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Laohiracia acuta, a new genus and species of Parahiraciini planthopper with elongate cephalic process from Laos (Hemiptera: Fulgoromorpha: Issidae)

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Front cover: *Laohiracia acuta* gen. et sp. nov., holotype, dorsal view. © Jérôme Constant.

Laohiracia acuta, a new genus and species of Parahiraciini planthopper with elongate cephalic process from Laos (Hemiptera: Fulgoromorpha: Issidae)

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Abstract

The new genus *Laohiracia* gen. nov. is described to accommodate a new species, *L. acuta* sp. nov. from Laos. The new genus is placed in the Parahiraciini. It is compared with the genera *Macrodaruma* Fennah, 1978, *Macrodarumoides* Che, Zhang & Wang, 2012, *Pseudochoutagus* Che, Zhang & Wang, 2011 and *Rostrolatum* Che, Zhang & Wang, 2020 with which it shares possessing an elongate, pointed head. Illustrations of habitus, details and male genitalia are given along with equivalent habitus illustration of *Pseudochoutagus rubens* Gnezdilov & Constant, 2012 for comparison, and a distribution map. Together with the new taxa, the Issidae fauna of Laos now comprises 5 species belonging to 5 genera. The elongate head condition is discussed.

Keywords: biodiversity, cephalic process, Fulgoroidea, Indochina, laternarisation

Introduction

The Laotian fauna of Issidae is currently poorly documented and contains only five species: *Bardunia brevinaso* Gnezdilov, 2011, *Eusudasina nantouensis* Yang, 1994, *Flavina acuta* Ran & Liang, 2006, *Kodaianella bicinctifrons* Fennah, 1956 and *Tapirissus guilberti* Gnezdilov, 2014 (BOURGOIN, 2021). Within Indochina, this represents a very low number as compared to Vietnam (38 species) but a rather similar situation as in Cambodia (3 species) or Thailand (8 species), reflecting the need to study the issid faunal diversity of the region (CONSTANT & BARTLETT, 2019; BOURGOIN, 2021; CONSTANT, 2021).

The tribe Parahiraciini Cheng & Yang, 1991 was recently divided into three subtribes, chiefly diagnosed by features of the hindwing, with two of them containing very few taxa: Scantiniina Bourgoin & Wang, 2020 with one genus from Sundaland and Vindilisina Bourgoin & Wang, 2020 with two genera from Palawan in the Philippines (BOURGOIN & WANG, 2020). The third subtribe Parahiraciina Cheng & Yang, 1991 is by far the most diverse with 25 genera and 89 species mostly distributed in the Oriental Region (BOURGOIN, 2021).

Study of the recent material of Issidae in the collection of RBINS revealed an undescribed species of Parahiraciina with a pointed head from Laos, which could not be placed in any of the currently existing genera.

The present paper aims to describe a new genus within Parahiraciina to accommodate this new species and compare it with the other genera with an elongate, pointed head among the Parahiraciina.

Material and methods

The genitalia were extracted after soaking the abdomen for some hours in a 10% solution of potassium hydroxide (KOH) at room temperature. 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. Photographs were taken with a Leica EZ4W stereo-microscope, stacked with CombineZ software and optimized with Adobe Photoshop software. The map was produced with SimpleMappr (SHORTHOUSE, 2010). The external morphological terminology follows O'BRIEN & WILSON (1985), the wing venation terminology follows BOURGOIN *et al*. (2015) and for the male genitalia, BOURGOIN & HUANG (1990). For the transcription of the labels of the type, the wording on each single label is delimited by square brackets. The metatiobiotarsal formula gives the number of spines on (side of metatibia) apex of metatibia / apex of first metatarsomere / apex of second metatarsomere.

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

BB = maximum breadth of the body

BF = maximum breadth of the frons

BTg = maximum breadth of the tegmen

BV = maximum breadth of the vertex

LF = length of the frons at median line

LT = total length (apex of head to apex of tegmina)

LTg = length of the tegmen

LV = length of the vertex at median line

Acronyms used for the collections:

RBINS = Royal Belgian Institute of Natural Sciences, Brussels, Belgium

Results

Taxonomy

Family Issidae Spinola, 1839
Subfamily Hemisphaeriinae Melichar, 1906
Tribe Parahiraciini Cheng & Yang, 1991

Checklist of the Parahiraciini of Laos

Bardunia brevinaso Gnezdilov, 2011 [described from Laos (GNEZDILOV, 2011)]

Flavina acuta Ran & Liang, 2006 [described from Vietnam and Laos (RAN & LIANG, 2006)]

Laohiracia acuta gen. et sp. nov.

NOTE. All Laotian Parahiraciini belong to the subtribe Parahiraciina (BOURGOIN, 2021).

Subtribe Parahiraciina Cheng & Yang, 1991

According to BOURGOIN & WANG (2020), this subtribe can be recognized by the following combination of characters of the hind wings:

1. Hindwings bilobate, strongly notched at CuP with CuP-Pcu-A1 lobe generally wider than Sc-R-MP-CuA lobe; the two lobes almost the same length.

