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First record of *Phaenoserphus viator* (Haliday, 1839) (Hymenoptera: Proctotrupidae) as a parasite of *Carabus (Chrysocarabus) basilicus* Chevrolat, 1836 (Coleoptera: Carabidae) in the north of Spain

Primera cita de *Phaenoserphus viator* (Haliday, 1839) (Hymenoptera: Proctotrupidae) como parásito de *Carabus (Chrysocarabus) basilicus* Chevrolat, 1836 (Coleoptera: Carabidae) en el norte de España

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ABSTRACT: For the first time, *Phaenoserphus viator* (Haliday, 1839) (Hymenoptera: Proctotrupidae) has been detected infecting an III instar larva of *Carabus (Chrysocarabus) basilicus* Chevrolat, 1836 (Coleoptera: Carabidae) in Asturias, north of Spain.

KEY WORDS: Hymenoptera, Proctotrupidae, *Phaenoserphus viator* (Haliday, 1839), *Carabus (Chrysocarabus) basilicus* Chevrolat, 1836, Asturias, Spain.

RESUMEN: Por vez primera se ha detectado *Phaenoserphus viator* (Haliday, 1839) (Hymenoptera: Proctotrupidae) infectando una larva de tercer estadio de *Carabus (Chrysocarabus) basilicus* Chevrolat, 1836 (Coleoptera: Carabidae) en Asturias, norte de España.

PALABRAS CLAVE: Hymenoptera, Proctotrupidae, *Phaenoserphus viator* (Haliday, 1839), *Carabus (Chrysocarabus) basilicus* Chevrolat, 1836, Asturias, España.

Introduction

Only scarce data exist about properly identified *Carabus* species as a prey of *Phaenoserphus viator* (Haliday, 1839), even though this wasp is recognized as a common *Carabus* larva parasite. WEIDEMANN (1965) summarizing old literature includes *Carabus (Megodontus) violaceus* Linne, 1758 and *Carabus (Carabus) granulatus* Linne, 1758 as preys of this Proctotrupidae species. STURANI (1962) without identifying the Proctotrupidae species, talks about a *Phaenoserphus* sp. developing in a *Carabus (Oreocarabus) glabratus* Paykull, 1790 larva.

In the Iberian Peninsula, almost no data have been published about this wasp species, and none as a properly identified parasite of an Iberian *Carabus* sp. Data about the presence of an adult of this wasp is only present in one article that, on the other hand, was the first record of this species in the Iberian Peninsula (ALGARRA *et al.*, 1997).

Results and discussion

On 3-X-2015, a III instar larva of a *Carabus* species was found under a rock in a sweet chestnut wood on an east facing stepped slope in central Asturias by the second author, near the Valdemurio dam, at 350 m altitude (UTM 30TTN58). It was found dead, but infested with 42 developing pupae of a parasitic wasp within it (Figs. 1 and 2). This larva was collected to determine the parasite species it contained, and was later identified as a third instar larva of *Carabus* (*Chrysocarabus*) *basilicus* Chevrolat, 1836 (= *Carabus* (*Chrysocarabus*) *lineatus* Dejean, 1826). Eleven days later, in terrarium conditions, the adult wasps emerged and flew, at which point some of them were photographed. Thanks to the help of Victor Kolyada, the Proctotrupidae wasps were identified as belonging to *P. viator*.



Fig. 1: *Carabus* (*Chrysocarabus*) *basilicus* Chevrolat, 1836 infested with wasp larvae as found under a stone in Asturias, 3-X-2015, (GONZÁLEZ, 2015a).

<http://www.biodiversidadvirtual.org/insectarium/Phaenoserphus-viator-%28Haliday-1839%29-img755882.html>

In the literature, CRITCHLEY (1973) wrote that this wasp species mainly attacks winter larvae in England, but, according to literature, some field and breeding data (J. Á. Ramos Abuin, pers. obs.) we know that this *Carabus* species is a summer breeding species. The first author, with one and two years different trapping periods at one location in NW Spain (Feira do Dez, Monfero, A Coruña), has found *C. basilicus* larvae in summer (June and July mainly, one in September) in A Coruña and teneral adults in September and October. RAYNAUD (1966) obtained tenerals, after rearing larvae, in the months of July to September. Finally, it is easy to find adults hibernating in trunks during winter, when their activity stops during those months (J. Á. Ramos Abuin, pers. obs.).

