

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/341622565>

# Sogana cysana sp. nov., a new tropiduchid planthopper from Chu Yang Sin National Park in Vietnam and key to Vietnamese species of the genus (Hemiptera: Fulgoromorpha: Tropiduchidae...

Article in *Belgian Journal of Entomology* · May 2020

CITATIONS

0

READS

164

2 authors:



**Jérôme Constant**

Royal Belgian Institute of Natural Sciences

119 PUBLICATIONS 431 CITATIONS

SEE PROFILE



**Thai Hong Pham**

Vietnam National Museum of Nature

131 PUBLICATIONS 971 CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:



Insect diversity of Vietnam [View project](#)



GLOBAL TAXONOMY INITIATIVE - Entomodiversity of CAMBODIA [View project](#)

urn:lsid:zoobank.org:pub:B4E1BBAA-00DE-49EE-BFB1-DC82363391D5

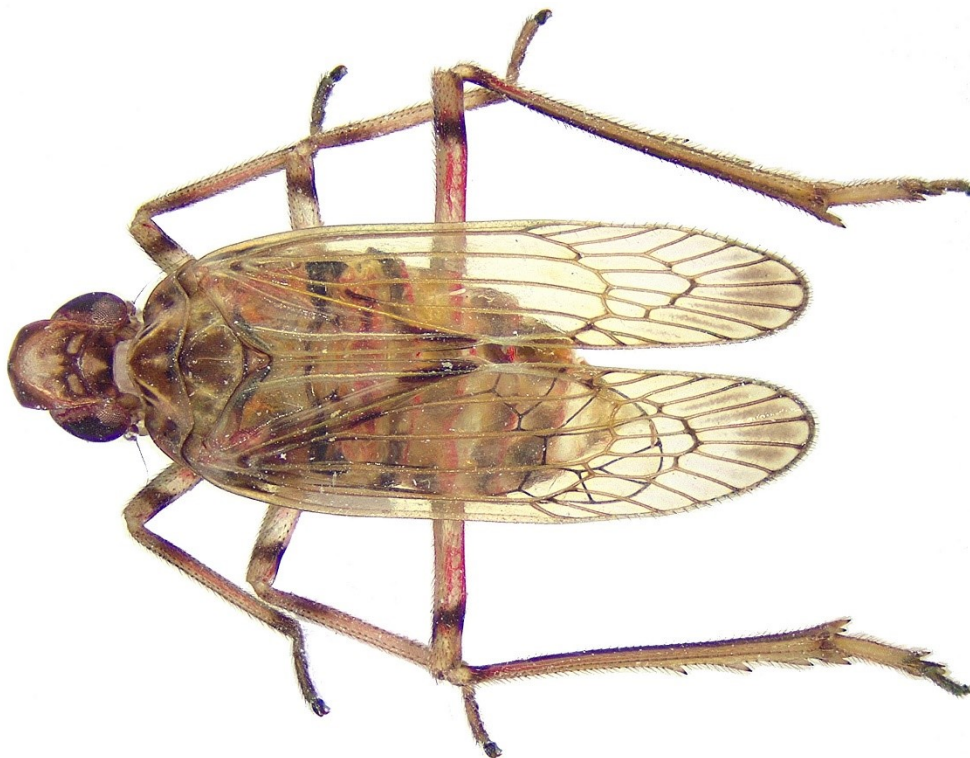
## Belgian Journal of Entomology

### ***Sogana cysana* sp. nov., a new tropiduchid planthopper from Chu Yang Sin National Park in Vietnam and key to Vietnamese species of the genus (Hemiptera: Fulgoromorpha: Tropiduchidae)**

Jérôme CONSTANT<sup>1</sup> & Thai Hong PHAM<sup>2</sup>

<sup>1</sup> Royal Belgian Institute of Natural Sciences, O.D. Phylogeny and Taxonomy, Entomology, Vautier street 29, 1000 Brussels, Belgium. E-mail: jerome.constant@naturalsciences.be (corresponding author).