2. Posterior margin of hindwings not or indistinctly notched at $A1_2$.

3. A2 lobe of hindwings with anal area posterior to A1 strongly reduced, much shorter and much thinner than the anterior lobes.

4. Hindwings with Sc-R-MP-CuA and CuP-Pcu-A1 lobes covered with a set of numerous transverse veins.

5. Hindwings with CuA and CuP not merging before the anterior notch.

6. Hindwings with Pcu and $A1_1$ not merging in basal half of forewing.

7. Hindwings with A2 present, not branched or absent. In some species, a transverse a2-a1 connecting A2 with A1 at the level of its basal branching (e.g. in *Tetricodes tamdaoensis* Vanslembrouck & Constant, 2018).

Genus *Laohiracia* gen. nov.

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Type species: *Laohiracia acuta* gen. et sp. nov. by present designation.

ETYMOLOGY. The new genus name is formed by the combination of "*Lao*", referring to the country of origin of the new genus, and "*hiracia*", which is the same ending as in *Parahiracia*, the type genus of the tribe Parahiraciini and a reminder of the placement of the new genus in this group. The gender is feminine.

DIAGNOSIS. The genus can be separated from all other Parahiraciini genera by the following combination of characters:

1. Head prolongated anteriorly by a straight, acutely pointed cephalic process;

2. Vertex and distal half of frons with strong median carina;

3. Sides of body subparallel on basal 2/3;

4. Metatibiae with 7 apical spines;

5. Anal tube of male furcate distally;

6. Aedeagus with pair of long asymmetrical, basiventral processes projecting cephalad then reflexed and distally sinuate.

DESCRIPTION. *Head*: (Fig. 1F–I) Head narrower than thorax and strongly elongate, bearing a cephalic process. Vertex elongate, longer than pro- and mesonotum combined in mid-line, more than twice as long in mid-line as broad basally, acutely narrowing towards apex; strong median carina not reaching apex; lateral margins carinate with carinae merging anteriorly; hind margin of vertex broadly acute, carinate. Lateral fields of cephalic process between carinae, convex, visible from above and underside; in lateral view, delimited by a dorsal and ventral carina remaining separated apically. Outer carinae of frons acute, arced dorsad around eyes (forming posterior margin of lateral fields), intersecting lateral carina of vertex and extending to vertex posterior margin. Frons elongate, slightly concave in lateral view, more than twice as long as broad, acutely rounded apically and widest close to fronto-clypeal suture; median line becoming strongly keeled on apical half, more strongly marked towards apex. Clypeus flat, moderately elongate, subtriangular with fronto-clypeal suture rounded; anteclypeus with median blunt carina. Labium elongate and narrow, reaching metacoxae, with apical segment elongate, less than half as long as penultimate. Eyes round (not emarginate) protruding laterally,

