

# First Finding of Alien Species *Nematus tibialis* Newman, 1873 (Hymenoptera: Tenthredinidae) in the South of the Russian Far East

N. A. Kolyada<sup>a, \*</sup>, E. A. Chilakhsaeva<sup>b, \*\*</sup>, Yu. I. Gninenko<sup>b, \*\*\*</sup>, and A. S. Kolyada<sup>c, \*\*\*\*</sup>

<sup>a</sup> Federal Scientific Center of the East Asia Terrestrial Biodiversity, Far Eastern Branch, Russian Academy of Sciences, Vladivostok, 690022 Russia

<sup>b</sup> All-Russian Research Institute of Silviculture and Mechanization of Forestry, Pushkino, Moscow oblast, 141202 Russia

<sup>c</sup> Primorye State Agricultural Academy, Ussuriysk, 692510 Russia

\*e-mail: Kolyada18@rambler.ru

\*\*e-mail: kchilakhsaeva@yandex.ru

\*\*\*e-mail: gninenko-yuri@mail.ru

\*\*\*\*e-mail: a.s.pinus@mail.ru

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**Abstract**—In the south of the Russian Far East, an alien North American species *Nematus tibialis* Newman, 1873 was registered for the first time. The insect develops on the main food plant, *Robinia pseudoacacia* L., cultivated in the settlement of Gorno-Taezhnoye and in the arboretum of the Gorno-Taezhnaya Station of the Federal Scientific Center of the East Asia Terrestrial Biodiversity, Far Eastern Branch, Russian Academy of Sciences. The degree of damage is small; one larva is localized on the leaf. There is no decrease in decorativeness. Nevertheless, because of the fairly widespread use of *Robinia pseudoacacia* in the landscaping of the region, further spread of its phytophage *Nematus tibialis* is possible. To assess the spread of the pest in the south of the Far East and evaluate the harm it causes, it is necessary to monitor plantations of *Robinia pseudoacacia* in other settlements of the region.

**Keywords:** Primorsky krai, *Nematus tibialis*, phytophage, *Robinia pseudoacacia*, invasive species

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## INTRODUCTION

Recently, new phytophages of introduced woody plants have been identified in the Russian Far East (Gninenko, 2013; Yurchenko et al., 2013; Kuprin et al., 2018; etc.). Researchers are faced with the task of monitoring the spread of both alien plant species and their accompanying insects. Their further study is a very urgent task, since it will allow us to evaluate the ways of their spread and methods of protection against them.

Currently, North American species *Robinia pseudoacacia* L. (black locust or false acacia) (Fabaceae Lindl.) has a vast secondary range, covering many countries in Europe and Asia (Rubtsov and Savelyeva, 2008; Kurokochi et al., 2010; Cierjacks et al., 2013; Ryzhaya and Glyakovskaya, 2019; Brus et al., 2019; Martin, 2019).

In new range, *Robinia pseudoacacia* often actively penetrates into natural biocenoses (Sabo, 2000; Benersperi et al., 2012; Vítková et al., 2017; Humphrey et al., 2019; Nicolescu et al., 2020; Vinogradova et al., 2020).

Together with this plant, its phytophagous insects also penetrate (Gninenko and Rakov, 2011; Maslyakov and Izhevsky, 2011; Martynov and Nikulina, 2016,

2020; etc.), and this process has significantly intensified in the 21st century.

In the south of the Far East, *Robinia pseudoacacia* appeared at the beginning of the last century and is currently distributed on the territory of Primorsky krai, occurring mainly in cultivation (Kolyada, N. and Kolyada, A., 2018). In some cases, it is involved in the formation of secondary plant communities (Kolyada, 2020).

In 2005, in Primorsky krai, on *Robinia pseudoacacia*, a new phytophage for the region *Obolodiplosis robiniae* (Hald., 1847) (Diptera: Cecidomyiidae) was discovered, commonly called black locust gall midge (Gninenko, 2007), which is already distributed in the countries adjacent to the Far East, such as China, Japan, and the Republic of Korea.

One of the phytophages of *Robinia pseudoacacia* is *Nematus tibialis* Newman, 1837 (Hymenoptera: Tenthredinidae) (locust sawfly), noted both in areas of the natural habitat of *Robinia pseudoacacia* in North America and in its secondary range.

In Europe *Nematus tibialis* was first noted in Germany in 1825 (Alien..., 2010; Maslyakov and Izhevsky, 2011). It is currently widespread on *Robinia pseudo-*



Fig. 1. Caterpillar *Nematus tibialis*.

*acacia* in most European countries (Marković and Stojanović, 2008; Alien..., 2010; Sautkin and Sinchuk, 2015; Martynov and Nikulina, 2016; De Groot and Kavčić, 2017; Glyakovskaya, 2018; etc.).

