European Journal of Taxonomy 1007: 35–56
https://doi.org/10.5852/ejt.2025.1007.2993

europeanjournaloftaxonomy.eu
ISSN 2118-9773
2025 · Constant J. & Pham H.T.

Received: 24 January 2025 • *Accepted: 22 May 2025* • *Published: 6 August 2025*

Topic editor: Tony Robillard • *Section editor: Christopher Dietrich* • *Desk editor: Eva-Maria Levermann*

Research article

urn:lsid:zoobank.org:pub:E10F4580-454C-4028-B415-D4EB84E99B2B

Keosarima gen. nov., a new genus in the planthopper tribe Sarimini from Indochina (Hemiptera: Fulgoromorpha: Issidae)

Jérôme CONSTANT [1,*] & Hong Thai PHAM [2,*]

[1] Royal Belgian Institute of Natural Sciences, O.D. Phylogeny and Taxonomy, Entomology, Vautier Street 29, B-1000 Brussels, Belgium.
[2] Mientrung Institute for Scientific Research, Vietnam National Museum of Nature, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet Street, Hanoi, Vietnam.
[2] Graduate School of Science and Technology, Vietnam Academy of Science and Technology, Hanoi, Vietnam.

[*] Corresponding authors: jconstant@naturalsciences.be; phamthai@vnmn.vast.vn

Abstract. A new genus of Issidae in the tribe Sarimini (Hemiptera: Fulgoromorpha), *Keosarima* Constant gen. nov., is described to include two new species, *Keosarima armillata* Constant gen. et sp. nov., collected in Keo Seima Wildlife Sanctuary in Mondulkiri Province in Cambodia, and *K. konkakinha* gen. et sp. nov., collected in Kon Ka Kinh National Park in Central Vietnam. As a result, four species of Issidae, including two Sarimini, are now recorded from Cambodia, and 59 species, including eight Sarimini, are recorded from Vietnam. A distribution map and illustrations of specimens, terminalia, habitat are provided, as well as a record of trophobiotic interaction for *K. armillata*, with ants in the genus *Camponotus* Mayr, 1861 (Hymenoptera: Formicidae). The relationship with the genus *Tetrica* Stål, 1866 is briefly discussed.

Keywords. Biodiversity, Fulgoroidea, Indochina, trophobiosis.

Constant J. & Pham H.T. 2025. *Keosarima* gen. nov., a new genus in the planthopper tribe Sarimini from Indochina (Hemiptera: Fulgoromorpha: Issidae). *European Journal of Taxonomy* 1007: 35–56. https://doi.org/10.5852/ejt.2025.1007.2993

Introduction

The family Issidae Spinola, 1839 is a large family of planthoppers (Hemiptera: Fulgoromorpha), which currently contains more than 1100 species in about 230 genera (Bourgoin 2025), representing about 8% of the species of Fulgoromorpha Evans, 1946. Although it has a worldwide distribution, the fauna of some major regions, such as tropical Africa, South America, New Guinea and Australia, remains very poorly documented (Gnezdilov & Fletcher 2010; Gnezdilov 2013, 2017; Gnezdilov *et al.* 2022; Constant & Semeraro 2023).

As about the Indochinese region, a recently published checklist of the Issidae fauna of Cambodia (Constant & Bartlett 2019) records only three species in the country: *Hemisphaerius interclusus* Noualhier, 1896, *H. hippocrepis* Constant & Pham, 2011 and *Vishnuloka bunonga* Constant & Bartlett 2019, a very low number if compared to the neighbouring countries. Indeed, the fauna of Laos is currently comprised of six species (Gnezdilov 2014; Constant 2021; Bourgoin 2025) and the fauna of Thailand of eight species (Constant & Jiaranaisakul 2020; Constant 2021). The fauna of Vietnam counts 65 species (Constant & Pham 2024a, 2024b, 2025), and most of them (about 75%) were described in the last 20 years. Our study of recent material of Issidae collected in 2018 during fieldwork in Cambodia, in Keo Seima Wildlife Sanctuary, and in Vietnam, in Kon Ka Kinh National Park, revealed two closely related new species of Issidae belonging to the tribe Sarimini Wang, Zhang & Bourgoin, 2016, which could not be placed in any of the existing genera.

The present paper aims to describe one new genus, *Keosarima* gen. nov., to accommodate the new species, as a contribution to the knowledge of the Issidae planthoppers of Cambodia and Vietnam.

Material and methods

The specimens were captured by hand using small transparent vials with which they were slowly covered or by sweeping the lower vegetation, bushes and lower branches of trees in the forest, along trails.

The photographs of habitats and live specimens were taken with a Sony DSC-H300 camera. The preserved specimens and terminalia were photographed with a Leica EZ4W stereo microscope with an integrated camera, and the images were stacked with CombineZ software and optimized with Adobe Photoshop CS3. The distribution map was produced with SimpleMappr (Shorthouse 2010). All photographs were taken by the first author. The genitalia were extracted after soaking the abdomen in a 10% solution of potassium hydroxide (KOH) at room temperature for about 12 hours. The pygofer was separated from the abdomen and the aedeagus dissected with a needle blade for examination. The whole was thoroughly rinsed in 70% ethanol, then placed in glycerine for preservation in a tube attached to the pin of the corresponding specimen. The hind wings were glued with white glue on a small white cardboard rectangle attached to the pin of the corresponding specimen.

The external morphological terminology follows O'Brien & Wilson (1985) and for the terminalia, Bourgoin & Huang (1990), Gnezdilov (2003) and Gnezdilov *et al.* (2014). The metatibiotarsal formula gives the number of spines on (side of metatibia) apex of metatibia / apex of first metatarsus / apex of second metatarsus. The terminology of the wing venation follows Bourgoin *et al.* (2015). The higher classification follows the most recent one as published by Gnezdilov *et al.* (2022).

Abbreviations for measurements

The measurements were taken as in Constant (2004).

BB = maximum breadth of the body
BF = maximum breadth of the frons
BTg = maximum breadth of the tegmen
BV = maximum breadth of the vertex
BW = maximum breadth of the hind wing
LF = length of the frons in median line
LTg = maximum length of the tegmen
LT = total length (apex of head to apex of tegmina)
LV = length of the vertex in median line
LW = maximum length of the hind wing

Abbreviations for morphological terms

ae = aedeagus
An = anal tube
ca = capitulum of the gonostylus
co = connective of the aedeagus
dl = dorsal lobe of the periandrium
G = gonostylus
ldp = laterodorsal process of the periandrium
lvp = lateroventral process of the aedeagus
Py = pygofer
sp = shaft of the laterodorsal process of the periandrium
te = tectiductus of the aedeagus
vl = ventral lobe of the periandrium

Institutional abbreviations

RBINS = Royal Belgian Institute of Natural Sciences, Brussels, Belgium
RUPP-CEI = Royal University of Phnom Penh, Cambodian Entomology Initiative, Phnom Penh, Cambodia

Results

Taxonomy

Class Insecta Linnaeus, 1758
Order Hemiptera Linnaeus, 1758
Suborder Auchenorrhyncha Duméril, 1806
Infraorder Fulgoromorpha Evans, 1946
Superfamily Fulgoroidea Latreille, 1807
Family Issidae Spinola, 1839
Subfamily Issinae Spinola, 1839

Tribe **Sarimini** Wang, Zhang & Bourgoin, 2016

Type genus

Sarima Melichar, 1903.

Genus ***Keosarima*** Constant gen. nov.
urn:lsid:zoobank.org:act:DC3A4382-03F6-4F40-A217-D43928DDB17A

Type species

Keosarima armillata Constant gen. et sp. nov. by present designation.

Diagnosis

The genus *Keosarima* gen. nov. can be differentiated from the other genera of Sarimini by the following combination of characters:

(1) the vertex twice as wide as long in dorsal view;
(2) the frons with obsolete peridiscal carinae and with complete, distinct median carina prolongated at least along basal portion of clypeus;

(3) the tegmina elongate, about 2.2 × as long as wide, with distinct lateral hump slightly before basal ⅓ hiding costal margin in dorsal aspect, and with distinct epipleuron;
(4) the vein ScP of the tegmen long, rather weakly curved and reaching margin of tegmen around distal 1/5 of tegmen length;
(5) the first fork of MP and the first fork of CuA at about the same level (fork of CuA slightly more basal), around halflength of tegmen;
(6) the anal tube strongly elongate, dorsoventrally flattened, and oblong, moderately narrow in dorsal view;
(7) the massive gonostyli, with capitulum elongate, strongly projecting anterodorsad and with poorly distinct neck, and with anterodorsal margin moderately rounded;
(8) the aedeagus (sensu stricto) with a single pair of elongate, sinuate, ribbon-like, lateroventral processes arising at about distal ⅓, and with the laterodorsal process of the periandrium bearing an apical hook directed dorsad, and an elongate shaft directed cephalad.

Differential diagnosis

The most similar genus is *Tetrica* Stål, 1866, which also shows a complete, distinct median carina of the frons, and a median carina on the clypeus (see illustrations of the holotype of the type species, *Tetrica fusca* Stål, 1970 in Gnezdilov *et al.* 2015: figs 20–23). However, *Keosarima* Constant gen. nov. can be separated from the latter by the tegmina more elongate, about 2.2 × as long as wide (1.8 × in *Tetrica*), with its rounded angle of the costal margin placed more basally, before midlength (around midlength in *Tetrica*), and by the hind wings with lobe CuP-Pcu-A1 without a closed cell (with a large, closed cell in *Tetrica*).