<sup>2</sup> Vietnam National Museum of Nature, and Graduate School of Science and Technology, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet Street, Hanoi, Vietnam. E-mail: phamthai@vnmn.vast.vn.



Published: Brussels, May 25, 2020

Citation: CONSTANT J. & PHAM T.H., 2020. - *Sogana cysana* sp. nov., a new tropiduchid planthopper from Chu Yang Sin National Park in Vietnam and key to Vietnamese species of the genus (Hemiptera: Fulgoromorpha: Tropiduchidae). *Belgian Journal of Entomology*, 95: 1–13.

ISSN: 1374-5514 (Print Edition)

ISSN: 2295-0214 (Online Edition)



The Belgian Journal of Entomology is published by the Royal Belgian Society of Entomology, a non-profit association established on April 9, 1855.

Head office: Vautier street 29, B-1000 Brussels.



The publications of the Society are partly sponsored by the University Foundation of Belgium.

In compliance with Article 8.6 of the ICZN, printed versions of all papers are deposited in the following libraries:

- Royal Library of Belgium, Boulevard de l'Empereur 4, B-1000 Brussels.
- Library of the Royal Belgian Institute of Natural Sciences, Vautier street 29, B-1000 Brussels.
- American Museum of Natural History Library, Central Park West at 79th street, New York, NY 10024-5192, USA.
- Central library of the Museum national d'Histoire naturelle, rue Geoffroy SaintHilaire 38, F-75005 Paris, France.
- Library of the Muséum d'Histoire naturelle de Genève, route de Malagnou 1, CH-1208 Genève, Suisse.
- Zoological Record, Thomson Reuters, Publication Processing, 1500 Spring Garden Street, Fourth Floor, Philadelphia PA 19130, USA.

Front cover: *Sogana cysana* sp. nov., holotype ♂. © Jérôme Constant (RBINS).

# ***Sogana cysana* sp. nov., a new tropiduchid planthopper from Chu Yang Sin National Park in Vietnam and key to Vietnamese species of the genus (Hemiptera: Fulgoromorpha: Tropiduchidae)**

Jérôme CONSTANT<sup>1</sup> & Thai Hong PHAM<sup>2,3</sup>

<sup>1</sup> Royal Belgian Institute of Natural Sciences, O.D. Phylogeny and Taxonomy, Entomology, Vautier street 29, B-1000 Brussels, Belgium. E-mail: jerome.constant@naturalsciences.be (corresponding author).

<sup>2</sup> Vietnam National Museum of Nature, and Graduate School of Science and Technology, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet Street, Hanoi, Vietnam.

<sup>3</sup> Faculty of Biology, Hanoi National University of Education, 136 Xuan Thuy, Cau Giay, Hanoi, Vietnam. E-mail: phamthai@vnmm.vast.vn.

## **Abstract**

A new species of *Sogana* Matsumura, 1914 *S. cysana* sp. nov. from Chu Yang Sin National Park in southern Central Vietnam, is described. Illustrations of the holotype and male genitalia are provided. Updated identification key and distribution map are provided for the six species of *Sogana* documented from Vietnam. The genus *Sogana* now contains 14 species.