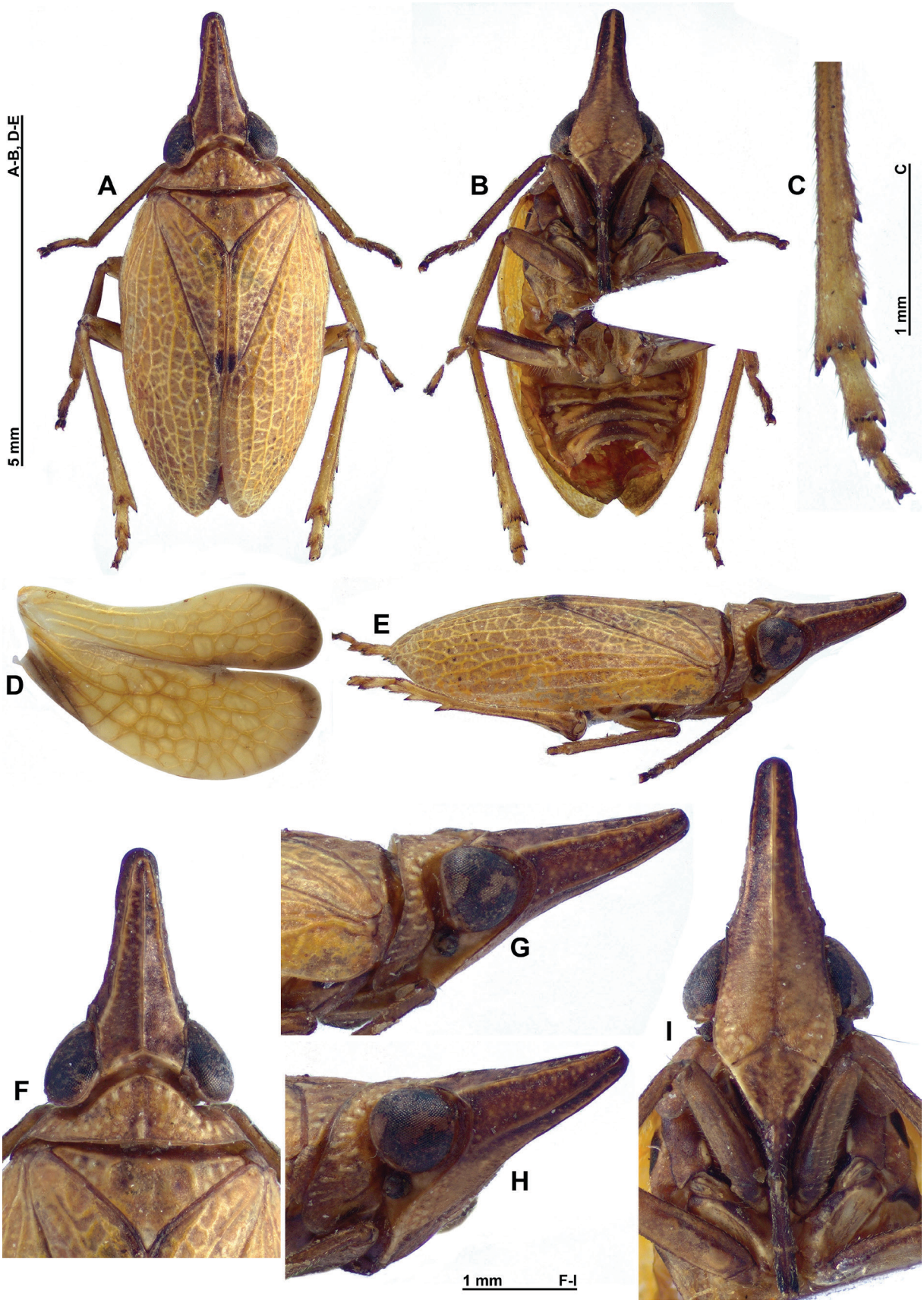

Fig. 1. *Laohiracia acuta* gen. et sp. nov., holotype ♂. A, habitus, dorsal view. B, habitus, ventral view. C, distal part of left metatibia and metatarsus, ventral view. D, right hind wing. E, habitus, lateral view. F, head and thorax, dorsal view. G, head and thorax, lateral view. H, head and thorax, anterolateral view. I, head, perpendicular view of frons.

with half of eye beyond a line joining lateral carina of vertex to lateral margin of pronotum; ocelli obsolete. Antennae very short with scape ring-shaped and pedicel bulbous.

Thorax: (Fig. 1A, E–H) Pronotum short, slightly shorter than mesonotum in mid-line; anterior margin strongly sinuate and strongly, roundly protruding anteriorly between eyes; posterior margin weakly sinuate (nearly truncate); median carina obsolete anteriorly with weakly impressed point on each side; blunt tubercles along anterior margin and irregularly on disc; paranotal lobes (lateral view) broad, with irregular short, blunt, longitudinal carinae and with posteroventral angle rounded. Mesonotum subtriangular without median carina, disc smooth; weak, blunt longitudinal carina on each side of disc; some blunt tubercles in lateral fields of mesonotum. Tegulae moderately developed.

Tegmina: (Figs 1A, E, 2A) Tegmina subcoriaceous with a dense reticulum of veinlets, elongate with sides subparallel on basal 2/3, nearly 2.5 times longer than broad, convex. Costal margin slightly sinuate basally, broadly rounded on posterior half. Apex narrowly rounded. Postclaval margin weakly rounded on distal half and slightly notched at apex of clavus. Clavus closed, slightly surpassing mid-length of tegmen. Venation: ScP+R(+MA) very short, forking very close to basal cell into subparallel ScP+RA and RP(+MA); MP visible to half-length of tegmen, then forking and with numerous veinlets; CuA forked at 2/3 of clavus length; CuA_1 and CuA_2 subparallel; Pcu fused with A1 at 3/5 of clavus length; Pcu+A1 fused with CuP slightly before apex of clavus.

Hind wings: (Figs 1D, 2B) Broader than tegmina and deeply bilobed, strongly notched at CuP; costal margin strongly sinuate; CuP-Pcu-A1 lobe about 1/3 wider than Sc-R-MP-CuA lobe, the two lobes almost the same length; both lobes rounded apically; postclaval margin broadly rounded; A2 lobe reduced and narrow, with A2 vein present, simple. Venation: Main veins present; ScP+R, MP and CuA running more or less parallel, with numerous cross-veinlets; Pcu strongly curved at mid-length of wing towards CuP but not reaching the latter; A1 curved, more or less parallel to postclaval margin; CuP-Pcu-A1 lobe with numerous cross-veinlets.

Legs: (Fig. 1A–C, E) Elongate and slender. Femora slightly flattened dorsoventrally. Tibiae longer than corresponding femora; metatibiae with 2 lateral teeth placed on distal 1/3 of tibia and 7 apical teeth. Tarsi elongate; first metatarsomere elongate and slender, with a strong spine at each side and a row of 5–6 smaller spines in between ventrally along posterior margin; second metatarsomere short with one tooth at each side. Metatibiotarsal formula: (2) 7 / 7–8 / 2.

