2022; the same locality, 14.ix.2022, 1 ♀, em. 16–19.ix.2022 from seed pods of *G. triacanthos,* D. Gradinarov & Y. Petrova leg. (IBER-BAS).

Cyrtoptyx sp. 1

Material: Bulgaria: Upper Thracian Plain, Gelemenovo Village, 42°16′13.4″N 24°18′54.7″E, 242 m a.s.l., 6.ix.2022, 1 ♀, em. 11–15.ix.2022 from seed pods of *G. triacanthos,* D. Gradinarov & Y. Petrova leg. (IBER-BAS).

Cyrtoptyx sp. 2

Material: Bulgaria: Danubian Plain, N of Brenitsa Village, 43°27′24.5″N 24°06′52.9″E, 157 m a.s.l., 7.xi.2023, 1 ♂, 3 ♀♀, em. 11.iii–14.iv.2024 from seeds of *G. triacanthos,* T. Toshova leg. (IBER-BAS).

Notes: Our findings represent new host association with *M. dorsalis* and *G. triacanthos* for *C. lichtensteini*. This species is newly reported for Bulgaria.

The two unnamed species clearly differ from each other and from *C. lichensteini* by antennal and propodeal characters as well as by the colouration of their metatibiae.

Dinarmus Thomson, 1878

Dinarmus acutus (Thomson, 1878) (Fig. 6)

Material: Bulgaria: Upper Thracian Plain, Gelemenovo Village, 42°16′13.4″N 24°18′54.7″E, 242 m a.s.l., 6.ix.2022, 2 ♂♂, em. 6–8.ix.2022 from seed pods of *G. triacanthos,* D. Gradinarov & Y. Petrova leg. (IBER-BAS); the same data, 2 ♂♂, em. 9–11.ix.2022; the same locality, 14.ix.2022, 1 ♂, em. 14–15.ix.2022 from seed pods of *G. triacanthos,* D. Gradinarov & Y. Petrova leg. (IBER-BAS); the same data, 1 ♀, em. 15–16.ix.2022; the same data, 1 ♀, em. 16–19.ix.2022; Black Sea Coast, Varna, City Garden, 43°12′14.5″N 27°54′38.0″E, 30 m a.s.l., 22.viii.2023, 1 ♀, em. 22–31.viii.2023 from seed pods of *G. triacanthos,* D. Gradinarov leg. (IBER-BAS);

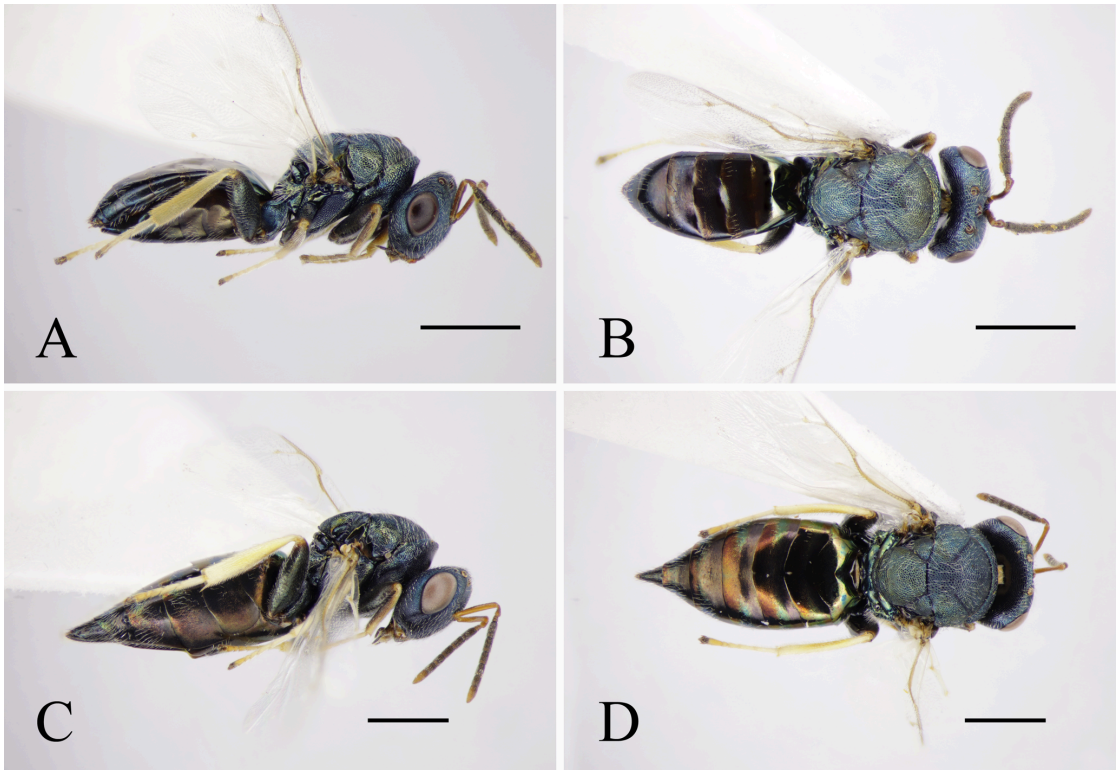

Fig. 5. *Cyrtoptyx lichtensteini* from Gelemenovo locality, Bulgaria – (A) male, habitus, (B) male, dorsal view, (C) female, habitus, (D) female, dorsal view. Scale bars: 1 mm.

