



<http://dx.doi.org/10.11646/zootaxa.3666.2.5>

<http://zoobank.org/urn:lsid:zoobank.org:pub:BCA7BC2C-C942-4856-BE4A-5B696306A87C>

## Morphology of preimaginal stages and taxonomical relationship of *Synanthedon spuleri* (Fuchs, 1908) (Lepidoptera: Sesiidae) with closely related species in Central Europe

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### Abstract

The egg, last larval instar, and pupa of *Synanthedon spuleri* Fuchs are described and illustrated. In Central Europe there is a group of four closely related species including *S. spuleri*, *S. tipuliformis* Clerck, *S. loranthi* Králíček, and *S. cephiiformis* Ochseneheimer. Thus far *S. spuleri* has been classified as closely related to *S. tipuliformis*. However, the results of molecular analyses and partly studies of the morphology of the preimaginal stages indicate that *S. spuleri* is more closely related to *S. cephiiformis* than to *S. tipuliformis*. In terms of the response of males to similar attractants it appears that *S. spuleri* is more closely related to *S. tipuliformis*; however, further research needs to be conducted in this respect.

**Key words:** Sesiidae, chaetotaxy, preimaginal stages, sympatric species

### Introduction

Substantial changes have taken place in the systematic status of Sesiidae during the last decades. Recent molecular studies of Ditrysia (Regier *et al.* 2009; Mutanen *et al.* 2010) are responsible for the synonymy of Sesiioidea with Cossoidea. On the basis of the similar life history of the larvae and the habitus of the adults the Sesiidae had previously been placed close to Cossidae (Kovacs 1953). The explanation of the systematic position of Sesiidae, the internal division of the family, the taxonomic status of many, especially closely related species, requires further taxonomic studies.

One of the main studies with a comprehensive description of the larvae of Sesiidae has been made by Mackay (1968), who described the morphology of larvae of approximately 60 North American species. Based on studies of the larval morphology MacKay (1968) divided the Sesiidae into two subfamilies, Zenodoxinae (now Sesiinae) and Synanthedoninae. The latter subfamily, Synanthedoninae, as distinguished by Mackay, is now ranked as the tribe Synanthedonini and this distinction remains valid until the present. Synanthedonini is the largest sesiid tribe, represented in all zoogeographical regions.

In Central Europe there is a group of four closely related species including *Synanthedon spuleri* (Fuchs, 1908), *S. tipuliformis* (Clerck, 1759), *S. loranthi* (Králíček, 1966), and *S. cephiiformis* (Ochseneheimer, 1808). A comparison of the latter two species, including their preimaginal stages, was carried out by Laštůvka (1983). The morphology of the larva of *S. tipuliformis* was studied by Mackay (1968), but the larva of *S. spuleri* has not yet been described.

The larva of *S. spuleri*, unlike larvae of the other three related species, is clearly polyphagous (Laštůvka & Laštůvka 2001). This fact can account for the relatively high variability in the coloration of the imagines of this species. The specimens of *S. spuleri*, recently recorded from Poland (Bąkowski & Hołowiński 2013), have distinctly yellow spots on the metathorax, which makes them more similar to *S. loranthi* and *S. cephiiformis* than to *S. tipuliformis*. This diversity in coloration led the author of the present study to analyze the relationships between *S. spuleri* and the related species under investigation, mainly on the basis of the morphology of the preimaginal stages, especially of their larvae. The results of these morphological analyses were compared with the results of molecular and sexual ethology studies.