Russian Entomol. J. 25(2): 161–165

Nokona mahawu sp.n., a new clearwing moth species (Lepidoptera: Sesiidae) from North Sulawesi, Indonesia

Nokona mahawu sp.n., новый вид бабочек-стеклянниц (Lepidoptera: Sesiidae) с Северного Сулавеси, Индонезия

Oleg G. Gorbunov
О.Г. Горбунов

A.N. Severtsov Institute of Ecology and Evolution, Russian Academy of Sciences, Leninsky prospekt 33, Moscow 119071, Russia. E-mail: gorbunov.oleg@mail.ru

Институт проблем экологии и эволюции им. А.Н. Северцова РАН, Ленинский пр., 33, Москва 119071, Россия.

KEY WORDS: Lepidoptera, Sesiidae, *Nokona mahawu*, new species, description.

КЛЮЧЕВЫЕ СЛОВА: Lepidoptera, Sesiidae, *Nokona mahawu*, новый вид, описание.

ABSTRACT. *Nokona mahawu* O. Gorbunov, **sp.n.** is described and figured from North Sulawesi, Indonesia. Holotype of the new species is deposited in the collection of the A.N. Severtsov Institute of Ecology and Evolution, Russian Academy of Sciences, Moscow, Russia (COGM).

РЕЗЮМЕ. Описывается новый вид *Nokona mahawu* O. Gorbunov, **sp.n.** с Северного Сулавеси, Индонезия. Голотип нового вида хранится в коллекции Института проблем экологии и эволюции им. А.Н. Северцова РАН в Москве, Россия (COGM).

Introduction

The taxon *Nokona* was established by a famous Japanese entomologist Shonen Matsumura (1872–1960) as a subgenus of the genus *Paranthrene* Hübner, 1819 ["1816"] with his *Paranthrene yezonica* Matsumura 1931 [Matsumura, 1931a] as the type species [Matsumura, 1931b]. Yano in his revision of so-called "*Paranthrene*" of Japan showed that *P. yezonica* Matsumura 1931 is a junior subjective synonym of *Sciapteron regale* Butler, 1878 [Yano, 1965]. Somewhat later, after studying the larval morphology of two Japanese species, namely *Sciapteron regale* Butler, 1878 and *Paranthrene purpurea* Yano, 1965, MacKey concluded that these two species differ from six North American species of *Paranthrene* and raised *Nokona* Matsumura, 1931 to the generic status [MacKey, 1968]. Naumann [1971] supported her opinion, and considered *Nokona* to be a good genus, while Heppner and Duckworth [1981] cited the genus as a synonym of *Paranthrene*.

Analysis of the external morphology of adults and the structure of both male and female genitalia, the morphology and biology of immature stages convincingly points us to the heterogeneity of the genus in its modern sense. Toševski and Arita had the same opinion and showed that "the genus *Nokona* can be considered heterogenous. It comprises three different groups of species: 1) the *regalis*-group … 2) the *bicincta*-group … 3) the *feralis*-group …" [Toševski, Arita, 1992: 619–620]. Nakamura [2009] having studied the morphology of clearwing moth pupa agreed that the genus *Nokona* is constituted from three groups and established a new subgenus *Aritasesia* Nakamura, 2009 with two included species: *Bembecia pernix* Leech, 1889 and *Nokona rubra* Arita, Toševski, 1992. This subgenus completely corresponds to the "*bicincta*-group" of Toševski and Arita [1992]. However, Kallies with co-authors formally synonymised *Aritasesia* because of lacking of a modern revision of the genus *Nokona* [Kallies et al., 2014].

Currently, *Nokona* concludes up to 43 species [Arita, Gorbunov, 2001; Pühringer, Kallies, 2004; Arita et al., 2009; Kallies et al., 2014; Kishida et al., 2014; Gorbunov, Arita, 2015]. The genus occurs in the eastern part of Palaearctic (China, Korea and Japan), Oriental and Australian Regions.

In April 2008 I visited North Sulawesi (Sulawesi Utara), Indonesia together with my friends for investigations of Lepidoptera. We stopped in a small guesthouse in the vallage of Kakaskesen Dua. The village is situated between two volcanoes, namely Lokon (Fig. 1) and Mahawu (Fig. 2). The slopes of these volcanoes are covered with a rather pristine condition secondary tropical forest (Fig. 3). On 15 of April at about the noon I could collect a single male of clearwing moth which has been attracted to artificial pheromones. After a careful investigation it was a new species of the genus *Nokona*.

