



**NEW DATA ON THE DISTRIBUTION OF *SYNANTHEDON
MESIAEFORMIS* (HERRICH-SCHÄFFER, 1846) (LEPIDOPTERA:
SESIIDAE) IN SOUTHERN CENTRAL EUROPE**

Željko PREDOVNIK

Polzela 68 c, 3313 Polzela, Slovenija, e-mail: zeljko99@volja.net

Abstract – New faunistic data about the distribution of the clearwing moth species *Synanthedon mesiaeformis* (Herrich-Schäffer, 1846) in the southern part of Central Europe are reported. The species has been found for the first time in Slovenia and is thus new to the fauna of the country. The first concrete findings are given for Croatia. In Hungary, *S. mesiaeformis* was observed more northwest of previously known localities. Its discovery, distribution and biology are described.

KEY WORDS: Sesiidae, *Synanthedon mesiaeformis*, Slovenia, Croatia, Hungary.

Izveček – NOVI PODATKI O RAZŠIRJENOSTI STEKLOKRILCA *SYNANTHEDON MESIAEFORMIS* (HERRICH-SCHÄFFER, 1846) (LEPIDOPTERA: SE-SIIDAE) V JUŽNI SREDNJI EVROPI

Podane so nove favnistične informacije o razširjenosti steklokrilca vrste *Synanthedon mesiaeformis* (Herrich-Schäffer, 1846) v južnem delu Srednje Evrope. Vrsta je bila prvič najdena v Sloveniji in je novost za favno dežele. Podani so prvi konkretni podatki za Hrvaško. Na Madžarskem je bil *S. mesiaeformis* opažen severozahodnjeje od do sedaj znanih lokalitet. Podana sta opis njegovega odkritja, razširjenost in biologija.

KLJUČNE BESEDE: Sesiidae, *Synanthedon mesiaeformis*, Slovenija, Hrvaška, Madžarska.

Introduction

Synanthedon mesiaeformis (Herrich-Schäffer, 1846) has a West Palaearctic distribution and is a rare exception among European clearwing species in that it has very disjunct area, while its host plant is more or less widespread (Laštůvka & Laštůvka,

2001, 2008). This large, yellow banded species has been described from southern Russia and has been found in SE and SW Hungary, Romania, Bosnia (Herzegovina), on the southern coast of Finland, in southern parts of Lithuania, in Bulgaria, Serbia, Macedonia, in E Poland, Greece, Turkey (NW Anatolia), S France, Spain (northern Catalonia), SE Czech Republic and in W Slovakia. Slovenia and Croatia can now be added to this list. Finds are noted in the literature, without concrete data or collection documentation, for Estonia, Ukraine and Siberia (Špatenka et al., 1999; Laštůvka & Laštůvka, 2008; Lendel, 2011). The new finds provide important knowledge and increase the recorded distribution of this still insufficiently investigated species in Europe and suggest a more widespread occurrence of *S. mesiaeformis* than has been known so far.

Methods

Two research methods were used during the study, alternately or together, in order to investigate the presence of *S. mesiaeformis* in the field. One was the traditional method of searching for characteristic symptoms in its preimaginal stages, such as typical ca. 4 mm round old exit holes, usually with the remains of cocoons inside the burrows and feeding traces of larvae under the bark of lower parts, mainly in the trunks of *A. glutinosa* on sunny sites. As in the case of *S. scoliaeformis* and some other xylophagous clearwing species, the old exit holes remain for several years as a good sign of previous infestation by the species. It is occasionally necessary to be careful in identifying old exit holes in the field, because the larvae of some other xylophagous species (Coleoptera, Hymenoptera) that sometimes live together in the same trunks, have at first glance quite similar exit holes, although their tunnels usually come directly from the timber and do not contain cocoons and the forms of tunnels characteristic of larvae of *S. mesiaeformis*. During the research, particular attention was paid to the trunks of old and middle-aged solitary trees and those with injuries of various thicknesses, caused by other insects or by mechanical damage along roads. Fresh cocoons with larvae and pupae were usually detected near old exit holes with the help of wire brush, and then carefully cut out with the surrounding bark and reared until adults in room conditions.

