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**A NEW SPECIES OF THE GENUS *SYNANTHEDON* HÜBNER, 1819
(LEPIDOPTERA: SESIIDAE) FROM THE RUSSIAN FAR EAST**

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Summary. *Synanthedon bastak* **sp. n.** is described and illustrated from the Bastak Nature Reserve in the eastern part of Jewish Autonomous Oblast in Russia. This new species belongs to the *Synanthedon andrenaeformis* species-group and is very close to *S. soffneri* Špatenka, 1983, from which it differs in the shape of the external transparent area of the forewing and some details in the male genitalia. The female and larvae of a new species are unknown.

Key words: clearwing moths, Lepidoptera, Synanthedonini, taxonomy, new species, Jewish Autonomous Oblast, Russia.

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Резюме. Из государственного природного заповедника “Бастак”, расположенного в восточной части Еврейской автономной области, описан новый для науки вид *Synanthedon bastak* **sp. n.** Новый вид относится к видовой группе *Synanthedon andrenaeformis* и очень близок к *S. soffneri* Špatenka, 1983, от которого отличается формой внешней прозрачной области переднего крыла и некоторыми деталями в гениталиях самца. Самка и гусеницы нового вида неизвестны.

INTRODUCTION

The genus *Synanthedon* Hübner, 1819 [“1816”], in the sense that it is currently accepted, is the most numerous and widespread genus of the clearwing moths throughout the globe. It has 204 species and 9 subspecies (Pühringer & Kallies, 2022). All of them are characterized by a well-developed proboscis, clearly defined transparent areas of the forewing, and almost identical venation of both the forewing and hindwing. A. Kallies noted that “*Synanthedon* in its current form is one of the most ... morphologically diverse genera of Sesiidae ...” (Kallies, 2020: 51). In our opinion, this should apply only to the genitalia of both males and females.

Although in this case, this morphological diversity is quite clearly grouped. Such groups have in the recent past been singled out as good genera, namely *Kantipuria* O. Gorbunov et Arita, 1999, *Schimia* O. Gorbunov et Arita, 1999, *Uncothedon* O. Gorbunov et Arita, 1999, *Anthedonella* O. Gorbunov et Arita, 1999, *Ravitria* O. Gorbunov et Arita, 2000, and *Ichneumonella* O. Gorbunov et Arita, 2005 (Gorbunov & Arita, 1999, 2000, 2005). Among the Palearctic *Synanthedon*, there are also several groups that should be distinguished into separate taxa of the generic level. On the whole, we completely agree with the opinion of A. Kallies that "... it is likely that the genus is not monophyletic, and it is therefore in urgent need of revision" (Kallies, 2020: 51).

Currently, 28 species of the genus *Synanthedon* are known from the territory of Russia (Gorbunov, 2019), from which 15 are from the Russian Far East (Gorbunov & Tschistjakov, 1995; 1999; Tschistjakov, 2016). The new species described below increases this number to 29 and 16, respectively. Undoubtedly, this number will be increased both due to the presence of species known from the adjacent territories of China and Korea, and also, possibly, due to new species.

MATERIAL AND METHODS

The morphological examinations were made using a Leica EZ4 stereomicroscope with LED illumination. All images of moths were taken with a Sony α 450 DSLR camera equipped with a Minolta 50 mm f/2.8 macro lens. The genitalia were photographed using a Keyence BZ-9000 Bioreveo fluorescence microscope. The processing of all illustrations was finalised using Adobe Photoshop CC2020 software.

All labels of the holotype are cited verbatim. The labels with geographical data, data on photos and preparation numbers of the genitalia are printed on white paper, but the type label of the holotype and paratypes are printed on red paper. Each label is separated by a semicolon (";") lines in a label are separated by a slash ("/"). All pictures of specimens are labelled with a number, consisting of letters and digits: name of the family, two consecutive digits separated by an n-dash and a year following the m-dash (e.g. SESIIDAE pictures No. 0005-0006-2023). These letters and digit codes correspond to the numbering system of the figured specimens in the author's archive. Each preparation of the genitalia is stored in a microtube with glycerol pinned under the specimen. The dissected genitalia are equipped with the corresponding number placed in the microtube. This number as a label (e.g. genitalia preparation No. OG-001-2023) is pinned under the specimen and listed in the author's archive.

The names of plants were verified with the WFO (2023).