All of the images of moths were taken with a Sony α450 DSLR camera with Minolta 50 Macro lens. Biotopes were taken with Konica Minolta Dynax 5D (Figs 1, 3) and Sony α200 DSLR (Fig. 2). The genitalic images were taken with a Keyence BZ–9000 Biorevo Fluorescence Microscope. The final processing of all illustrations was held with Adobe® Photoshop® CS5.

Figs 1–3. Collecting locality: 1 — Indonesia, North Sulawesi, Mt. Lokon, 16.IV.2008; 2 — Indonesia, North Sulawesi, Mt. Mahawu, 16.IV.2008; 3 — a secondary tropical forest on west slope of Mt. Mahawu, 01°22´N, 124°51´E, 1000 m, 15.IV.2008 (Photo by E. Polevoi).

Рис. 1–3. Места сбора: 1 — Индонезия, Северный Сулавеси, вулкан Локон, 16.IV.2008; 2 — Индонезия, Северный Сулавеси, вулкан Махаву, 16.IV.2008; 3 — вторичный тропический лес на западном склоне вулкана Махаву, 01°22´N, 124°51´E, 1000 м, 15.IV.2008 (фото Е. Полевой).

All labels of the holotype are shown in detail. Each label is separated by quotation marks, and lines in a label separated by a "/". The holotype of the new species is deposited in the collection of A.N. Severtsov Institute of Ecology and Evolution, Russian Academy of Sciences, Moscow, Russia (COGM).

Description of a new species

Nokona mahawu O. Gorbunov, **sp.n.**
Figs 4–9.

MATERIAL. Male, holotype with labels: "Indonesia, Sulawesi Utara, / Tomohon, Kakaskesen Dua, / 01°22´N, 124°51´E, / 1000 m, 15.IV.2008, / O. Gorbunov leg."; "Sesiidae / Pictures №№ / 0227-0228-2013 / Photo by O. Gorbunov"; "Genitalia examined / by O. Gorbunov / Preparation № / OG-010-2014"; "HOLOTYPUS ♂ / *Nokona mahawu* / O. Gorbunov, 2016 / O. Gorbunov des., 2014" (COGM).

DESCRIPTION. **Male** (holotype) (Figs 4–5). Alar expanse 28.0 mm; body length 16.9 mm; forewing 12.0 mm; antenna 7.5 mm.

Head: antenna dorsally black with dark green-blue sheen, ventrally light brown; scapus dark gray-brown; frons dark gray with purple sheen, with a narrow white strip with golden sheen laterally; vertex black with dark green-blue sheen, with a few yellow scales anteriorly; labial palpus white to pale yellow internally and black with dark green-blue sheen externally; occipital fringe black dorsally and pale yellow to white laterally.

Thorax: patagia dark brown to black with green-purple sheen, with a few pale yellow scales laterally; tegula dark brown to black with purple-green sheen with a few yellow scales posteriorly; mesothorax dark brown to black with purple-green sheen narrowly yellow distally; metathorax dark brown to black with purple-green sheen, with a few yellow scales medially and with a tuft of pale yellow hairs laterally; beside that, patagia, meso- and metathorax densely covered with short white hairs; thorax laterally dark gray-brown with green-purple sheen; posteriorly both metepimeron and metameron dark gray-brown with green-purple sheen, covered with white hairs.

Legs: neck plate dark gray with blue-purple sheen; fore coxa black with green-violet sheen, with a small white spot with golden sheen interior-basally; fore femur and tibia black with green-blue sheen; posterior margin of both fore femur and tibia covered with elongated scales forming a broad tuft; fore tarsus yellow with golden sheen, basal tarsomere black with dark green-blue sheen dorsally; mid coxa dark gray-brown with greenish sheen, with a few light gray scales interior-posteriorly; mid femur black with green-blue sheen, with long black and white hairs on posterior margin; mid tibia black with green-blue sheen, with a few yellow scales posterior-dorsally; spurs pale yellow with golden sheen internally and black with bronze sheen externally; mid tarsus pale yellow with bronze sheen interior-ventrally and black with bronze sheen exterior-dorsally; hind coxa dark gray-brown with greenish sheen, with a few light gray scales interior-posteriorly; hind femur black with green-blue sheen, with long black and white hairs on posterior margin; hind tibia black with green-violet sheen, with an admixture of individual yellow scales interior-dorsally and with a small white spot at base of mid spurs posterior-ventrally; spurs pale yellow with golden sheen internally and black with bronze sheen externally; hind tarsus black with bronze sheen, basal tarsomere white to pale yellow interior-ventrally.