Another successful method was the use of synthetic pheromones and pheromone traps. The method is highly efficient in faunistic studies and reliable for monitoring this and some other rare clearwing species that have low densities and that cannot easily be detected by other methods (Bąkowski, 2011). The pheromone traps were baited with one or the other of two pheromones made by Plant Research International (PRI) in Wageningen, The Netherlands. One of them, with the chemical composition E2,Z13-18:Ac+Z3,Z13-18:Ac in the ratio 5:5, is highly attractive for males of *S. mesiaeformis* (Karalius & Būda, 2006). Some traps were baited with pheromones intended for *Paranthrene insolita* Le Cerf, 1914, with the chemical composition E2,Z13-18:Ac+Z3,Z13-18:Ac+Z3,Z13-18:OH in the ratio 100:100:5. In the study area, both compositions were also attractive for males of the clearwing species *Paranthrene insolita* Le Cerf, 1914 and *Synanthedon myopaeformis* (Borkhausen, 1789), which

were sometimes trapped together in the same pheromone traps with males of *S. mesiaeformis*. Each pheromone was single placed in transparent plastic delta traps (RAG-Trap), which had an exchangeable bottom coated with sticky material, and funnel plastic traps (Uni-Trap) with commercial insecticides. Forty-three traps were hung in NE Slovenia and SW Hungary at selected localities with common *A. glutinosa* in wetlands and at the edges of forests. The traps were fixed on tree branches at heights of 1 m to 3 m above the ground, one or two traps being placed at each locality. Specimens trapped in delta traps were later soaked in clean gasoline and prepared. Captured and reared specimens were identified by analysis of their external morphological characters. Representative specimens have been deposited in the private collection of the author. The nomenclature used is according to Laštůvka & Laštůvka (2001).

Results and discussion

The bionomics of *S. mesiaeformis* is well studied (Saramo, 1973; Fibiger & Kristensen, 1974; De Freina, 1997; Špatenka et al., 1999; Laštůvka & Laštůvka, 2008; Lendel, 2011). The species has a similar biology to *S. scoliaeformis* and lives in lowland, where it often chooses trees that then serve several generations of the moth. According to most authors, its development takes two years, but according to recent observations in the southern Czech Republic, it can sometimes complete in one year, at least in central and southern Europe (Z. Laštůvka, personal communication). Accord-



Fig. 1: Numerous old exit holes in the trunk of a host tree near Nagyátad (SW Hungary).



Fig. 2: Mature larva in its tunnel, near Nagyátad (SW Hungary).

ding to De Freina (1997) it takes three years in northern Europe. The host plant of the monophagous larvae is black alder (*Alnus glutinosa* (L.), Betulaceae), in which they live between the bark and the wood, usually in the lower parts of the trunk up to about



Fig. 3: A newly hatched female (wingspan 23 mm) sitting on the bark (Draganci, Croatia).

2.5 meters, although, in contrast to other reports, sometimes higher, up to 4 m (own observations). During its development, the larva forms a 6-8 cm long broad and flat tunnel between the bark and the wood. The presence of younger larvae is sometimes observable externally from traces of excrement in the bark. The emerging hole is completed in spring and is covered with a membrane of a thin layer of bark, strengthened with silk and well covered from the outside. The larva forms a densely spun cocoon of saw-dust and silk in which it pupates. According to Špatenka et al. (1999), the flight season of adults occurs from June to July, according to Laštůvka & Laštůvka (2008) and Lendel (2011) from the second half of May to the end of July. In the southern Czech Republic, several fresh exuviae were found around 10th May in 2010 (Z. Laštůvka, personal communication). In the area investigated, *S. mesiaeformis* start to swarm at the beginning of May, with a peak in the second half of May, individually in June. Such an early start to the flight season may be a result of global warming in recent years. Adults are good and mobile fliers that visit flowers on sunny days; Lendel (2011) mentioned *Ligustrum vulgare* as a host plant of adults. According to Pühringer & Ryrholm (2000) and Bąkowski (2002), males fly to pheromones during the afternoon, between 14:00 and 19:00, with peak activity between 16:00 and 18:00.

