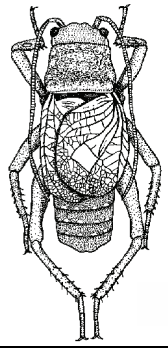

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TWO NEW SPECIES OF THE GENUS *NOKONA* MATSUMURA, 1931 (LEPIDOPTERA: SESSIIDAE) FROM VIETNAM

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Summary. Two new species of clearwing moth, *Nokona vietnamica* **sp. n.** and *Nokona cucphuongae* **sp. n.**, are described and illustrated from Vietnam. The holotypes of the new species are deposited in the collection of National Museum of Nature and Science, Tsukuba, Tokyo. The females and the larval host plants of both species are unknown.

Key words: clearwing moth, Sesiidae, Paranthreninae, Paranthrenini, *Nokona*, taxonomy, new species, Oriental Region.

О. Г. Горбунов, Ю. Арита. Два новых вида рода *Nokona* Matsumura, 1931 (Lepidoptera: Sesiidae) из Вьетнама // Дальневосточный энтомолог. 2020. N 412. С. 1-12.

Резюме. Из Вьетнама описываются два новых вида бабочек-стеклянниц: *Nokona vietnamica* **sp. n.** и *Nokona cucphuongae* **sp. n.** Голотипы описываемых видов хранятся в коллекции Национального научного музея в Токио, Япония. Самки и кормовые растения гусениц обоих видов неизвестны.

INTRODUCTION

The genus *Nokona* was described by Matsumura as a subgenus of *Paranthrene* Hübner, 1819 ["1816"] with *Paranthrene yesonica* Matsumura, 1931 [= *Sciapteron ferale* Leech, 1889] as the type species (Matsumura, 1931a, b; Yata *et al*., 2017). As we have repeatedly pointed out, this genus in its modern interpretation is polyphyletic (Gorbunov & Arita, 2015; 2020). It includes about 50 species distributed in the Oriental, Australian and eastern part of Palaearctic regions (Gorbunov & Arita, 1995; 2001; Arita & Gorbunov, 2001; Pühringer & Kallies, 2004; Kallies *et al*., 2014). By the structure of both male and female genitalia *Nokona* can be clearly divided to several groups (Toševski & Arita, 1992; Gorbunov, 2016). Of the two new species described below, *N. vietnamica* sp. n. belongs to the *N. bicincta* species-group, and *N. cucphuongae* sp. n. is apparently a member of *N. regalis* species-group.

The photos of the specimens were made using a Leica EZ4 stereomicroscope with LED illumination. All the images of the holotypes were taken with a Sony® α450 DSLR camera equipped with a Minolta® 50 f/2.8 Macro lens. The genitalia figures were taken with a Keyence® BZ-9000 Biorevo Fluorescence Microscope. The processing of all illustrations was finalized with the Adobe® Photoshop® CC 2020 software.

All labels of the holotypes are cited verbatim. Each label is separated by a semicolon ";" lines in a label are separated by a slash "/". All pictures of the dry specimens are labeled with a number, consisting of letters and digits: name of the family, two consecutive digits separated by n-dash and a year following m-dash (e.g. SESIIDAE pictures No 0169-0170–2018). These letter and digit codes correspond to the numbering system of the figured specimens in the first author's archive. The genitalia preparation is stored in a microtube with glycerol and 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–029-2018) is pinned under the specimen and is listed in the archives of the first author.

Holotypes of the new species are deposited in the collection of National Museum of Nature and Science, Tsukuba (formerly Natural Science Museum Tokyo), Japan (NSMT).

TAXONOMY

Nokona vietnamica O. Gorbunov et Arita, sp. n.

http://zoobank.org/NomenclaturalActs/EE2864DA-F64F-44F6-AE1D-D5820DA0A282

Figs 1–6

MATERIAL. Holotype – ♂ with labels: "**Vietnam** / Ninh Binh Prov., / Gia Vien, / Cuc Phuong, 370 m / 26.IV.2015 / Y. Arita leg."; "SESIIDAE / Pictures No / 0169-0170–2018 / Photo by O. Gorbunov"; "Genitalia examined / by O. Gorbunov / Preparation No / OG–029-2018"; "HOLOTYPUS ♂ / *Nokona vietnamica* / O. Gorbunov et Arita, 2020 / O. Gorbunov des., 2018" (NSMT).