The material studied or mentioned herein is kept in the collection of the A.N. Severtsov Institute of Ecology and Evolution of the Russian Academy of Sciences, Moscow, Russia (COGM) (holotype and two paratypes), and in the private collection of Evgeny Koshkin (one paratype).

TAXONOMY

Synanthedon bastak O. Gorbunov et Koshkin, sp. n.

<https://zoobank.org/NomenclaturalActs/137B7B8D-CE39-4992-A91F-1C5BCB2A374E>

Figs 1, 2, 7–11

MATERIAL. Holotype – ♂ (Figs 1, 2) with labels: "Russia / Jewish Autonomous Oblast / Obluchenskii district / Bastak Nature Reserve / cordon "39th km" 49°05'25" N, / 133°05'21" E,

150 m / willow thickets along stream / 11.06.2022, leg. E.S. Koshkin”; “in trap with pheromone of / *Synanthedon flaviventris* / (produced by Pherobank BV, / Netherlands) / time of catch 14.00–16.00”; “SESIIDAE / Pictures No. / 0005-0006–2023 / Photo by O. Gorbunov”; “HOLOTYPUS ♂ / *Synanthedon bastak* / O. Gorbunov et Koshkin, 2023 / O. Gorbunov des., 2022”. Paratypes: 3 ♂♂, with same locality as in holotype, 11.06.2022, 12.06.2022 and 13.06.2022, leg. E.S. Koshkin (SESIIDAE / Pictures No. / 0007-0010–2023), 1 ♂ with genitalia preparation No. OG–001-2023.

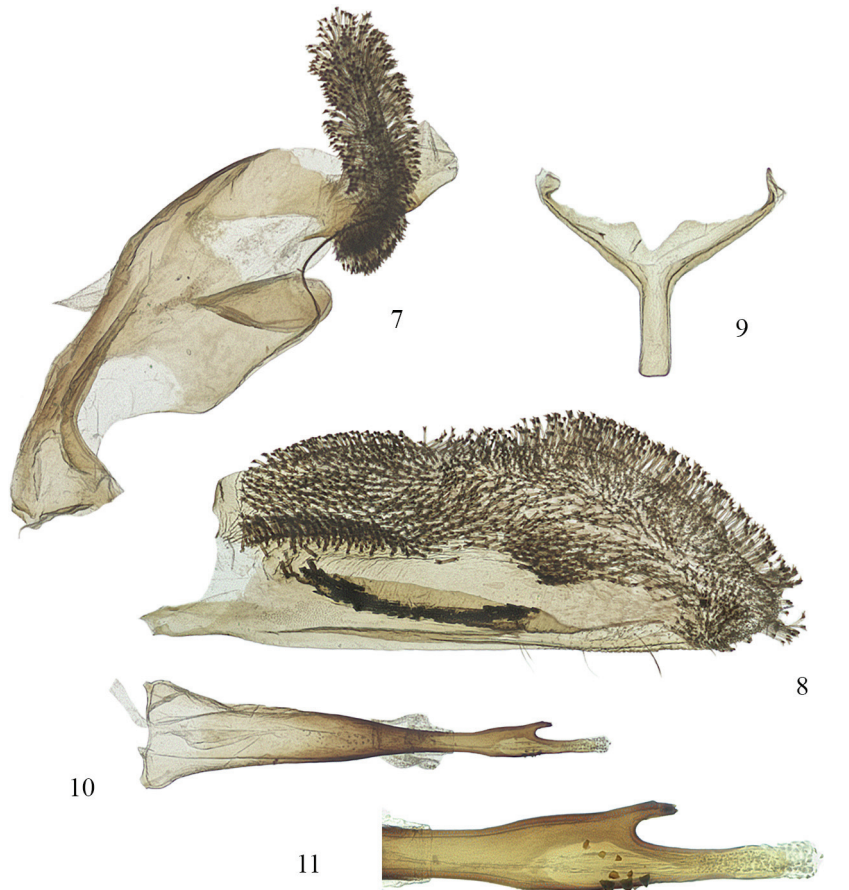
DESCRIPTION. Male (holotype) (Figs 1–2). Alar expanse 20.5 mm; body length 11.2 mm; forewing 9.4 mm; antenna 6.1 mm.