Keosarima gen. nov. also shows morphological similarities with the genera *Parallelissus* Meng, Qin & Wang, 2020 (illustrations in Zhang *et al.* 2020: figs 182–183; Constant & Pham 2024a: figs 33–34) and *Duplexissus* Wang, Zhang & Bourgoin, 2019 (illustrations in Wang *et al.* 2019: figs 12–22), which also possess an elongate shaft directed cephalad on the periandrium. However, in both latter genera, the median carina of the frons doesn't reach the ventral margin of the frons and does not extend to the clypeus. *Parallelissus* furthermore differs from *Keosarima* by the hind wings with vein Pcu furcating distally (not furcate in *Keosarima*), and the male genitalia with gonostyli showing a very elongate neck (neck very short in *Keosarima*). *Duplexissus* also differs from *Keosarima* by a less elongate anal tube (2.4 × as long as wide vs at least 3.0 × in *Keosarima*), a strongly rounded anterodorsal margin of the gonostyli (moderately rounded in *Keosarima*), and a periandrium with laterodorsal processes lacking an apical hook (strong apical hook in *Keosarima*), but with distinctly dentate dorsal margin of the shaft of the periandrium (shaft smooth in *Keosarima*).

Etymology

The genus name is formed from the combination of 'Keo', for 'Keo Seima', the Wildlife Sanctuary where the new genus was discovered, and '*Sarima*', the type genus of the tribe Sarimini. Gender feminine.

Description

Body. Medium sized (around 5.0–6.0 mm), very convex, moderately elongate, rather robust-bodied.

Colour. Mostly brown with paler markings on frons. Live specimens often more or less covered in golden brown powdery wax.

Head. Vertex distinctly broader than long in midline (about 2.0 ×), weakly concave with obsolete median carina; anterior margin forming widely obtuse angle, posterior one rather deeply concave, lateral ones sinuate; all margins moderately carinate. Frons weakly convex, narrowly visible (median carina distinct) from above, about 1.2 × as wide as long in midline, smooth with distinct complete median carina, and

obsolete peridiscal carina; row of paler tubercles along margins; maximum breadth slightly under level of antennae; dorsal margin weakly concave. Anteroventral angle of genae not projecting anteriad. Ocelli present, under eye. Clypeus triangular, convex, smooth, with distinct median carina (stronger in basal portion). Labium with last segment longer than broad, about as long as penultimate. Antennae with scape short, ring-shaped, and bulbous pedicel.

Thorax. Pronotum subtriangular, projecting anteriorly in blunt straight angle, about 0.6 × as long in midline, as mesonotum; smooth with anterior margin carinate and pair of impressed points on each side of paler median line; lateral fields very narrow behind eyes; paranotal lobes with posteroventral angle rounded, sometimes with some tubercles. Mesonotum subtriangular with posterolateral margins slightly incurved, smooth, weakly convex with shallow depression before scutellum; incomplete, rather distinct, median and sublateral carinae.

Tegmina. Distinctly convex, elongate, about 2.2 × as long as wide, with longitudinal veins elevated; costal margin forming broadly rounded angle at basal $^{2}/_{5}$; apical margin rounded; distinct lateral hump including vein ScP+RA slightly before basal ¼, hiding costal margin in dorsal aspect; costal margin hidden by vein RP in distal half, in dorsal view; distinct epipleuron; clavus closed, reaching $^{4}/_{5}$ of tegmen length. Venation: ScP+R rather short; ScP+RA long, reaching external margin of tegmen around distal $^{1}/_{5}$ of tegmen length; RP unforked, long and weakly curved; first fork of MP slightly before midlength of tegmen, MP1 with two terminales; first fork of CuA at about same level (slightly more basal), around halflength of tegmen; Pcu and A1 fused slightly beyond halflength of clavus, Pcu+A1 reaching apex of clavus; A1-Pcu+A1 strongly elevated, and slightly sinuate in dorsal aspect; numerous cross-veins on all surface of tegmen.

Hind wings. Well developed, with three distinct lobes (Sarimini type) more or less equal in width; mostly brown. Venation: ScP+R and CuA furcate; MP simple, sinuate; second branch of CuA fused distally with CuP; Pcu and A1 fused on basal half, Pcu unforked and A2 simple; one transverse vein between second branch of ScP+R and MP, and between MP and first branch of CuA.

Legs. Moderately elongate and slender, with pro- and mesofemora and pro- and mesotibiae slightly flattened dorsoventrally, tibiae more slender than corresponding femora; posteroventral margin of pro- and mesofemora with row of minute teeth; pro- and mesotarsi rather elongate. Metatibiae with two lateral spines in distal half and six apical spines. Metatarsi moderately short with first segment about as long as combined length of remaining segments. First metatarsomere with two latero-apical and six intermediate spines arranged in arc. Metatibiotarsal formula: (2) 6/8–9/2.

Male terminalia

Pygofer short, about 2.2 × as high as long at midheight in lateral view, with posterior margin broadly rounded in lateral view; in caudal view suboval, 1.4 × as high as wide. Gonostyli massive, moderately convex, subtriangular in lateral aspect with posterior and anterodorsal margins distinctly rounded; capitulum elongate, rather strongly projecting dorsad and with poorly distinct neck, curved anterodorsad and more or less evenly tapering towards apex in lateral view, with basilateral laminate process directed lateroventrad in caudal view. Anal tube strongly elongate, dorsoventrally flattened, and oblong, moderately narrow in dorsal view, about 3.0–3.4 × as long as wide in dorsal view and with anal opening in basal ¼; in lateral view, downcurved. Aedeagus symmetrical, rather strongly curved posterodorsad in lateral view. Ventral lobe of periandrium laminate, spatulate. Dorsal lobe of periandrium laminate, elongate, spatulate; laterodorsal processes of periandrium arising lateroventrally from middle portion of dorsal lobe, curved posterodorsad with apical hook directed dorsad, and moderately upcurved, elongate shaft directed cephalad. Aedeagus (sensu stricto) surpassing dorsal and ventral lobes of periandrium,

bifid, with distal portion dilated, with single pair of elongate, sinuate, ribbon-like, lateroventral processes arising at about distal ⅓.

Distribution

Cambodia: Mondulkiri Province; Vietnam: Gia Lai Province.

Species included

Keosarima armillata Constant gen. et sp. nov.
Keosarima konkakinha gen. et sp. nov.

Keosarima armillata Constant gen. et sp. nov.
urn:lsid:zoobank.org:act:D847D2D5-661E-4A3D-99F3-88F6B531D44B
Figs 1–6

Diagnosis

Keosarima armillata Constant gen. et sp. nov. can be recognized by the very elongate shaft of the laterodorsal process of the periandrium, reaching nearly to base of aedeagus (*sp* – Fig. 3E) and the lateroventral process of the aedeagus reaching to basal third of aedeagus (lvp – Fig. 4G).

Differential diagnosis

The new species is close to *Keosarima konkakinha* gen. et sp. nov. but it shows a much longer shaft of the laterodorsal process of the periandrium, reaching nearly to the base of the aedeagus (limited to about halflength of the aedeagus in *K. konkakinha*), and the shorter lateroventral process of the aedeagus more strongly sinuate and reaching to the basal third of the aedeagus (less sinuate and reaching to the basal fourth of the aedeagus in *K. konkakinha*).

Etymology

The specific epithet '*armillata*' is a Latin adjective meaning 'ornamented with a bracelet'; it refers to the apical black ring of the pro- and mesotibiae.

Type material

Holotype

CAMBODIA • ♂ (dissected); Mondulkiri Province, Keo Seima Wildlife Sanctuary, near O Pam station; 12°11′39″ N, 107°01′01″ E; 14–24 Nov. 2018; J. Constant leg.; I.G.: 33.919; RBINS.

Paratypes

CAMBODIA • 25 ♂♂, 25 ♀♀; same data as for holotype; RBINS • 5 ♂♂, 9 ♀♀; same data as for holotype; RUPP-CEI.

Description

Measurements and ratios. LT: ♂ (n = 6): 5.3 mm (5.2–5.5), ♀ (n = 10): 5.4 mm (5.2–5.7); LT/BB = 1.90; LTg/BTg = 2.16; LW/BW = 1.15; BV/LV = 2.00; LF/BF = 0.82.

Head (Fig. 1A–E). Vertex medium brown, often paler on posterior angles, and with obsolete median carina yellowish brown; 2.0 × as broad as long in midline, weakly constricted in middle; disc moderately concave; anterior margin slightly, angularly projecting anteriad; posterior margin rather deeply concave; all margins elevated. Frons brown densely covered in small yellowish mottling, with more or less distinct transverse yellowish marking in middle, and with row of yellowish tubercles along margins; convex,

Fig. 1. *Keosarima armillata* Constant gen. et sp. nov., dissected holotype, ♂ (RBINS). **A**. Habitus, dorsal view. **B**. Habitus, ventral view. **C**. Habitus, lateral view. **D**. Habitus, anterolateral view. **E**. Habitus, perpendicular view of frons. **F**. Right hind wing.

smooth with complete median carina, peridiscal carina obsolete, not distinct. Genae yellowish brown, distinctly paler than vertex and frons, with slightly darker area above ocellus; anteroventral angle not projecting anteriad. Clypeus triangular, convex, smooth with distinct meadian carina; anteclypeus yellowish brown with apical portion darker; postclypeus blackish brown. Labium yellowish brown with last segment longer than broad, slightly shorter than penultimate. Antennae with scape short, ring-shaped, dark brown, and pedicel bulbous, brown.