DESCRIPTION. Male (holotype) (Figs 1, 2). Alar expanse 22.8 mm; body length 13.6 mm; forewing 10.0 mm; antenna 6.1 mm.

Head with antenna and scapus dark brown to black with dark blue-violet sheen; frons dark gray with bronze-purple sheen and a white stripe laterally; basal joint of

Figs 1–2. *Nokona vietnamica* O. Gorbunov et Arita, sp. n.: 1 – holotype ♂ (Sesiidae pictures No 0163-0164–2018), alar expanse 22.8 mm; 2 – ditto, underside.

labial palpus dark brown to black with greenish sheen, remain joints palpus dark brown to black with greenish sheen exterior-dorsally and yellow to pale yellow interior-ventrally; vertex black with bright greenish-anthracite sheen; pericephalic hairs yellow dorsally and white laterally.

Thorax with patagia dark brown to black with violet sheen; tegula dark brown to black with bronze-violet sheen and a small yellow spot anteriorly; mesothorax dark brown to black with bronze-violet sheen and a small yellow spot posterior-laterally; besides this, tegula and mesothorax covered with sparse, short, white hairs; metathorax dark brown to black with greenish sheen; thorax laterally dark brown to black with blue-violet sheen and with three small yellow spots: anteriorly, medially and at base of forewing; posteriorly both metepimeron and metameron dark brown to black with violet sheen and with long white hairs.

Legs with neck plate mixed with white, dark gray and yellow scales; fore coxa, femur and tibia dark brown to black with greenish-violet sheen, beside this, femur and tibia with a row of long hair-like scales posteriorly; fore tarsus dark gray dorsally and gray ventrally; mid coxa dark gray with greenish-bronze sheen and a few white scales; mid femur and tibia dark brown to black with greenish-violet sheen; spurs dark gray-brown with a few gray scales internally; mid tarsus dark gray-brown with bronze sheen exterior-dorsally and gray interior-ventrally; hind coxa dark gray with greenish-bronze sheen and a few white scales; hind femur dark brown to black with greenish-violet sheen and with long white hairs posteriorly; hind tibia dark brown to black with greenish-violet sheen and a few white scales at base of mid spurs; spurs dark gray-brown with a few gray scales internally; hind tarsus dark brown to black with bronze sheen and a few white scales distally on two basal tarsomeres.

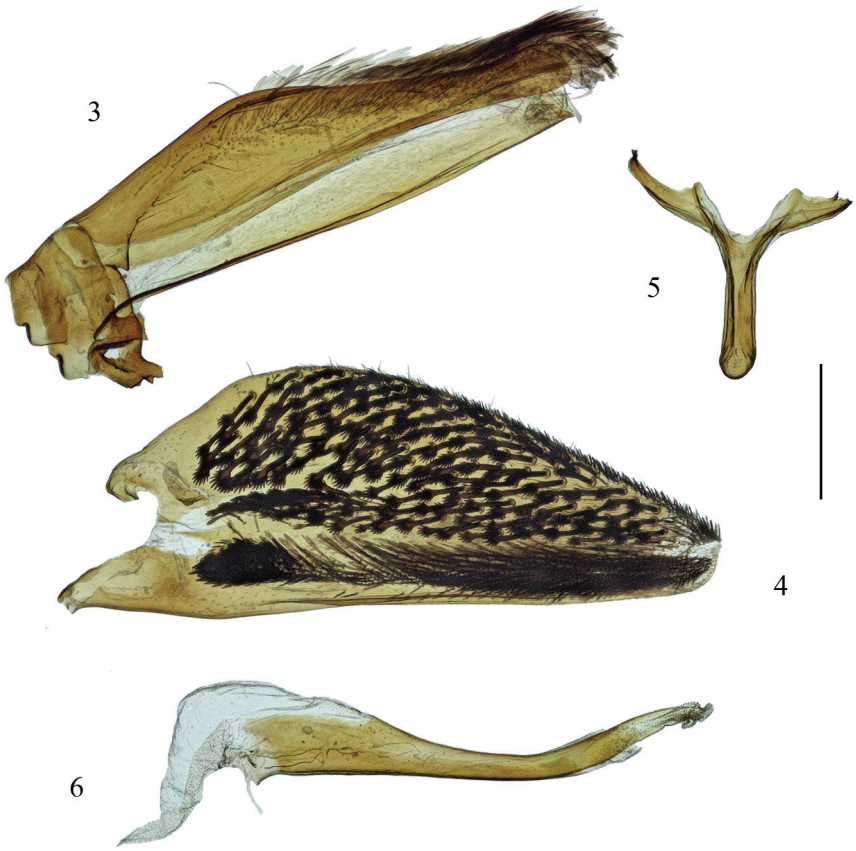
Forewing dorsally black with a few yellow scales with golden sheen at base; all opaque parts dark brown to black with dark blue sheen; transparent areas poorly developed; external transparent area undeveloped; anterior and posterior transparent areas small covered with translucent with electric-blue lustre and a few dark brown scales; ventrally opaque parts dark brown to black with dark blue-violet sheen and a few brick-red scales at cross-vein; cilia dark brown with bronze sheen.