Figs 4–5. *Nokona mahawu* O. Gorbunov, **sp.n.**, holotype, ♂: 4 — dorsal view. Sesiidae picture No. 0227–2013; 5 — ventral view. Sesiidae picture № 0228–2013. Alar expanse 28.0 mm.

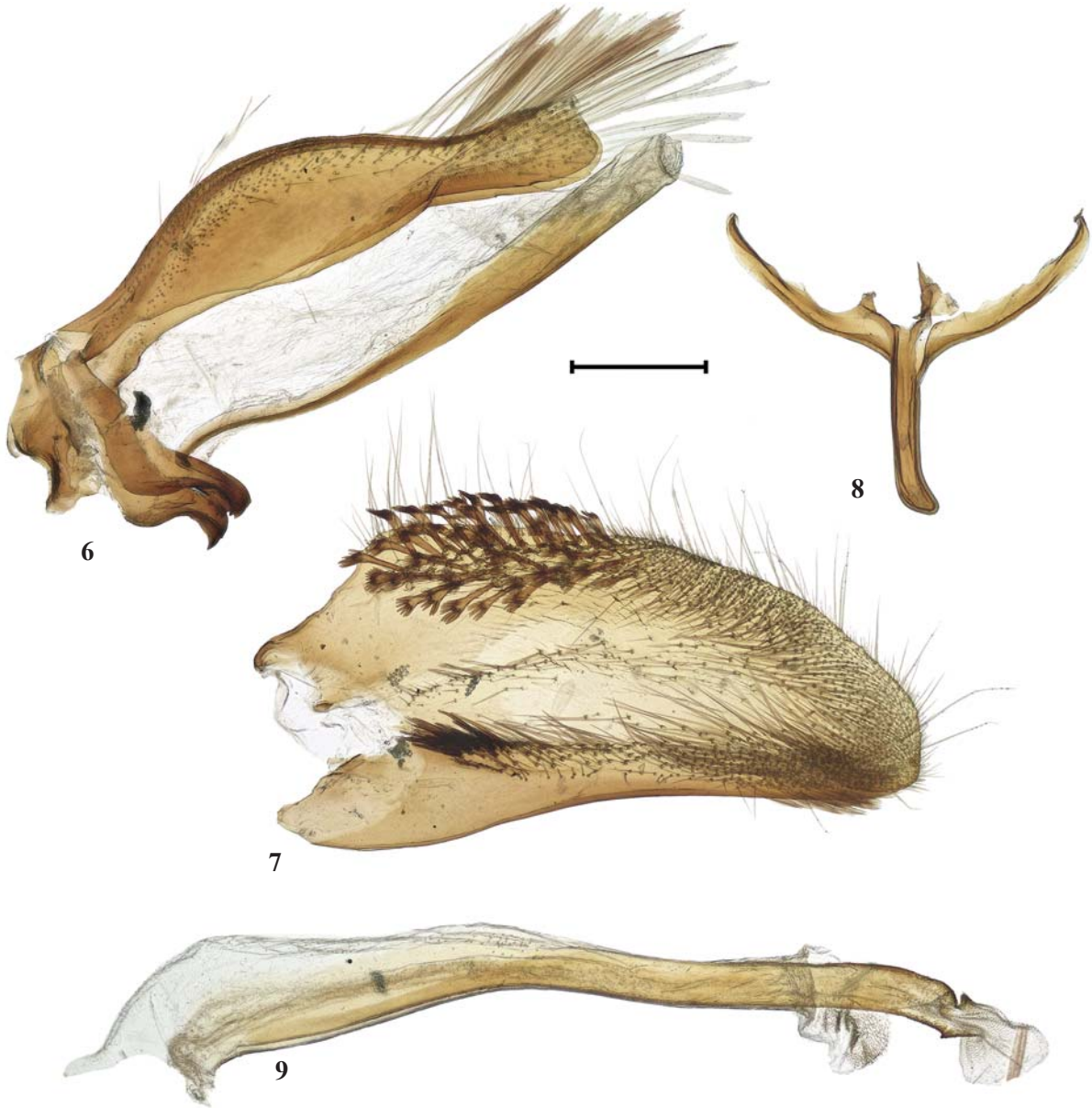
Рис. 4–5. *Nokona mahawu* O. Gorbunov, **sp.n.**, голотип, ♂: 4 — вид сверху. Sesiidae снимок № 0227–2013; 5 — вид снизу. снимок № 0228–2013. Размах крыльев 28,0 мм.