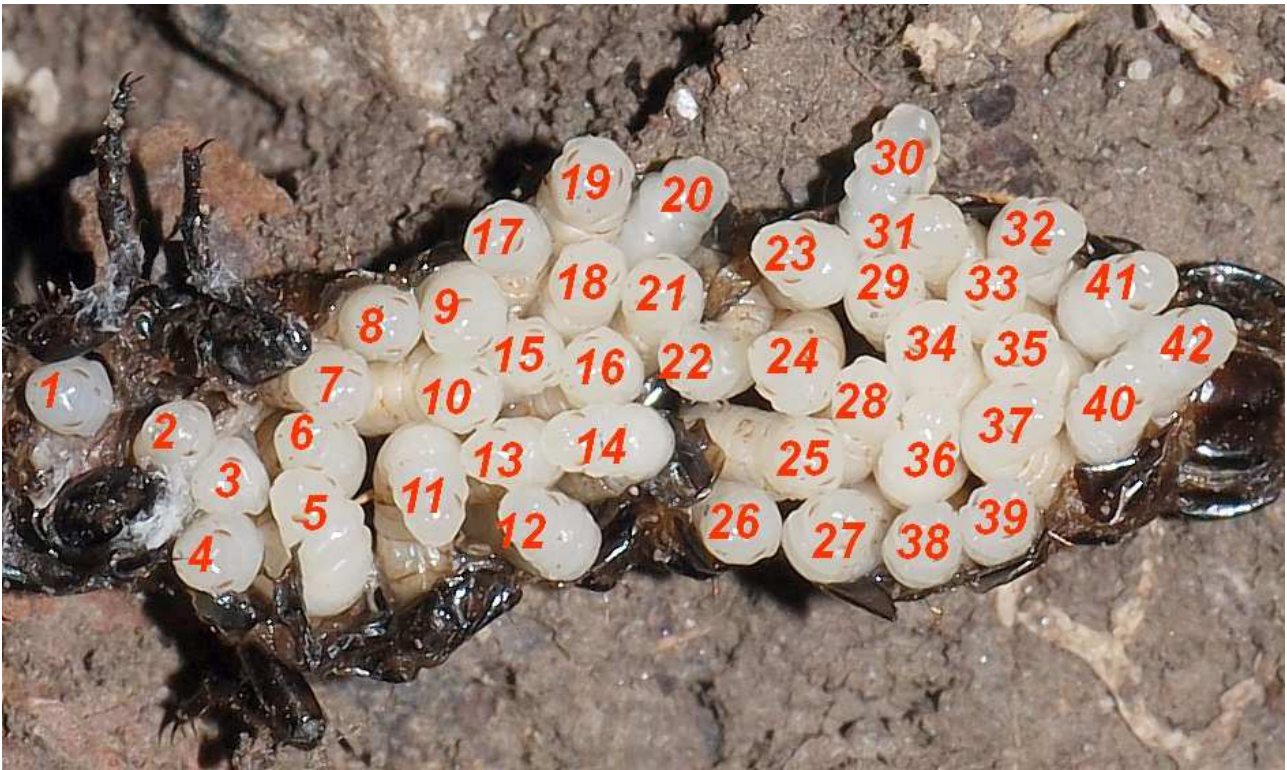


Fig. 2: 42 wasp larvae developed from one larva of *Carabus* (*Chrysocarabus*) *basilicus* Chevrolat, 1836.

According to breeding data obtained at home, the *C. basilicus* life cycle has a length of at least 69 days from egg to the emergence of the teneralis (14 days from pupa to emergence). RAYNAUD (1966) wrote about 63 days of development, at home, in good conditions, and 20 days from pupa to teneral in the same conditions. Eggs were laid from May to August (own data), and May to July according to RAYNAUD (1966).

It is suggested that the infestation could have occurred in the first instar of the *Carabus* larva or even in the egg stage, in the soil (given the burrowing activity of the wingless *P. viator* females that are frequently found in the ground (CRITCHLEY, 1973), but no data about observed ovopositions exist in the literature.

EASTHAM (1929) showed that the life cycle of the *P. viator* larva lasts from October to August (seven months, at least), infesting larvae of *Pterostichus vulgaris* (Linnaeus, 1758) (= *Pterostichus melanarius* (Illiger, 1798)). He had recorded the earliest first wasp larva in October, on one *P. vulgaris* first instar larva. During winter months, there is little growth in the host and wasp larvae. After hibernation, in April, both have an active life and the parasites grow rapidly. In June, *Pterostichus* larvae are found lying in soil cells, unable to walk, and at the end of June, any sign of life vanishes. In August, the parasite larvae are fully grown, and, in a prepupal stage, they emerge from the host larva. This stage lasts a week or ten days. First, they show thin, transparent cuticles, and they are white. Then, the imaginal appendages gradually become everted and they are visible at the pupa stage. A week after, the ocelli and eyes begin to darken (Fig. 3) and in the next two days, the whole body becomes nearly black (Fig. 4). From five to seven days later the adults emerge (Figs. 5 and 6).