Hindwing transparent; veins, discal spot and outer margin dark brown to black with dark violet sheen; discal spot broad with parallel margins, reaching to vein M_3; outer margin broad, about twice as broad as cilia; cilia dark brown with bronze sheen.

Abdomen dorsally dark brown to black with greenish-violet sheen; tergite 2 with a narrow yellow stripe distally; ventrally dark brown to black with dark violet sheen; sternite 1+2 with a few yellow scales anteriorly; anal tuft well-developed, clipped spear-shaped, dark brown to black with greenish-violet sheen and narrowly white laterally.

MALE GENITALIA (holotype, genital preparation No OG–029-2018) (Figs 3–6). Uncus narrow, slightly broadened medially, slightly broadened and rounded distally, covered with a lot short setae and scales in dorso-distal two thirds; tegumen small; gnathos somewhat broader than tegumen, with a short tooth medially; tuba analis with subscaphium broadly sclerotized (Fig. 3); valva (Fig. 4) triangular-oval, covered with multifurcate hand-shaped setae in dorsal two thirds, short simple setae at dorsal

margin, and a row of pointed elongated setae subventrally; medial row of hand-shaped setae narrow; crista sacculi low, densely covered with strong pointed setae; saccus (Fig. 5) slightly longer than vinculum, straight, slightly broadened and rounded basally; aedeagus (Fig. 6) rather thick, broadened basally, about 1.5 times shorter than valva; vesica with numerous minute flat cornuti.



Figs 3–6. Male genitalia of *Nokona vietnamica* O. Gorbunov et Arita, sp. n. (genital preparation No OG–029-2018): 3 – tegumen-uncus complex; 4 – valva; 5 – saccus; 6 – aedeagus. Scale bar: 0.5 mm.

FEMALE. Unknown.

DIFFERENTIAL DIAGNOSIS. By the structure of the male genitalia this new species seems to belong to the *N. bicincta* species-group and superficially resembles to some dark forms of *N. pilamicola* (Strand, 1916) (type locality: Taiwan: Taitung Hsien, Taitung) and *N. powondrae* (Dalla Torre, 1925) (type locality: Taiwan: Tainan Hsien, Kuantyling).