Occurrence in Slovenia: Despite years of extensive research of appropriate habitats throughout the country, *S. mesiaeformis* has so far only been recorded in the north-easternmost part of Slovenia in the region of Prekmurje, as the 17th confirmed species of the genus *Synanthedon* in this country (own data). Only four specimens in total have been trapped, at three locations close to the border with Croatia and Hungary, at an altitude of 149 - 153 meters above sea level. *S. mesiaeformis* there inhabits flood-plain groups of black alder trees between fields and on river banks in narrow and marshy, partly modified lowlands called Muriša and the edges of Murska šuma forest. Further faunistic investigation is required to identify the complete occurrence of *S. mesiaeformis* in areas of potential presence of the species elsewhere across the east of the country, especially along the Mura river more to the north and along the rivers Drava and Sava. Because of its special ecological requirements, as well as due to intensive logging and elimination of solitary black alder trees, *S. mesiaeformis* is among endangered species of clearwing moths, with a still very disjunct known range (Laštůvka & Laštůvka, 2008). The species is considered to be extremely rare in most European countries (Karalius & Būda, 2006 b). In view of this, it is proposed that *S. mesiaeformis* be placed on the list of endangered animal species in Slovenia.

Finds: Prekmurje: Murska šuma, 20.-27.5.2012, trap RAG, pheromone mesiaeformis, 1♂ (together with 9♂ of *P. insolita*). Muriša, 20.-27.5.2012, trap RAG, pheromone mesiaeformis, 1♂ and trap RAG, pheromone insolita, 1♂. Muriša (on the banks of the river Mura), 20.-27.5.2012, trap UNI, pheromone mesiaeformis, 1♂ (together with 2♂ of *S. myopaeformis*). All. leg. et coll. Ž. Predovnik.

Occurrence in Croatia: *S. mesiaeformis* is on the list of clearwing moths of Croatia (Kučinić et al., 1997) without any concrete data and it is not mentioned for this coun-



Fig. 4: A river bank as habitat of *S. mesiaeformis* in Muriša (NE Slovenia).

try in any of the major works about clearwings. In view of the distribution of the species close to the Hungarian side of the border, the mentioned finds were expected and the occurrence of *S. mesiaeformis* in Croatia is now confirmed. Old exit holes, larvae and



Fig. 5: Habitat of *S. mesiaeformis* in Muriša (NE Slovenia).

pupae of the species were recorded at three localities along the Drava river in the region of Podravina (NW Croatia), at 108 - 117 m a.s.l. In Pitomača, the presence of the species was detected from several old exit holes around the edges of a large wound in one trunk in a group of *A. glutinosa* trees, growing in a meadow. A small, bird damaged population was observed in four trunks of a group of old *A. glutinosa* trees at the edge of a floodplain forest near Kladare. Around Ferdinandovac, a giant, about one hundred-year-old *A. glutinosa* tree, heavily infested with ca. 200, mostly old exit holes of several generations of moths on its trunk was found. Due to increasingly intensive logging, such old black alder trees are very hard to find today. Some of the holes were located up to 4 meters above the ground, probably because the lower part of the trunk was partially shaded with a *Sambucus ebulus* bush growing nearby, while there were no exit holes on its northern side. Due to the new find of *S. mesiaeformis* on the Slovenian side of the border river Mura, the moth is likely also to occur in suitable habitats on the other side of the border along the river, in the region of Međimurje (N Croatia). The species can also be expected elsewhere in the poorly investigated Pannonian part of Croatia.