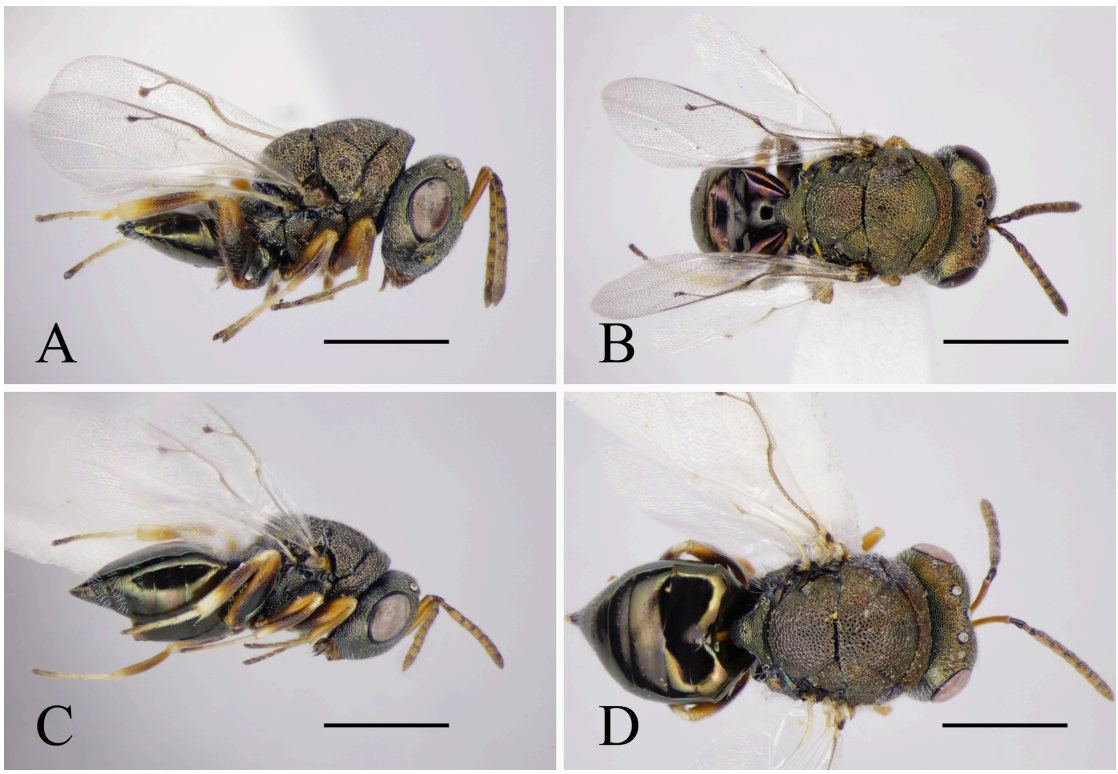

Fig. 6. *Dinarmus acutus* from Gelemenovo locality, Bulgaria – (A) male, habitus, (B) male, dorsal view, (C) female, habitus, (D) female, dorsal view. Scale bars: 1 mm.

Danubian Plain, N of Brenitsa Village, 43°27′24.5″N 24°06′52.9″E, 157 m a.s.l., 7.xi.2023, 1 ♀, em. 3–7. iii.2024 from seeds of *G. triacanthos,* T. Toshova leg. (IBER-BAS).

Discussion

Both introduced in Europe species of the genus *Megabruchidius* – *M. dorsalis* and *M. tonkineus* are recorded in the present study and appear successfully established in Bulgaria. *Megabruchidius tonkineus* can be easily distinguished from *M. dorsalis* by the presence of a long tooth at the apex of the hind tibia in both sexes (much shorter in *M. dorsalis*) and by the reddish elytra (mainly black in *M. dorsalis*) (Yus Ramos, 2009; Korotyaev, 2015) (Fig. 2).

Megabruchidius dorsalis was found in nine new localities from different regions of the country, including Northern and Southern Bulgaria as well as the Black Sea coast. This wide distribution in the country suggests that the species entered Bulgaria much earlier than the first report from Sofia indicates (Gradinarov, 2022). *Megabruchidius tonkineus* is recorded only from two remote localities – near Ustrem Village in Sakar Mts and from Knezha town in Danubian Plain. In these localities, *M. tonkineus* coexist with *M. dorsalis*.