From dark forms of the first species compered, *N. vietnamica* sp. n. can be distinguished by the colouration of the tegula (entirely dark brown to black with bronze-violet sheen in *N. pilamicola*, *vs*. dark brown to black with bronze-violet sheen and a small yellow spot anteriorly in new species), mesothorax (brown to dark brown with an admixture of a few yellow scales distally in the species compared, *vs*. dark brown to black with a small yellow spot posterior-laterally in *N. vietnamica* sp. n.; *vs*. Fig. 1 with figs 1–3 in Arita *et al*., 2016: 250) and abdomen dorsally (at least tergites 2 and 4 each with a narrow dark ohreous or yellow stripe distally in *N. pilamicola*, *vs*. tergite 2 with a narrow yellow stripe distally in *N. vietnamica* sp. n.; compare Fig. 1 with figs 35 and 36 in Arita & Gorbunov, 2001: 148 or figs 9 and 10 in Kallies *et al*., 2014: 191, or with figs 1–3 in Arita *et al*., 2016: 250). In addition, these two species differ from each other by some details in the male genitalia (compare Figs 3–6 with figs 58a–d in Arita & Gorbunov, 2001: 175).

New species is separable from the dark forms of *N. powondrae* (figs 27–29 in Arita & Gorbunov, 2001: 147) by the scapus (yellow-orange ventrally in *N. powondrae*, *vs*. entirely dark brown to black with dark blue-violet sheen in *N. vietnamica* sp. n.), labial palpus (basal joint dark brown to black with purple sheen, mid and apical joints dorsally white, externally dark brown to black with purple-green sheen, internally yellow-orange, ventrally yellow-orange distally and black dorsally in the species compared, *vs*. dark brown to black with greenish sheen, remain joints palpus dark brown to black with greenish sheen exterior-dorsally and yellow to pale yellow interior-ventrally in the new species) and abdomen dorsally (at least tergites 2 and 4 each with a narrow yellow-orange stripe distally in *N. powondrae*, *vs*. dark brown to black with greenish-violet sheen; tergite 2 with a narrow yellow stripe distally in *N. vietnamica* sp. n.; compare Fig. 1 with figs 23–29 in Arita & Gorbunov, 2001: 147).

From some other species of the *N. bicincta* species-group, namely *N. bicincta* (Walker, 1865 ["1864"]) (type locality: "North China" [= China: Shanghai or Beijing]), *N. iridina* (Bryk, 1947) (China: Jiangsu, Shanghai (?)), *N. pernix* (Leech, 1889) (type locality: Japan: Honshu, Oiwake) and *N. rubra* Arita et Toševski, 1992 (type locality: Japan: Ryukyus, Amami-Ohshima, Akatsushiyama), *N. vietnamica* sp. n. is distinguished by a combination of the colour signs of various parts of the body.

BIONOMICS. The larval host plant is unknown, but highly likely it could be a species of *Paederia*, for example *P. foetida* L. (Rubiaceae). The holotype was collected at the end of April.

HABITAT. The male was collected on the edge of the rainforest.

DISTRIBUTION. The new species is known only from the type locality in the Cuc Phuong National Park in North Vietnam (Ninh Binh Province).

ETHYMOLOGY. This new species is named after the country of Vietnam.

***Nokona cucphuongae* O. Gorbunov et Arita, sp. n.**

http://zoobank.org/NomenclaturalActs/0E528F24-367C-4C13-AA6C-13CD5DC206D8

Figs 7–12

MATERIAL. Holotype – ♂ with labels: "**Vietnam** / Ninh Binh Prov., / Gia Vien / Cuc Phuong, N.P. / 1.VI.2016 / Y. Arita legit"; "SESIIDAE / Pictures No /

0163-0164–2018 / Photo by O. Gorbunov"; "Genitalia examined / by O. Gorbunov / Preparation No / OG–030-2018"; "HOLOTYPUS ♂ / *Nokona cucphuongae* / O. Gorbunov et Arita, 2020 / O. Gorbunov des., 2018" (NSMT).

DESCRIPTION. Male (holotype) (Figs 7, 8). Alar expanse 28.4 mm; body length 17.7 mm; forewing 12.2 mm; antenna 7.8 mm.

Head with antenna and scapus dark brown to black with dark blue-violet sheen; frons dark gray with bronze-purple sheen and a white stripe laterally; basal joint of labial palpus dark brown to black with greenish sheen and pale yellow scales ventro-basally, remain joints dark brown to black with greenish sheen exterior-dorsally and yellow to pale yellow interior-ventrally; vertex black with bright greenish-anthracite sheen; pericephalic hairs yellow to pale yellow.