Figs 1–6. *Synanthedon* spp. 1–2 – *S. bastak* O. Gorbunov et Koshkin, sp. n., holotype ♂, Sesiidae picture No. 0005-0006–2023; alar expanse 20.5 mm; 3–4 – *S. soffneri* Špatenka, 1983, Russia: Moscow Region, Serebryano-Prudsky District, Lishnyagi, 54°23.89' N, 038°32.15' E, 172 m, 08.VI.2021, O. Gorbunov leg., picture No. 0243-0244–2021; alar expanse 19.7 mm; 5–6 – *S. spatenkai* O. Gorbunov, 1991, holotype ♂, Sesiidae picture No. 0011-0012–2023; alar expanse 19.4 mm. 1, 3, 5 – dorsal view; 2, 4, 6 – ventral view.

Head: antenna and scapus black with dark blue shine; frons dark gray-brown with anthracitic shine medially and greenish-blue shine laterally; labial palpus black with purple-blue shine exterior-dorsally and yellow interior-ventrally; vertex and pericephalic hairs black with bright anthracitic shine; neck plate black with greenish-blue shine.

Thorax dorsally entirely black with bright greenish-violet shine; thorax laterally black with bright violet shine and large yellow-orange spot medially; both metepimeron and metameron posteriorly black with dark violet shine densely covered with black, long, hair-like scales.



Figs 7–11. Male genitalia of *Synanthedon bastak* O. Gorbunov et Koshkin, sp. n., paratype, genitalia preparation No. OG–001-2023. 7 – tegumen-uncus complex; 8 – valva; 9 – saccus; 10 – phallus; 11 – phallus distally. Scale bar: 0.5 mm and 0.2 mm for 11.

Legs: fore coxa dark brown to black with bright violet shine and few pale yellow scales exterior-distally; fore femur dark brown to black with bronze-violet shine and a few pale yellow scales interior-distally; fore tibia dorsally dark brown to black with bronze shine, ventrally whitish with golden shine; fore tarsus dorsally dark grey-brown with golden shine,

ventrally whitish with golden shine; mid coxa dark brown to black with greenish-violet shine; mid femur dark brown to black with blue-violet shine; mid tibia dark brown to black with greenish-violet shine; spurs whitish with oily shine; mid tarsus dorsally dark grey-brown with bronze shine and small yellowish spot distally on basal tarsomere, ventrally whitish with oily shine; hind coxa dark brown to black with greenish-violet shine; hind femur dark brown to black with blue-violet shine; hind tibia dark brown to black with greenish-violet shine; spurs whitish with oily shine; hind tarsus dorsally dark grey-brown with bronze-violet shine on basal tarsomere and bronze shine on remaining tarsomeres, ventrally yellowish with golden shine.

Forewing dorsally with basal part black with bright greenish-violet shine; costal and anal margins, CuA-stem, veins within external transparent area and apical area black with blue-violet shine; discal spot trapeziform, black with dark greenish shine; ventrally costal and anal margins, CuA-stem and surface between veins R_3 and CuA_1 within apical area yellow; discal spot, stripe between veins R_1 – R_3 and veins distally of discal spot dark brown to black with dark purple-violet shine; cilia dark brown with bronze shine; transparent areas well-developed, densely covered with translucent scales with light golden hue; posterior transparent area reaching distal margin of discal spot; external transparent area large, rounded distally, divided into five cells between veins R_3 and CuA_1 , level to vein M_2 about 2.2 times as broad as discal spot and 1.1 times as broad as apical area; cilia dark brown with bronze shine.

Hindwing transparent; dorsally costal margin, discal spot, veins and outer margin black with purple-violet shine; ventrally costal margin yellow, discal spot, veins and outer margin dark brown to black with bronze-purple shine; cilia dark brown with bronze shine, anally yellow; discal spot triangular, not reaching base of common stem M_3 – CuA_1 ; outer margin narrow, about 0.5 times as broad as cilia.

Abdomen black with dark greenish-violet shine; laterally segments 1 and 2 narrowly yellow-orange; segment 4 with broad, slightly narrower dorsally, yellow-orange ring; anal tuft well-developed, black with dark greenish shine dorsally and blue-violet shine ventrally.

