

# First Records of Parasitoids of the Orders Hymenoptera (Ichneumonidae and Pteromalidae) and Diptera (Tachinidae) from *Heterogynis sondereggeri* de Freina, 2012 (Lepidoptera: Heterogynidae)

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**Abstract:** After the description of *Heterogynis sondereggeri*, this is the second finding of the species in Europe. Additionally, a new food source, *Chamaecytisus heuffelii*, is reported for this species for the first time. Two hymenopteran and one dipteran parasitoid species emerged from the pupae of *H. sondereggeri*: *Agrothereutes hospes* (Ichneumonidae), *Trichomalopsis heterogynidis* (Pteromalidae) and *Phryxe hirta* (Tachinidae). All trophic associations with parasitoids are newly recorded, too. The pteromalid wasp *T. heterogynidis* is new for the fauna of Serbia, while *Phryxe hirta* is new also for the fauna of the Balkan Peninsula.

**Keywords:** *Heterogynis sondereggeri*, *Chamaecytisus heuffelii*, *Agrothereutes hospes*, *Trichomalopsis heterogynidis*, *Phryxe hirta*, parasitoids, trophic associations

## Introduction

The genus *Heterogynis* Rambur, 1837 comprises about 15 species from Europe (DE FREINA 2003a, b, 2012). The most common and widespread species throughout Europe is *Heterogynis penella* (Hübner, 1819), the only recorded species from the territory of Serbia according to Fauna Europaea (<http://www.faunaeur.org/>). Since the *Heterogynis* species are not important as pests in agronomy or forestry, the genus has not been frequently studied in Europe. There are only few publications on this genus from the past decades (e.g. ZILLI, RACHELI 1989, DE FREINA 2003a, b, 2004, 2012, DE FREINA, TSCHORSNIG 2005). *Heterogynis sondereggeri* de Freina, 2012 was known only from Greece (Peloponnesus), inhabiting high-

altitude mountains. The larvae feed on *Astragalus taygeteus* Jim. Perss. and Strid (Fabaceae) during a short period from June to July (DE FREINA 2012). According to the online database Flora Europaea, *A. taygeteus* is a synonym name of *A. angustifolius*.

No natural enemies of *H. sondereggeri* were known before the present investigation. Several parasitoids are recorded from other species of the genus *Heterogynis*, particularly from *H. penella* (DE FREINA 2004, DE FREINA, TSCHORSNIG 2005). These are the hymenopterans *Itopectis maculator* (Fabricius, 1775) (DE FREINA 2004) and species of the genus *Nipponaetes* Uchida, 1833 (see BROAD *et al.* 2004) (Ichneumonidae); *Trichomalopsis het-*

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*erogynidis* Graham, 1984 (Pteromalidae) (probably as hyperparasitoid of *Phryxe hirta* [Bigot, 1880]) (GRAHAM 1984), and *Baryscapus endemus* (Walker, 1839) (Eulophidae), also known as hyperparasitoid of various hymenopteran species of the families Braconidae, Encyrtidae, Eulophidae, Ichneumonidae and Pteromalidae (UNIVERSAL CHALCIDOIDEA DATABASE). There are three species known of Diptera: Tachinidae: *Exorista segregata* (Rondani, 1859) and *Compsilura concinnata* (Meigen, 1824), both unspecific parasitoids, and the specific one *Phryxe hirta*. *Exorista segregata* is reported from *H. paradoxa* Rambur, 1837 (DE FREINA, TSCHORSNIG 2005) and *H. canalensis* Chapman, 1904 (unpublished record of the last author of the present paper); *C. concinnata* is known from *H. canalensis* (DE FREINA, TSCHORSNIG 2005) and *H. penella* (XAMBEU 1907, FORD, SHAW 1991); *P. hirta* is a well-known parasitoid of *Heterogynis* spp. (*H. canalensis*, *H. paradoxa*, *H. penella*, and *H. indet.*) (BIGOT 1880, KRÖBER 1910, 1931, HERTING 1960, Liste d'identification des entomophages 8, 1971, FORD, SHAW 1991, DE FREINA, TSCHORSNIG 2005; and a few unpublished records of the last author of the present paper).