Fig. 3: Well-formed pupae of *Phaenoserphus viator* (Haliday, 1839), 4-X-2015. Note that some are orientated towards the rear of the larva and the others face in the opposite direction, (GONZÁLEZ, 2015b).
<http://www.biodiversidadvirtual.org/insectarium/Phaenoserphus-viator-%28Haliday-1839%29-img755883.html>



Fig. 4: Completely developed pupae of *Phaenoserphus viator* (Haliday, 1839), 13-X-2015. The first adult emerged this day, with the remainder the following day, (GONZÁLEZ, 2015c).
<http://www.biodiversidadvirtual.org/insectarium/Phaenoserphus-viator-%28Haliday-1839%29-img755884.html>

In addition, THIELE (1977) and CRITCHLEY (1973) wrote about other species infested by *P. viator* in England, *Nebria brevicollis* (Fabricius, 1792) and *Pterostichus madidus* (Fabricius, 1775). These species have winter larvae like *P. vulgaris*, but have a shorter life cycle (three months in *N. brevicollis*) (i.e., first larvae of *P. viator* appear in November or December, pupae in January, and after a pupal period of one week, adults emerge and mate in the next 24 hours).



Fig. 5: A young male adult of *Phaenoserphus viator* (Haliday, 1839), 14-X-2015, (GONZÁLEZ, 2015d).
<http://www.biodiversidadvirtual.org/insectarium/Phaenoserphus-viator-%28Haliday-1839%29-img755879.html>

STURANI (1962) wrote about an infestation by a *Phaenoserphus* sp. of a *C. glabratus* larva. This *Carabus* species is a summer-autumn breeder and has another long life cycle and winter larvae: copulations have been reported from May to July and young teneral appear in June and July, one year later (TURIN *et al.*, 2003). Nevertheless, the *Phaenoserphus* species was not identified.

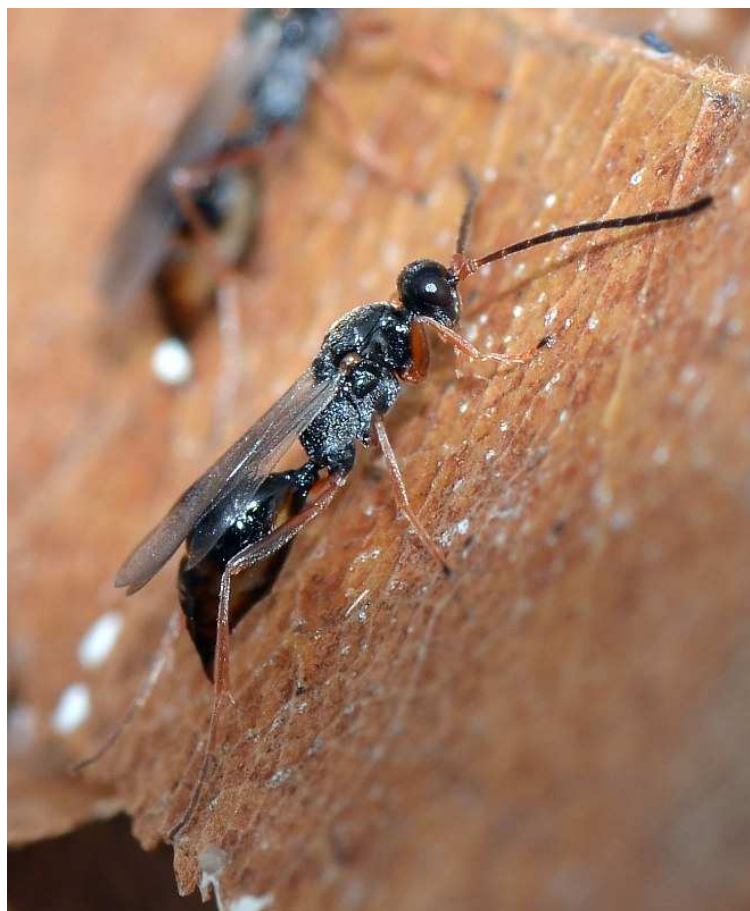


Fig. 6: All the adults of *Phaenoserphus viator* (Haliday, 1839) emerged and flew between 13 th and 14 th of October, 14-X-2015, (GONZÁLEZ, 2015e).
<http://www.biodiversidadvirtual.org/insectarium/Phaenoserphus-viator-%28Haliday-1839%29-img755880.html>

However, this *C. basilicus* larval infestation suggests a shorter development that ends in the early autumn and lasts only two months and seven days. For example, in England, in *P. vulgaris*, the emergence of the adult wasps occurs in five to seven days when all the wasp pupae are dark; in our case the emergence occurred the next day (Fig. 4). These data lead to the conclusion that higher temperatures could be related to this short development and show a high plasticity of the *P. viator* wasp. Whatever the case, according to EASTHAM (1929) we should remember that “the maximum growth of the parasites is sure to take place from the time when pupation would normally occur” because the parasite larvae feed on “the storing up reserve material necessary for pupation”, making it impossible that this larva could change into a pupa. In the case of the *C. basilicus* at Asturias, it is in the second half of the summer.

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