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Belgian Journal of Entomology

**Two new Nogodinidae from Vietnam
in the genera *Orthophana* Melichar, 1923
and *Goniopsarites* Meng, Wang & Wang, 2014
(Hemiptera: Fulgoromorpha: Nogodinidae)**

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Abstract

A fourth species of the genus *Orthophana* Melichar, 1923 (Nogodinidae, Tongini), *O. (Orthophana) maichiae* sp. nov. is described from Bach Ma National Park in Central Vietnam and a second species of *Goniopsarites* Meng, Wang & Wang, 2014 (Nogodinidae, Pisachini), *G. tonkinensis* sp. nov., from Ba Be and Cuc Phuong national parks, and from Me Linh Biodiversity Station in Northern Vietnam. *O. maichiae* sp. nov. is compared with the three species hitherto described in the genus, *O. (Orthophana) bidouzensis* Constant & Pham, 2014, *O. (Orthophana) spinata* Melichar, 1923 and *O. (Eupharos) tamdaoina* Gnezdilov & Constant, 2014, and *G. tonkinensis* sp. nov. with *G. fronticonvexus* Meng, Wang & Wang, 2014. An updated key to the subgenera and species of the genus *Orthophana* is given. *Habitus* and male genitalia are illustrated and a distribution map is provided. Male genitalia of a species of *Orthophana* are described and illustrated for the first time. For the first time, the genus *Goniopsarites* is recorded from Vietnam, and behavioural observations and photographs of live specimens are provided.

Keywords: Global Taxonomic Initiative, Planthopper, Fulgoroidea.

Introduction

Nearly one century after the description of the genus *Orthophana* and its single species by MELICHAR (1923), GNEZDILOV & CONSTANT (2014) and CONSTANT & PHAM (2014) added successively two species and one new subgenus from Vietnam. *Orthophana (Orthophana) spinata* Melichar, 1923 was described from Malaysia, and *O. (Orthophana) bidouzensis* Constant & Pham, 2014 and *Orthophana (Eupharos) tamdaoina* Gnezdilov & Constant, 2014 from Central and North Vietnam respectively.

Details on the nomenclatural history of the genus were given in GNEZDILOV & CONSTANT (2014) and CONSTANT & PHAM (2014).

A recent complete check of the older papered material in the collections of the Vietnam National Museum of Nature (VNMN) in Hanoi in the framework of the Global Taxonomic

Initiative project “A step further in the entomodiversity of Vietnam” (Part 6), allowed the discovery of a male of an additional new species of *Orthophana* (*Orthophana*).

At the same time, examination of material collected during fieldwork in the frame of the same project revealed a new species of *Goniopsarites* Meng, Wang & Wang, 2014, a genus recently erected for one species from China (Hainan, Guangdong): *G. fronticonvexus* Meng, Wang & Wang, 2014.

The present paper aims at describing these two new species.

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 in the forest. One of the specimens illustrated alive (Fig. 5 A–D) was transferred in a mesh pop up cage (Exo Terra Explorarium®) for photography. All live photographs were taken with a Sony DSC-H300 camera.

The genitalia were extracted after boiling the abdomen about one hour in a 10% solution of potassium hydroxide (KOH) at about 100°C. Some drops of saturated alcoholic Chlorazol black solution were added for contrasting (CARAYON, 1969). The pygofer was separated from the abdomen and the aedeagus dissected with a needle blade for examination. The whole was then placed in glycerine for preservation in a tube attached to the pin of the corresponding specimen.

The measurements were taken as in CONSTANT (2004) and the following abbreviations are used:

BF	=	maximum breadth of the frons
BTg	=	maximum breadth of the tegmen
BV	=	maximum breadth of the vertex
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

Photographs were taken with a Canon EOS 700D camera equipped with a Tamron DI SP 90 mm Macro lens, staked with CombineZ software and optimized with Adobe Photoshop CS3. Observations were done with a Leica MZ8 stereo microscope.

Tegmina and wing terminology follows BOURGOIN *et al.* (2015). The definition of the subgenus *Orthophana* (*Orthophana*) given by CONSTANT & PHAM (2014) and the definition of the genus *Goniopsarites* given by MENG *et al.* (2014) are followed.

Acronyms used for the collections.

RBINS: Royal Belgian Institute of Natural Sciences, Brussels, Belgium.

VNMN: Vietnam National Museum of Nature, Hanoi, Vietnam.

Taxonomy

Family **Nogodinidae** Melichar, 1898

Subfamily **Nogodininae** Melichar, 1898

Tribe **Tongini** Kirkaldy, 1907

Genus ***Orthophana*** Melichar, 1923

FLOW (BOURGOIN, 2016): <http://hemiptera-databases.org/flow/?page=explorer&db=flow&lang=en&card=taxon&rank=genus&id=17693>

Orthophana MELICHAR, 1923: 11. Type species: *Orthophana spinata* Melichar, 1923 (by original designation).