Thorax (Fig. 1A, C–E). Pronotum brown (generally darker than vertex and mesonotum) with weak paler, yellowish median line; subtriangular, projecting anteriorly; smooth with anterior margin carinate and some yellowish tubercles in lateral fields, and pair of impressed points on each side of midline; lateral

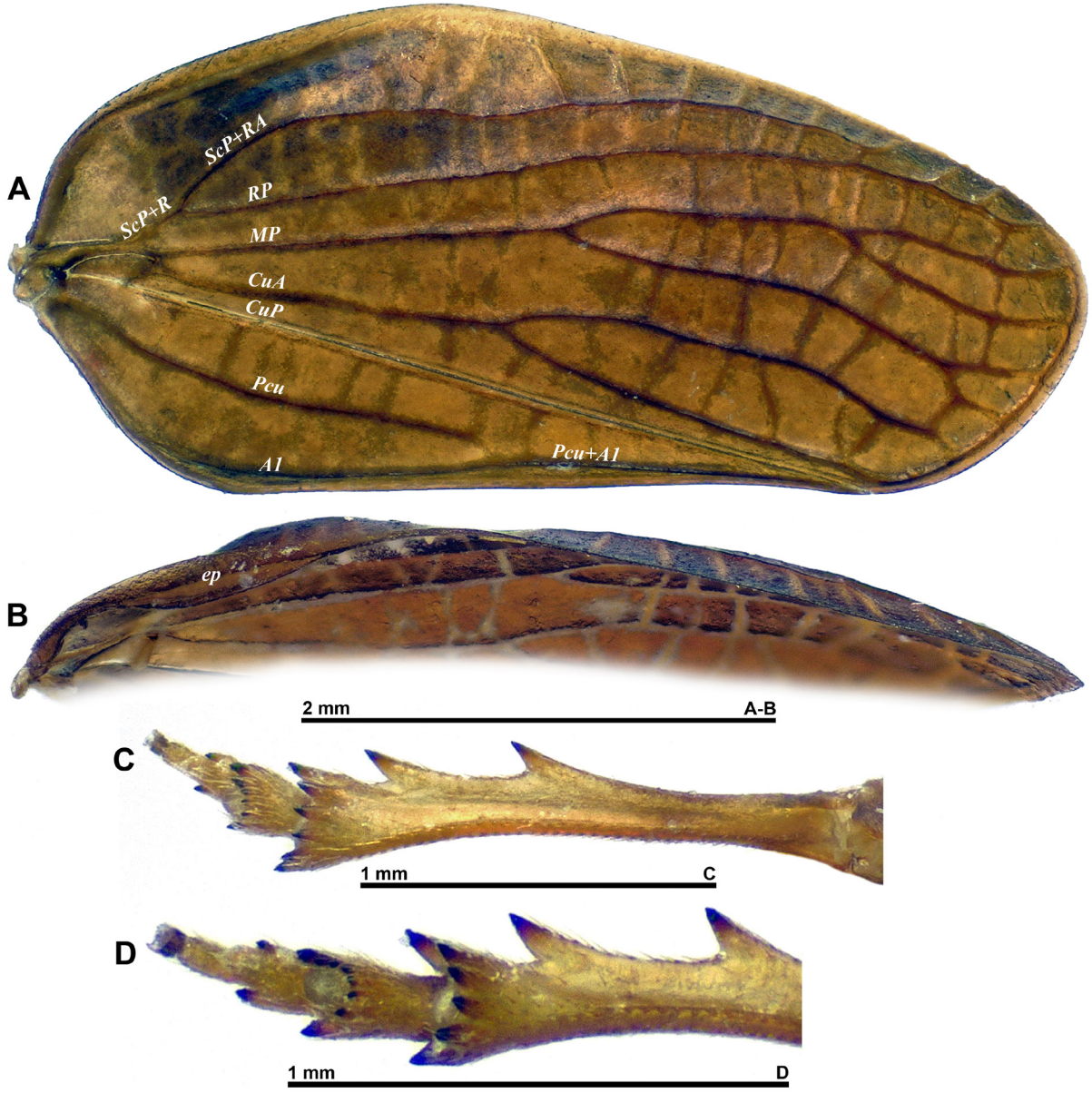

Fig. 2. *Keosarima armillata* Constant gen. et sp. nov., holotype, ♂ (RBINS). **A**. Right tegmen, laterodorsal view. **B**. Right tegmen, ventral view. **C**. Metatibia and metatarsus, ventral view. **D**. Apex of metatibia and metatarsus, ventral view. Abbreviations: see Bourgoin *et al.* (2015).

fields very narrow behind eyes; paranotal lobes brown, pale yellowish under eye and with strong black marking along ventral margin, sometimes with small yellowish tubercles, posteroventral angle rounded. Mesonotum brown, often with carinae marked with paler colour, smooth, weakly convex with shallow depression before scutellum; sublateral (peridiscal) carinae incomplete but rather distinct, some pale tubercles in angles. Tegulae brown.

Tegmina (Figs 1A–D, 2A–B). Brown with veins usually slightly paler, main veins more elevated than cross-veins; distinctly convex, and about 2.2 × as long as wide, with distinct lateral hump including vein ScP+RA slightly before basal ¼; distinct, brown epipleuron; clavus closed, reaching 4/5 of tegmen length. Venation: as in genus description.

Hind wings (Fig. 1F). Blackish brown; veins darker than background, generally black, sometimes marked with red; well developed, with three distinct lobes (Sarimini type) more or less equal in width; indentation between ScP-R-MP-Cu and Pcu-A1 lobes rather deep. Venation: as in genus description.

Legs (Figs 1A–E, 2C–D). Generally yellowish brown, paler than tegmina; darker rings on pro- and mesofemora (basal and anteapical), about midlength of pro- and mesotibiae, and anteapical on metafemora; pro- and mesotibiae blackish apically; all spines of posterior legs black apically. Anterior and median legs slightly flattened dorsoventrally, tibiae more slender than corresponding femora; posteroventral margin of pro- and mesofemora with row of minute teeth; pro- and mesotarsi yellowish brown, rather elongate. Metatibiae with two lateral spines in distal half and six apical spines. Metatarsi yellowish brown, moderately short with first segment about as long as combined length of remaining segments. First metatarsomere with two latero-apical and six intermediate spines arranged in arc. Metatibiotarsal formula: (2) 6 / 8 / 2.

Abdomen (Fig. 1B). Brown, each segment with middle area and two spots along base darker.

Male terminalia (Figs 3–4). Pygofer (*Py* – Fig. 3A–D) short, about 2.4 × as high as long at midheight in lateral view, with posterior margin broadly rounded in lateral view; in caudal view suboval, 1.4 × as high as wide; dorsally abruptly, deeply notched. Gonostyli (*G* – Fig. 3A–D) massive, moderately convex, subtriangular in lateral aspect with posterior margin rounded but not forming a distinct lobe, anterodorsal margins distinctly convex and posterodorsal margin slightly sinuate; capitulum (*ca* – Fig. 3A–B, D) elongate, rather strongly projecting dorsad and with poorly distinct neck, curved anterodorsad and more or less evenly tapering towards apex in lateral view, with basilateral laminate process directed lateroventrad in caudal view, and with distal portion anteroposteriorly laminate, apically rounded in caudal view. Anal tube (*An* – Fig. 3A–D) strongly elongate, dorsoventrally flattened, and oblong, moderately narrow with lateral margins weakly sinuate in dorsal view, about 3.4 × as long as wide in dorsal view and with anal opening in basal ¼; in lateral view, downcurved and sinuate. Aedeagus (*ae* – Figs 3E–L, 4) symmetrical, rather strongly curved posterodorsad in lateral view around distal 2/5. Ventral lobe of periandrium (*vl* – Figs 3G–L, 4A–D) laminate, spatulate, with apical margin roundly notched. Dorsal lobe of periandrium (*dl* – Figs 3E–G, J–K, 4A–D) laminate, elongate, spatulate; curved in lateral view in distal portion. Laterodorsal processes of periandrium (*ldp* – Figs 3E–L, 4A–D) arising lateroventrally from middle portion of dorsal lobe, curved posterodorsad and somewhat twisted, with apical hook directed dorsad moderately upcurved; elongate shaft (*sp* – Figs 3E–L, 4A–D) directed cephalad, upcurved and reaching nearly to base of aedeagus, pointed apically. Aedeagus (sensu stricto, *ae* – Figs 3E–L, 4E–G) surpassing dorsal and ventral lobes of periandrium, bifid with lateral margins sinuate, forming a lateral lobe distally in dorsal aspect, and with distal portion dilated in lateral view; pair of elongate, sinuate lateroventral processes (*lvp* – Figs 3E, G, J–L, 4E–G), ribbon-like, arising at about distal third of aedeagus, somewhat spiralate, distally curved mesad above dorsal lobe of periandrium and reaching to about basal third of aedeagus. Connective (*co* – Fig. 3G) well developed, corpus connective