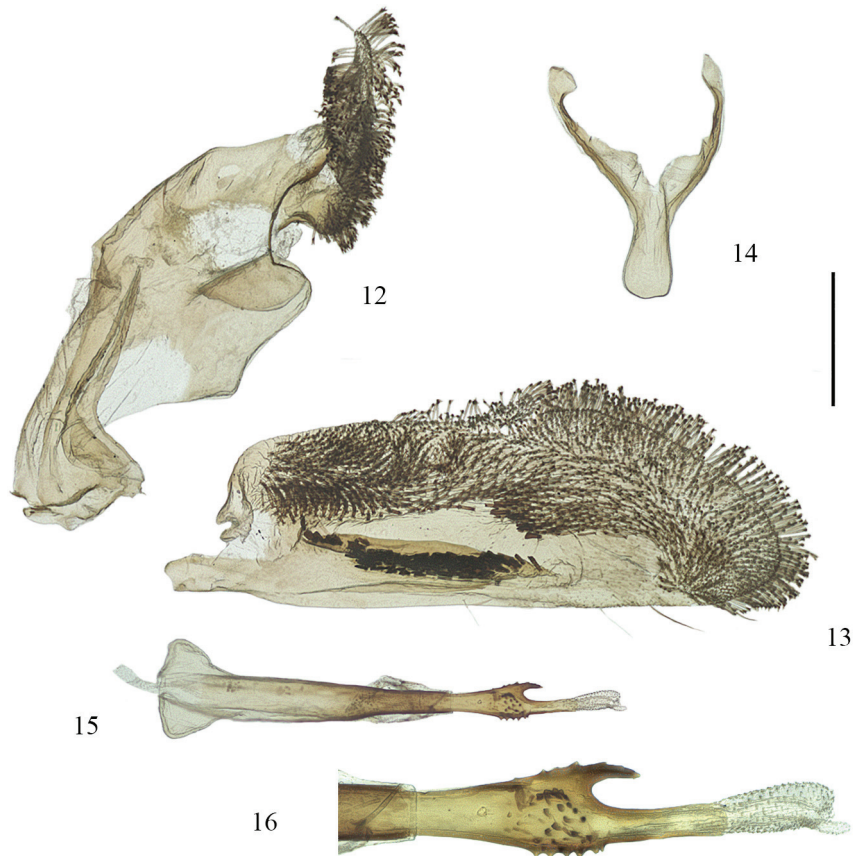
MALE GENITALIA (paratype, genital preparation № OG-001-2023) (Figs 7–11). Tegumen-uncus complex relatively broad; scopula androconialis well-developed, about 0.5 times as long as tegumen-uncus complex (Fig. 7); crista gnathi medialis long and broad; crista gnathi lateralis subcordiform, short and slightly broader than crista gnathi medialis (Fig. 7); valva (Fig. 8) trapeziform, crista sacculi oblique, long, about 0.44 as long as length of valva, pocket-shaped, covered with two rows of strong flat-topped setae; saccus (Fig. 9) narrow, flattened basally, short, about 0.5 times as long as vinculum; phallus (Fig. 10) rather thin, straight, slightly broadened subdistally, about 0.7 times as long as valva, with short finger-shaped projection and few strong thorns subdistally; vesica with numerous small cornuti (Fig. 11).

FEMALE. Unknown.

INDIVIDUAL VARIABILITY. The specimens slightly varying in the number of yellow-orange scales on the thorax laterally and abdomen. Individual size is variable as follows: wings span 17.0–20.5 mm; body length 10.0–11.2 mm; forewing 7.8–9.4 mm; antenna 5.8–6.1 mm.

DIFFERENTIAL DIAGNOSIS. Without a doubt, this new species belongs to the *Synanthedon andrenaeformis* (Laspeyres, 1801) species-group and is very close to *S. soffneri* Špatenka, 1983 (type locality: “Bohemia mer., Šumava (Böhmerwald), Dobrá na Šumavě, ...” (Špatenka, 1983: 30)). These two species can be distinguished by the size of the external transparent area of the forewing (small, rounded distally, divided into five cells between veins R_3 and CuA_1 , level to vein M_2 about 1.75 times as broad as discal spot and about 0.75

times as broad as apical area in *S. soffneri*, vs. large, rounded distally, divided into five cells between veins R_3 and CuA_1 , level to vein M_2 about 2.2 times as broad as discal spot and 1.1 times as broad as apical area in the new species; cp. Figs 1–2 with Figs 3–4), number of yellow scales on the forewing ventrally (visibly more numerous in *S. bastak* sp. n.; compare Figs 1–2 with Figs 3–4), and by some details in the male genitalia (crista gnathi lateralis subcordiform, short and slightly broader than crista gnathi medialis; crista sacculi long, about 0.44 as long as length of valva, covered with two rows of strong



