Short Communication

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New Data on the Parasitoid-Inquiline Community of *Andricus quercustozae* (Bosc, 1792) (Hymenoptera: Cynipidae) in Bulgaria

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Abstract: New data on parasitoids and inquilines occurring in galls of the cynipid hymenopteran *Andricus quercustozae* (Bosc, 1792) from the Lozenska Mts., Bulgaria, are presented. *Bootanomyia stigmatizans* (Fabricius, 1798) (Hymenoptera: Torymidae) is the most abundant parasitoid species in galls of *A. quercustozae*. The inquiline *Pammene amygdalana* (Duponchel in Godart, 1842) (Lepidoptera: Torticidae) is recorded from *A. quercustozae* galls from Bulgaria for the first time. Co-existence of two inquilines, *P. amygdalana* and *Synergus umbraculus* (Olivier, 1791) (Hymenoptera: Cynipidae), within the same gall on *Quercus dalechampii* is documented. In addition, a new gall association for *Torymus cyaneus* Walker, 1847 (Hymenoptera: Torymidae) is recorded.

Key words: *Torymus cyaneus*, oak galls, *Pammene amygdalana*.

Introduction

The gall wasp *Andricus quercustozae* (Bosc, 1792) is a Western Palaearctic species causing some of the most striking and easy recognisable oak galls. Only asexual females are known but some authors suppose the existence of unknown sexual generation. Galls develop on the buds of the previous year shoots and grow up to 40 mm in diameter, having spherical form and brownish colour. Besides the gall-inducer larva, a number of parasitoids and inqulines could invade the gall, where they develop as primary or secondary parasitoids or compete for plant tissue with the host larva. Amongst the 27 known parasitoids in *A. quercustozae* galls (Noyes 2018), only 11 species are recorded on this host from Bulgaria (Stojanova 2005, 2006, Askew et al. 2013, Antov & Stojanova 2015). In addition, nine cynipid inquilines are associated with this host (Askew et al. 2013) but just one, *Synergus umbraculus* (Olivier) (Cynipidae), has been found to attack *A. quercustozae* galls in Bulgaria (Vassileva-Samnalieva 1976, 1987, 1989).

The present study aimed to obtain new information on parasitoids and inqulines in galls of *Andricus quercustozae* from oak forests in Bulgaria.

Materials and Methods

During the winter-spring periods of 2015-2017, we collected 224 overwintered mature galls of *A. quercustozae* from six oak species, i.e. *Quercus cerris* L., *Q. dalechampii* Ten., *Q. pedunculiflora* K. Koch, *Q. petraea* (Matt.) Liebl., *Q. polycarpa* Schur and *Q. pubescens* Willd., in the Lozenska Mts., Bulgaria. Every single gall was placed in a plastic cup and stored outside in order to obtain phenological data. Emerged parasitoids and inquilines were dehydrated following Heraty & Hawks (1998). Emerged moths were killed with ethylacetate and, when necessary,

the genitalia were dissected (Robinson 1976). In the list below, we use the following abbreviations: S – south of; em. – emerged on; h.pl. - host plant of the gall. The new association is marked with one asterisk. Observed co-existence of *S. umbraculus* and *Pammene amygdalana* (Duponchel in Godart, 1842) (Tortricidae), i.e. specimens emerged from a single gall, are marked with two asterisks.

Results

The following insect species were recorded from the examined galls:

Hymenoptera

Family Eurytomidae

***Eurytoma brunniventris* Ratzeburg, 1852**

Material: S Lanina mogila, 42°34'24.25"N/23°29'33.02"E, 948 m a.s.l., 1 ♂, em. 15-17.iv.2015, h. pl. *Q. petraea*.

***Sycophila biguttata* Swederus, 1795**

Material: S Lanina mogila, 42°34'24.25"N/23°29'33.02"E,948 m a.s.l., 1 ♀, em. 15-17.iv.2015, h. pl. *Q. petraea*; Kurlevite dupki, 42°34'36.26"N/23°30'11.93"E, 1015 m a.s.l., 1 ♀, em. 10-20.iii.2016, h. pl. *Q. polycarpa*; Rakovichka mogila, 42°35'6.14"N/23°28'14.39"E, 1130 m a.s.l., 3 ♀, em. 1-10.iv.2016, 2 ♀, em. 18.iv.2016, 1 ♀, em. 20-30.IV.2017, h.pl. *Q. dalechampii*.

Family Ormyridae

***Ormyrus nitidulus* (Fabricius, 1804)**

Material: Kurlevite dupki, 42°34'38.12"N/23°30'35.81", 1030 m a.s.l., 1 ♀, em. 1-10.iv.2016, 1 ♀, 2 ♂, em. 20-30.iv.2016, 1♂, em. 10-20.VI.2016, h.pl. *Q. cerris*; Rakovichka mogila, 42°35'6.14"N/23°28'14.39"E, 1130 m a.s.l., 1 ♀, em. 10-20.vi.2016, h.pl. *Q. dalechampii*.

Family Torymidae

***Bootanomyia stigmatizans* (Fabricius, 1798)**

Material: S Lanina mogila, 42°34'24.25"N/23°29'33.02"E, 948 m a.s.l., 2 ♂, em. 15-20.v.2015, 3♂, em. 21-30.vi.2015, 1 ♂, em. 2.vii.2015, 1 ♀, em. 9.vii.2015, h.pl. *Q. petraea*; S Lanina mogila, 42°34'10.00"N/23°29'54.37"E, 898 m a.s.l., 2 ♂, em. 24.v.2015, 1 ♀, em. 9.vii.2015, 1 ♀, em. 14.vii.2015, h.pl. *Q. pedunculiflora*.