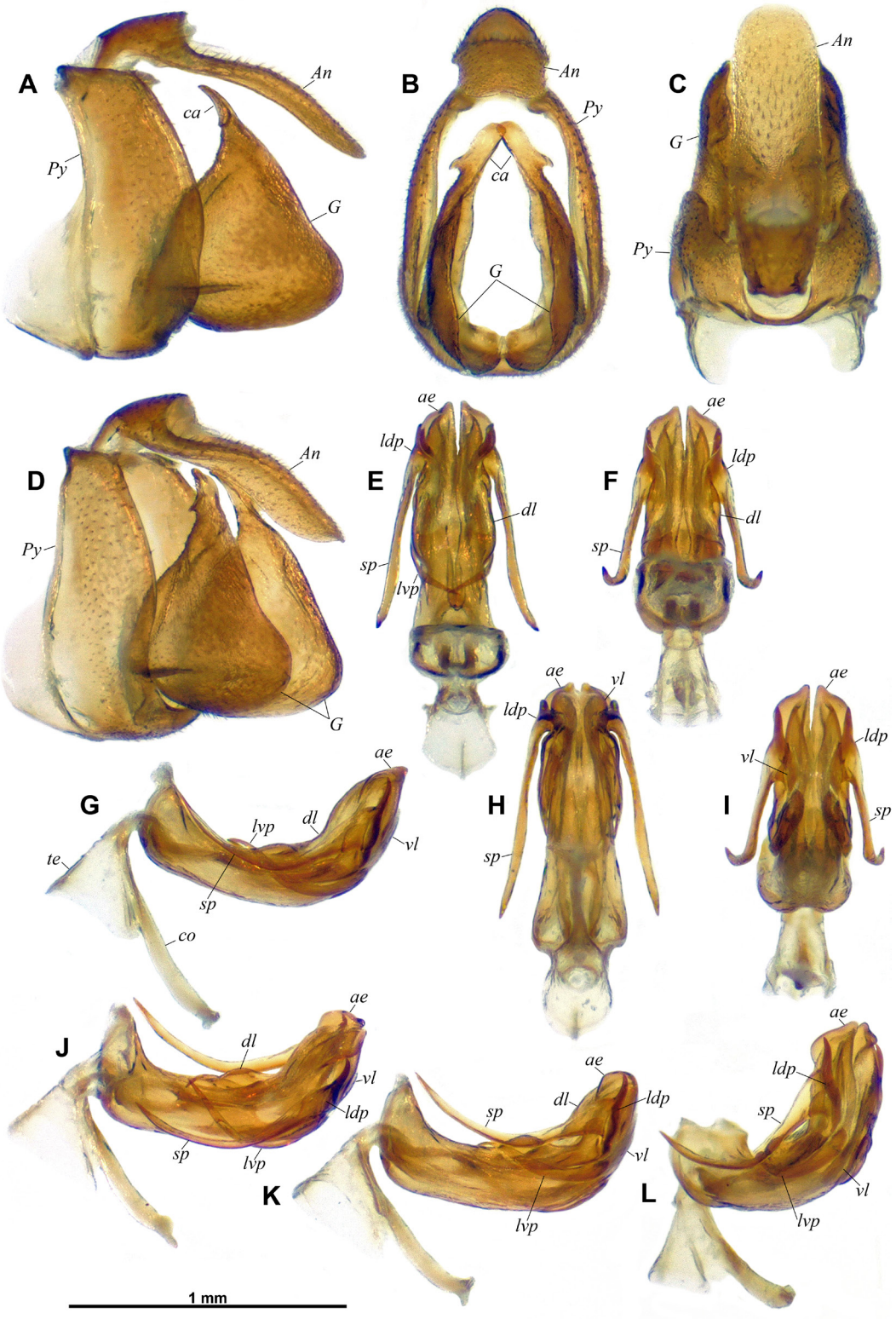

Fig. 3. *Keosarima armillata* Constant gen. et sp. nov., holotype, ♂ (RBINS), terminalia. **A–D**. Pygofer, anal tube and gonostyli. **A**. Left lateral view. **B**. Caudal view. **C**. Dorsal view. **D**. Posterolateral view. **E–L**. Aedeagus. **E**. Dorsal view. **F**. Anterodorsal view. **G**. Left lateral view. **H**. Ventral view. **I**. Posteroventral view. **J**. Left laterodorsal view. **K**. Left lateroventral view. **L**. Posterolateral view. Abbreviations: see Material and methods.

long, slightly curved in lateral view, tectiductus (*te* – Fig. 3G) well developed, conical with anteroventral apodemes and wide anterior foramen.

Biology

Keosarima armillata Constant gen. et sp. nov. was collected in November, on lower vegetation and bushes, in moist evergreen tropical forest at about 300 m a.s.l. (Fig. 5D) in the Keo Seima Wildlife Sanctuary. A specimen was observed at day time, in a trophobiotic interaction with ants that were collecting the honeydew produced by the planthopper. The ants belong to an unidentified species of the genus *Camponotus* Mayr, 1861 (Hymenoptera: Formicidae: Formicinae) (Fig. 5A–C); the behaviour of the ants included antennal, palps and prolegs contact / palpation which are regarded as a way to stimulate honeydew production by the planthopper (Bourgoin *et al.* 2023). The latter observation was previously reported in Bourgoin *et al.* (2023: 57, fig. 21c) under "Sarimini indet.".

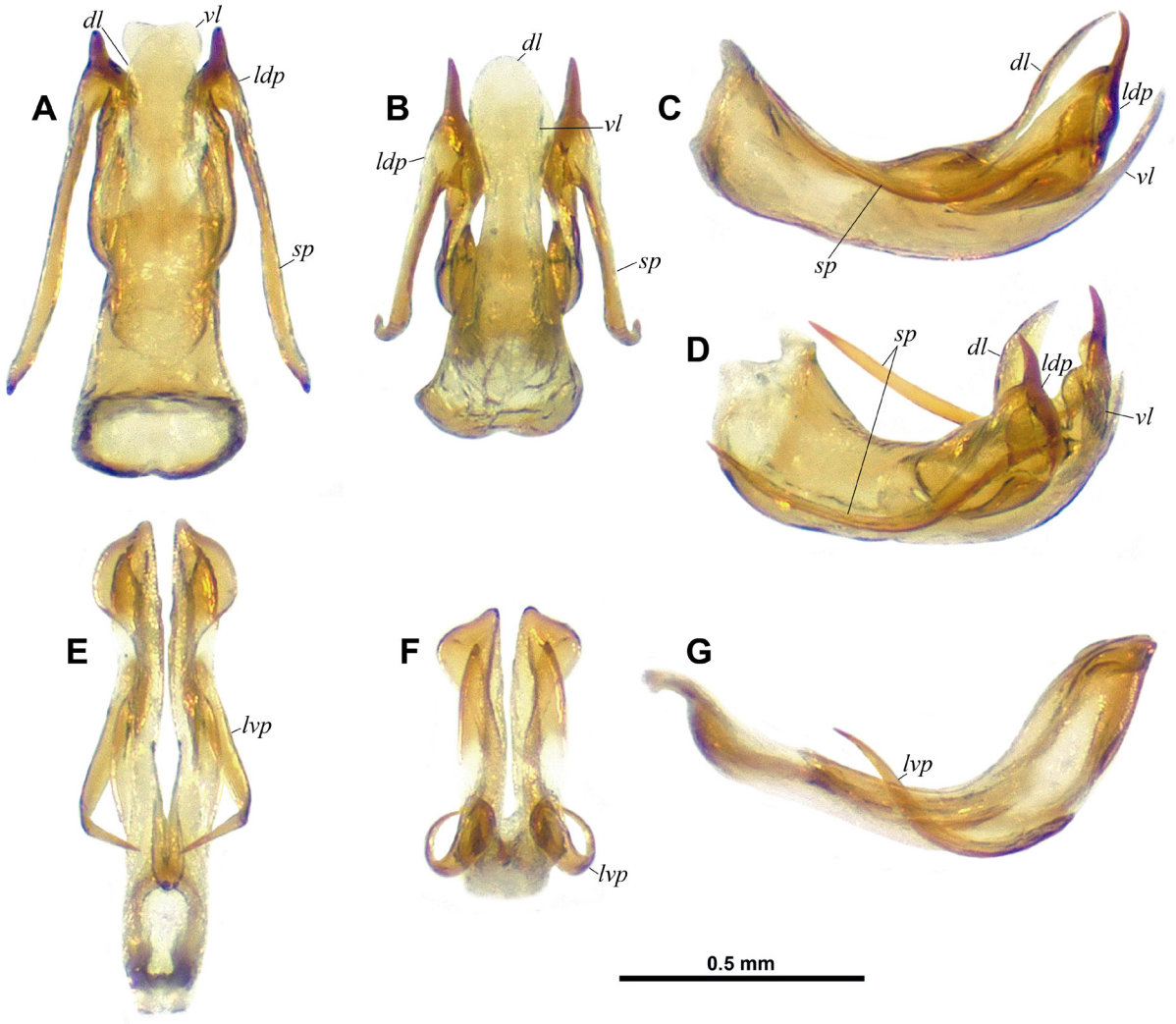

Fig. 4. *Keosarima armillata* Constant gen. et sp. nov., holotype, ♂ (RBINS). **A–D**. Periandrium. **A**. Dorsal view. **B**. Posteroventral view. **C**. Left lateral view. **D**. Posterolateral view. **E–G**. Aedeagus sensu stricto. **E**. Dorsal view. **F**. Posteroventral view. **G**. Left lateral view. Abbreviations: see Material and methods.