In Russia, the species was recorded in the Caucasus (Shchurov et al., 2019; Martynov et al., 2020), in Bryansk oblast (Sinchuk et al., 2015), and in Volgograd, Samara, and Rostov oblasts (Belitskaya and Gribust, 2019; Belitskaya et al., 2020).

*Nematus tibialis* is that rather rare invader that, penetrating into new habitats, feeds only on its main food plant. Over the 200 years that have passed since its first discovery in Europe, no outbreaks of its mass reproduction are known in the secondary range (Martynov et al., 2020).

*Nematus tibialis* appeared in Eurasian plantings of *Robinia pseudoacacia* much earlier than its invasive phytophages, such as *Parectopa robiniella* Clemens, 1863 (Lepidoptera, Gracillariidae), locust digitate leafminer, and *Phyllonorycter robiniella* Clemens, 1859 (Lepidoptera, Gracillariidae), miner moth, as well as *Obolodiplosis robiniea*, but unlike them, it does not harm the fodder plant anywhere.

However, there are reports of damage to leaves of other legumes by *Nematus tibialis*, such as *Caragana* sp. (*caragana*) (Sautkin et al., 2012).

## MATERIALS AND METHODS

The object of the study was caterpillars (larvae) of *Nematus tibialis* of different ages found on leaves *Robinia pseudoacacia*. When performing research, visual inspections of black locust were carried out regularly throughout the entire growing season and the appearance of damage and feeding insects on the foliage was recorded.

The collection of caterpillars to determine their species was carried out by the first author in 2020 in plantations of *Robinia pseudoacacia* on the territory of the village of Gorno-Taezhnoye of Ussuri urban district of Primorsky krai (43°42'00" N, 132°09'00" E).

Caterpillars and adults were photographed with a Sony Cyber-shot camera using an MBS-9 microscope.

The species was determined 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

For the first time, damage by caterpillars *Nematus tibialis* to leaf blades of *Robinia pseudoacacia* were found during visual inspection of plants in the village of Gorno-Taezhnoye in the summer of 2019. They were more often localized closer to the center of the leaf blade. On one blade, one caterpillar 3–8 mm long was observed.

The collection of leaf blades with larvae feeding on them was carried out during the summer from July to September 2020 (Fig. 1). In order to breed adults, leaf blades with larvae were placed in Petri dishes and kept in the laboratory at room temperature. Once every two days, the excrement was removed and fresh leaves of the fodder plant were added.

After two or three weeks, having reached a size of 10–12 mm, the caterpillars stopped feeding and pupated (Fig. 2). Cocoon formation did not occur. Two weeks after the start of pupation, live adults appeared from the pupae, the length of which was 6–7 mm (Fig. 3). The hatched adults were euthanized with ether and placed in 95% ethanol.

## DISCUSSION

When examining landscaping stands of *Robinia pseudoacacia* in the village of Gorno-Taezhnoye and the nearby arboretum of the Gorno-Taezhnaya Station, a slight amount of damage to the leaves by the phytophage *Nematus tibialis* was noted. Approximately 2–3% of the leaf blades of plants on each specimen were eaten to one degree or another (a total of 23 specimens of *Robinia pseudoacacia* were examined).

A similar pattern of interaction between this sawfly and its host plant is observed everywhere in their secondary ranges. The phytophage never manifests itself as a dangerous invader causing significant damage to its host plant. There is the rare case when, having found itself in territories new to it and having a familiar food resource, the invader phytophage could not form centers of mass reproduction everywhere. What the reason is for such a development of relationships in the system of a phytophage invader and a fodder plant invader has not been established.



Fig. 2. Chrysalis *Nematus tibialis*.



Fig. 3. Imago *Nematus tibialis*.

Thus, at present *Nematus tibialis* does not cause damage to the fodder plant, and minor damage does not lead to loss of decorativeness.

### CONCLUSIONS

According to the results obtained, an alien North American species *Nematus tibialis*, a widespread phytophage of *Robinia pseudoacacia*, was discovered for

the first time in the south of the Russian Far East, often exhibiting invasive properties. This plant is also cultivated in Primorsky krai of the Far East region, including in the village of Gorno-Taezhnoye and in the arboretum of the Gorno-Taezhnaya Station.

To date, there has been a slight degree of damage to the leaves; usually there is one larva on one leaf. Damage does not lead to a decrease in the decorativeness of plants; however, fairly widespread use *Robinia pseudoacacia* in landscaping makes possible the further spread of the phytophage. In this regard, monitoring of cultivation of this species in other settlements of Primorsky krai is necessary to identify the pest and assess the damage it causes.

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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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