## Material and Methods

In total, we collected 24 larvae and 158 pupae of *Heterogynis* sp. which were based on six emerged adults identified as *H. sondereggeri*. Larvae and pupae were put separately in small plastic containers with perforated covers and kept until eventual parasitoid emergence. The larvae were fed for one week with leaves of the host plant and kept in a refrigerator until their metamorphosis.

All caterpillars and cocoons were collected from plants of *Chamaecytisus heuffelii* (Wierzb. ex Griseb. and Schenk) Rothm. (Fabaceae) from the Vlasina Plateau on 15.06.2013. *Chamaecytisus heuffelii* is an endemic species for the Balkan Peninsula. It is a deciduous perennial shrub reaching up to 80 cm in height. According to the Flora Europaea online database its geographical distribution includes Albania, Bulgaria, Greece, Hungary, Romania and Serbia.

The Vlasina Plateau is an area around the Vlasina Lake (= Vlasinsko jezero) about 1200 m a.s.l. (42°42'N, 22°20'E) in South-eastern Serbia, near to the Bulgarian border (Fig. 1). The weather of the Vlasina Plateau is unpredictable and rather harsh during winters. Average snow cover is about 45 cm, lasting for 100 days per year on average. The hottest period is during August with average temperature of 14.7°C, and the coldest is January with average temperature of -4°C. On average, it rains 55 days

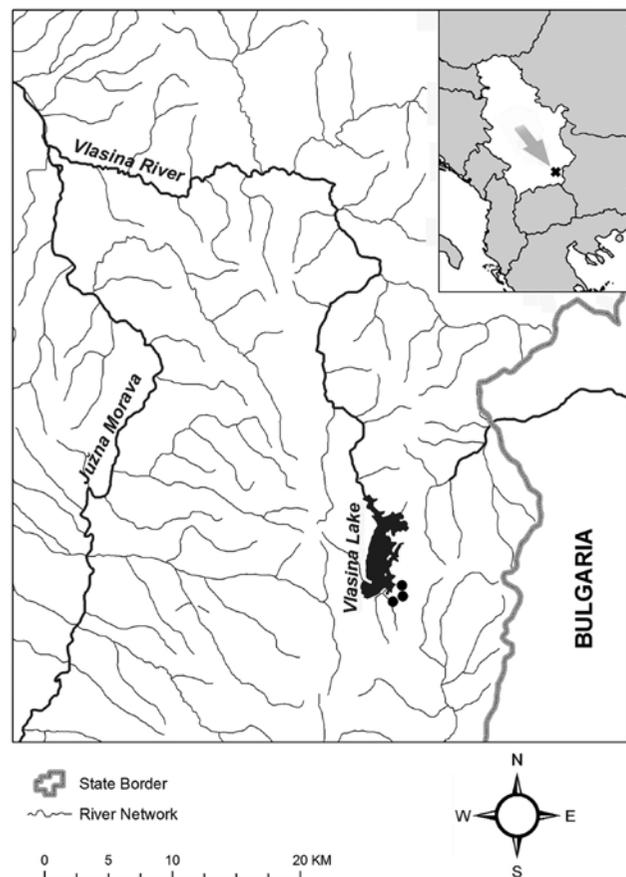
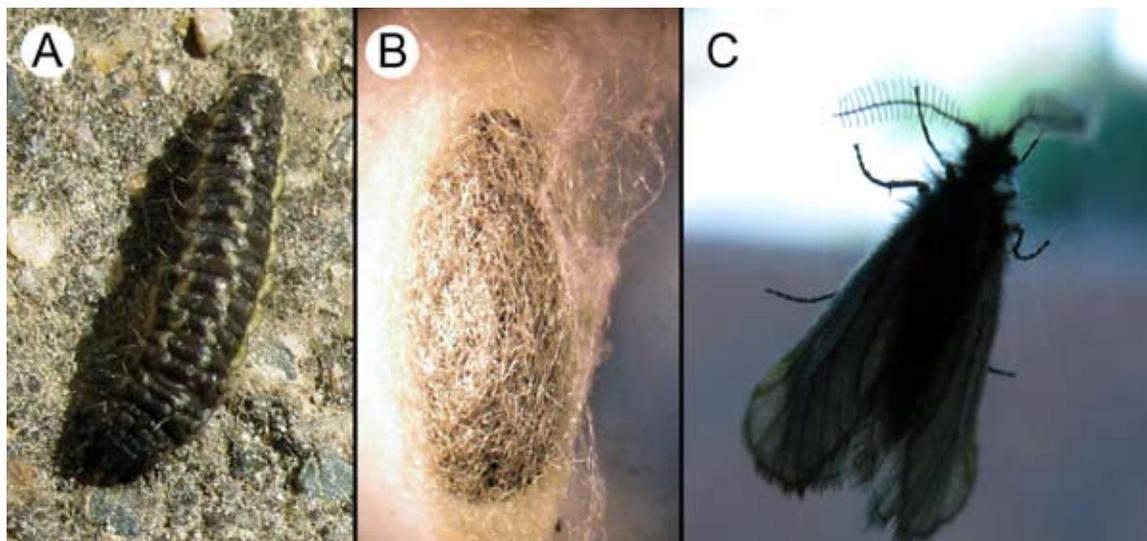