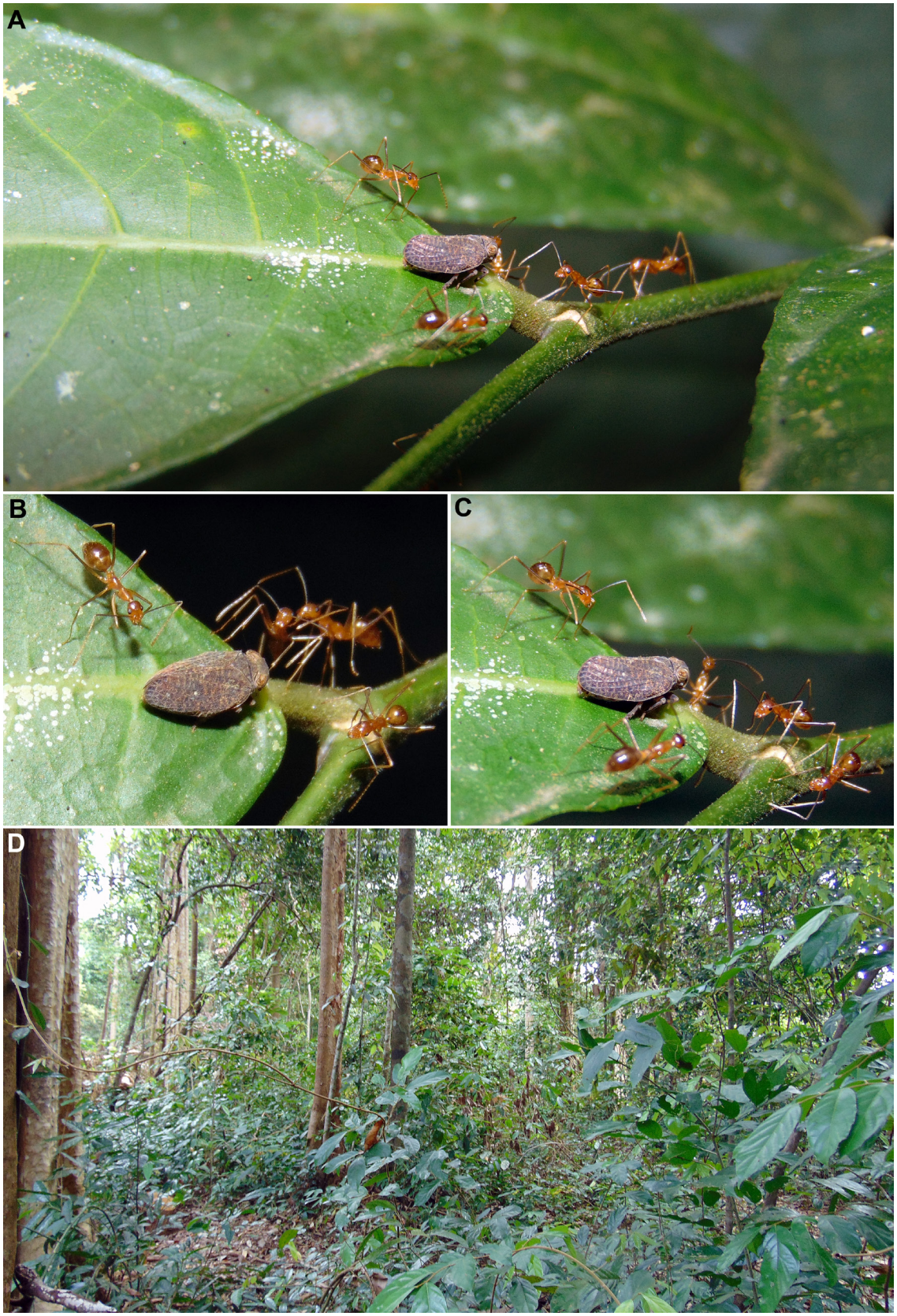

Fig. 5. *Keosarima armillata* Constant gen. et sp. nov. **A–C**. Specimen in trophobiotic interaction with ants (*Camponotus* sp.), 19 Nov. 2018. **D**. Habitat in Keo Seima Wildlife Sanctuary, 17 Nov. 2018.

Distribution

Cambodia: Mondulkiri Province, Keo Seima Wildlife Sanctuary (Fig. 6).

Fig. 6. Distribution map of the species of *Keosarima* Constant gen. nov.

Keosarima konkakinha gen. et sp. nov.
urn:lsid:zoobank.org:act:06C549A3-51D5-44C6-B676-3447352E3631
Figs 6–10

Diagnosis

Keosarima konkakinha gen. et sp. nov. can be recognized by the moderately elongate shaft of the laterodorsal process of the periandrium, reaching nearly to halflength of the aedeagus (*sp* – Fig. 8H) and the lateroventral process of the aedeagus reaching to the basal fourth of the aedeagus (*lvp* – Fig. 9H).

Differential diagnosis

The new species is close to *Keosarima armillata* Constant gen. et sp. nov. but it shows a much shorter shaft of the laterodorsal process of the periandrium, limited to about halflength of the aedeagus (reaching nearly to the base of the aedeagus in *K. armillata*), and the longer lateroventral process of the aedeagus less strongly sinuate and reaching to the basal fourth of the aedeagus (more sinuate and reaching to basal third of the aedeagus in *K. konkakinha* gen et sp. nov.).

Etymology

The specific epithet '*konkakinha*' refers to the type locality of the species: Kon Ka Kinh National Park in Central Vietnam.

Type material

Holotype

VIETNAM • ♂ (dissected); Gia Lai Province, Kon Ka Kinh National Park; 14°12′10″ N, 108°18′40″ E; 700–1500 m a.s.l.; 6–13 Jul. 2018; J. Constant, J. Bresseel and X. Vermeersch leg.; Global Taxonomy Initiative Project; I.G.: 33.769; RBINS.

Description

Measurements and ratios. LT: ♂ (n = 1): 5.7 mm; LT/BB = 2.05; LTg/BTg = 2.25; LW/BW = 1.16; BV/LV = 2.00; LF/BF = 0.80.

Head (Fig. 7A–E). Vertex medium brown, slighlty darker along anterior margin, and with obsolete median carina yellowish brown; 2.0 × as broad as long in midline, weakly constricted in middle; disc moderately concave; anterior margin slightly, angularly projecting anteriad; posterior margin rather deeply concave; all margins elevated. Frons brown densely covered in small yellowish mottling, with more or less distinct transverse yellowish marking in middle; row of yellowish tubercles along lateral margins, larger yellowish spots along fronto-clypeal suture; convex, smooth with complete median carina, peridiscal carina obsolete. Genae yellowish brown, distinctly paler than vertex and frons, with small slightly darker area above ocellus; anteroventral angle not projecting anteriad. Clypeus triangular, convex, smooth with distinct meadian carina; anteclypeus yellowish brown with apical portion darker; postclypeus blackish brown. Labium yellowish brown with last segment longer than broad, slightly shorter than penultimate. Antennae with scape short, ring-shaped, dark brown, and pedicel bulbous, brown.

Thorax (Fig. 7A, C–E). Pronotum brown with weak, paler, yellowish median line; subtriangular, projecting anteriorly; smooth with anterior margin carinate and some yellowish tubercles in lateral fields, and pair of impressed points on each side of midline; lateral fields very narrow behind eyes; paranotal lobes brown, pale yellowish under eye and with strong black marking along ventral margin, with small yellowish tubercles, posteroventral angle rounded. Mesonotum brown, with carinae marked with paler

