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A REVISION OF CLEARWING MOTHS (LEPIDOPTERA: SESIIDAE) IN THE COLLECTIONS OF THE CROATIAN NATURAL HISTORY MUSEUM IN ZAGREB AND THE ENTOMOLOGICAL DEPARTMENT OF THE VARAŽDIN MUNICIPAL MUSEUM

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Predovnik, Ž.: A revision of clearwing moths (Lepidoptera: Sesiidae) in the collections of the Croatian Natural History Museum in Zagreb and the Entomological Department of the Varaždin Municipal Museum. Nat. Croat., Vol. 19, No. 2, 381–388, 2010, Zagreb.

The results of a re-examination of specimens of clearwings (Lepidoptera: Sesiidae) deposited in the Varaždin Municipal Museum and the Croatian Natural History Museum (CNHM) in Zagreb are presented. Re-determination confirmed 21 species from 6 genera among the 142 clearwing moth specimens from Croatia.

Key words: Lepidoptera, Sesiidae, Croatian museums, fauna, redetermination

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Izneseni su rezultati ponovnog pregleda entomoloških zbirki staklokrilki (Lepidoptera: Sesiidae) pohranjenih u Gradskom muzeju u Varaždinu i Hrvatskom prirodoslovnom muzeju u Zagrebu. Među 142 primjerka staklokrilki iz Hrvatske kroz redeterminaciju je utvrđena 21 vrste iz 6 rodova.

Ključne riječi: Lepidoptera, Sesiidae, hrvatski muzeji, fauna, redeterminacija

INTRODUCTION

Clearwings (Sesiidae) are a unique family of Lepidoptera, which have expanded to almost 1400 species worldwide, with the exception of Antarctica; 107 species have been discovered in Europe (LAŠTŮVKA & LAŠTŮVKA, 2001; PÜHRINGER & KALLIES, 2004). The caterpillars live hidden in the roots or lower parts of stems of herbaceous plants and in the wood of woody plant species. Imagoes are day-time animals, whose appearance well mimics venomous insects, particularly wasps (Batesian mimicry), so that they are more secure from predators. With their unusual appearance for butterflies and often quick flight in the field, they are easily lost among the mass of

Croatian Natural History Museum, Demetrova 1, Zagreb, Croatia

other insects and so are difficult to collect using conventional methods. Until recently, therefore, it was a little known family represented in museums with not very many specimens. With the development of synthetic sex pheromones and using pheromone traps, the number of finds of clearwings has recently shown a dramatic increase and a number of new species have been discovered. In a previous contribution (KUČINIĆ *et al*., 1997), among others things knowledge was presented of the history of clearwings in Croatia, as well as the titles of all major works dealing with clearwings in that territory. Nine clearwing species are added here, as part of the list of Lepidoptera of Knin and its immediate surroundings, which Ivan HAFNER (1994) assembled over 30 years of the last century. Subsequently 13 species together between this material were determined (PREDOVNIK, 2003). The final list of LAŠTŮVKA & LAŠTŮVKA (2001) enumerates 50 species for the fauna of Croatia. One species has been discovered since then (PREDOVNIK, 2009), and more species will undoubtedly be recorded in the future.

MATERIAL AND METHODS

Based on analysis of a previous contribution (KUČINIĆ *et al*., 1997), of a total of 246 specimens of clearwings kept in CNHM (Zagreb), 142 specimens collected in the territory of Croatia are redetermined. Sixty-one specimens stored in two boxes from the entomological collections of the Central and Lorković collections (CNHM, Zagreb), and 81 specimens stored in three boxes in the Košćec collection (Varaždin Municipal Museum) were re-examined.

The redetermined specimens came from the following regions of Croatia: Turopolje, Kordun, Banovina, Hrvatsko zagorje, central Croatia, Dalmatia and Istria.

More than 90% of European species of clearwings can be relatively easy and reliably determined by the external morphological characteristics. Despite the relatively easy determination, certain identification of some of the species requires considerable experience (LAŠTŮVKA & LAŠTŮVKA, 2001).

Redetermination of the existing material of clearwings was done on the basis of their external morphological characteristics with the use of illustrated keys from basic works: Clearwings in Europe (LAŠTŮVKA & LAŠTŮVKA, 2001) and Clearwings of the Palaearctic region (ŠPATENKA *et al*., 1999). Erroneous determinations were corrected and some previously undetected data were entered.

The identification used the method of comparing photographs of specimens in the museum collections taken in the museum premises with a digital camera (Canon PowerShot G5) with material from the private collection of the author.