**Keywords:** Fulgoroidea, Auchenorrhyncha, Tonkin, Indochina, Annam.

## **Introduction**

The family Tropiduchidae contains about 670 species according to the FLOW database (Fulgoromorpha Lists On the Web – BOURGOIN, 2020), representing less than 5 % of the species of Fulgoromorpha globally. In Vietnam the family currently includes 20 species, which is much more than Cambodia (2 species) or Thailand (4), but less than China (48) (BOURGOIN, 2020). A recent expedition to southern Central Vietnam in the framework of the Global taxonomy Initiative (GTI) project “A step further in the entomodiversity of Vietnam” allowed the discovery of an additional new species of *Sogana* Matsumura, 1914. FENNAH (1982) placed this genus in the Oriental tribe Isporisini Fennah, 1982 with three other genera: *Eilithya* Distant, 1912, *Isporisa* Walker, 1857 and *Isporisella* Baker, 1927. Thirteen species of *Sogana* are described (LIANG & WANG, 2008; CONSTANT, 2010; CONSTANT & PHAM, 2013, 2019; CONSTANT, 2019), including five from Vietnam: *S. bachmana* Constant & Pham, 2019, *S. baviana* Constant & Pham, 2019, *S. longiceps* Fennah, 1978, *S. condaoana* Constant & Pham, 2013 and *S. cucphuongana* Constant & Pham, 2013 (CONSTANT & PHAM, 2019). *Sogana extrema* Melichar, 1914, described from Myanmar, was recorded by LALLEMAND (1942) from China or Vietnam but this record requires confirmation as noted by LIANG & WANG (2008) and CONSTANT & PHAM (2013) and is not considered here.

The aim of this paper is to describe the new species of *Sogana*, *S. cysana* sp. nov. as an addition to the biodiversity of Vietnam and to provide an updated identification key and a distribution map for the six Vietnamese species of *Sogana*.

## **Material & methods**

The male genitalia were extracted after boiling the abdomen several minutes in a 10% solution of potassium hydroxide (KOH) at about 100°C. 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 specimen. 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), apical cells of the tegmina were counted along margin from vein ScP to CuP.

The measurements were taken as in CONSTANT (2004) and the following acronyms 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.

The photographs of the collection specimens and genitalia were taken with a Leica EZ4W stereomicroscope with integrated camera, stacked with CombineZ software and optimized with Adobe Photoshop CS3. The distribution map was produced with SimpleMappr (SHORTHOUSE, 2010).

Acronym used for collections:

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

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

Abbreviation:

GTI = Global Taxonomy Initiative.

## Results

**Order Hemiptera Linnaeus, 1758**  
**Suborder Auchenorrhyncha Duméril, 1806**  
**Infra-order Fulgoromorpha Evans, 1946**  
**Superfamily Fulgoroidea Latreille, 1807**  
**Family Tropiduchidae Stål, 1866**  
**Subfamily Tropiduchinae Stål, 1866**  
**Tribe Isporisini Fennah, 1982**  
**Genus *Sogana* Matsumura, 1914**

*Sogana* MATSUMURA, 1914: 268. Type species: *Sogana hopponis* Matsumura, 1914, by monotypy.

*Sogana* – MELICHAR, 1914: 194; DISTANT, 1916: 54; METCALF, 1954: 130; TSAUR, 1990: 245; LIANG & WANG, 2008: 30; CONSTANT, 2010: 64; CONSTANT & PHAM, 2013: 72; CONSTANT, 2019: 4; CONSTANT & PHAM, 2019: 4.

FLOW, 2020:

<https://www.hemiptera-bases.org/flow/?page=explorer&db=flow&lang=en&card=taxon&rank=genus&id=8083>

SPECIES INCLUDED (TYPE LOCALITY):

*Sogana bachmana* Constant & Pham, 2019 (Vietnam);

*Sogana baviana* Constant & Pham, 2019 (Vietnam);

*Sogana chartieri* Constant, 2019 (Cambodia);

*Sogana clara* Liang & Wang, 2008 (Laos);

*Sogana condaoana* Constant & Pham, 2013 (Vietnam);

*Sogana cucphuongana* Constant & Pham, 2013 (Vietnam);

*Sogana cysana* sp. nov. (Vietnam);

*Sogana extrema* Melichar, 1914 (Myanmar);  
*Sogana floreni* Constant, 2010 (Borneo);  
*Sogana hopponis* Matsumura, 1914 (Taiwan);  
*Sogana longiceps* Fennah, 1978 (Vietnam);  
*Sogana pseudohopponis* Liang & Wang, 2008 (Laos);  
*Sogana robustocarina* Liang & Wang, 2008 (Borneo);  
*Sogana stimulata* Melichar, 1914 (Mentawai Islands).