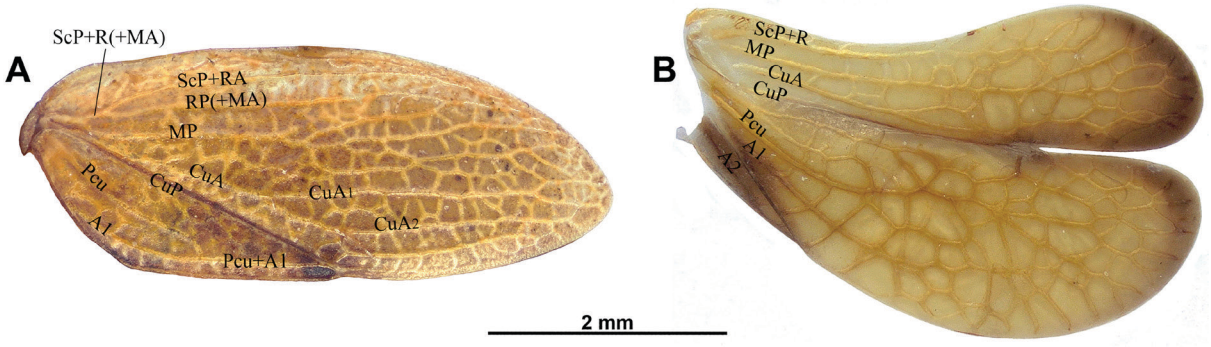

Fig. 2. *Laohiracia acuta* gen. et sp. nov., holotype, venation of wings. A, right tegmen. B, right hind wing.

Terminalia ♂: (Fig. 3) Pygofer higher than long in lateral view, with anterior margin concave and posterior margin projecting posteriorly on upper half. Gonostyli (in lateral view) elongate and broad, projecting posteriorly with strongly developed capitulum with elongate neck with outer margin strongly concave in posterior view; in ventral view abruptly narrowing after mid-length. Aedeagus (in lateral view) moderately curved dorsad, with asymmetrical pair of long basiventral teeth directed cephalad, then roundly reflexed posterad and sinuate; right tooth longer than left one. Connective elongate with well-developed tectiductus. Dorsal lobe of periandrium with apicolateral process at each side and median foliaceous process. Ventral lobe of periandrium simple, narrower than dorsal lobe and without process. Anal tube elongate, dorsoventrally flattened, furcate apically in dorsal view.

DISTRIBUTION. Laos.

***Laohiracia acuta* gen. et sp. nov.**

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(Figs 1–4)

ETYMOLOGY. The species epithet *acuta* is a Latin adjective meaning "forming an acute angle" and refers to the pointed head in this species.

TYPE MATERIAL. LAOS. Holotype ♂ (dissected, right hind wing mounted): [Coll. I.R.Sc.N.B., Laos, Hua Phan prov., Mt Phu Pane, 900–1600 m, 20°12'N 103°59'E, 10–21.vi.2010, Leg. S. Jakl & Lao collectors] [I.G.: 34.330] (RBINS).

DIAGNOSIS. Only species in the genus. The shape of the vertex, 2.2 times longer than broad, and characters of the male terminalia, are probably relevant diagnostic characters to recognize the species, e.g., the gonostyli strongly projecting posteriorly in lateral view, the strongly reflexed, asymmetrical basiventral teeth of the aedeagus, and the dorsal lobe of the periandrium with a median, rounded, foliaceous process and one apicolateral process projecting anterodorsad at each side.

DESCRIPTION. *Measurements and ratios*: LT: ♂ (n = 1): 7.25 mm; Lt/BB = 2.39; LTg/BTg = 2.46; LV/BV = 2.2; LF/BF = 2.32.

Head: (Fig. 1F–I) Brown, darker on distal portion of cephalic process ventrally, with carinae paler, yellowish. Head narrower than thorax, strongly elongate with a porrect cephalic process; vertex elongate, 2.2 times as long in midline as broad basally, slightly shorter than pro- and mesonotum combined, with sides slightly concave in dorsal view; in lateral view, dorsal margin straight and ventral margin slightly concave at about mid-length; acutely narrowing towards apex; strong median carina not reaching apex; lateral carinae merging anteriorly. Lateral fields of cephalic process convex (visible from above and underside); delimited by a dorsal and a ventral carina remaining separated apically. Outer carinae of frons acute, continued around eyes and reaching posterior margin of vertex, delimiting narrow genae. Frons elongate, about 2.3 times as long as broad, acutely rounded apically and widest close to fronto-clypeal suture; disc of frons smooth with few irregular small tubercles at basilateral angles and with slightly darker median line turning into keeled carina on distal half, more strongly marked towards apex. Clypeus flat, moderately elongate, subtriangular with fronto-clypeal suture rounded; anteclypeus darker with median blunt carina. Labium brown, elongate and narrow, reaching metacoxae, with apical segment elongate, less than half as long as penultimate. Eyes round (not emarginated), protruding laterally; in dorsal view as long as breadth of vertex between eyes. Antennae black, very short with scape ring-shaped and pedicel bulbous.