Fig. 1. The sampling localities on Vlasinsko lake

per year; average precipitation is 722.9 mm (DUCIĆ, RADOVANOVIĆ 2005, RANĐELOVIĆ, ZLATKOVIĆ 2010). The vascular flora around the lake represents a mixture of species characteristic of humid meadows and typical highland trees such as *Betula pendula* Roth, *Fagus sylvatica* L., *Populus tremula* L., *Pinus sylvestris* (L.) and *Juniperus communis* L. Conifers, other than *P. sylvestris*, were introduced after the Second World War. This habitat is particular also because of the presence of several endemic species such as the downy birch (*Betula pubescens* Ehrh.) and *Elatine triandra* Schkuhr, *Utricularia minor* L., *Cirsium helenioides* (L.) Hill., *Carex limosa* L. and the sundew (*Drosera rotundifolia* L.), a carnivorous plant unique in Serbia for the Vlasina region (RANĐELOVIĆ *et al.* 2010, RANĐELOVIĆ, ZLATKOVIĆ 2010).

## Results and Discussion

Of the total number of collected specimens, only six adults emerged from cocoons. The majority of the pupae died probably due to high temperature and low humidity during summer. There were no parasitoids reared from caterpillars, all of them underwent metamorphosis. Out of 18 cocoons, three parasitoid species emerged, two hymenopterans and



**Fig. 2.** *Heterogynis sondereggeri*, life stages: A – Final instar larva (L5), B – Pupa in cocoon, C – Imago

one dipteran: *Agrothereutes hospes* (Tschek, 1871) (Hymenoptera: Ichneumonidae), *Trichomalopsis heterogynidis* (Hymenoptera: Pteromalidae) and *Phryxe hirta* (Diptera: Tachinidae). Since no research on the natural enemies of *H. sondereggeri* has been carried out until now, all three trophic associations reported are new (Fig. 3).

#### Notes on *Heterogynis sondereggeri* and its parasitoids

*Heterogynis sondereggeri* was present in very dense colonies, sporadically destroying shrubs of *Ch. heuffelii* to a great extent. Although larvae in their final instars were also present, pupae that were attached to the surrounding vegetation were much more numerous.