### Identification key to the species of *Sogana* from Vietnam

1. Vertex more or less subquadrate (Fig. 1 B, D), ratio LV/BV < 0.85; apical margin of anal tube roundly notched apically in dorsal view (Fig. 1 N, O); aedeagus with strong, deeply furcate or strongly dentate process on left side (Fig. 1 S–T, 3 F) ..... **2**
  - Vertex elongate (Fig. 1 A, C, E), ratio LV/BV > 0.85; apical margin of anal tube rounded or oblique apically in dorsal view, not notched (Fig. 1 K–M); aedeagus without strong furcate process (Fig. 1 P–R)..... **4**
2. Tegmina more elongate, LTg/BTg = 3.8, with 18–19 apical cells (Fig. 1 I); vertex more elongate, LV/BV = 0.8 (Fig. 1 B); ventral process of periandrium ended in a hook (Fig. 1 X)..... ***S. baviana* Constant & Pham, 2019**
  - Tegmina less elongate, LTg/BTg = 3.3–3.5, with 13 (Fig. 2 E) or 19–21 apical cells (Fig. 1 J); vertex shorter, LV/BV = 0.63–0.7 (Figs. 1 D, 2 G); ventral process of periandrium not ended in a hook (Fig. 1 Y) ..... **3**
3. Size smaller, ♂ LT = 8.8 mm; tegmina more elongate, LTg/BTg = 3.5, with 13 apical cells (Fig. 2 E); vertex slightly more elongate, LV/BV = 0.7 (Fig. 2 G); right dorsal process of periandrium not furcate (Fig. 3 E, H); apical projections of anal tube pointed (Fig. 3 A–C) ..... ***S. cysana* sp. nov.**
  - Size larger, ♂ LT = 13 mm; tegmina less elongate, LTg/BTg = 3.3, with 19–21 apical cells (Fig. 1 J); vertex shorter, LV/BV = 0.63 (Fig. 1 D); right dorsal process of periandrium furcate (Fig. 1 T); apical projections of anal tube not pointed (Fig. 1 O) ..... ***S. cucphuongana* Constant & Pham, 2013**
4. Vertex more elongate, ratio LV/BV = 1.15 (Fig. 1 E); aedeagus with two elongate dorsal processes ending in a single point (Fig. 1 R, W)..... ***S. longiceps* Fennah, 1978**
  - Vertex less elongate, ratio LV/BV = 0.9 (Fig. 1 A, C); aedeagus with dorsal processes with multiple teeth or crenulations apically (Fig. 1 P–Q) ..... **5**
5. Tegmina more elongate, LTg/BTg = 3.6 (Fig. 1 F); tegmina with 14 apical cells (Fig. 1 F); clypeus mostly pale yellow-brown; dorsal processes of aedeagus with left one strongly sinuate and directed anteroventrally and right one spatulate apically and directed mostly dorsally (Fig. 1 P)..... ***S. bachmana* Constant & Pham, 2019**
  - Tegmina less elongate, LTg/BTg = 3.0 (Fig. 1 G); tegmina with 18 apical cells (Fig. 1 G); clypeus mostly pale brown; dorsal processes of aedeagus both nearly straight and directed anterodorsally (Fig. 1 Q) ..... ***S. condaoana* Constant & Pham, 2013**