Species included

- O. (Orthophana) bidouensis* Constant & Pham, 2014 [Vietnam, Bidoup National Park]
O. (Orthophana) maichiae sp. nov. [Vietnam, Bach Ma National Park]
O. (Orthophana) spinata Melichar, 1923 [Peninsular Malaysia]
O. (Eupharos) tamdaoina Gnezdilov & Constant, 2014 [Vietnam, Tam Dao National Park]

Identification key to the subgenera and species of *Orthophana*

(adapted from CONSTANT & PHAM, 2014)

1. Branches of radius of tegmina with a common stem basally and costal vein furcating apically; tegmina without apical tooth-shaped spine. Ratio LTg/BTg = 1.93. Hind tibia with two lateral spines distally. Lateral margins of frons not projecting laterally before clypeus. General coloration brown or dark brown. Larger, total length: 14–15 mm – North Vietnam (subgenus *Eupharos*) ***O. tamdaoina* Gnezdilov & Constant, 2014**
- Branches of radius of tegmina separated since basal cell and costal vein simple; tegmina with apical tooth-shaped spine. Ratio LTg/BTg = 2.2. Hind tibia with one lateral spine distally. Lateral margins of frons projecting laterally before clypeus. General coloration green or brown. Smaller, total length < 12.5 mm – Malaysia and Vietnam (subgenus *Orthophana*) **2**
2. General coloration green (can turn to yellow-brown in collection specimens); costal margin of tegmina smoothly rounded or straight on apical half..... **3**
- General coloration brown with dark brown markings; hind wings yellow and largely infusate; costal margin of tegmina sinuate on posterior half. Total length: 11.9 mm – Central Vietnam..... ***O. bidouensis* Constant & Pham, 2014**
3. Tegmina more elongate: LTg/BTg = 2.30. Costal margin of tegmina straight on apical half (Fig. 1 A). Dorsal margin of head straight on basal half in lateral view (Fig. 1 A) – Central Vietnam ***O. maichiae* sp. nov.**
- Tegmina less elongate: LTg/BTg = 2.20. Costal margin of tegmina smoothly rounded. Head regularly rounded in lateral view. Total length: 12.5 mm – Malaysia..... ***O. spinata* Melichar, 1923**

***Orthophana (Orthophana) maichiae* sp. nov.**

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Figs 1-2, 6.

ETYMOLOGY. The species is named after Maichi, the daughter of Prof. Nguyen Trung Minh, director of VNMN.

TYPE MATERIAL. Holotype ♂ (dissected, right hind wing mounted): Vietnam: [Coll. V.N.M.N., Vietnam, Hue prov., Bach Ma National Park, 16°12'N 107°52'E, 8.VI.2002, 1300 m, Leg. H.T. Pham] (VNMN).

DIAGNOSIS. The species is easily separated from (1) *O. (Eupharos) tamdaoina* by the apical spinose process of the tegmina (absent in *tamdaoina*) and by veins Sc and R of tegmina running separately from the basal cell (fused basally in *tamdaoina*), from (2) *O. (Orthophana) spinata* by the more elongate tegmina, posterior wings and head, from (3) *O. (Orthophana) bidoupensis* by its yellow-brown colour (probably green in fresh specimens) (brown in *bidoupensis*) and more elongate tegmina, posterior wings and head.

DESCRIPTION.

Measurements and ratios (♂; n = 1): LT = 15.0 mm; LTg/BTg = 2.30; LV/BV = 1.47; LF/BF = 1.16.

Head: yellow-brown. Frons and vertex deeply concave, not separated by a carina, elongate with lateral margins carinate (Fig. 1 A-C). Head elongate, roundly projecting anteriorly in lateral view with antero-ventral angle; genae before eye as long as breadth of eye (Fig. 1 A). Posterior margin of vertex concave and slightly carinate (Fig. 1 C). Lateral carinae of frons slightly projecting laterally then curved internally in obtuse angle before clypeus (Fig. 1 B). Fronto-clypeal suture transverse, deeply grooved (Fig. 1 B). Clypeus strongly convex, not carinate, much longer than broad (Fig. 1 B). Scape ring-shaped; pedicel subcylindrical, about 1.5 times longer than broad (Fig. 1 B).

Thorax: pronotum yellow-brown, smooth with anterior margin strongly curved and posterior margin straight (Fig. 1 A, C). Paradiscal fields of pronotum wide behind eyes (Fig. 1 A, C). Paranotal lobes of pronotum elongate and broad, without carina (Fig. 1 A). Mesonotum yellow-brown with slight median groove; lateral carinae rather straight (Fig. 1 C).

Tegmina: crescent-shaped without hypocostal plate, yellow brown with some minute yellow spots. Costal margin broadly rounded on basal half, obliquely straight nearly to apex and rounded subapically in lateral view (Fig. 1 A); sutural margin straight on basal $\frac{3}{4}$, obliquely elevated on apical $\frac{1}{4}$ (Fig. 1 A). Apex with tooth-shaped spine formed by fusion of veins CuA₁₊₂ and MP₁₊₂ (Fig. 1 A, C). Costal area broad (Fig. 1 A). Clavus slightly surpassing $\frac{2}{3}$ of tegmen length, closed (Fig. 1 A, C).

Venation: (Fig. 1 A, C) C visible to slightly further than half of tegmen length, densely furcate; ScP and R running separately from basal cell, simple, subparallel; MP furcate at basal third into MP₁₊₂ and MP₃₊₄ not subdivided latter, running in parallel; CuA furcate after half of tegmen; CuA₂ fused with costal margin after clavus and merging with CuA₁ before apex; PCu and A₁ fused at half of clavus.

Hind wings: (Fig. 1 D) pale yellow, slightly infusate medially. Well developed, bilobed apically. Costal margin concave with coupling lobe at middle. Veins slightly darker; veins black on apical half of anal area.

Venation (Fig. 1 D): ScR forked at wing coupling apparatus level; RA and RP single; MP forked in single M₁₊₂ and M₃₊₄; CuA single almost straight; CuP single, anterobasally concave then subparallel to CuA; Pcu probably single, A₁ and A₂ bifurcate after middle line.