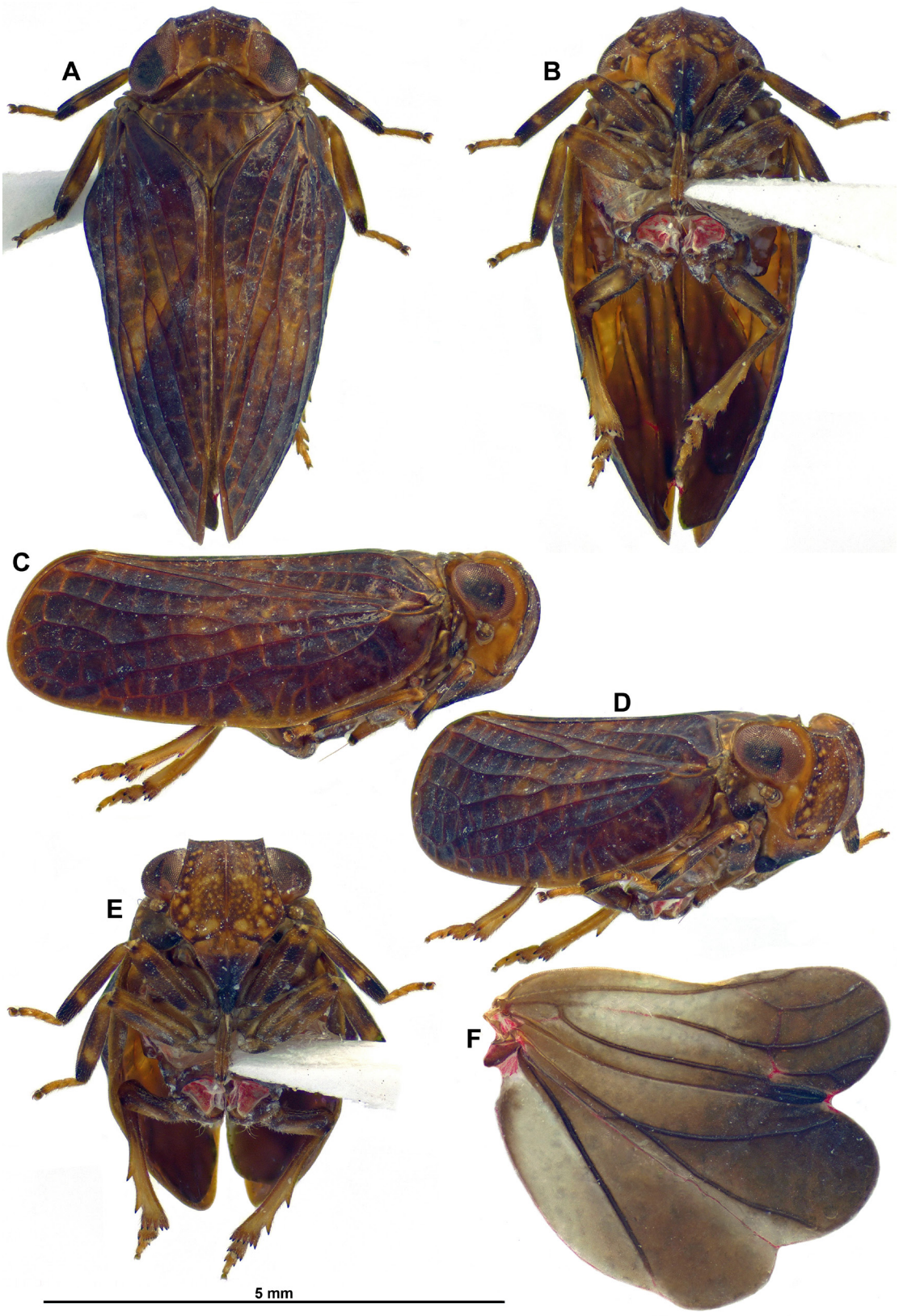

Fig. 7. *Keosarima konkakinha* gen. et sp. nov., holotype, ♂ (RBINS). **A**. Habitus, dorsal view. **B**. Habitus, ventral view. **C**. Habitus, lateral view. **D**. Habitus, anterolateral view. **E**. Habitus, perpendicular view of frons. **F**. Left hind wing (mirrored).

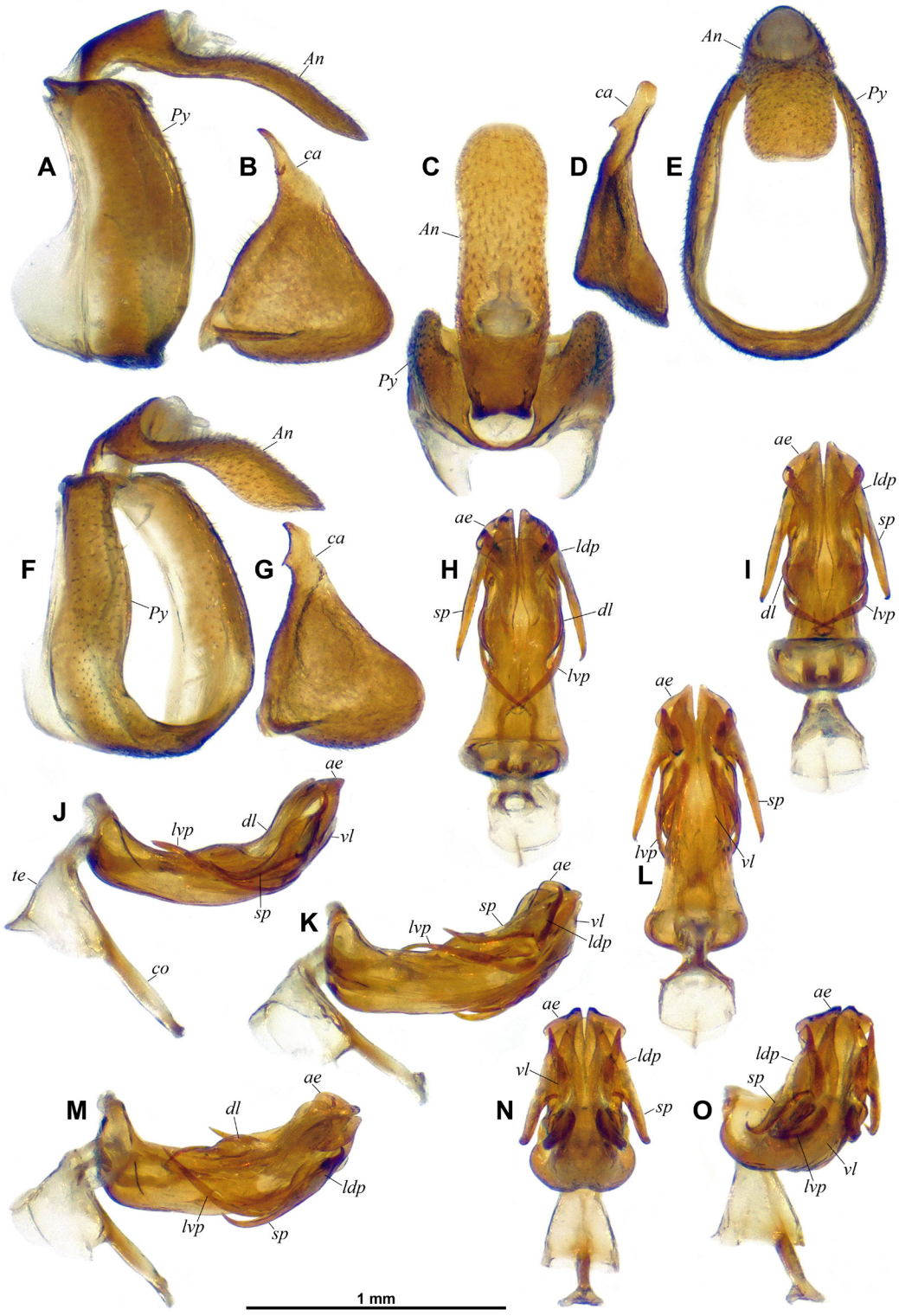

Fig. 8. *Keosarima konkakinha* gen. et sp. nov., holotype, ♂ (RBINS), terminalia. **A**. Pygofer and anal tube, lateral view. **B**. Gonostylus, lateral view. **C**. Pygofer and anal tube, dorsal view. **D**. Gonostylus, caudal view. **E**. Pygofer and anal tube, caudal view. **F**. Pygofer and anal tube, posterolateral view. **G**. Gonostylus, posterolateral view. **H–O**. Aedeagus. **H**. Dorsal view. **I**. Anterodorsal view. **J**. Left lateral view. **K**. Left lateroventral view. **L**. Ventral view **M**. Left laterodorsal view. **N**. Posteroventral view. **O**. Posterolateral view. Abbreviations: see Material and methods.

colour, smooth, weakly convex with shallow depression before scutellum; sublateral (peridiscal) carinae incomplete but rather distinct, some pale tubercles in angles. Tegulae brown.

Tegmina (Fig. 7A–D). Brown with most veins slightly paler, main veins more elevated than cross-veins; distinctly convex, and about 2.2 × as long as wide, with distinct lateral hump including vein ScP+RA slightly before basal ¼; distinct, brown epipleuron; clavus closed, reaching 4/5 of tegmen length. Venation: as in genus description.

Hind wings (Fig. 7F). Blackish brown; veins darker than background, generally black, sometimes marked with red; well developed, with three distinct lobes (Sarimini type) more