Finds: **Podravina: Pitomača**, 26.3.2009, 4 old exit holes, fresh feeding trace of young larvae, leg. Ž. Predovnik; 21.10.2009, old exit hole, leg. Ž. Predovnik & R. Kranjčev. **Kloštar, Kladare**, 13.4.2012, pupa and mature larva, 13 old exit holes, 9 fresh and empty cocoons, opened by birds, ex.p.: 6.5.2012, 1♂. **Ferdinandovac, Draganci**, 13.4.2012, ca. 200 old exit holes, 10 fresh cocoons with pupae and mature larvae, two dead last year pupae, 14 young larvae, ex.l.-ex.p.: 7.-13.5.2012, 4♂, 3♀. All leg. et coll. Ž. Predovnik.

Occurrence in Hungary: The author studied *S. mesiaeformis* in several localities, previously known from the literature in the Somogy region, and a few new ones in the Zala region (SW Hungary). The species is locally common throughout the investigated area and inhabits various habitats, such as the edges of wet *A. glutinosa* or mixed forest, small groups of trees on meadows, as well as marshes or between fields and trees along roads, from 120 - 155 m a.s.l. Deeper into the forest, trees were not infected. In a plantation of middle-aged *A. glutinosa* trees in Nagykanizsa, not numerous old exit holes and fresh pupae of species around the edges of wounds on trunks were observed. In some places, more mature larvae become the prey of birds through the winter and spring. Fifteen fresh cocoons opened by birds and only one surviving mature larva were once found in a severely traffic damaged younger *A. glutinosa* trunk, leaning about four meters above the road around Nagyatád. One larva in tumorous tissue on the trunk and numerous old exit holes and larvae in/under the bark of mechanically damaged edges were found there in a middle-aged group of alder trunks along a road through swampy forest. Some of the old exit holes, a few of the previous year's cocoons and larvae were observed under the bark on the edges of a stump in early succession. The trunk was subsequently cut, with the larvae still living in it. The species was also discovered in floodplain forest along the river Mura near Muraszemenye, at



Fig. 6: Habitat of *S. mesiaeformis* near Draganci (NW Croatia).



Fig. 7: Habitat of *S. mesiaeformis* near Nagyátad (SW Hungary).

149 m a.s.l. in the border area with Slovenia and Croatia, which is the most northerly location of *S. mesiaeformis* in Hungary by far.

Finds: **Somogy: Nagyatád-Barcs, Csokonyavisonta**, 11.4.2004, 35 larvae of both ages, e.l.-e.p.: 13.-21.5.2004, 5♂, 2♀, leg. Ž. Predovnik & A. Kapla; 24.3.2006: several young and 10 mature larvae, 15 fresh and empty cocoons, opened by birds, e.l.: 7.-17.5.2006, 3♂, 3♀; 26.3.2009: a number of old exit holes, several young and 16 mature larvae, e.l.: 3.-28.5.2009, 5♂, 4♀. **Nagyatád, Mike**, 24.3.2006, 2 old exit holes with remains of exuvia. **Zala: Nagykanizsa**, 6.5.2012, 5 old exit holes, 2 empty cocoons, opened by birds, pupa, ex.p.: 11.5.2012, 1♂; 6.-19.5.2012, trap UNI, pheromone mesiaeformis, 3♂. **Nagykanizsa, Palin**, 6.5.2012, ca. 260 old exit holes, 25 fresh cocoons, mostly with pupae and with a few mature larvae, ex.l.-ex.p.: 11.-26.5.2012, 7♂, 10♀, and 13.6.2012, 1♀; 6.-19.5.2012, 2 traps UNI, pheromone mesiaeformis, 4♂ (together with 1♂ of *S. myopaeformis*) and trap UNI, pheromone insolita, 4♂. **Nagykanizsa, Sormás**, 19.5.2012, 2 old cocoons. **Muraszemenye**, 6.-19.5.2012, trap UNI, pheromone mesiaeformis, 1♂. All leg. et coll. Ž. Predovnik.

Acknowledgment

I would like to thank Dr. Radovan Kranjčev, Andrej Kapla and my father Dušan for their support for my excursions, Dr. Zdenek Laštůvka for additional phaeenologic information, and Andrej Kapla also for his work on the distribution map.



Fig. 8: Map of finds.