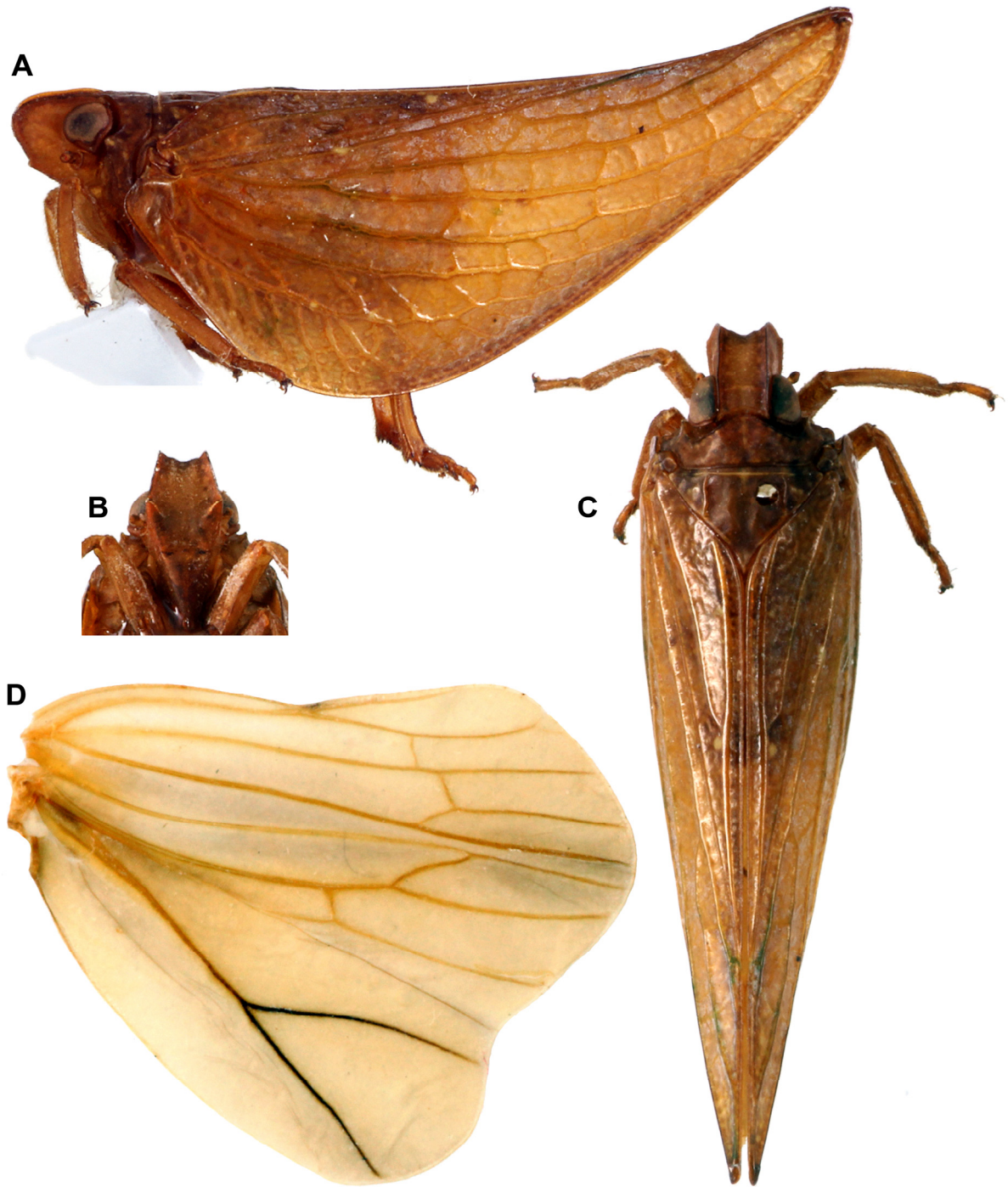


Fig 1. *Orthophana (Orthophana) maichiae* sp. nov., holotype, total length: 15.0 mm. A, habitus, lateral view. B, head, antero-ventral view. C, habitus, dorsal view. D, right posterior wing.