Abdomen: dorsally black with green-violet sheen; tergite 2 with a narrow yellow stripe distally; tergites 1 and 4 both with a few yellow scales distally; ventrally dark brown to black with bronze sheen, medially covered with individual yellow scales; sternites 1+2, 3–6 with a narrow yellow stripe distally, sternite 7 with a few yellow scales distally; anal tuft black with dark purple sheen, edged with white.

Forewing: dorsally at base black with a few yellow scales; costal margin black with dark green sheen; remaining opaque surface dark brown with strong blue-violet sheen; both anterior and external transparent areas undeveloped, posterior transparent area short, not extending to cross-vein; ventrally dark brown with bronze sheen, covered with brick-orange scales medially; cilia dark brown with bronze sheen.

Hindwing: transparent; dorsally veins and discal spot light brown; discal spot narrow, extending to base of vein M_3; outer margin dark brown with bronze sheen, narrow, about as narrow as cilia; ventrally veins and discal spot light brown; outer margin dark brown with bronze sheen; cilia dark brown with bronze sheen, yellow anally.

Male genitalia (holotype, genital preparation № OG-010-2014) (Figs 6–9). Uncus narrow, slightly broadened medially, slightly broadened and obtuse distally, covered with a few short setae in distal half; tegumen small; gnathos somewhat broader than tegumen, beak-shaped; tuba analis with subscaphium narrowly sclerotized (Fig. 6); valva (Fig. 7) triangular-oval, covered with hand-shaped setae at dorsal margin in basal half, short simple setae at both distal and dorsal



Figs 6–9. Male genitalia of *Nokona mahawu* O. Gorbunov, **sp.n.**, holotype. Genital preparation No. OG–010–2014: 6 — tegumen-uncus complex; 7 — valva; 8 — saccus; 9 — aedeagus. Scale bar 0.5 mm.

Рис. 6–9. Гениталии самца *Nokona mahawu* O. Gorbunov, **sp.n.**, голотип. Препарат гениталий № OG–010–2014: 6 —тегумен-ункус комплекс; 7 — вальва; 8 — саккус; 9 — эдеагус. Масштаб 0,5 мм.

margins; medial row of hand-shaped setae bears only a few narrow satae; crista sacculi low, densely covered with strong pointed setae; saccus (Fig. 8) slightly shorter than vinculum, straight, somewhat narrower basally; aedeagus (Fig. 9) rather narrow, slightly longer than valva, with a small well-sclerotized carina penis; vesica with numerous minute flat cornuti.

Female. Unknown.

INDIVIDUAL VARIABILITY. Unknown.

DIFFERENTIAL DIAGNOSIS. By the structure of the male genitalia *N. mahawu* sp.n. seems to belong to the *N. regalis* (Butler, 1878) species-group and superficially resembles to *N. sulawesiensis* O. Gorbunov et Arita, 2015, but it can be distinguished by the coloration of the labial palpus (yellow to pale yellow with a broad black stripe exterior-ventrally in the species compared), occipital fringe (dorsally mixed with black and yellow scales, ventrally pale yellow in *N. sulawesiensis*), neck plate and fore coxa (neck plate yellow to pale yellow and fore coxa black with green-violet sheen, broadly yellow to yellow-orange basally in the species compared), abdomen (dorsally entirely black with strong blue-violet sheen; ventrally dark brown to black with dark blue sheen; anal tuft dorsally black with blue-violet sheen with a few white scales laterally, valva dirty yellow in *N. sulawesiensis*) and by the poorly-developed transparent areas of the forewing (*cp*. Fig. 4 with fig. 1 in Gorbunov, Arita, 2015) and details of the male genitalia (cp. Figs 6–9 with figs 3–6 in Gorbunov, Arita, 2015). From *N. poecilocephala* (Diakonoff, 1967) this new species differs by the coloration of the vertex (bright orange mixed with black scales in the species compared), abdomen (each tergite with a narrow yellow stripe distally in *N. poecilocephala*), coloration of forewing (dorsally with strong indigo-green sheen in the species compared) and by the conformation of the male genitalia (*cp*. Figs 6–9 with fig. 349 in Diakonoff, 1967). From *N. acaudata* Arita et O. Gorbunov, 2001, *N. mahawu* **sp.n.** differs by the coloration of the tegula (with a large yellow-orange spot at base of forewing in the species compared), abdomen dorsally (tergite 2 with an admixture of orange scales on distal half; tergite 4 with a broad orange stripe distally; tergite 6 with a narrow orange stripe distally in *N. acaudata*) and by the structure of the male genitalia (*cp*. Figs 6–9 with fig. 55a–d in Arita, Gorbunov, 2001). From other congeners *N. mahawu* **sp.n.** is distinguished by the details of the coloration of various parts of the body and by the conformation of the male genitalia.