Thorax: (Fig. 1A, E–H) Yellowish brown with tubercles, carinae and scutellum pale yellowish. Pronotum short, 0.76 times as long as mesonotum on mid-line; anterior margin strongly sinuate

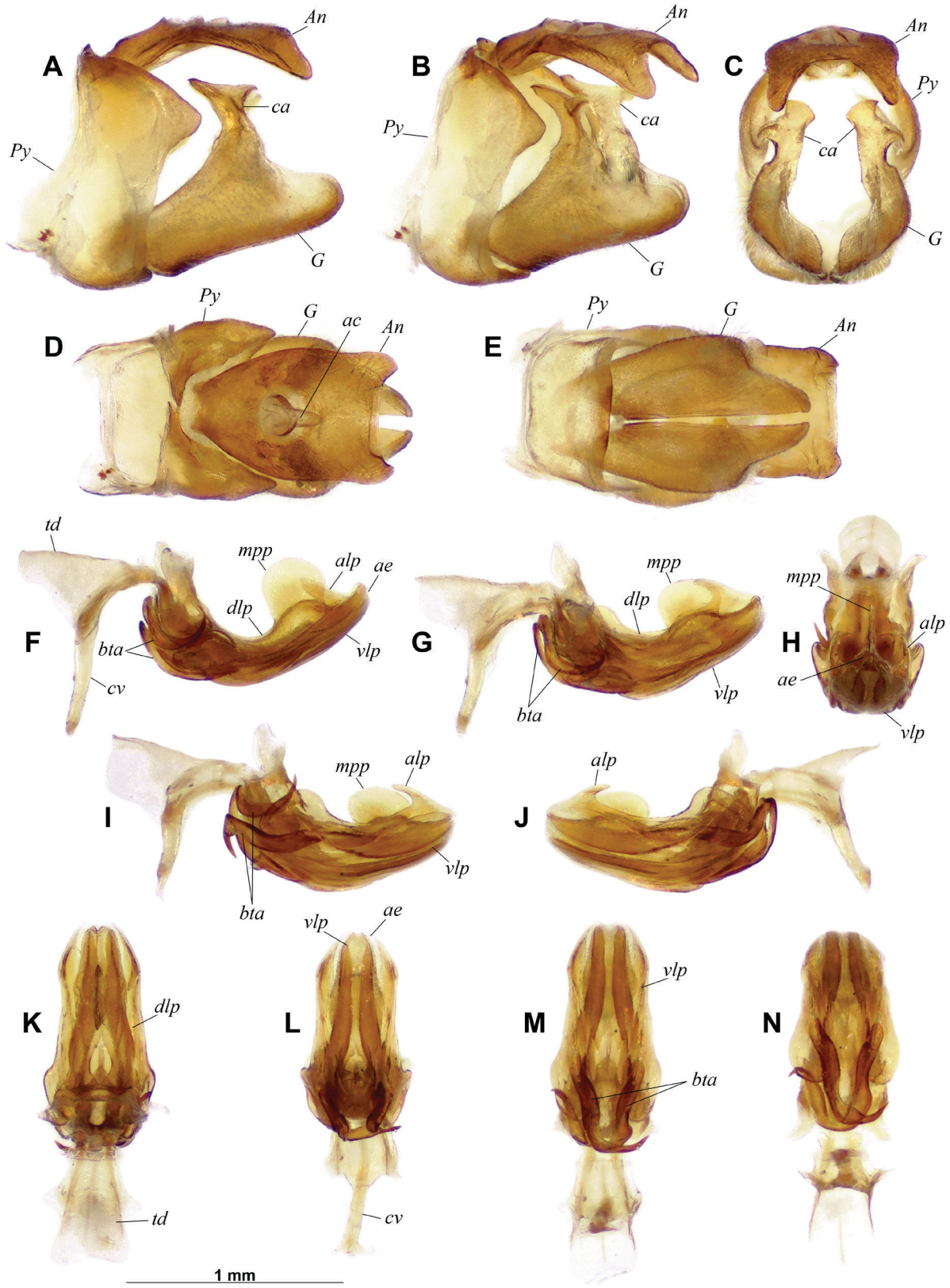

Fig. 3. *Laohiracia acuta* gen. et sp. nov., holotype, genitalia ♂. A–E, pygofer, gonostyli and anal tube. A, lateral view. B, posterolateral view. C, posterior view. D, dorsal view. E, ventral view. F–N, aedeagus, phallobase and connective. F, left lateral view. G, left laterodorsal view. H, posterior view. I, left lateroventral view. J, right lateroventral view. K, dorsal view. L, posteroventral view. M, ventral view. N, anteroventral view.

ac: anal column – *alp*: apicolateral process of dorsal lobe of periandrium – *An*: anal tube – *bta*: basiventral tooth of aedeagus – *ca*: capitulum of gonostylus – *cv*: connective – *dlp*: dorsal lobe of periandrium – *G*: gonostylus – *mpp*: median process of periandrium – *Py*: pygofer – *td*: tectiductus – *vlp*: ventral lobe of periandrium.

and strongly, roundly protruding anteriorly between eyes; posterior margin somewhat foliate, weakly sinuate (nearly truncate); median carina obsolete past mid-length with weakly impressed point on each side; no other carinae but blunt tubercles along anterior margin and irregularly on disc; paranotal lobes broad, with irregular short, blunt, longitudinal striae and with posteroventral angle rounded. Mesonotum subtriangular without median carina, disc smooth; weak, blunt longitudinal carina on each side of disc, rounded anteriorly and fused with anterior margin; some blunt tubercles in lateral fields of mesonotum. Mesothoracic episternum with a black spot. Tegulae uniformly brown.