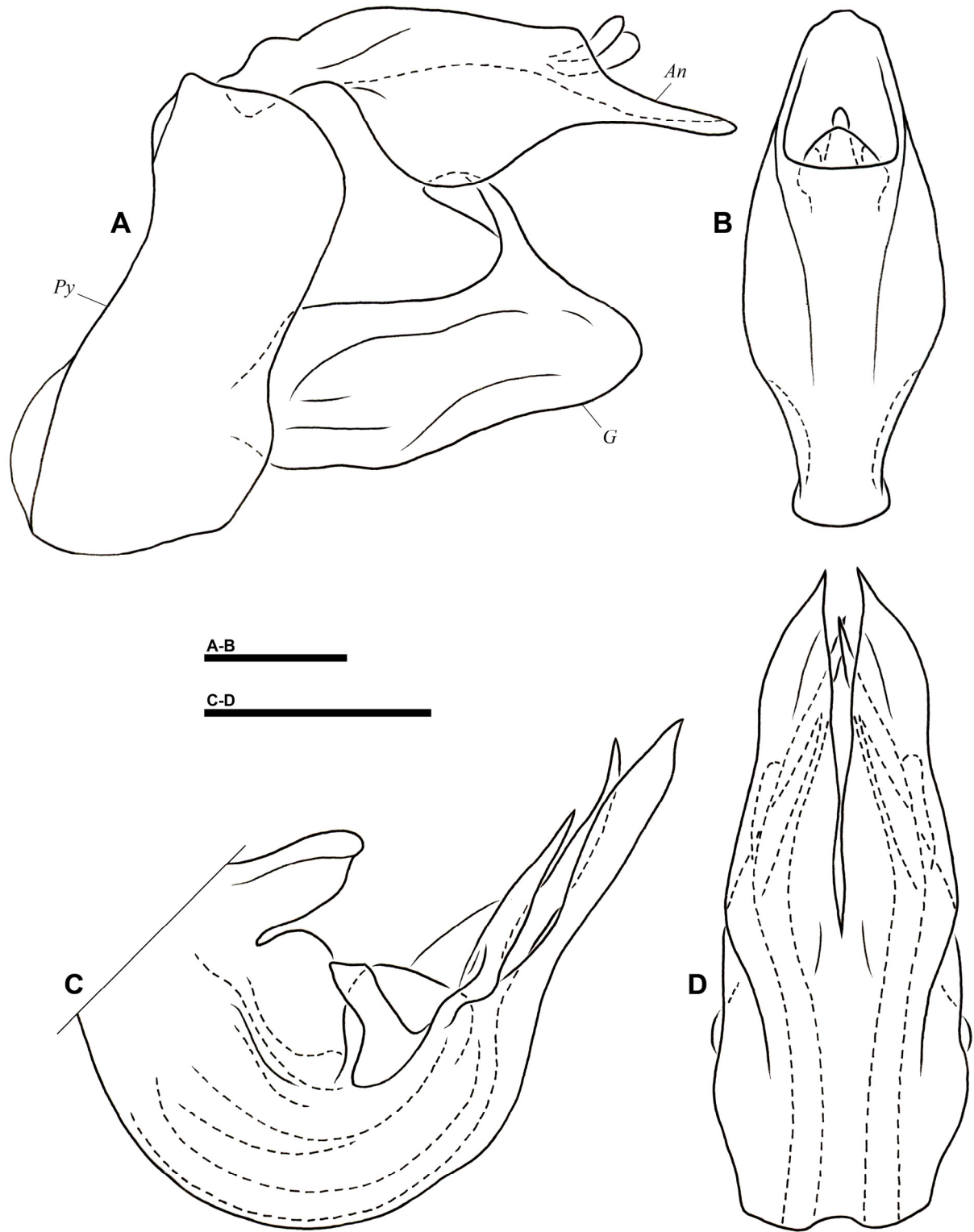


Fig. 2. *Orthophana* (*Orthophana*) *maichiae* sp. nov., holotype, male genitalia. A, pygofer, anal tube and gonostylus, left lateral view. B, anal tube, dorsal view. C, aedeagus, left lateral view. D, aedeagus, posterior view. Scale = 1 mm. An: anal tube; G: gonostylus; Py: pygofer.

Legs: (Fig. 1 A, C) elongate and slender. All tibiae with strong longitudinal carinae. Metatibiae with one anteapical lateral spine and 8-9 apical spines. Metatarsomeres with long setae ventrally; first and second with 2 strong lateral spines, first longer than second and with 10 small ventral spines arranged in arc ventrally. Metatibiotarsal formula: 1+8-9/10/0.

Genitalia ♂: pygofer higher than long in lateral view, with anterior and posterior margins sinuate; posterodorsal angle rounded (Fig. 2 A). Anal tube elongate, lanceolate with apical margin truncate in dorsal view (Fig. 2 B); 2.5 times longer than broad with maximum breadth at basal 1/3 in dorsal view (Fig. 2 B); dorsoventrally flattened on apical 1/3 after anal opening; lateral margins strongly produced ventrally into broadly rounded lobe (Fig. 2 A). Gonostyli (Fig. 2 A) elongate and rather narrow in lateral view, rounded apically and with strong process before apex projecting dorso-internally on dorsal margin; ventral margin slightly excavate after middle; dorsal process slightly twisted internally. Aedeagus strongly curved in lateral view, with a series of simple, elongate, apically pointed and narrow processes directed posterodorsally (Fig. 2 C). Periandrium deeply notched posteriorly (Fig. 2 D), forming a pair of dorsoventrally depressed processes (Fig. 2 C-D); shorter pair of laterodorsal processes with basal laminate process directed dorsoanteriorly and with apical margin truncate (Fig. 2 C). Phallus membranous medially and with pair of sclerified processes between processes of periandrium (Fig. 2 C-D).

BIOLOGY. The holotype was collected in moist evergreen mountain forest (1300 m asl.).

DISTRIBUTION. Currently recorded from a single place in Central Vietnam (Fig. 6).

Tribe **Pisachini** Fennah, 1978

Genus **Goniopsarites** Meng, Wang & Wang, 2014

FLOW (BOURGOIN, 2016): <http://hemiptera-databases.org/flow/?page=explorer&db=flow&lang=en&card=taxon&rank=genus&id=19154>

Goniopsarites MENG *et al.*, 2014: 80, figs 1-27.

Type species: *Goniopsarites fronticonvexus* Meng, Wang & Wang, 2014 (by original designation).

Species included

G. fronticonvexus Meng, Wang & Wang, 2014

[China: Hainan and Guangdong]

G. tonkinensis sp. nov.

[Vietnam: Ba Be and Cuc Phuong national parks, and Me Linh Biodiversity Station]

***Goniopsarites tonkinensis* sp. nov.**

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Figs 3-6.

TYPE MATERIAL. Holotype ♂ (dissected, right hind wing mounted): Vietnam: [Coll. I.R.Sc.N.B., Vietnam, BacKan pr., BaBe N.P., 22°24'19"N 105°36'55"E, 2-7.VII.2015 day collecting, Leg. J. Constant & J. Bresseel, I.G.: 33.092].

Paratypes (2♂, 3♀): 3♀: same data as holotype (RBINS; 1♀: VNMN); 1♂ (dissected): [Coll. I.R.Sc.N.B., Vietnam, Vinh Phuc pr., MeLinh B.S., 21°23'38"N 105°42'56"E, 30.VI-1.VII.2015 day collecting, Leg. J. Constant & J. Bresseel, I.G.: 33.092] (VNMN); 1♂ (dissected): [Coll. I.R.Sc.N.B., Vietnam, Cuc Phuong N.P., 20°19'00"N 105°36'30"E, 19-23.VII.2011 Malaise trap, Leg. J. Constant & J. Bresseel, I.G.: 31.933] (RBINS).