Zoogeographical characteristics of the species were given in the previous contribution (KUČINIĆ *et al*., 1997), so that this is only done in exceptional cases and only with a few species in this paper. A systematic survey of clearwings is given by LAŠTŮVKA & LAŠTŮVKA (2001).

RESULTS AND DISCUSSION

The final number of clearwing species in the fauna of Croatia is not yet known and will amount in my assessment to some 57 species. Twenty-one species were

confirmed among the museum material, representing around 37 % of the approximate total number. Although none of these species is a novelty for the fauna of Croatia, their existence as part of an entomological estate provides a very important document for the local fauna of clearwings in individual regions.

Comments are provided in small print in connection with the faunistically most interesting finds; some errors in the previous contribution (KUČINIĆ *et al*., 1997) are corrected. In the absence of sample specimens and incorrect indentifications, the following species could not be confirmed in the museum material in the previous contribution: *Pyropteron muscaeformis*, *Chamaesphecia chalciformis* and *C. hungarica*.

These species will have to be reconfirmed by new finds. Incorrectly identified and unidentified specimens included some as yet unpublished species: *Bembecia albanensis*, *B. pavicevici*, *Chamaesphecia euceraeformis*, *C. nigrifrons*, which are now presented in this paper.

Potential specimens of two sister species, *Chamaesphecia empiformis* and *C. tenthrediniformis*, for reasons given in the commentary below, could not be identified with sufficient certainty and distinguished from one another, and are given under a common name. Only three specimens, too damaged to be reliably determined, remained unidentified.

Abbreviations: CNHM: Central Collection of Lepidoptera of the Croatian Natural History Museum, Zagreb; GMV: Varaždin Municipal Museum.

***Sesia apiformis* (Clerck, 1759)**
Bosiljevo, ex coll. Kozulić; Peščenica 18.6.1974. leg. F. Perović, Trnovec, 1♀, 6.1950. leg. I. Igalffy, ex. coll. Igalffy, Zagreb (Cvjetno naselje), 2♀, 26.6.1978., leg. et coll. Lorković (CNHM); Varaždin, 2.7.1928., 20.6.1929., 30.6.1929., 17.7.1930., 4.8.1936., leg. et coll. Košćec (GMV);

***Paranthrene tabaniformis* (Rottemburg, 1775)**
Bosiljevo, ex coll. Kozulić (CNHM); Varaždin, 4.8.1925., 17.7.1929., 25.7.1930. leg. et (6♂) coll. Košćec (GMV);

***Synanthedon spheciformis* ([Denis & Schiffermüller], 1775)**
Trnovec, 1♀, 5.1914, leg. I. Igalffy, ex coll. Igalffy (CNHM);

***Synanthedon stomoxiformis* (Hübner, 1790)**
Trnovec, 2♂, 30.6.1948., 7.1950. leg. I Igalffy, ex coll. Igalffy (CNHM); Kamenica, 1♀, 2.7.1932, leg. et coll. Košćec (GMV);

***Synanthedon culiciformis* (Linnaeus, 1758)**
Varaždin, 1♂, 2.5.1947., leg. et coll. Košćec (GMV);

***Synanthedon formicaeformis* (Esper, 1783)**
Varaždin, 1♂, 4.7.1928., leg. et coll. Košćec (GMV);

***Synanthedon myopaeformis* (Borkhausen, 1789)**
Zagreb, 9.7.1932., 10.7.1932., ex coll. Valjavec, Caska (otok Pag), 5♂, 23.6.1962. leg. Mladinov, 26.6.1962. leg. K. Igalffy, ex coll. Igalffy, Trnovec, 7.1939, leg. I. Igalffy, ex. coll. Igalffy, Sijasetska draga, 12.7.1983, leg. N. Tvrtković (CNHM); Kamenica, 18.7. 1929., 2.8.1936., leg. et (3♂, 1♀) coll. Košćec (GMV);