Tegmina: (Figs 1A, E, 2A) Yellowish brown with venation pale yellowish, elongate black spot at apex of clavus, between postclaval margin and CuP. Elongate, nearly 2.5 times longer than broad, subcoriaceous with venation slightly elevated and reticulate. Costal margin slightly sinuate basally, broadly rounded on posterior half. Apex narrowly rounded. Postclaval margin weakly rounded on distal half and slightly notched at apex of clavus. Clavus closed (Pcu+A1 reaching CuP before composite vein reaches wing margin), slightly surpassing half-length of tegmen. Venation: ScP+R(+MA) very short, forking very close to basal cell into subparallel ScP+RA and RP(+MA); MP visible to half-length of tegmen, then forking and with numerous veinlets; MP_1 fused with RP(+MA) at 2/3 of tegmen length; CuA forked at 2/3 of clavus length; CuA_1 and CuA_2 subparallel; Pcu fused with A1 at 3/5 of clavus length; Pcu+A1 fused with CuP slightly before apex of clavus.

Hind wings: (Figs 1D, 2B) Yellow-brown with venation slightly darker; A2 lobe and adjacent area of CuP-Pcu-A1 lobe, and marginal band on distal portion of lobes Sc-R-MP-CuA and CuP-Pcu-A1, dark brown. Broader than tegmina, bilobed, deeply notched at CuP; costal margin strongly sinuate; CuP-Pcu-A1 lobe about 1/3 wider than Sc-R-MP-CuA lobe, the two lobes about the same length; both lobes rounded apically; postclaval margin broadly rounded; A2 lobe reduced and narrow. Venation: Main veins present; ScP+R, MP and CuA running more or less parallel, with numerous cross-veinlets: Pcu strongly curved at half-length of wing towards CuP but not reaching the latter; A1 curved, more or less parallel to postclaval margin; CuP-Pcu-A1 lobe with numerous cross-veinlets. A2 vein present, simple.

Legs: (Fig. 1A–C, E) Yellowish brown; apex of pro- and mesotarsi brown; pro- and mesocoxae with blackish brown marking; metacoxae black; elongate dark brown marking on metafemora along venter of leading margin; apex of metatibial and metatarsal spines black. All legs elongate and slender. Femora slightly flattened dorsoventrally and broader than tibiae. Tibiae longer than corresponding femur; metatibiae about 15 times as long as broad at mid-length, with 2 moderately developed lateral teeth placed on distal 1/3, and 7 apical teeth. Tarsi elongate; first metatarsomere elongate and slender, ventral posterior margin with a strong spine at each side and a row of 5–6 smaller spines in between; second metatarsomere short, rather bulbous with one tooth at each side. Metatibiotarsal formula: (2) 7 / 7–8 / 2.

Abdomen: (Fig. 1B) Yellowish brown with broad-based triangular dark brown markings on sternites.

Terminalia ♂: (Fig. 3) Pygofer (*Py*) roughly quadrate (in lateral view), about 2.4 times higher than long in lateral view, with anterior margin concave and posterior margin projecting posteriorly on upper half into an angular process (Fig. 3A–B), the process forming an acute apical angle in dorsal view (Fig. 3D). Gonostyli (*G*) elongate, with body convex (Fig. 3A–C); in lateral view projecting posteriorly and with posterior margin rounded and ventral margin slightly concave (Fig. 3A); capitulum (*ca*) rather strongly developed, projecting anterodorsad, with apex dorsoventrally spatulate and lateroposterior laminate tooth (Fig. 3A–C); neck of capitulum elongate with outer margin strongly concave in posterior view (Fig. 3A–C); in ventral view, progressively widening caudad to slightly beyond half-length, then abruptly narrowing

and tapering towards apex (Fig. 3E). Aedeagus (*ae*) moderately curved dorsad in lateral view (Fig. 3F), with asymmetrical pair of long basiventral teeth (*bta*) directed cephalad, then roundly reflexed posterad and sinuate, right tooth longer and more strongly sinuate apically than left one (Fig. 3F–G, I–J, M–N). Connective (*cv*) elongate, strongly curved ventrad on basal half then straight, with well-developed tectiductus (*td*) longer than half of connective (Fig. 3F, K–L). Dorsal lobe of periandrium (*dlp*) rather abruptly tapering at basal 1/4; with laterally flattened apicolateral process (*alp*) at each side, directed cephalad and narrowly rounded apically (Fig. 3 F–J); foliaceous, rounded, median process (*mpp*) distally to mid-length, projecting dorsad (Fig. 3F–K). Ventral lobe of periandrium simple, narrower than dorsal lobe and without process (Fig. 3F–N). Anal tube (*An*) dorsoventrally flattened, elongate, slightly curved in lateral view (Fig. 3A); in dorsal view, 1.4 times longer in mid-line than broad at maximal breadth near apex (Fig. 3D); furcate apically with lateral angles projecting posteroventrally and narrowly rounded apically, posterior margin roundly concave (Fig. 3A–D); paraproct short.

