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Revelation of *Platygaster robiniae* Buhl & Duso, 2007 (Hymenoptera: Platygastridae) in the South of the Russian Far East

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Abstract—In the south of the Far East of Russia, the egg-larval endoparasitoid *Platygaster robiniae* of the phytophage insect *Obolodiplosis robiniae* was found for the first time. The development of *Platygaster robiniae* occurs in galls of *Obolodiplosis robiniae*, the host plant of which is *Robinia pseudoacacia*, cultivated in the arboretum of the Mountain-Taiga Station of the Branch of the Federal Scientific Center for Biodiversity of the Terrestrial Biota of East Asia, Far Eastern Branch, Russian Academy of Sciences. Despite the fact that, at present, damage to the leaves of *Obolodiplosis robiniea* leads to a slight decrease in the decorativeness of plants, the further spread of this phytophage can increase its damage; therefore, the detected *Platygaster robiniae* can be used for the biocontrol of *Obolodiplosis robiniea*. Further monitoring of stands of *Robinia pseudoacacia* in Primorsky krai is required to determine the infestation of *Platygaster robiniae*.

Keywords: arboretum, Mountain-Taiga Station, *Robinia pseudoacacia*, phytophagous insect, endoparasitoid

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INTRODUCTION

Early detection and prediction of the appearance of alien organisms plays an important role in the development of scientifically based methods for controlling their numbers and in the conservation of biodiversity. Estimating the intensity of the invasive process requires the collection and analysis of data on the dynamics of the distribution of invasive organisms within the region under study (Martynov et al., 2020).

The North American species *Robinia pseudoacacia* (Fabaceae Lindl.) (black locust) is one of the most widespread woody plants in cultivation. Its secondary range covers many countries of Europe and Asia (Kurokochi et al., 2010; Cierjacks et al., 2013; Martin, 2019; Brus et al., 2019). In new ranges, *Robinia pseudoacacia* often actively penetrates into natural biocenoses (Vítková et al., 2017; Humphrey et al., 2019; Vinogradova et al., 2020; Nicolescu et al., 2020; Kolyada, 2021).

Together with this plant, its phytophagous insects also penetrate (Maslyakov and Izhevsky, 2011; Gninenko and Rakov, 2011; Martynov and Nikulina, 2016; Martynov et al., 2020; Sautkin, 2021; Kolyada et al., 2022; etc.).

One of them is also the North American species *Obolodiplosis robiniae* (Haldeman, 1847) (Diptera: Cecidomyiidae)—locust gall midge, which has now spread with its host in many regions of Eurasia, including countries adjacent to the Russian Far East—China, Japan, and Korea (Kodoi et al., 2003; Woo et al., 2003, Lee et al., 2009; Yao et al., 2020). In 2002, this phytophage was first recorded in Japan and the Republic of Korea, and in 2003, in Europe (Duso and Skuhrava, 2004).

It also appeared in the Far East of Russia. In 2005, *Obolodiplosis robiniae* was first discovered in Primorsky krai (Gninenko, 2007). In 2008, a special survey showed the presence of the phytophage in four population centers of Primorsky krai: in Vladivostok, in Ussuriysk, and in two settlements of the Khasansky district (Gninenko and Glavendekich, 2010). In 2010, it was discovered on Sakhalin (Gninenko, 2013).

One of the parasites of *Obolodiplosis robiniae* is an ovi-larval endoparasitoid *Platygaster robiniae* Buhl et Duso, 2007 (Hymenoptera: Platygastroidea). The

Fig. 1. Leaf of *Robinia pseudoacacia* with galls.

species was described from Italy (Buhl and Duso, 2008) and has been found in various countries of Europe and East Asia (Jørgensen, 2009; Lu Chang-Kuan et al., 2010; Kim et al., 2011), including in Russia, in the Donbass and Rostov oblast (Martynov et al., 2017, 2020).

In 2019, *Platygaster robiniae* was first discovered in the south of the Russian Far East, in plantings of *Robinia pseudoacacia* on the territory of the Mountain-Taiga Station of the Branch of the Federal Scientific Center for Biodiversity, Far Eastern Branch, Russian Academy of Sciences.