The main characters of the observed stages of *H. sondereggeri* are as follows:

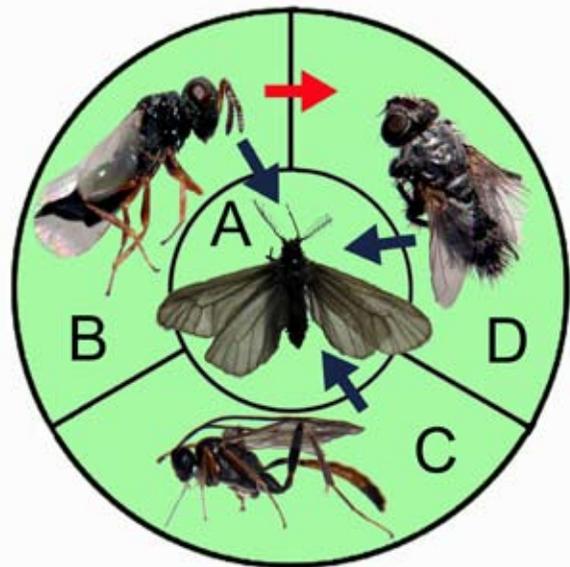
Caterpillar L5 (Fig. 2A): black body with yellowish patches forming four stripes, 12-14 mm long. Lateral stripes more conspicuous than the two dorsal ones. Sporadic long setae black, slightly curved.

Cocoon (Figs 2B, 3A): yellowish to greyish, about 10 mm long, attached on stalk, solitary or hoarded in clusters.

Imago (Fig. 2C): entire body (head, thorax and abdomen) of both sexes black. Fore and hind wings semitransparent black in contrast to the wing venation which is remarkably dark black. Body and wings with dense setation. Males: body length 6.0-7.0 mm, wing span about 15-16 mm (13.0 mm HT). Females: body length 6.5-7.5 mm, wing span 16.0-17.5 mm.

The following parasitoids were reared, all emerged during July and August 2013.

*Trichomalopsis heterogynidis*: 32 ♂, 52 ♀ (Fig. 3B). By dissecting cocoons of *H. sondereggeri* we



**Fig. 3.** Members of trophic associations: A – *Heterogynis sondereggeri* cocoon, B – *Trichomalopsis heterogynidis*, C – *Agrothereutes hospes*, D – *Phryxe hirta*. Blue arrows mark the cases of primary parasitism, red arrow marks the case of hyperparasitism

concluded, based on the lack of other parasitoid remains that in this case *T. heterogynidis* is a primary parasitoid. However, GRAHAM (1984) stated that this species is probably a hyperparasitoid of *Phryxe hirta*. In this research we confirmed both hosts, showing that it has a dual life strategy; in both cases it was a gregarious parasitoid. This particular plasticity, being a primary parasitoid of *H. sondereggeri*, may serve as an alternative strategy when *P. hirta* as a primary host is not abundant enough. The species is recorded for the first time in Serbia.

*Agrothereutes hospes*: 5♂, 5♀ (Fig. 3C). We reared this parasitoid as a primary solitary parasitoid of *H. sondereggeri* pupae. Usually, females oviposit in mature larvae, prepupae and pupae of Lepidoptera, primarily Zygaenidae (e.g. SCHWARZ, SHAW 1998) less often Pyralidae, e.g. *Galleria mellonella* (GÜRBÜ *et al.* 2006), Lasiocampidae, (ŠEDIVÝ 1965) or in various species of Hymenoptera: Symphyta (RAZMI *et al.* 2011). Its life strategy is ectoparasitism. This species has already been reported from the former Serbia and Montenegro state (KOLAROV 2008).

*Phryxe hirta*: 2♀ (Fig. 3D). Only two females emerged from cocoons. However, there were 17

dead puparia from which *T. heterogynidis* emerged. Body length about 5 mm. This dipteran parasitoid is specialised on the genus *Heterogynis* (DE FREINA, TSCHORSNIG 2005). The species is recorded for the first time from Serbia and the Balkan Peninsula.

Since the description of *Heterogynis sondereggeri* by DE FREINA (2012), this is the second finding of this moth in Europe. Furthermore, *H. sondereggeri* is a new host recorded for *T. heterogynidis*, *P. hirta* and *A. hospes*, the first two species being also recorded for the first time from the territory of Serbia.

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