BIONOMICS. The host plant and larval bionomics are unknown. The type was collected in the mid April with using of artificial pheromones.

HABITAT. A secondary tropical forest on west slope of volcano Mahawu at elevation of about 1000 m a.s.l. (Fig. 3).

DISTRIBUTION. Known from the type-locality in North Sulawesi, Indonesia.

ETYMOLOGY. This new species is named after the name of volcano Mahawu on a slope of which it was collected.

ACKNOWLEDGEMENTS. I would like to express my cordial thanks to Mr. M.B. Markhasyov, Mr. E.M. Polevoi, Dr. Vasily K. Tuzov and Mr. Alexey N. Zamesov (all from Moscow, Russia) for the company and help during our successful trip to Indonesia in 2008.

References

Arita Y., Gorbunov O. 2001. Sesiidae of Taiwan. I. The Tribes Tinthiini, Similipepsini, Paraglosseciini, Pennisetiini, Paranthrenini and Cissuvorini // Jpn. J. syst. Ent. Vol.7. No.2. P.131–188.

Arita Y., Kimura M., Owada M. 2009. Two new species of the clearwing moth (Sesiidae) from Okinawa-jima, the Ryukyus // Trans. Lipid. Soc. Japan. Vol.60. No.3. P.189–192.

Diakonoff A.N. 1967. Microlepidoptera of the Philippine Islands // US Nat. Mus. Bull. No.257. P.1–484.

Gorbunov O.G., Arita Y. 2015. A new species of the Genus *Nokona* Matsumura, 1931 (Lepidoptera, Sesiidae) from South Sulawesi // Far Eastern Entomologist. No.293. P.1–6.

Heppner J. B., Duckworth W. D. 1981. Classification of the Superfamily Sesioidea (Lepidoptera, Ditrysia) // Smithsonian Contr. Zool. No.314. P.1–144.

Kallies A., Arita Y., Owada M., Wu G.-Y., Wang M. 2014. The Paranthrenini of Mainland China (Lepidoptera, Sesiidae). // Zootaxa. No.3811. No.2. P.185–206.

Kishida Y., Kudo T., Kudo S. 2014. A new species of *Nokona* Matsumura from Japan (Lepidoptera, Sesiidae) // Tinea. Vol.23. No.1. P.4–9.

MacKey M.R. 1968. The doubtful occurrence of *Paranthrene* in Japan (Lepidoptera: Aegeriidae) // Canadian Entomologist. Vol.100. No.12. P.1324–1327.

Matsumura Sh. 1931a. 6000 Illustrated Insects of Japan-Empire. Tokyo. 1479+191 pp. [in Japanese].

Matsumura Sh. 1931b. A list and new species of Aegeridae [sic] from Japan // Insecta Matsumurana. Vol.6. No.1. P.4–12. Pl.1.

Nakamura M. 2009. Pupae of Japanese Sesiidae (Lepidoptera) // Trans. Lipid. Soc. Japan. Vol.60. No.1. P.63–78.

Naumann C. M. 1971. Untersuchungen zur Systematik und Phylogenese der holarktischen Sesiiden (Insecta, Lepidoptera) // Bonner Zool. Monogr. Bd.1. 190 S.

Pühringer F., Kallies A. 2004. Provisional checklist of the Sesiidae of the world (Lepidoptera: Ditrysia) // Mitt. Ent. Arb.gem. Salzkammergut. Bd.4. S.1–85.

Toševski I., Arita Y. 1992. A new species of the clearwing moth genus *Nokona* (Lepidoptera, Sesiidae) from the Ryukyus// Jap. J. Ent. Vol.60. No.3 P.619–623.

Yano K. 1965. A revision of the genus *Paranthrene* Hübner from Japan (Lepidoptera, Aegeriidae) // Mushi. Vol.39. No.1. P.1–8.