References

- Bąkowski, M.**, 2002: Daily activity patterns of clearwing moth species at pheromone baits in Poland (Lepidoptera: Sesiidae). *Biological Letters* **39**(1/2): 43-48.
- Bąkowski, M.**, 2011: Use of sex pheromones in faunistic research on *Synanthedon scoliaeformis* (Lepidoptera, Sesiidae) in Poland.– *Fragmenta Faunistica* **54**(2): 153-156.
- Carnelutti, J.**, 1992a: Rdeči seznam ogroženih metuljev (Macrolepidoptera) v Sloveniji.– *Varstvo narave* **17**: 61-104, Ljubljana.
- Carnelutti, J.**, 1992b: Popravki / errata.– *Varstvo narave* **18**: 189-190, Ljubljana.
- Fibiger M., Kristensen, N. P.**, 1974: The Sesiidae (Lepidoptera) of Fennoscandia and Denmark.– *Fauna Ent. Scand.* **2**: 91 S.
- Freina, J. J. de**, 1997: *Die Bombyces und Sphinges der Westpalaearktis* (Insecta, Lepidoptera) 4. *Sesioidea: Sesiidae*.– 431 pp 31 pls, 27 pls. München.
- Karalius, V., Būda, V.**, 2006 a: Sex attractants for clearwing moths *Synanthedon mesiaeformis* (Herrich-Schäffer) and *S. flaviventris* (Staudinger) (Lepidoptera, Sesiidae).– *Acta Zool. Lituanica* **16**(3): 198-203.
- Karalius, V., Būda, V.**, 2006 b: The investigation of *Synanthedon mesiaeformis* (Herrich-Schäffer) and *S. flaviventris* (Staudinger) (Lepidoptera, Sesiidae) distribution in Lithuania using sex attractants.– *Acta Zool. Lituanica* **16**(3): 204-209.
- Kučinić, M., Hrašovec, B., Bregović, A & Perović F.**, 1997: Contribution to the knowledge of clearwing moths (Lepidoptera, Sesiidae) in Croatia.– *Nat. Croat.* **6**(2): 275-284.
- Laštůvka, Z., Laštůvka, A.**, 2001: The Sesiidae of Europe. Apollo Books, Stentsrup. 9 colour ills, 245 S.
- Laštůvka, Z., Laštůvka, A.**, 2008: *Synanthedon mesiaeformis* (Herrich-Schäffer) new to the Czech Republic and to Spain (Lepidoptera: Sesiidae).– *Acta Univ. Agric. Silvic. Mendel. Brun.* **56**(5): 141-146.
- Lenđel, A.**, 2011: The first record of *Synanthedon mesiaeformis* (Lepidoptera, Sesiidae) in Slovakia.– *Folia Faun. Slov.* **16**(2): 91-96.
- Lesar, T., Govedič, M.**, 2010: Check list of Slovenian Microlepidoptera.– *Nat. Slo.* **12**(1): 35-125.
- Pühringer, F., Ryrholm, N.**, 2000: Pheromonanflug europäischer Glasflügler (Lepidoptera, Sesiidae).– *Mitt. ent. ArbGem. Salzkammergut* **3**: 65-72.
- Saramo, Y.**, 1973: *Synanthedon mesiaeformis* H.S. (Lep., Aegeriidae) at Kotka and in the eastern archipelago of the Gulf of Finland.– *Annls ent. Fenn.* **39**: 24-28.
- Špatenka, K., Gorbunov, O., Laštůvka, Z., Toševski, I & Arita, Y.**, 1999: Handbook of Palaearctic Macrolepidoptera, Volume 1, Sesiidae- 569 pp pls, 489 colour ills. Gem publishing company, Wallingford, -England.
- Uradni list RS**, 2002: Pravilnik o uvrstitvi ogroženih rastlinskih in živalskih vrst v rdeči seznam. *Uradni list RS*, št. 82/2002, Ljubljana, 8893-8975.
- Uradni list RS**, 2004: Uredba o zavarovanih prosto živečih živalskih vrstah. *Uradni list RS*, št. 46/2004, Ljubljana, 5933-6016.

Received / Prejeto: 11. 10. 2012