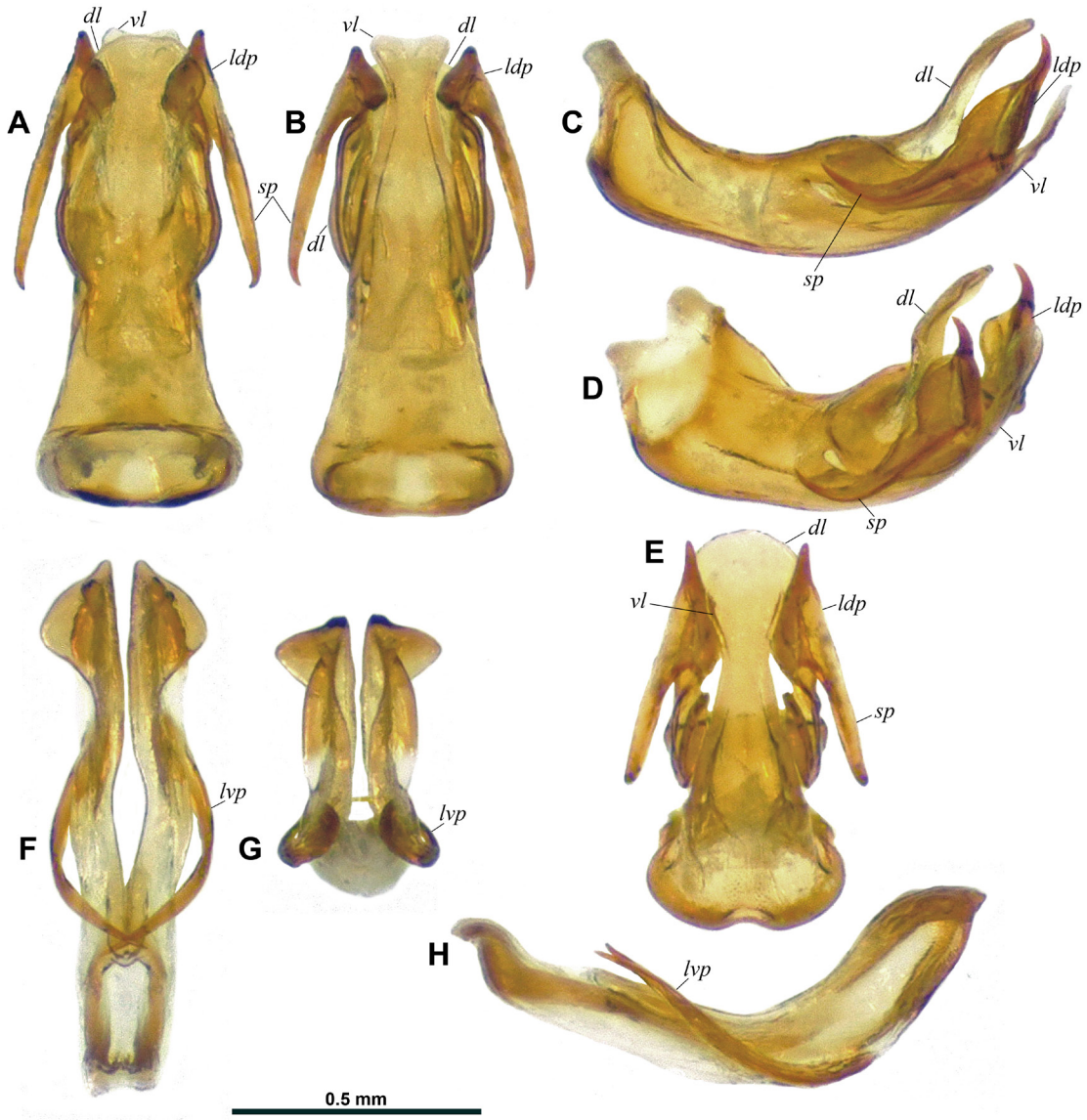

Fig. 9. *Keosarima konkakinha* gen. et sp. nov., holotype, ♂ (RBINS). **A–E**. Periandrium. **A**. Dorsal view. **B**. Ventral view. **C**. Left lateral view. **D**. Posterolateral view. **E**. Posteroventral view. **F–H**. Aedeagus sensu stricto. **F**. Dorsal view. **G**. Posteroventral view. **H**. Left lateral view. Abbreviations: see Material and methods.

or less equal in width; indentation between ScP-R-MP-Cu and Pcu-A1 lobes rather deep. Venation: as in genus description.

Legs (Fig. 7A–E). Generally brown, paler than tegmina; darker rings on profemora (basal and anteapical), wide one about midlength of pro- and mesotibiae, and anteapical on metafemora; pro- and mesotibiae blackish apically; metatibiae darker basally; all spines of posterior legs black apically. Anterior and median legs slightly flattened dorsoventrally, tibiae more slender than corresponding femora; posteroventral margin of pro- and mesofemora with row of minute teeth; tarsi yellowish brown, pro- and mesotarsi rather elongate. Metatibiae with two lateral spines in distal half and six apical spines. Metatarsi moderately short with first segment about as long as combined length of remaining segments. First metatarsomere with two latero-apical and seven intermediate spines arranged in arc. Metatibiotarsal formula: (2) 6/9/2.

Abdomen. Brown, each segment with middle area and two spots along base darker.

Male terminalia (Figs 8–9). Pygofer (*Py* – Fig. 8A, C, E–F) short, about 2.6 × as high as long at midheight in lateral view, with posterior margin broadly rounded in lateral view; in caudal view suboval, 1.4 × as high as wide; dorsally abruptly, deeply notched. Gonostyli (*G* – Fig. 8B, D, G) massive, moderately convex, subtriangular in lateral aspect with posterior margin rounded but not forming distinct lobe, anterodorsal margin distinctly convex and posterodorsal margin slightly sinuate; capitulum (*ca* – Fig. 8B, D, G) elongate, rather strongly projecting dorsad and with poorly distinct neck, curved

Fig. 10. *Keosarima konkakinha* gen. et sp. nov., habitat in Kon Ka Kinh National Park, 17 Jul. 2018.

anterodorsad and more or less evenly tapering towards apex in lateral view, with basilateral laminate process directed lateroventrad in caudal view, and with distal portion anteroposteriorly laminate, apically rounded in caudal view. Anal tube (*An* – Fig. 8A, C, E–F) strongly elongate, dorsoventrally flattened, and oblong, moderately narrow with lateral margins weakly sinuate in dorsal view, about 3.0 × as long as wide in dorsal view and with anal opening in basal ¼; in lateral view, downcurved and sinuate. Aedeagus (*ae* – Figs 8H–O, 9) symmetrical, rather strongly curved posterodorsad in lateral view around distal 2/5. Ventral lobe of periandrium (*vl* – Figs 8J–L, N–O, 9A–E) laminate, spatulate, with apical margin roundly notched. Dorsal lobe of periandrium (*dl* – Figs 8H–J, M, 9A–E) laminate, elongate, spatulate; curved in lateral view in distal portion. Laterodorsal processes of periandrium (*ldp* – Figs 8H–O, 9A–E) arising lateroventrally from middle portion of dorsal lobe, curved posterodorsad and slightly twisted, with apical hook directed dorsad and upcurved; elongate shaft (*sp* – Figs 8H–O, 9A–E) directed cephalad, distinctly upcurved and reaching to about halflength of aedeagus, pointed apically. Aedeagus (sensu stricto, *ae* – 8H–O, 9F–H) surpassing dorsal and ventral lobes of periandrium, bifid with lateral margins sinuate, forming lateral lobe distally in dorsal aspect, and with distal portion dilated in lateral view; pair of elongate, moderately sinuate lateroventral processes (*lvp* – Figs 8H–M, O, 9E–G), ribbon-like, arising at about distal third of aedeagus, somewhat spiralate, distally curved mesad above dorsal lobe of periandrium and reaching to about basal fourth of aedeagus. Connective (*co* – Fig. 8J) well developed, corpus connective long, nearly straight in lateral view, tectiductus (*te* – Fig. 8J) well developed, conical with anteroventral apodemes and wide anterior foramen.

Biology

Keosarima konkakinha gen. et sp. nov. was collected in July, on lower vegetation, in moist evergreen tropical forest at about 700–800 m a.s.l. (Fig. 10) in Kon Ka Kinh National Park.

Distribution

Vietnam: Gia Lai Province, Kon Ka Kinh National Park (Fig. 6).

Discussion

The present study adds a new genus of Sarimini to the fauna of Vietnam and Cambodia and one new species to the fauna of each country. As a result, Cambodia now counts four species of Issidae in three genera, including two species of Sarimini, both currently known only from Cambodia, in two genera; Vietnam now counts 59 species, including eight species of Sarimini in seven genera, with five of these Sarimini species known only from Vietnam (Constant & Bartlett 2019; Constant & Pham 2024a; Zhang *et al.* 2020).

The new genus *Keosarima* Constant gen. nov. is externally close to *Tetrica* Stål, 1866; however, it can be separated from the latter by the tegmina more elongate with the rounded angle of the costal margin placed more basally (before midlength) and by the hind wings with lobe CuP-Pcu-A1 without a closed cell. Our interpretation of the genus *Tetrica* is based on its type species *T. fusca* Stål, 1870, as illustrated from its type specimen by Gnezdilov *et al.* (2015). Indeed, as mentioned long ago by Melichar (1906) or Fennah (1956), the genus appears to be inconsistent and needs revision / splitting / transfer of some species to other genera. As recent examples, *Tetrica scapularis* Jacobi, 1928 was transferred to the genus *Orinda* Kirkaldy, 1907 by Gnezdilov & Fletcher (2010), and later to the subgenus *Scapulorinda* Constant & Semeraro, 2023 of *Orinda* by Constant & Semeraro (2023), and Gnezdilov *et al.* (2015) transferred one species, *Terica fasciatifrons* Melichar, 1906, to the genus *Papunega* Gnezdilov & Bourgoin, 2015.