Figs 12–16. Male genitalia of *Synanthedon soffneri* Špatenka, 1983, Russia; Moscow Region, Serebryano-Prudsky District, Lishnyagi, 54°23.89' N, 038°32.15' E, 172 m, 08.VI.2021, O. Gorbunov leg., genitalia preparation No. OG-001-2023. 12 – tegumen-uncus complex; 13 – valva; 14 – saccus; 15 – phallus; 16 – phallus distally. Scale bar: 0.5 mm, and 0.2 mm for 16.

flat-topped setae; saccus narrow, flatted basally, short, about 0.5 times as long as vinculum; phallus rather thin, straight, slightly broadened subdistally, with short finger-shaped projection and few strong thorns subdistally in *S. bastak* sp. n., vs. crista gnathi lateralis subcordiform, short and visibly shorter than crista gnathi medialis; crista sacculi, long, about 0.41 as long as length of valva, covered with more numerous strong flat-topped setae; saccus broad, rounded basally, short, about 0.4 times as long as vinculum; phallus rather thick, straight, slightly broadened subdistally, with short, toothed, finger-shaped projection and numerous strong thorns subdistally in *S. soffneri*; compare Figs 7–11 with Figs 12–16).

S. bastak sp. n. is separable from *S. spatenkai* O. Gorbunov, 1991 (type locality: "... USSR, Transcaucasus, Georgia, Meskhetian Mt. Range, appr. 6 km S Abastumani, 41°42'N, 42°50'E," (Gorbunov, 1991: 125)) by the colouration of the labial palpus (black with greenish-violet shine in *S. spatenkai*, vs. black with purple-blue shine exterior-dorsally and yellow interior-ventrally in *S. bastak* sp. n.; compare Fig. 2 with Fig. 6), forewing ventrally (surface between veins R_3 and CuA_1 within apical area dark brown to black with violet shine in *S. spatenkai*, vs. surface between veins R_3 and CuA_1 within apical area yellow in the new species; compare Fig. 2 with Fig. 6) and abdomen (dorsally black with bright greenish shine, laterally segments 1 and 2 without yellow-orange scales in the species compared, vs. black with dark greenish-violet shine, laterally segments 1 and 2 narrowly yellow-orange in *S. bastak* sp. n.), and by somewhat different size and shape of the discal spot of the forewing; compare Figs 1–2 with Figs 5–6). In addition, these two species differ from each other by some details in the male genitalia (compare Figs 7–11 with Figs 1–4 in Gorbunov, 1991: 127).

From all other so-called "red banded" far eastern species of the genus, namely *S. culiciformis* (Linnaeus, 1758) (type locality: "Europe [Sweden].") (Špatenka *et al.*, 1999: 125), *S. velox* (Fixsen, 1887) (type locality: "Korea, Pung-Tung." (Špatenka *et al.*, 1999: 131) = South Korea, Gangwon-do, Cheorwon-gun) and *S. herzi* Špatenka *et al.* O. Gorbunov, 1992 (type locality: "Insel Sakhalin, Bezirk Anivsk, Novoalexandrovsk, ..." (Špatenka & Gorbunov, 1992: 378)) is distinguished by a combination of the colour signs of various parts of the body and by the structure of the male genitalia (compare Figs 1–2, 7–11 with corresponding figures in Špatenka *et al.*, 1999; Gorbunov & Tschistjakov, 1999; Arita *et al.*, 2004; Gorbunov, 2022).

BIONOMICS AND HABITAT. All specimens were collected in a roadside borrow pit and a nearby swampy stream floodplain, where shrubs of *Salix* sp., trees of *Betula pendula* subsp. *mandshurica* (Regel) Ashburner *et al.* and *Alnus hirsuta* (Spach) Rupr. grow mainly. On the adjacent territory there is a coniferous-broadleaved forest with predominance of *Quercus mongolica* Fisch. ex Turcz., *Tilia* spp., *Betula costata* Trautv., *Populus tremula* L. and *Pinus koraiensis* Siebold *et al.* Zucc. The larval host plant is unknown, but the morphological similarity to *S. soffneri* suggests that they may be species of the genus *Lonicera* L., of which there are four in the type locality of this new species, namely *L. chrysantha* Turcz. ex Ledeb., *L. caerulea* L., *L. maximowiczii* (Rupr.) Regel, and *L. ruprechtiana* Regel. Specimens of the type series were collected in the first half of June using an artificial sex attractant for European populations of *Synanthedon flaviventris* (Staudinger, 1883). They were attracted from 14:00 to 16:00.