MATERIALS AND METHODS

In accordance with generally accepted methods (Gninenko and Glavendekich, 2010), plantings of *Robinia pseudoacacia* on the territory of Gorno-Taezhnoe of the Ussuriysk urban district of Primorsky krai (43°42′00″ N, 132°09′00″ E) were observed.

Collection to determine the species affiliation of *Platygaster robiniae* carried out by the first author in 2019 in plantings of *Robinia pseudoacacia* on the territory of the arboretum of the Mountain Taiga Station of the Branch of the Federal Scientific Center for Biodiversity, Far Eastern Branch, Russian Academy of Sciences. However, some leaves *Robinia pseudoacacia* with galls were placed in Petri dishes, and after a while the appearance of imagoes of *Obolodiplosis robiniea* was observed. The imagoes were fixed in 96% alcohol.

Photographing of pupae of egg-larval endoparasitoid and imago *Platygaster robiniae* was taken with a Sony cyber-shot camera using an MBS-9 microscope.

Determination of the species identification of *Platygaster robiniae* imagoes was carried out by E.A. Chilakhsaeva, an employee of the Laboratory of Forest Protection from Invasive and Quarantine Organisms of the All-Russian Research Institute of Forestry and Forestry Mechanization (Pushkino, Moscow oblast).

RESULTS AND DISCUSSION

During a visual examination on young leaves of the lower and middle parts of the crowns of *Robinia pseudoacacia*, galls formed by *Obolodiplosis robiniea* were revealed (Fig. 1).

In the galls during the summer period, whitish-matte, almost transparent spindle-shaped larvae and red-brown pupae of *Obolodiplosis robiniea* were found (Fig. 2). Our observations showed that galls can contain from one to four live larvae of various stages, the sizes of which vary from 1 to 6 mm.

Fig. 2. Larva (1) and pupa (2) of *Obolodiplosis robiniea*.

Fig. 3. Imago of *Obolodiplosis robiniea*.

Fig. 4. Pupae of *Platygaster robiniae* in larva of *Obolodiplosis robiniea*.

The size of the adult gall midge is about 8 mm (Fig. 3). The material is stored in the collection of the first author.

In addition, in some galls in larvae of *Obolodiplosis robiniea*, we found pupae of egg-larval endoparasitoid *Platygaster robiniae* (Fig. 4).

Several (6–10) parasitoid larvae always develop inside the gall midge larva, which pupate without leaving the shell of the dead host larva.

After a while, the appearance of an imago of *Platygaster robiniae* was observed (Fig. 5).

The body length of *Platygaster robiniae* imago is about 2 mm. Material of pupae and imagoes of endoparasitoid *Platygaster robiniae* are kept in the collection of the first author.

At present, the role of the identified parasitoid in the regulation of the number of gall midges has not been established. Further observations will help assess the ability of this entomophage to regulate the abundance of the host in new habitats for these invaders.

CONCLUSIONS

According to the results obtained, on the territory of the arboretum of the Mountain-Taiga station of the Branch of the Federal Scientific Center for Biodiversity, Far Eastern Branch, Russian Academy of Sciences, in plantings of *Robinia pseudoacacia*, galls of *Obolodiplosis robiniea* were found. In some of them, we found pupae of the egg-larval endoparasitoid *Platygaster robiniae*. Despite the fact that damage to leaves by galls leads so far to a slight decrease in the decorativeness of *Robinia pseudoacacia* plants, the further spread of this phytophage can increase the damage caused by it; therefore, the detected *Platygaster robiniae* can be used for biocontrol of *Obolodiplosis robiniea*.

Owing to climate change and active use in recent decades of *Robinia pseudoacacia* in landscape design in the south of the Russian Far East, further monitor-

Fig. 5. Imago of *Platygaster robiniae*.

ing of plantings of this plant in Primorsky krai is necessary to establish the role of *Platygaster robiniae* in the regulation of the number of a new pest for the region *Obolodiplosis robiniea*.

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COMPLIANCE WITH ETHICAL STANDARDS

Conflict of interest. The authors declare that they have no conflicts of interest.

Statement of the welfare of animals. The article does not contain any studies involving animals in experiments performed by any of the authors.

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