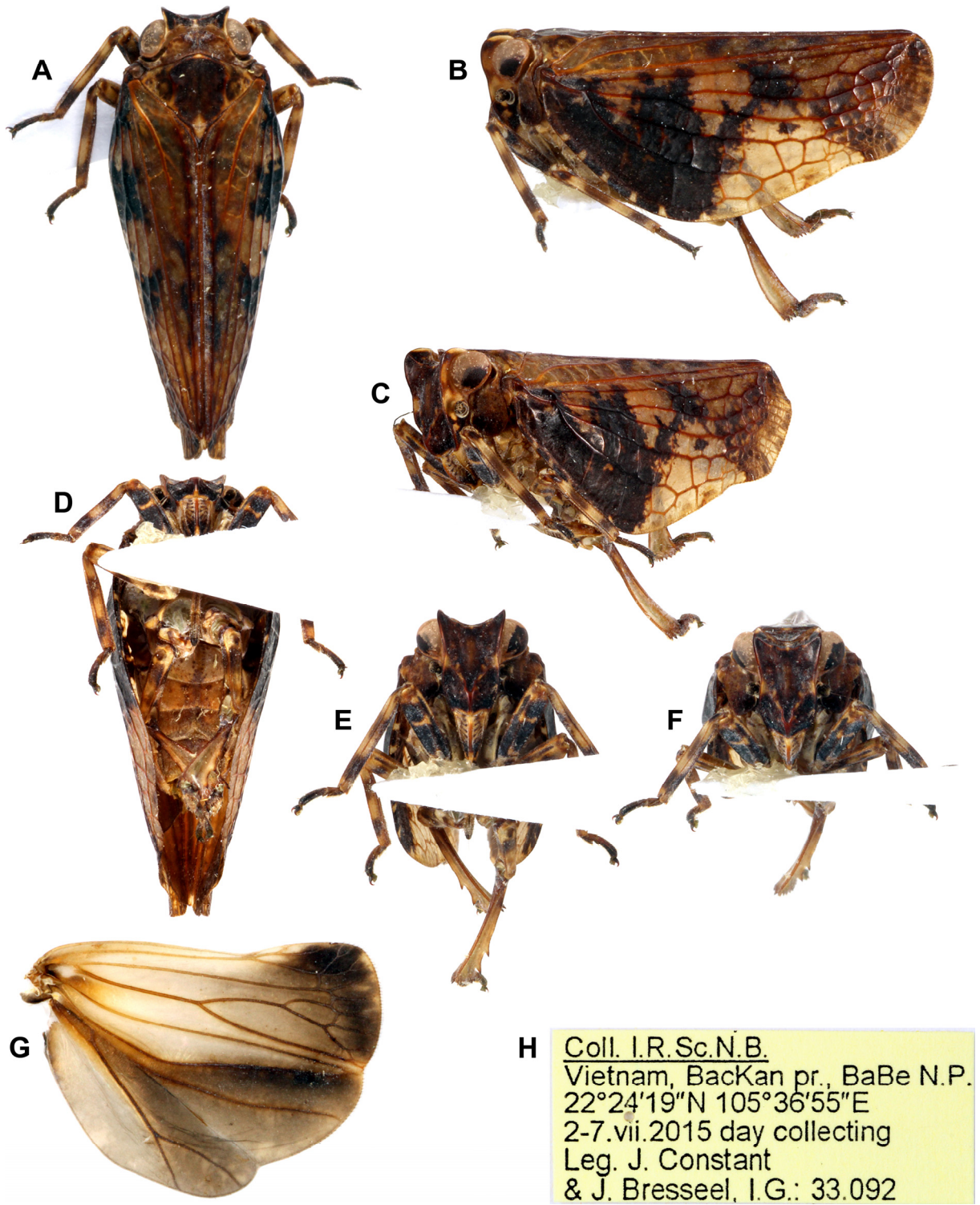


Fig. 3. *Goniopsarites tonkinensis* sp. nov., holotype, total length: 11.6 mm. A, habitus, dorsal view. B, habitus, lateral view. C, habitus, half-lateral view. D, habitus, ventral view. E, habitus, normal view of frons. F, habitus, frontal view. G, right posterior wing. H, label.

DIAGNOSIS. The species is very close externally to *G. fronticonvexus* Meng, Wang & Wang, 2014 and must be separated from the latter by the study of male genitalia. It can be separated from the latter by the anal tube more strongly curved and broader apically in lateral view, and with lateral margins more strongly sinuate and narrowing basally in dorsal view; the apex of the phallus more elongate and curved ventrally at apex (not curved and roundly truncate apically in *G. fronticonvexus*); lateral processes of aedeagus strongly sinuate (regularly curved in *G. fronticonvexus*), and especially the pair of posterior spinose processes of perianthrium (absent in *G. fronticonvexus*).

DESCRIPTION.

Measurements and ratios: LT (n = 3): 12.0 mm (11.0–13.4); LTg/BTg = 2.05; BV/LV = 9.0; LF/BF = 1.31.

Head: black-brown with yellow markings along carinae of frons and on lateral carinae of vertex; genae largely variegated yellow-brown; clypeus yellowish, black on sides near apex and with brown oblique lines on each side (Fig. 3 A–F). Vertex concave with lateral margins carinate and with anterior and posterior margins concave in dorsal view and slightly carinate (Fig. 3 A–C, E–F). Frons elongate, broader dorsally, concave with median carina on middle of disc and with a strong projection on ventral half marked by 2 oblique carinae joining at summit of projection and further extending on clypeus; projection forming an obtuse angle in lateral view; lateral margins of frons carinate (Fig. 3 C–F). Fronto-clypeal suture grooved and rounded ventrally (Fig. 3 C–E). Clypeus elongate, narrower and shorter than frons, and showing a strong median carina, nearly laminate (Fig. 3 D–F); roundly convex in lateral view (Fig. 3 C). Labium elongate and narrow, yellow-brown, slightly surpassing posterior coxae (Fig. 3 D). Scape ring-shaped; pedicel subglobose (Fig. 3 B–C, E–F).