DISTRIBUTION. The new species is known only from the type locality in the northeastern part of the Jewish Autonomous Oblast in the Russian Far East.

ETHYMOLOGY. This new species is named after the Bastak Nature Reserve, where it was collected.

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REFERENCES

- Arita, Y., Bae, Y.S., Lee, C.M. & Ikeda, M. 2004. Sesiidae (Lepidoptera) of Korea. *Transactions of the lepidopterological Society of Japan*, 55(1): 1–12.
- Gorbunov, O.G. 1991. Six new species of the clearwing moths from the Caucasus, USSR (Lep., Sesiidae). *Atalanta*, 22(2/4): 125–143, 378–379.
- Gorbunov, O.G. 2019. Sesiidae. P. 158–161. In: Sinev, S.Y. (ed.). *Catalogue of the Lepidoptera of Russia*. 2nd edition. St. Petersburg: Zoological Institute RAS. [In Russian]
- Gorbunov, O.G. 2022. New data on clearwing moths (Lepidoptera: Sesiidae) of Sakhalin island. *Far Eastern Entomologist*, 449: 21–28. DOI: 10.25221/fee.449.4
- Gorbunov, O.G. & Arita Y. 1999. New taxa of the clearwing moths (Lepidoptera, Sesiidae) from Nepal. *Tinea*, 16(2): 106–143.
- Gorbunov, O.G. & Arita, Y. 2000. *Ravitria* nom. nov. for *Vitraria* Gorbunov, Arita, 1999 (Lepidoptera, Sesiidae). *Tinea*, 16(4): 231.
- Gorbunov, O.G. & Arita, Y. 2005. A new genus and two new species of Synanthedonini (Lepidoptera, Sesiidae) from the Oriental Region. *Tinea*, 18 (Supplement 3): 86–95.
- Gorbunov, O.G. & Tschistjakov, Y.A. 1995. A review of the clearwing moths (Lepidoptera, Sesiidae) of the Russian Far East. *Far Eastern Entomologist*, 10: 1–18.
- Gorbunov, O.G. & Tschistjakov, Y.A. 1999. 44. Fam. Sesiidae – Clearwing Moths. P. 292–307. In: Lerh, P.A. (ed.). *Key to the insects of Russian Far East. Vol. V. Trichoptera and Lepidoptera. Pt. 2*. Vladivostok: Dalnauka. [In Russian]
- Kallies, A. 2020. The clearwing moths (Lepidoptera, Sesiidae) of Australia, New Guinea and the Pacific Islands. *Zootaxa*, 4833(1): 1–64. DOI: 10.11646/zootaxa.4833.1.1
- Pühringer, F. & Kallies, A. 2022. *Checklist of the Sesiidae of the world (Lepidoptera: Ditrysia)*. Online database. Last modified: 26.12.2022. Available from: <http://www.sesiidae.net> (accessed 17 February 2023)
- Špatenka, K. 1983. *Synanthedon soffneri* sp. n. (Lepidoptera, Sesiidae) aus der Tschechoslowakei. *Acta entomologica bohemoslovaca*, 80(4): 297–303.
- Špatenka, K. & Gorbunov, O.G. 1992. Vier neue paläarktische Glasflügler (Sesiidae, Lepidoptera). *Entomofauna*, 13(23): 377–396.
- Špatenka, K., Gorbunov, O., Laštůvka, Z., Toševski, I. & Arita, Y. 1999. Sesiidae, Clearwing Moths. In: Naumann C.M. (ed.). *Handbook of Palaearctic Macrolepidoptera. Vol. 1*. Wallingford: Gem Publishing Company. 569 pp. + 57 pls.

Tschistjakov, Y.A. 2016. Fam. Sesiidae – clearwing moths. P. 213–216. *In*: Leley, A.S. (ed.) *Annotated catalogue of the Insects of Russian Far East. Volume II. Lepidoptera*. Vladivostok: Dalnauka. [In Russian]
WFO 2023. *World Flora Online*. Available at: <http://www.worldfloraonline.org> (accessed 18 February 2023).

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