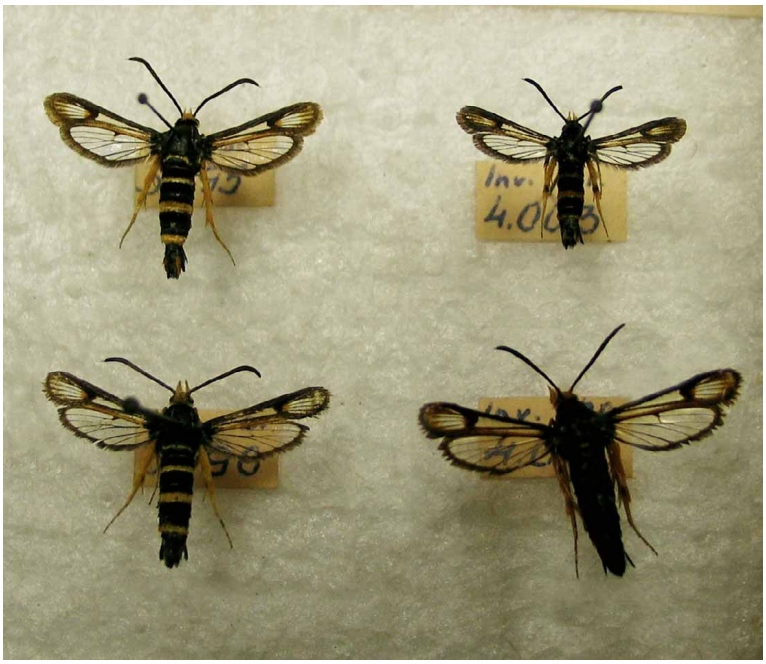

Fig. 1. Specimens of *Bembecia megillaeformis* (Hübner [1813]) from the Košćec collection, a very rare and local species in the continental part of Europe.

***Synanthedon vespiformis* (Linnaeus, 1761)**
Bosiljevo, ex coll. Kozulić (CNHM); Kamenica 18.7.1929., 17.7.1933., Varaždin 29.6. 1928., 3.7.1928., 10.7.1928., 25.7.1930., 28.6.1937., 13.7.1950., leg. et (9♀, 2♂) coll. Košćec (GMV);

***Synanthedon conopiformis* (Esper, 1782)**
Klanjec, 1♂, 6.6.1931 (CNHM);

***Synanthedon tipuliformis* (Clerck, 1759)**
Zagreb, 1♂, 11.7.1929. ex coll.Valjavec, 1♂, Zagreb, 21.5.1947, Zagreb, 1♀, 5.7.1949, leg. et coll. Lorković (CNHM); Varaždin, 1♂, 25.7.1925 (det. as *Synanthedon conopiformis*), Varaždin, 1♀, 5.7.1929., leg. et coll. Košćec (GMV);

***Synanthedon cephiformis* (Ochsenheimer, 1808)**
Trnovec, 1♀, 7.1939., leg. I. Igalffy, ex coll. Igalffy (CNHM); Kamenica, 1♂, 12.7. 1929., leg. et coll. Košćec (GMV);

***Bembecia ichneumoniformis* ([Denis & Schiffermüller], 1775)**
Trnovec, 1♂♀, 7.1946, ex coll. Igalffy, Šamarica, 1♂, 8.1955. ex. coll. Igalffy (CNHM); Kamenica 16.7.1929., 22.7.1929., 28.7.1933., 19.7.1934., Ravna Gora 18.7.1928., Varaždin, 1♀, 8.8.1929. leg. et coll. Košćec (GMV);

***Bembecia albanensis* (Rebel, 1918)**
Trnovec, 1♀, 7. (unreadable!) 2., Trnovec, 1♀, 7.1945., leg. I. Igalffy, ex coll. Igalffy (CNHM);

***Bembecia pavicevici* Toševski, 1989**
Pag (otok Pag), 1♀, 2.8.1935. (CHNM);

***Bembecia megillaeformis* (Hübner, [1813])**
Mošćenička Draga, 1♀, 21.7.1972., leg. et coll. Lorković, Povljana (otok Pag), 1♀, 1.7.1960., leg. L. Mladinov (CNHM); Kamenica, 17.7.1929., 23.7.1929., 2.8.1934., leg. et (5♀) coll. Košćec (GMV);

*The find of this West Palaearctic species in Kamenica (leg. et coll. Košćec) is very interesting. *B. megillaeformis* is a widespread and sometimes frequent species, especially on the Adriatic coast, while in the continental part of Europe it is very local and rare. In recent decades, some Central European populations have already become extinct and this species is now lost to the fauna of Germany, Poland and the Czech Republic (LAŠTŮVKA & LAŠTŮVKA, 2001). Only old records are known-for the east of Austria as well (PÜHRINGER, 1997). In this context, new research is needed to determine whether *B. megillaeformis* still lives in Kamenica and what the current state of the population is.