Thorax: pronotum variegated yellow-brown with median carina slightly marked (Fig. 3 A); lateral fields of prothorax broadening ventrally and rounded apically (Fig. 3 B–C). Mesonotum (Fig. 3 A) dark brown with yellowish markings on sides and yellowish spot on scutellum; median carina obsolete; lateral carinae uniting anteriorly in a rounded carina parallel to posterior margin of pronotum. Tegulae brown (Fig. 3 B–C).

Tegmina: elongate with costal margin broadly rounded on proximal half and strongly sinuate on posterior half (Fig. 3 B); pale brown with large irregular black marking on basal half, not extending on clavus; large pale yellowish marking along costal margin at mid-length; costal area narrow with small pale yellowish spots; clavus with darker markings on posterior half (Fig. 3 A–B). Hypocostal plate narrow, visible on proximal third (Fig. 3 D). Posterior margin obliquely rounded (Fig. 3 B); clavus closed, extending to posterosutural angle (Fig. 3 A–B). Veins reddish, black in black zones (Fig. 3 A–B).

Hind wings: (Fig. 3 G) brown with blackish markings and large basal yellow-brown area. Well developed with posterior margin trilobed. Costal margin sinuate with coupling apparatus at 2/3 of length.

Venation (Fig. 3 G): ScR forked at wing coupling apparatus level; Sc and RA single, RP with 4 terminals; MP forked distally in single M_{1+2} and M_{3+4} ; CuA forking in CuA1 with 3 terminals and CuA2 forking very distally in two terminals; CuP single, almost straight merging at the wing margin with PCu anterobasally strongly concave; A_1 forked before middle line, A_2 forked in its last third.

Legs: (Fig. 3 A–B, D–E) profemora black-brown with narrow pale yellow rings; mesofemora pale yellow with brown rings; pro- and mesotibiae elongate and slender, with 6 rings alternatively pale yellow and brown, basal one brown, apical one yellow; metafemora yellow with brown markings; metatibiae rather short, broadening towards apex, pale yellow, infuscate basally, with 2 strong lateral spines near apex. Tarsi brown, darker apically. Metatibiotarsal formula: 2+10/7/0.