NOTE. The colouration of live specimens may be different, with yellowish replaced with green, as observed in *Macrodaruma pertinax* Fennah, 1978 (compare illustrations in GNEZDILOV & CONSTANT, 2012 and CONSTANT & PHAM, 2014).

BIOLOGY. The species was found in Northern Indochina subtropical forests ecoregion, at medium altitude (900–1,600 m).

DISTRIBUTION. Laos, Hua Phan Province (Fig. 4).

Fig. 4. *Laohiracia acuta* gen. et sp. nov., distribution map.

Discussion

The new genus *Laohiracia* gen. nov. superficially resembles *Choutagus* Zhang, Wang & Che, 2006 and *Macrodaruma* Fennah, 1978, with which it shares an elongate head and, with the latter, a yellowish colouration in collection specimens (live specimens of *Macrodaruma* are green; live colouration of *Laohiracia* remains unknown). However, those two genera belong to a different tribe, Hemisphaeriini Melichar, 1906, while *Laohiracia* belongs to Parahiraciini, the former tribe possessing tegmina without visible claval suture and unilobed hind wings, which separates it from Parahiraciini which show a well-defined claval suture on tegmina and bilobed hind wings (ZHANG *et al*., 2006; GNEZDILOV & CONSTANT, 2012; CONSTANT & PHAM, 2014).

Within the Parahiraciina, three other genera possess the condition of an elongate, pointed head: *Macrodarumoides* Che, Zhang & Wang, 2012, *Pseudochoutagus* Che, Zhang & Wang, 2011 and *Rostrolatum* Che, Zhang & Wang, 2020 (in ZHANG *et al*., 2020). The genus *Rostrolatum* can be separated from *Laohiracia* by its shorter cephalic process curved ventrad (cephalic process longer and straight in *Laohiracia*), the median carina on mesonotum (absent in *Laohiracia*) and the less developed, curved teeth of the aedeagus (teeth much longer, reflexed and apically sinuate in *Laohiracia*) (see ZHANG *et al*., 2020: 337 and plate XXV). The genus *Macrodarumoides* can be separated from *Laohiracia* by a shorter cephalic process, the shape of its tegmina, much wider at basal 1/3 (tegmina with sides subparallel on basal 2/3 in *Laohiracia*), 11 apical spines of metatibia (7 in *Laohiracia*), the anal tube of male apically rounded (furcate in *Laohiracia*) and the teeth of the aedeagus projecting cephalad, moderately curved (teeth much longer, reflexed and apically sinuate in *Laohiracia*) (see CHE *et al*., 2012). The genus *Pseudochoutagus* (Fig. 5, *P. rubens* Gnezdilov & Constant, 2012, female holotype) most closely resembles *Laohiracia* but its cephalic process is slightly curved dorsally (Fig. 5E–F – straight in *Laohiracia*) and shows very weak dorsal and ventral longitudinal carinae (Fig. 5A–C, F–H – carinae obvious at least on distal half in *Laohiracia*), its eyes are less projecting laterally (Fig. 5C, H), the anterior margin of pronotum is curved but not strongly projecting anteriorly (Fig. 5C), the hind wings are less reticulate with vein Pcu weakly curved and well distinct (Fig. 5D), the legs with stronger spines and shorter relatively to body size (Fig. 5B, I), with the length of posterior tibia representing 43% of length of tegmen (60% in *Laohiracea*) and the teeth of the aedeagus projecting cephalad, moderately curved and placed more distally (teeth more basal, much longer, reflexed and apically sinuate in *Laohiracia*) (see CHE *et al*., 2011: 64–65, figs 1–3, 8–14).

An elongate head condition can be observed in most families of planthoppers (ZHANG *et al*., 2018), quite commonly (Dictyopharidae, Fulgoridae) or more exceptionally in few isolated genera (Delphacidae, Issidae, Tettigometridae, Tropiduchidae, Flatidae, Lophopidae, Caliscelidae), and even in fossil families such as in the Cretaceous families Lalacidae (HAMILTON, 1990), Mimarachnidae (ZHANG *et al*., 2018) and Dorytocidae (EMELJANOV & SHCHERBAKOV, 2018; SONG *et al*., 2021). Such a condition has been variously putatively interpreted as having a role in sexual selection, in bioluminescence (definitively rejected by RIDOUT, 1983), crypsis or mimicry by imitating thorns (as a way to protect the species from predators, especially birds), or other abiotic models (therefore assimilated to masquerade) (HOGUE, 1984; ZOLNEROWICH, 1992; O'BRIEN, 2002; GOEMANS, 2006; BOURGOIN *et al*. 2016; EMELJANOV & SHCHERBAKOV, 2018 – reviewed in ZHANG *et al*., 2018). However, in Fulgoridae, the family most famous for its various cephalic process shapes, the adaptive value of the head process remains unknown. The development of this morphological character was called “laternarisation syndrome” by JIANG *et al*. (2019) and was formally tested by URBAN & CRYAN (2009) who have shown that the cephalic process was gained and lost multiple times during the evolution of the family, adding to the confusion about its possible function(s) and