Thorax with patagia dark brown to black with violet sheen and a small yellow spot laterally; tegula dark brown to black with bronze-violet sheen and two small yellow spots anteriorly and at base of forewing; mesothorax dark brown to black with bronze-violet sheen and a small yellow spot posterior-laterally; metathorax dark brown to black with greenish sheen and a few yellow scales distally; thorax laterally dark brown to black with blue-violet sheen and a few pale yellow scales at base of forewing; posteriorly both metepimeron and metameron dark gray-brown with violet sheen and with long white and black hair-like scales.

Legs with neck plate mixed with white, dark gray and yellow scales; fore coxa dark brown to black with bluish sheen and a narrow pale yellow to white exterior margin; fore femur dark brown to black with blue-violet sheen, with a few yellow scales on dorsal margin and with elongate scales forming a tuft on ventral margin; fore tibia dark brown to black with blue-violet sheen; fore tarsus ochreous; mid coxa dark gray with greenish-bronze sheen and a few whitish scales distally; mid femur dark brown to black with blue-violet sheen and a broad yellow dorsal margin; mid tibia dark brown to black with blue-violet sheen and a few pale yellow scales medio-dorsally; spurs dark ochreous to whitish; mid tarsus dark gray-brown with greenish sheen with a dense admixture of ochreous scales interior-ventrally on two basal tarsomeres; hind coxa dark gray with greenish-bronze sheen and a few whitish scales proximally; hind femur dark brown to black with blue-violet sheen and a narrow white ventral margin; hind tibia dark brown to black with blue-violet sheen and a dense admixture of pale yellow to white scales interior ventrally from base to base of mid spurs; spurs ochreous with a few dark gray-brown scales externally on distal spurs; hind tarsus dark gray-brown with greenish sheen with a dense admixture of ochreous scales interior-ventrally on two basal tarsomeres.

Forewing dorsally black with a few yellow scales with golden sheen at base; all opaque parts dark brown to black with strong dark violet sheen; transparent areas poorly developed; external transparent area undeveloped; anterior and posterior transparent areas small covered with translucent with electric-blue lustre and a few dark brown scales; ventrally opaque parts dark brown to black with dark blue-violet sheen; cilia dark brown with dark blue sheen.

Hindwing transparent; veins, discal spot and outer margin dark brown to black with dark greenish sheen; discal spot broad with parallel margins, reaching to vein M_3; outer margin narrow, about as broad as cilia; cilia dark brown with dark blue sheen.

Figs 7–8. *Nokona cucphuongae* O. Gorbunov et Arita, sp. n.: 7 – holotype ♂ (Sesiidae pictures No 0163-0164–2018), alar expanse 22.8 mm; 8 – ditto, underside.

Abdomen dorsally dark brown to black with greenish-violet sheen; tergites 2, 4 and 5 each with a few yellow scales distally; ventrally dark brown to black with dark violet sheen; sternites 1+2–5 each with a narrow pale yellow to white stripe distally; anal tuft poorly developed, dark brown to black with greenish-violet sheen and an admixture of whitish scales laterally.

MALE GENITALIA (holotype, genital preparation No OG–030-2018) (Figs 9–12). Uncus narrow, visibly broadened medially, covered with short setae dorsally; tegumen small; gnathos somewhat broader than tegumen, with two strong beak-shaped projections; tuba analis with subscaphium narrowly sclerotized (Fig. 9); valva (Fig. 10) triangular-oval, covered with hand-shaped setae at dorsal margin in basal half, short simple setae at both distal and dorsal margins; medial row of hand-shaped setae bears only a few narrow satae; crista sacculi low, densely covered with strong pointed setae; saccus (Fig. 11) about as long as vinculum, thin, somewhat broadened subbasally; aedeagus (Fig. 12) rather narrow, slightly longer than valva, with a small well-sclerotized carina penis; vesica with numerous minute flat cornuti.