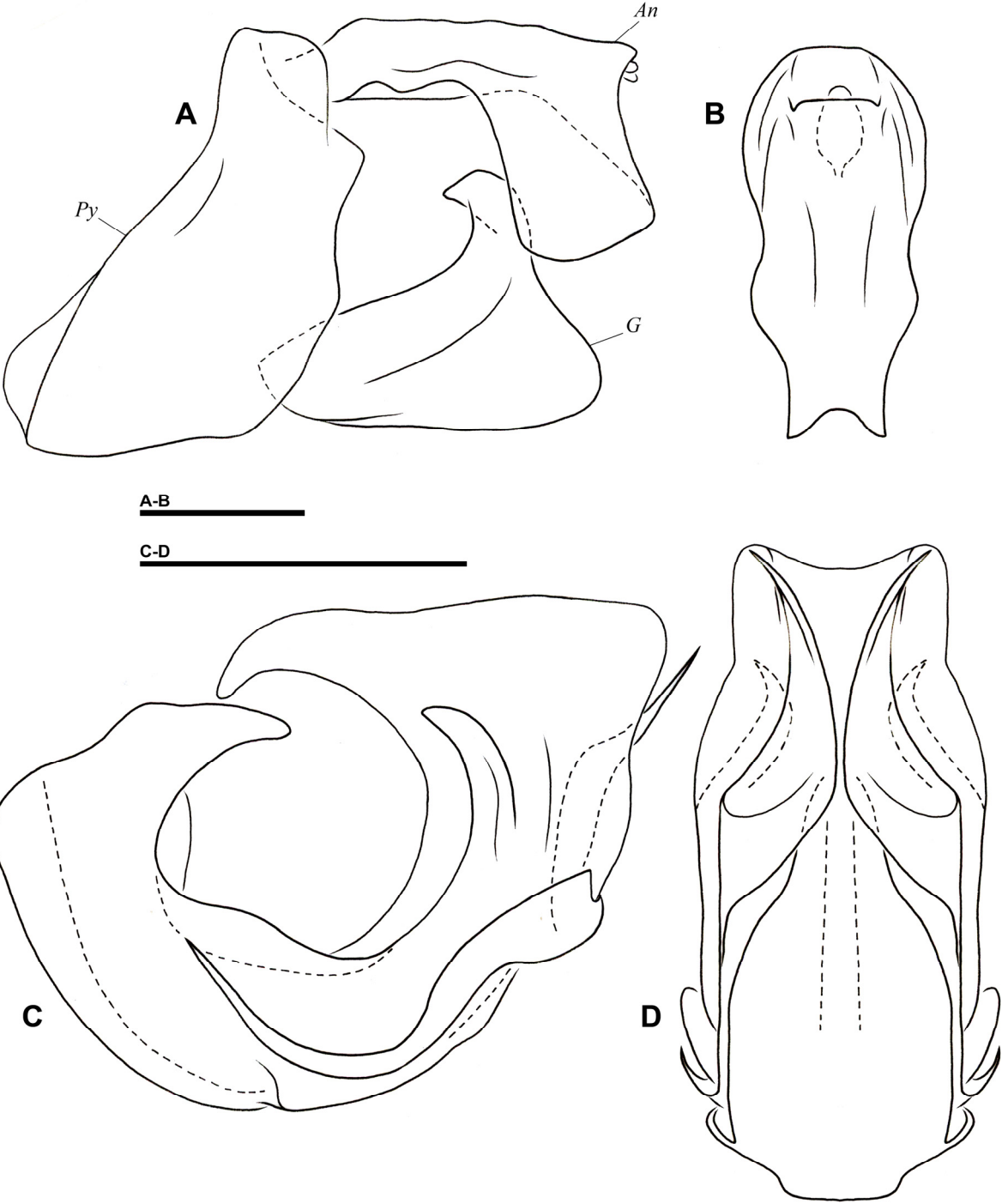


Fig. 4. *Goniopsarites tonkinensis* sp. nov., holotype, male genitalia. A, pygofer, anal tube and gonostylus, left lateral view. B, anal tube, dorsal view. C, aedeagus, left lateral view. D, aedeagus, posterior view. Scale = 1 mm. An: anal tube; G: gonostylus; Py: pygofer.

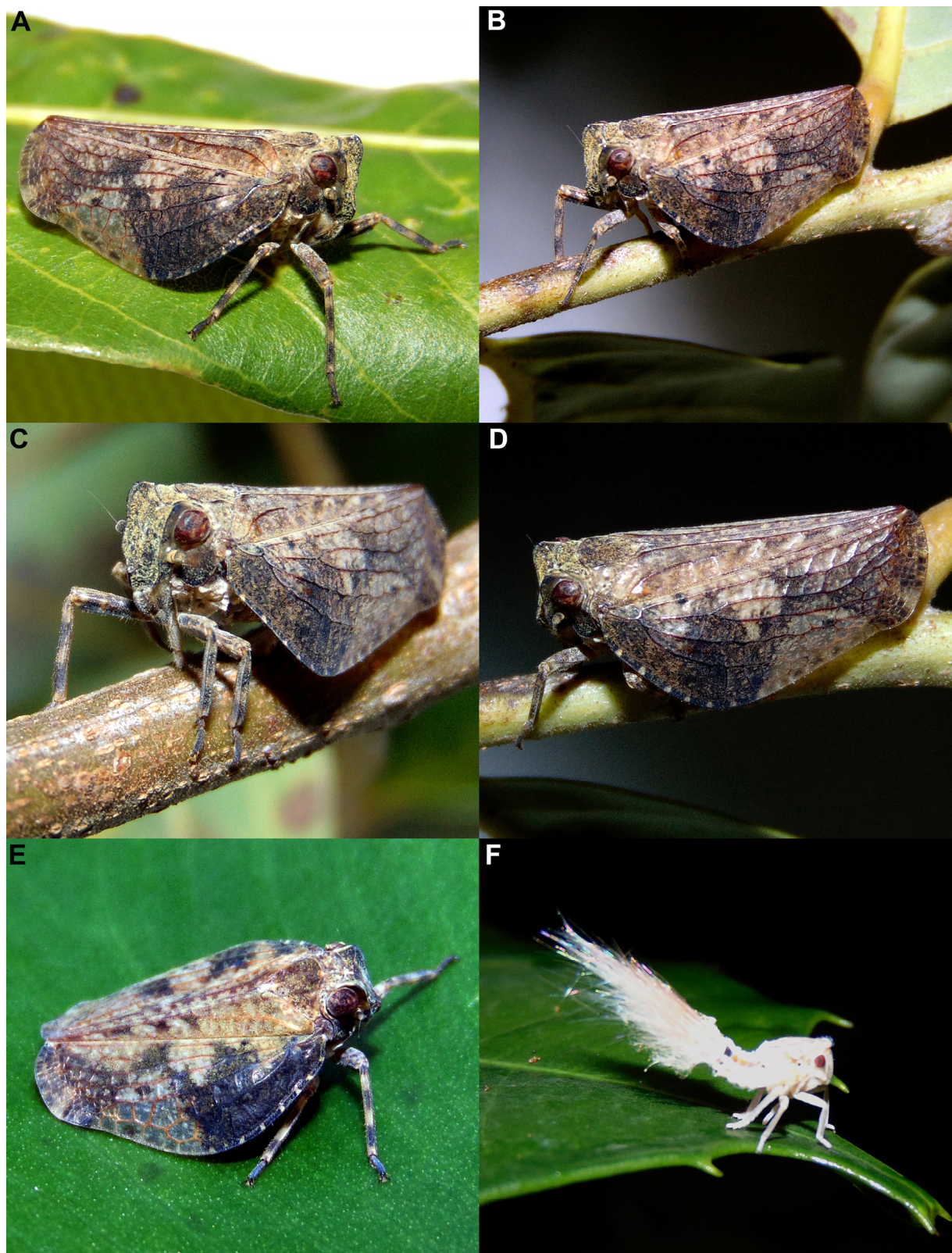


Fig. 5. *Goniopsarites tonkinensis* sp. nov., live specimens in Ba Be National Park (photographs J. Constant). A–D, specimen in typical position when sitting branches, 3 July 2015. E, specimen in “flattened” position on a broad smooth leaf, 5 July 2015. F, nymph, 4 July 2015, at night.