In Europe, *M. dorsalis* have expanded its range rapidly in the recent years (Sajna, 2019; Horvat & Sajna, 2021; Šipek et al., 2022; Inan & Hızal, 2023) becoming the dominant species in the areas where it co-occurs with *M. tonkineus* (Rheinheimer, 2014; Korotyaev, 2016a, 2016b; Horvat & Sajna, 2021). Our data in Bulgaria also support these results, and *M. dorsalis* appears more common and more abundant than *M. tonkineus* both from direct observations in natural habitats and by rearing from collected seed pods.

Megabruchidius dorsalis has a multivoltine life cycle with three to four generations within its natural range in Japan (Kurota & Shimada, 2001). According to these authors, females lay eggs in August on fresh pods of the Japanese honey locust (*G. japonica* Miq.), and the first-generation adults appears from late September to early November. Adults and larvae from the second generation overwinter. In the spring, the adults from the first and the second generation oviposit on the dry seed pods with dry matured seeds on the ground. One or two generations develop on mature seeds before the new seed pods develop on the host plant in August (Kurota & Shimada, 2001). It seems that in Bulgaria the species has a similar phenology. Adult beetles were observed and collected at the beginning of September on immature pods of *G. triacanthos* in Ustrem, Levski and Gelemenovo (Fig. 3 A). In these localities, beetle eggs and empty eggshells were also observed on the pods (Fig. 3 B, C). Larvae at different stages of development were found in ripening seeds in Levski soon after the pods were sampled (Fig. 3 D–F). In Gelemenovo, we observed emergence holes of the first-generation beetles during early September (Fig. 3 B), and adults emerged from the collected immature pods on the same day. The warmer climate in the Upper Thracian Plain probably accelerates fruiting of the host plant and may have contributed to the development of an additional generation of *M. dorsalis* during the fall.

The eupelmid species sampled are known as generalist idiobiont ectoparasitoids (Al khatib et al., 2016; Gibson & Fusu, 2016). They are common and develop on the larvae and pupae of a wide range of holometabolous insects concealed within plant tissues or cocoons (Gibson & Fusu, 2016; Antov & Stojanova, 2020). *Eupelmus urozonus* is recorded as a primary parasitoid of seven Bruchinae species belonging to the genera *Bruchidius* and *Bruchus* (Stojanova et al., 2011; Pérez-Benavides et al., 2019). Some of the bruchid hosts of this species listed by Noyes (2019) probably refer to other species included in the *Eupelmus urozonus* complex (Pérez-Benavides et al., 2019). This is the first association of this *Eupelmus* species with species of *Megabruchidius* associated with *G. triacanthos*.

Eupelmus confusus was obtained from seeds of *Albizia julibrissin* Durazz. and *Cercis siliquastrum* L. (Fabaceae) infested with the larvae of *Bruchidius terrenus* (Sharp, 1886) and *Bruchidius siliquastri* Delobel, 2007 (Pintilioaie et al. 2018). The species was also reared from seed pods of *G. triacanthos* infested by several seed-beetle species (Rădac et al., 2021). In Bulgaria, *E. confusus* was also reared from other host-legumes of several seed beetles (Stojanova & Antov, 2018). Our results confirm that *E. confusus* is a frequent parasitoid of Bruchinae species (Pintilioaie et al., 2018).

Considering the wide host range of these *Eupelmus* species and their ability to act as

hyperparasitoids on other hosts, a secondary parasitism cannot be excluded.

The pteromalid species obtained in our study exhibit contrasted host preferences. *Cyrtoptyx lichtensteini* is a larvo-pupal ectoparasitoid on various coleopteran, dipteran and hymenopteran host species. *C. lichtensteini* is also reported to attack an unidentified species of *Lixus* (Delucchi, 1962) and the seed eater weevil *Mononychus punctumalbum* (Herbst, 1784) (Curculionidae) (Thompson, 1958; Graham, 1969), the jujube tree pest *Carpomya vesuviana* Costa, 1854 (Tephritidae) (Amini et al., 2014) and the pea pod borer *Etiella zinckenella* (Treitschke, 1832) (Pyralidae) (Peck, 1963; Amini et al., 2014). In contrast, the host range of *D. acutus* appears limited to species of Bruchinae belonging mostly to the genera *Acanthoscelides, Amblycerus, Bruchidius, Bruchus* and *Callosobruchus* (Bruchinae), which larvae feed on various Fabaceae (Stojanova et al., 2011, Pintilioaie et al., 2018, Noyes, 2019, Rădac et al., 2021). Secondary parasitism is reported once for *D. acutus* (Andriescu & Mitroiu, 2004), but this record requires confirmation.

Besides beetles, moth larvae were also found in the pods collected in September and December 2022 from the Gelemenovo locality. Subsequently emerged moths were identified as *Apomyelois ceratoniae* (Zeller, 1839) (Lepidoptera: Pyralidae) (images on the mothdissection.co.uk website, https://mothdissection.co.uk/species.php?Tx=Apomyelois+ceratoniae; accessed on 21 April 2024). The larvae of this moth can also be a potential host for species of *Eupelmus* and *Cyrtoptyx* recorded in this study.

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