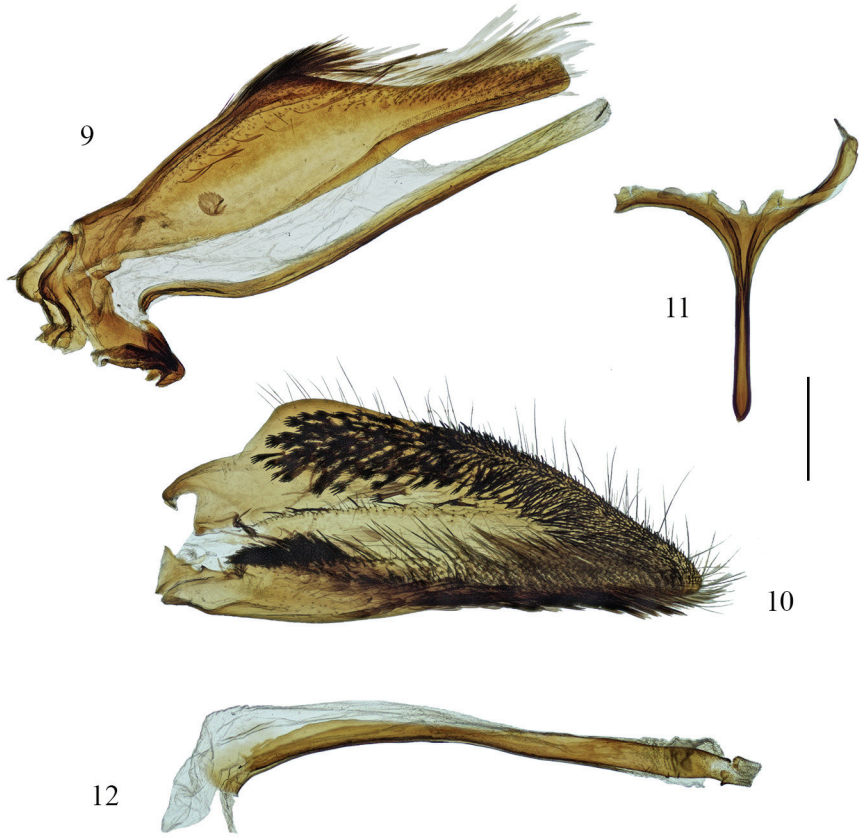
FEMALE. Unknown.

DIFFERENTIAL DIAGNOSIS. By the structure of male genitalia this new species belongs to *N. regalis* species-group and superficially it to be the closest to *N. sulawesiensis* O. Gorbunov et Arita, 2015 (type locality: Indonesia: S. Sulawesi, Bantimurung), *N. poecilocephala* (Diakonoff, 1968 [“1967”] (Philippines: Luzon, Los Baños), *N. mahawu* O. Gorbunov, 2016 (Indonesia: N. Sulawesi, Kakasken Dua) and *N. christineae* Fischer, 2003 (type locality: Malaysia: Cameron Highlands, Ringlet).

From *N. sulawesiensis*, *N. cucphuongae* sp. n. can be distinguished by the colouration of the scapus (yellow to pale yellow with a few black scales ventrally in the species compared, *vs*. dark brown to black with dark blue-violet sheen in the new species), frons (pale yellow with golden sheen, with a large gray spot with bronze sheen medially in *N. sulawesiensis*, *vs*. dark gray with bronze-purple sheen and a white stripe laterally in *N. cucphuongae* sp. n.), fore coxa (black with green-violet sheen and broadly yellow to yellow-orange basally in *N. sulawesiensis*, *vs*. dark brown to black with bluish sheen and a narrow pale yellow to white exterior margin *N. cucphuongae* sp. n.), discal spot of the hindwing (discal spot dark brown mixed with brick-orange scales in the species compared, *vs*. dark brown to black with dark greenish sheen in *N. cucphuongae* sp. n.), and abdomen (dorsally entirely black with strong blue-violet sheen; ventrally dark brown to black with dark blue sheen *N. sulawesiensis*, *vs*. dorsally dark brown to black with greenish-violet sheen; tergites 2, 4 and 5 each with a few yellow scales distally; ventrally dark brown to black with dark violet sheen; sternites 1+2–5 each with a narrow pale yellow to white stripe distally in *N. cucphuongae* sp. n.; compare Figs 7 and 8 with figs 1 and 2 in Gorbunov & Arita, 2015: 3). Beside this, these two species have some differences in the male genitalia (Figs 9–12 *vs*. figs 3–6 in Gorbunov & Arita, 2015: 5).