***Bembecia uroceriformis* (Treitschke, 1834)**
Otok Pag, 1♀♂, 7.1960., leg. I. Igalffy, ex. coll. Igalffy, Caska (otok Pag), 1♂♀, 8.7. 1960. leg. L. Mladinov, Povljana (otok Pag), 1♀, 1.7.1960., leg. L. Mladinov (CNHM);

***Pyropteron triannuliformis* (Freyer, 1843)**
Caska (otok Pag), 1♂♀, 21.6.1960. (det. as *Synansphecia muscaeformis*), 3♀, 28.6.1960. (det. as *S. muscaeformis*), 1♂, 4.7.1960. (det. as *S. muscaeformis*), 1♂, 29.6.1962. (det. as *S. muscaeformis*), leg. M. Mladinov, 1♂, 5.7.1960. (det. as *S. muscaeformis*), leg Magerle, Dubrava (otok Pag), 1♂, 7.1962. (det. as *S. muscaeformis*), leg. K. Igalffy, ex coll. Igalffy, Zagreb, 1♂, 6.7.1929. (det. as *S. muscaeformis*), 1♂, 17.7.1929. (det. as *S. muscaeformis*) 1♂, 1.7.1929. (det. as *S. muscaeformis*), ex coll.Valjavec (CNHM); Varaždin, 1♀, 31.7.1925., 1♀, 2.8.1925., 1♀, 23.7.1928., 1♂, 26.7.1928. (det. as *Chamaesphecia empi-*

Fig. 2. *Chamaesphecia nigrifrons* (Le Cerf, 1911) (coll. Košćec), an often overlooked species.

formis), 1♂, 6.7.1929. (det. as *C. empiformis*), 1♀, 18.7.1930., 1♂, 21.7. 1930., leg. et coll. Košćec (GMV);

***Pyropteron muscaeformis* (Esper, 1783)**
In the CNHM collection, among old material from the end of the 19th century, there are several probably reared specimens (ex. coll. Locke), which, judging by the very scarce data on their labels, represented foreign material (Tyrol, Germany). Specimens from Croatian localities, previously listed under *Synansphecia muscaeformis* (KUČINIĆ *et al*., 1997), belong to the similar species *P. triannuliformis*. The presence of this species on the territory of Croatia can be expected on the tops of mountains where the food plants of its caterpillars, *Armeria* spp., grow.

***Chamaesphecia chalciformis* (Esper, [1804])**
There are reports of this beautiful East Mediterranean-Asiatic species in a previous contribution, based on finds of a few specimens from localities in Babrovača (Velebit) and Vozilići (Istra) (leg. F. Perović, KUČINIĆ *et al*., 1997). The sample specimens underlying all these claims are no longer available for redetermination. These reports will have to be confirmed by new finds, also because of the possibility of confusing specimens of *C. chalciformis* with the similar species *C. schmidtiiformis*, which is also present in the area.

***Chamaesphecia hungarica* (Tomala, 1901)**
During the redetermination of specimens previously identified and referred to as *C. hungarica,* it was found that all these specimens actually belong to the species *C. euceraeformis*. *C. hungarica,* together with its food plant *Euphorbia lucida* Waldst. & Kit., is endangered in Europe and its numbers are falling, related to the destruction of its habitats in humid Pannonia. In Slovenia, this species has only been found in the Lake Cerknica and a small location near Laško (J. Rekelj leg.), where it already appears to have vanished (PREDOVNIK, 2002).

***Chamaesphecia nigrifrons* (Le Cerf, 1911)**
Okolina Varaždina, 1♀, 7.1929., leg. et coll. Košćec (GMV);
Despite the widely grown food plants (*Hypericum perforatum* L.), *C. nigrifrons* is only very locally distributed in eastern Slovenia (PREDOVNIK, 2005) and probably also in Međimurje and Hrvatsko Zagorje. The new finds indicate a higher frequency of *C. nigrifrons* in a primarily anthropogenic biotopes in eastern Croatia (Predovnik et Kranjčev, unpublished data).

***Chamaesphecia euceraeformis* (Ochsenheimer, 1816)**
Varaždin, 1♀, 25.7.1925., 1♂, 27.7.1925. (det. as *C. hungarica*), 1♂, 30.7.1925., 1♀, 31.7.1925., 1♂, 1.8.1925. (det. as *C. hungarica*), 1♂, 3.8.1925. (det. as *C. hungarica*), 1♂, 21.7.1927. (det. as *Chamaesphecia hungarica*), 1♂, 26.6.1928. (det. as *C. hungarica*), 1♀, 24.7.1928., 1♀, 13.6.1929., 1♂, 15.6.1929., 1♂, 3.7.1931., leg. et coll. Košćec (GMV);

*The species is dependent on habitats of the spurge, *Euphorbia polychroma* K., and is therefore locally widespread. *C. euceraeformis* is a relatively frequent species in the region of Hrvatsko Zagorje near the border with Slovenia, and in some areas of eastern Slovenia (Predovnik, unpublished data).