Acknowledgements

JC thanks Heng Neathmony (Ministry of Environment) and Oliver Griffin (Wildlife Conservation Society), and the authorities they respectively represent for supporting and facilitating the fieldwork in

KSWS; Lisa Arensen and Megan English of the School for Field Studies (SFS) for the kind invitation to participate as a field supervisor in the SFS 3800 Conservation Science and Practice course in KSWS; Phallin Heang (Ministry of Environment), Tony Yon (SFS), Arden Simone (SFS) and the SFS entomology group students Lian Gamble, Jesse Gross and Eva Paradiso for their company and enthusiasm in the field; Philip Mangis, Georgina Lloyd Rivera, Rattanak Sovan Dyna and Anni Franke (SFS) for their efficient help with the organization and logistics; Thierry Backeljau and Frederik Hendrickx (RBINS) for their support to this project; Wouter Dekoninck for identifying the ants. We thank Van Dat Nguyen, Thanh Trung Vu (VNMN), Joachim Bresseel and Xavier Vermeersch (collaborators, RBINS) for all their help and friendship during the collecting trip; the authorities of Kon Ka Kinh National Park who supported our studies; Patrick Grootaert, Luc Janssens de Bisthoven and Marie-Lucie Susini (RBINS) for their support to our projects in Vietnam. This study is a result of the SFS 3800 Conservation Science and Practice course and of the Global Taxonomy Initiative Project "A step further in the Entomodiversity of Vietnam" supported through a grant issued by the capacity building Programme of the Belgian Global Taxonomy Initiative National Focal Point that runs under the CEBioS Programme with financial support from the Belgian Directorate-General for Development Cooperation (DGD). The present study was partly funded by the Vietnam Academy of Science and Technology (VAST) under the grant number CBCLCA.12/25-27 for the second author.

References

Bourgoin T. 2025. FLOW (Fulgoromorpha Lists on The Web): a world knowledge base dedicated to Fulgoromorpha. ver. 8, updated [21 Jan. 2025]. Available from https://flow.hemiptera-databases.org/flow/ [accessed 21 Jan. 2025].

Bourgoin T. & Huang J. 1990. Morphologie comparée des genitalia mâles des Trypetimorphini et remarques phylogénétiques (Hemiptera: Fulgoromorpha: Tropiduchidae). *Annales de la Société entomologique de France, Nouvelle Série* 26 (4): 555–564. https://doi.org/10.1080/21686351.1990.12277614

Bourgoin T., Wang R.R., Asche M., Hoch H., Soulier-Perkins A., Stroinski A., Yap S. & Szwedo J. 2015. From micropterism to hyperpterism: recognition strategy and standardized homology-driven terminology of the fore wing venation patterns in planthoppers (Hemiptera: Fulgoromorpha). *Zoomorphology* 134 (1): 63–77. https://doi.org/10.1007/s00435-014-0243-6

Constant J. 2004. Révision des Eurybrachidae (I). Le genre *Amychodes* Karsch, 1895 (Homoptera: Fulgoromorpha: Eurybrachidae). *Bulletin de l'Institut royal des Sciences naturelles de Belgique* 74: 11–28.

Constant J. 2021. *Laohiracia acuta*, a new genus and species of Parahiraciini planthopper with elongate cephalic process from Laos (Hemiptera: Fulgoromorpha: Issidae). *Belgian Journal of Entomology* 118: 1–15.

Constant J. & Bartlett C.R. 2019. New records and species in five planthopper families from Keo Seima Wildlife Sanctuary, Cambodia with checklist of Cambodian planthoppers (Hemiptera: Fulgoromorpha). *Belgian Journal of Entomology* 83: 1–27.

Constant J. & Jiaranaisakul K. 2020. A strikingly coloured new species of *Hemisphaerius* Schaum, 1850 from Thailand (Hemiptera: Fulgoromorpha: Issidae). *Belgian Journal of Entomology* 98: 1–16.

Constant J. & Pham H.T. 2024a. Sixteen issid planthopper species in one day in Dong Son-Ky Thuong Nature Reserve in North Vietnam: Eight new species, one new genus and additional new records (Hemiptera: Fulgoromorpha: Issidae). *European Journal of Taxonomy* 919: 1–87. https://doi.org/10.5852/ejt.2024.919.2407

Constant J. & Pham H.T. 2024b. Issid planthoppers from Bach Ma and Phong Dien in Central Vietnam. I. Tribe Parahiraciini (Hemiptera: Fulgoromorpha: Issidae). *European Journal of Taxonomy* 975: 1–64. https://doi.org/10.5852/ejt.2024.975.2769

Constant J. & Pham H.T. 2025. Issid planthoppers from Bach Ma and Phong Dien in Central Vietnam: (II) Tribe Hemisphaeriini (Hemiptera: Fulgoromorpha: Issidae). *European Journal of Taxonomy* 994: 1–76. https://doi.org/10.5852/ejt.2025.994.2911

Constant J. & Semeraro L. 2023. The Australian issid planthopper genus *Orinda* Kirkaldy, 1907: New subgenera, new species, host plant and identification key (Hemiptera: Fulgoromorpha: Issidae). *European Journal of Taxonomy* 891: 128–150. https://doi.org/10.5852/ejt.2023.891.2277

Fennah R.G. 1956. Fulgoroidea from southern China. *Proceedings of the California Academy of Sciences* 28 (4): 441–527.

Gnezdilov V.M. 2003. Review of the family Issidae (Homoptera, Cicadina) of the European fauna, with notes on the structure of ovipositor in planthoppers. *Meetings in Memory of N.A. Cholodkovsky* 56 (1): 1–145. [In Russian with English summary.]

Gnezdilov V.M. 2013. Modern classification and the distribution of the family Issidae Spinola (Homoptera, Auchenorrhyncha: Fulgoroidea). *Entomologicheskoe Obozrenie* 92 (4): 724–738 [In Russian.] [English translation in *Entomological Review* (2014) 94 (5): 687–697).] https://doi.org/10.1134/S0013873814050054

Gnezdilov V.M. 2014. Review of Indochinese Issini Spinola, 1839 (Hemiptera, Fulgoroidea, Issidae), with description of a new genus from Laos. *Zoosystema* 36 (4): 761–770. https://doi.org/10.5252/z2014n4a4

Gnezdilov V.M. 2017. To the knowledge of the African fauna of the family Issidae (Hemiptera, Auchenorrhyncha: Fulgoroidea) with descriptions of new genera and new species. *Entomological Review* 96 (9): 1234–1260. https://doi.org/10.1134/S0013873816090074

Gnezdilov V.M. & Fletcher M.J. 2010. A review of the Australian genera of the planthopper family Issidae (Hemiptera: Fulgoromorpha) with description of an unusual new species of *Chlamydopteryx* Kirkaldy. *Zootaxa* 2366 (1): 35–45. https://doi.org/10.11646/zootaxa.2366.1.2

Gnezdilov V.M., Holzinger W.E. & Wilson M.R. 2014. The Western Palaearctic Issidae (Hemiptera, Fulgoroidea): an illustrated checklist and key to genera and subgenera. *Proceedings of the Zoological Institute RAS* 318 (Supplement 1): 1–124. Available from http://www.zin.ru/journals/trudyzin/doc/vol_318_s1/TZ_318_1_Supplement_Gnezdilov.pdf [accessed May 2024].

Gnezdilov V.M., Le Cesne M., Soulier-Perkins A. & Bourgoin T. 2015. New Guinean Issidae: description of new taxa in a poorly known island fauna (Hemiptera, Fulgoroidea). *Zootaxa* 3904 (1): 82–94. https://doi.org/10.11646/zootaxa.3904.1.4

Gnezdilov V.M., Konstantinov F.V. & Namyatova A.A. 2022. From modern to classic: Classification of the planthopper family Issidae (Hemiptera, Auchenorrhyncha, Fulgoroidea) derived from a total-evidence phylogeny. *Systematic Entomology* 47 (4): 551–568. https://doi.org/10.1111/syen.12546

Melichar L. 1906. Monographie der Issiden. (Homoptera). *Abhandlungen der K. K. Zoologisch-Botanischen Gesellschaft in Wien* 3: 1–327.

O'Brien L.B. & Wilson S.W. 1985. Planthoppers systematics and external morphology. *In*: Nault L.R. & Rodriguez J.G. (eds) *The Leafhoppers and Planthoppers*: 61–102. John Wiley & Sons, New York.

Shorthouse D.P. 2010. SimpleMappr, an online tool to produce publication-quality point maps. Available from https://www.simplemappr.net [accessed Jan. 2025].

Wang M.-L., Zhang Y.-L. & Bourgoin T. 2019. On the tribe Sarimini with two new genera from south of China (Hemiptera, Fulgoromorpha, Issidae). *Zootaxa* 4706 (2): 375–383. https://doi.org/10.11646/zootaxa.4706.2.10

Zhang Y.-L., Che Y.-L., Meng R. & Wang Y.-L. 2020. *Hemiptera. Caliscelidae. Issidae. Insecta*. *Fauna Sinica*. *Vol. 70*. Science Press, Beijing.

Printed versions of all papers are deposited in the libraries of four of the institutes that are members of the *EJT* consortium: Muséum national d'Histoire naturelle, Paris, France; Meise Botanic Garden, Belgium; Royal Museum for Central Africa, Tervuren, Belgium; Royal Belgian Institute of Natural Sciences, Brussels, Belgium. The other members of the consortium are: Natural History Museum of Denmark, Copenhagen, Denmark; Naturalis Biodiversity Center, Leiden, the Netherlands; Museo Nacional de Ciencias Naturales-CSIC, Madrid, Spain; Leibniz Institute for the Analysis of Biodiversity Change, Bonn – Hamburg, Germany; National Museum of the Czech Republic, Prague, Czech Republic; The Steinhardt Museum of Natural History, Tel Aviv, Israël.