From the second species compared, new species differs by the colouration of the vertex (bright orange mixed with black in *N. poecilocephala*, *vs*. black with bright greenish-anthracite sheen in *N. cucphuongae* sp. n.), forewing dorsally (with strong

indigo-green sheen in the species compared, *vs*. with strong dark violet sheen in *N. cucphuongae* sp. n.), abdomen dorsally (each tergite with a narrow yellow stripe distally in *N. poecilocephala*, *vs*. tergites 2, 4 and 5 each with a few yellow scales distally in the new species), and by the conformation of the male genitalia, especially by the shape of the valva (Figs 9–12 *vs*. fig. 349 in Diakonoff, 1967: 384).



Figs 9–12. Male genitalia of *Nokona cucphuongae* O. Gorbunov et Arita, sp. n. (genital preparation No OG–030-2018): 9 – tegumen-uncus complex; 10 – valva; 11 – saccus; 12 – aedeagus. Scale bar: 0.5 mm.

From *N. mahawu*, *N. cucphuongae* sp. n. is separable by the colouration of the fore coxa (black with green-violet sheen, with a small white spot with golden sheen interior-basally *N. mahawu*, *vs*. dark brown to black with bluish sheen and a narrow pale yellow to white exterior margin in the new species), forewing ventrally (with brick-orange scales medially in *N. mahawu*, *vs*. without any orange or brick-orange scales in *N. cucphuongae* sp. n.), discal spot of the hindwing (light brown in *N. mahawu*, *vs*. dark brown to black with dark greenish sheen in the new species), and

abdomen (dorsally black with green-violet sheen; tergite 2 with a narrow yellow stripe distally; tergites 1 and 4 each 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 in *N. mahawu*, *vs*. dorsally dark brown to black with greenish-violet sheen; tergites 2, 4 and 5 each with a few yellow scales distally; ventrally dark brown to black with dark violet sheen; sternites 1+2–5 each with a narrow pale yellow to white stripe distally in *N. cucphuongae* sp. n.; compare Figs 7 and 8 with figs 4 and 5 in Gorbunov, 2016: 163). In addition, there are some visible differences between these two species in the male genitalia (Figs 9–12 *vs*. figs 6–9 in Gorbunov, 2016: 164).

From *N. christineae*, *N. cucphuongae* sp. n. easily differs by the colouration of the abdomen (tergite 4 with a narrow light red stripe distally, all sternites with a narrow yellow stripe distally in *N. christineae*, *vs*. tergites 2, 4 and 5 each with a few yellow scales distally, sternites 1+2–5 each with a narrow pale yellow to white stripe distally in *N. cucphuongae* sp. n.; Fig. 1 *vs*. fig. 1 in Fischer, 2003: 141) and by the shape of the valve in the male genitalia (compare Fig. 10 with fig. 3 in Fischer, 2003: 140).

N. cucphuongae sp. n. is distinguishable from all other congeners in combinations of colouring of various parts of the body and wings and in the structure of the male genitalia.

BIONOMICS. The larval host plant is unknown. The holotype was collected in the beginning of June.

HABITAT. The male was collected on the edge of the rainforest.

DISTRIBUTION. The new species is known only from the type locality in the Cuc Phuong National Park in North Vietnam (Ninh Binh Province).

ETHYMOLOGY. This new species is named after a very famous place with a great diversity of Sesiidae in North Vietnam.

ACKNOWLEDGEMENTS

We would like to express our sincere gratitude to Hiromichi Ogane, Singo Onodera, Naoki Toda (all Nagoya, Japan) and Naoki Yata (Kariya, Japan) for their constant help in our study of Oriental Sesiidae. The study was conducted using the equipment of the Joint Usage Center “Instrumental methods in ecology” at the A.N. Severtsov Institute of Ecology and Evolution, Russian Academy of Sciences (Moscow, Russia).

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