***Chamaesphecia ampiformis* (Esper, 1783) / *Chamaesphecia tenthrediniformis* ([Denis & Schiffermüller], 1775)**
Kamenica, 1♂, 19.7.1929., 1♂, 21.7.1929., 1♂, 22.7.1929., 1♂, 23.7.1929., 1♂, 29.7.1929., 1♀, 29.7. 1931., Ravna Gora, 1♀, 14.7.1928., 1♀, 3.8.1931., Varaždin, 1♂, 25.7.1925., 1♀,

30.7.1925., 1♂, 28.7.1927., 1♀, 1.8.1927., 1♂, 30.6.1928., 1♀, 24.7.1928., 1♂, 31.7.1928., 1♂, 27.7.1929. (det. as *C. hungarica*), 1♀, 9.7.1935., 1♂, 14.7.1935., leg et coll. Košćec (GMV);

*Because of wide variability, these two closely related species cannot be reliably identified and distinguished from one another by external or internal (genital) morphology. Reliable identification is possible mainly through determination of the food plant of the caterpillars. *C. empiformis* is a monophag, whose caterpillars live only in the roots of *Euphorbia cyparissias* L. while the caterpillars of *C. tenthrediniformis* live in *Euphorbia esula* L. (NAUMANN & SCHRÖEDER, 1980) and *E. salicifolia* Host (LAŠTŮVKA & LAŠTŮVKA, 2001). *C. empiformis,* together with hostplant of its caterpillars, usually appears very widespread and in general common, so the vast majority of these specimens probably belong to *C. empiformis*.

***Chamaesphecia astatiformis* (Herrich-Schäffer, 1846)**

Dubrava (otok Pag), 1♂, 7.1962., leg. K. Igalffy, ex coll. Igalffy (CNHM);

*Interesting find of the species within the Caspian-Asiatic area of distribution in the region of Dalmatia.

Undetermined specimens:

Synanthedon sp. (*S. loranthi / cephiformis*), Lička Plješevica, 1♀, 14.7.1927. (det. as *Synanthedon tipuliformis*), ex coll. Valjavec, *Bembecia* sp. (under *B. ichneumoniformis*), Caska (otok Pag), 1♀, 21.6.1960., leg. L. Mladinov, *Bembecia* sp. (under *B. ichneumoniformis*), Caska (otok Pag), 1♀, 28.6.1960., leg. L. Mladinov (CNHM);

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REFERENCES

HAFNER, I., 1994: Verzeichnis der bei Knin gesammelten Schmetterlinge (Lepidoptera). Nat. Croatica **3**(2), 119–184.

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 colours ills, 245 S.

NAUMANN, C. M. & SCHRÖEDER, D., 1980: Ein weiteres Zwillingsarten-Paar mitteleuropäischer Sesiiden: *Chamaesphecia tenthrediniformis* ([Denis & Schiffermüller], 1775) und *Chamaesphecia empiformis* (Esper, 1783) (Lepidoptera, Sesiidae). Z. ArbGem. Öst. Ent. **32**(1/2), 29–46.

PREDOVNIK, Ž., 2002: Nove najdbe steklokrilcev (Lepidoptera: Sesiidae) v Sloveniji. Acta Entomologica Slovenica **10**(2), 161–169.

PREDOVNIK, Ž., 2003: Steklokrilci (Lepidoptera: Sesiidae) centralne zbirke metuljev Prirodoslovnega muzeja Sovenije. Acta Etomologica Slovenica **11**(2), 171–182.

PREDOVNIK, Ž., 2005: Clearwing moths (Lepidoptera: Sesiidae) new to the fauna of Slovenia. Acta Entomologica Slovenica, **13**(2), 93–102.

PREDOVNIK, Ž., 2009: *Pennisetia bohemca* (Lepidoptera: Sesiidae) in Southern Slovenia and Northern Croatia. Entomologia Croatica **13(**2), 55–60.

PÜHRINGER, F., 1997: Glasflüglernachweise in Österreich (Lepidoptera, Sesiidae). – Mitt. ent. ArbGem. Salzkammergut 2, 1–171.

PÜHRINGER, F. & KALLIES, A., 2004: Provisional check list of the Sesiidae of the world (Lepidoptera: Ditrysia). Mitt. ent. ArbGem. Salzkammergut **4**, 1–85.

ŠPATENKA, K., GORBUNOV, O., LAŠTŮVKA, Z., TOŠEVSKI, I. & ARITA, Y., 1999: Sesiidae – Clearwing Moths. Handbook of Palaearctic Macrolepidoptera 1, 569 pp., 57 pl.