***Torymus auratus* (Müller, 1764)**

Material: S Lanina mogila, 42°34'24.25"N/23°29'33.02"E, 948 m a.s.l., 1 ♀, em. 15-17.iv.2015, h.pl. *Q. petraea*; Kurlevite dupki, 42°34'38.12"N/23°30'35.81"E, 1030 m a.s.l., 1 ♀, em. 10-20.iii.2016, 2 ♀, em. 20-30.iii.2016, 2 ♀, em. 1-10.iv.2016, h.pl. *Q. cerris*.

****Torymus cyaneus* Walker, 1847**

Material: S Lanina mogila, 42°34'24.25"N/23°29'33.02"E, 948 m a.s.l., 1 ♀, em. 24.v.2015, 1 ♀, em. 11-20.vi.2015, h.pl. *Q. petraea*.

Family Cynipidae

***Synergus umbraculus* (Olivier, 1791)**

Material: Rakovichka mogila, 42°35'6.14"N/23°28'14.39"E, 1130 m a.s.l., 8 ♀, 3 ♂, em. 09.iv.2016, 2 ♀, em. 10-20.iv.2016, 1 ♀, em. 18.iv.2016, 4 ♀, 3 ♂, em. 20-30.iv.2016, **6 ♀, em. 1-10.vii.2016, 1 ♀, 2 ♂, em. 20-30.ix.2017, h. pl. *Q. dalechampii*.

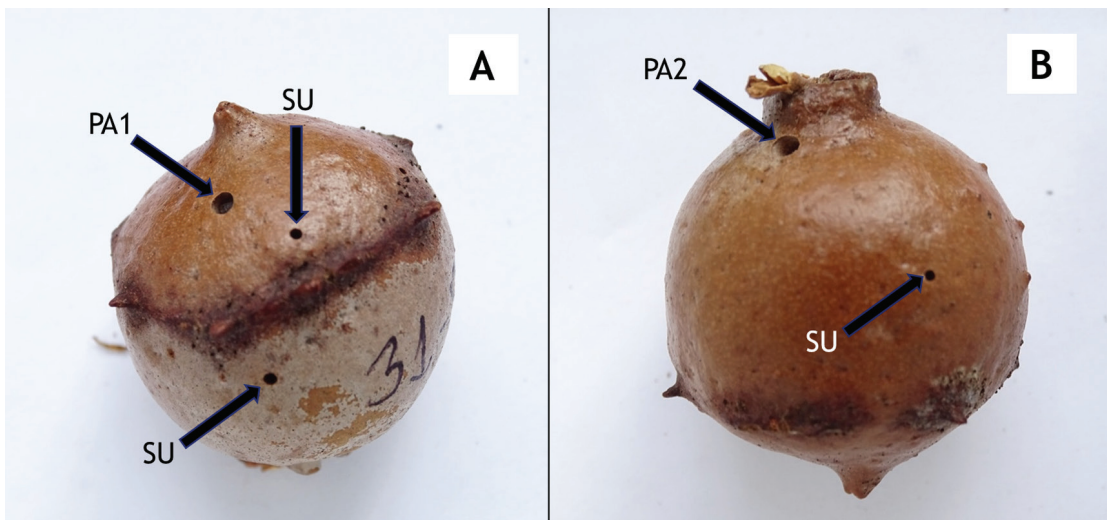

Fig. 1. A gall of *Andricus quercustozae* with emerging holes of two specimens of *Pammene amygdalana* (PA1 and PA2) and three specimens of *Synergus umbraculus* (SU). A total of six female cynipids emerged from that gall; A. view from the upper side; B. view from the lower side.

Lepidoptera
Family Tortricidae
***Pammene amygdalana* (Duponchel, 1842)**
Material: Kurlevite dupki, 42°34'38.12"N/23°30'35.81"E, 1030 m a.s.l., 1♂, em. 20-30.v.2016, 2 ♀, em. 10-20.vi.2016, h. pl. *Q. cerris*; Rakovichka mogila, 42°35'6.14"N/23°28'14.39"E, 1130 m a.s.l., 1 ♂, em. 10-20.vi.2016, **1 ♂, em. 10-20.vi.2016, **1 ♂, em. 20-30.vi.2016, h. pl. *Q. dalechampii*.

Discussion

Our results fit well with previous data and confirm that *Bootanomyia stigmatizans* is the most abundant among the inhabitants of *A. quercustozae* galls. *Bootanomyia stigmatizans* accounted 32.35% of the parasitoids and 15.71% of all parasitoid-inquiline material in our samples. In her work on chalcids from Bulgaria, Stojanova (2006) analysed the collection of Vassileva-Samnalieva and listed 24 specimens of *B. stigmatizans* emerged from *A. quercustozae* galls, which are 42.85% of all recorded parasitoids reared from this host. However, no species of the Pteromalidae have been recorded in that paper. Although Askew et al. (2013) listed eight pteromalid species emerged from this host from various European countries, we did not find any of them in our rearings. *Torymus cyaneus*, known to emerge from many oak galls (Noyes 2018), was recorded for the first time from Bulgaria in *A. quercustozae* galls. Regarding the other gall inhabitants, the materials from the Lozenska Mts. differ significantly from those recorded by Stojanova (2006); however, no conclusions can be drawn.

Concerning the inqulines, our results confirm that *Synergus umbraculus* is the only species of this group associated with *A. quercustozae* galls in Bulgaria. An uncommon co-existence of two inquiline species in a single gall was also found. These were two males of *P. amygdalana* and six females of *S. umbraculus* (Fig. 1) emerged from the same gall.

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