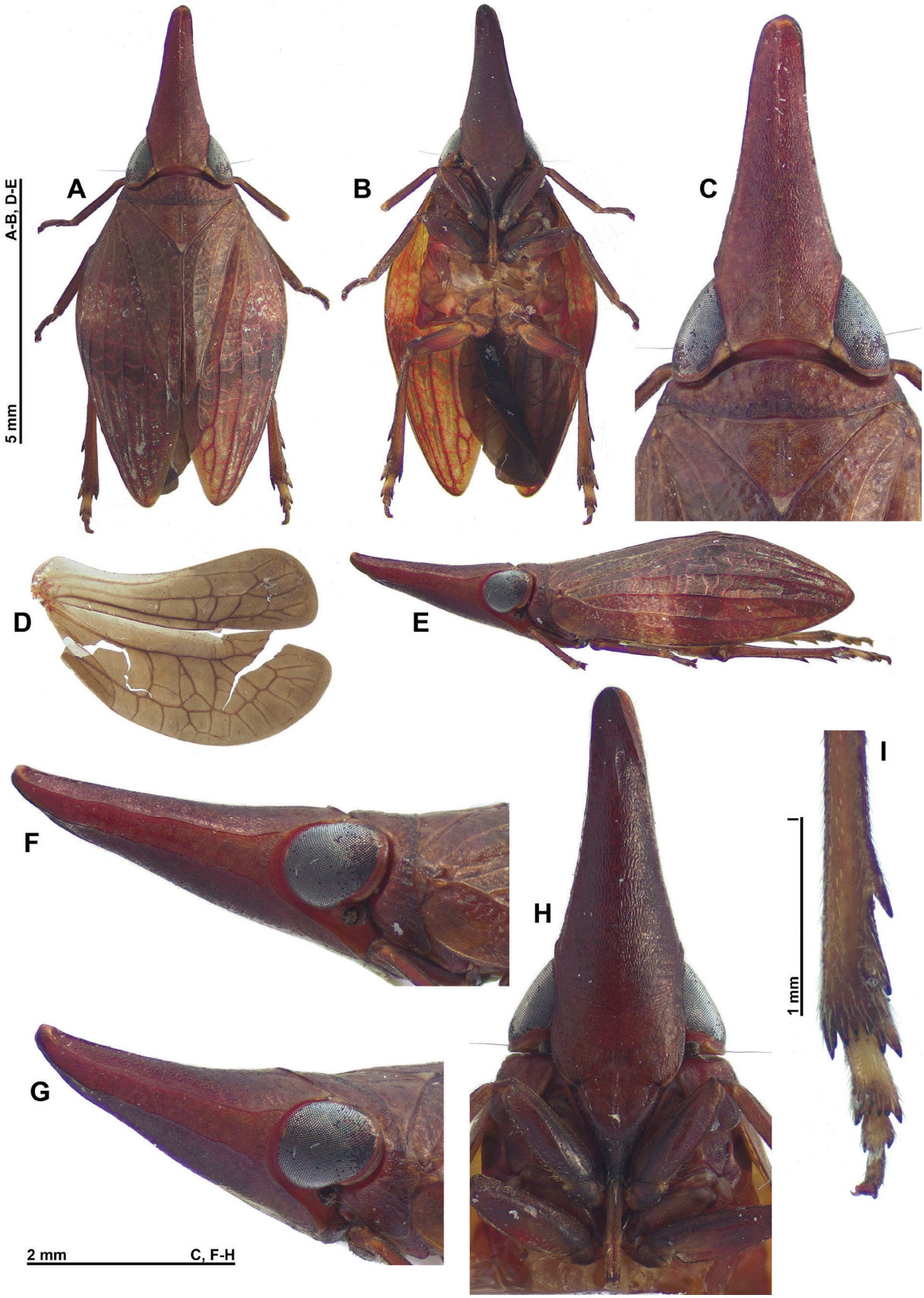

Fig. 5. *Pseudochoutagus rubens* Gnezdilov & Constant, 2012, holotype ♀ in RBINS. A, habitus, dorsal view. B, habitus, ventral view. C, head and thorax, dorsal view. D, right hind wing. E, habitus, lateral view. F, head and thorax, lateral view. G, head and thorax, anterolateral view. H, head, perpendicular view of frons. I, distal part of left metatibia and metatarsus, ventral view.

the possible evolutionary advantage it might represent. As a conclusion, so little is precisely known about the ethology of these planthopper taxa, how they interact with their environment, etc. that more observations and comparative tests, both in the field and in the laboratory, need to be conducted before any non-speculative and well-supported hypothesis can be proposed about the cephalic condition and the "laternarisation syndrome".

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