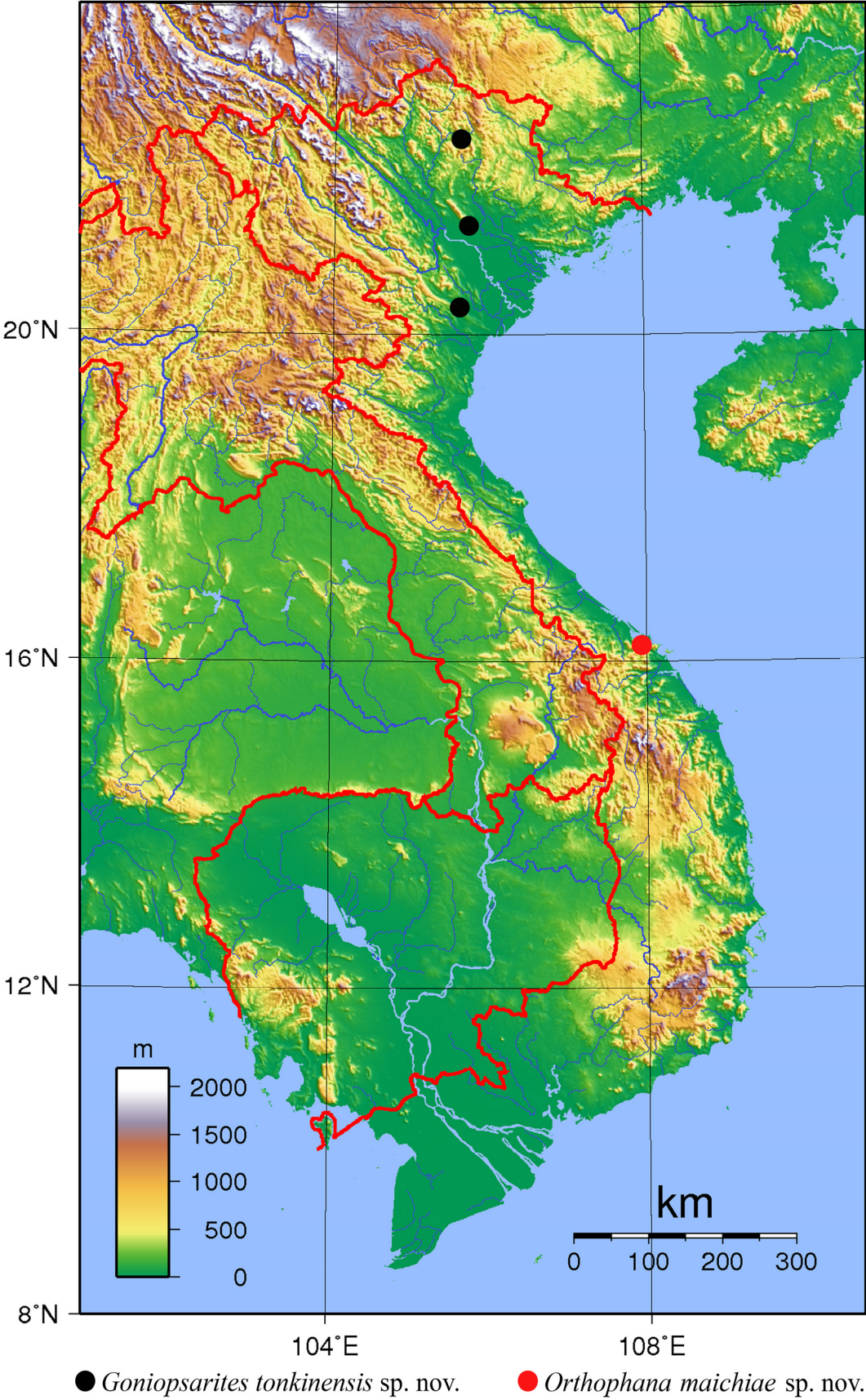


Fig. 6. Distribution map of *Orthophana maichiae* sp. nov. and *Goniopsarites tonkinensis* sp. nov.

Genitalia ♂: pygofer higher than long in lateral view, with anterior and posterior margins sinuate; posterodorsal angle vertically laminate and rounded (Fig. 4 A). Anal tube elongate, with lateral margins strongly bisinuate in dorsal view; 2.15 times longer than broad with maximum breadth near apex in dorsal view (Fig. 4 B); dorsoventrally flattened on basal half; strongly curved ventrally at level of anal opening with lateral margins strongly produced ventrally into broad lobe; lobes subrectangular in lateral view (Fig. 4 A). Gonostyli (Fig. 4 A) elongate in lateral view, rounded apically and with strong process projecting dorso-internally on dorsal margin, before apex; ventral margin slightly sinuate and posterior margin sinuate in lateral view; dorsal process slightly twisted internally, ended in a smooth pointed hook directed postrointernally. Aedeagus strongly curved in lateral view, with a pair of lateral, elongate, strongly sinuate processes directed anteriorly, attached posteriorly at 2/3 of length (Fig. 4 C). Periandrium posteriorly with a pair of narrowly pointed processes directed dorsoexternally (Fig. 4 C-D). Phallus membranous, large, with pair of curved, sclerified processes directed dorsoanteriorly before apex; strongly, angularly projecting posterodorsally; apex narrowing, directed anteriorly and curved ventrally (Fig. 4 C).

NYMPH. See Fig. 5 F.

BIOLOGY. The specimens were collected in low altitude tropical rainforests (less than 300 m asl.). Specimens in Ba Be National Park were observed sitting on branches or trunks holding their tegmina laterally compressed, while they opened their tegmina and flattened their body when sitting on leaves (Fig. 5 E).

DISTRIBUTION. Recorded from three locations extending from southern to northern parts of North Vietnam (Fig. 6).

Discussion

The new *Orthophana* record confirms that the genus seems to live at altitude between 1000 and 1600 m (CONSTANT & PHAM, 2014) in tropical mountain evergreen forest. All species of *Orthophana* are known from very few specimens and nothing is known of their host plants. According to our experience in the field, species of *Orthophana* are not common insects.

The new species of *Goniopsarites* illustrates the very close relationship between the fauna of south-eastern China and Hainan, and the fauna of North Vietnam. It also shows the importance of verifying the male genitalia characters when it comes to identifying planthopper species. *Goniopsarites tonkinensis* can apparently be rather common in suitable habitats like in Ba Be National Park. However, its precise ecological requirements are still to be defined.

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