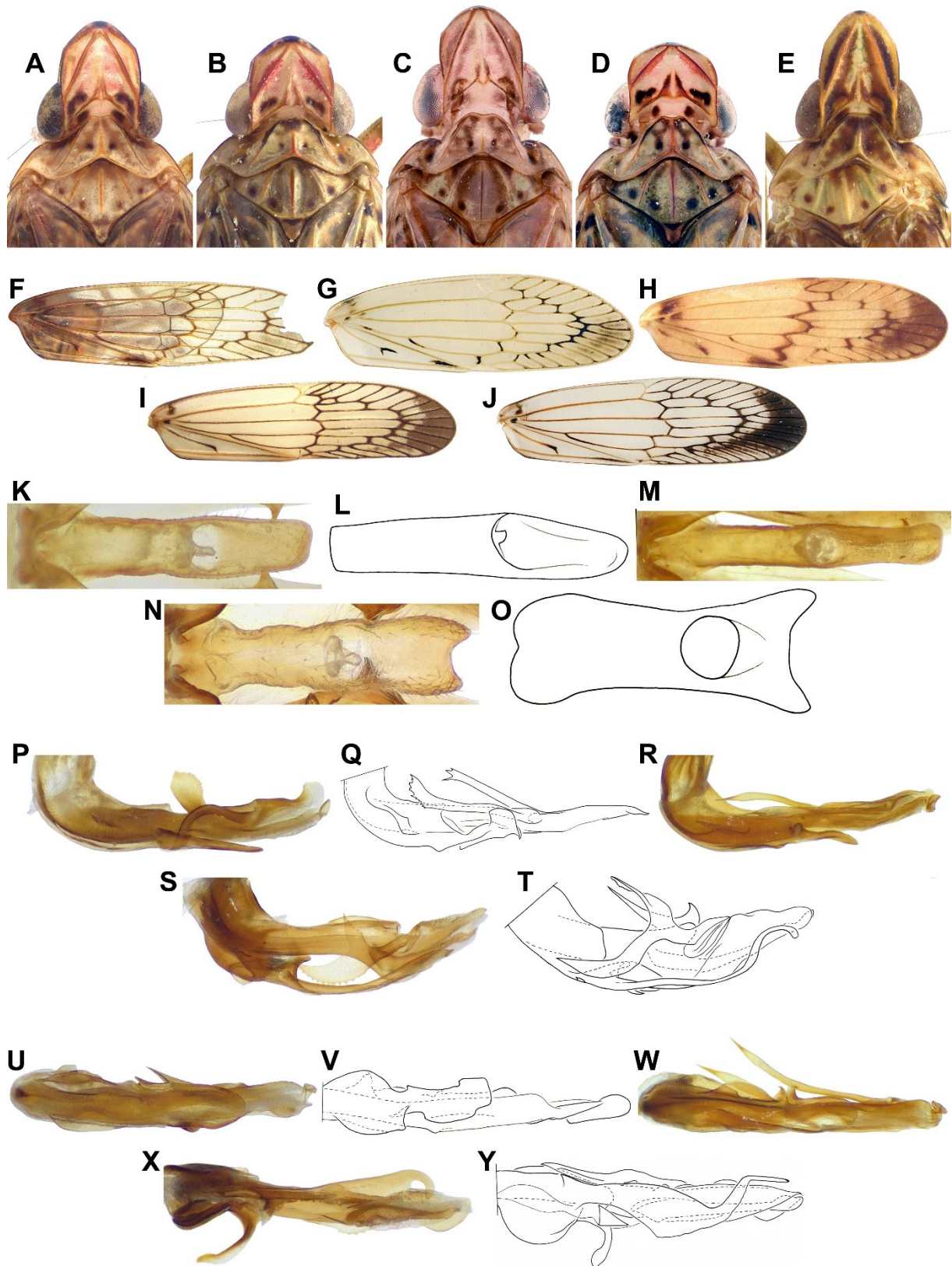


Fig. 1. *Sogana* spp., diagnostic characters. A–E, head and thorax, dorsal view. F–J, right tegmen. K–O, anal tube, dorsal view. P–T, aedeagus, left lateral view. U–Y, aedeagus, ventral view.

*S. bachmana*: A, F, K, P, U; *S. baviana*: B, I, N, S, X; *S. condaoana*: C, G, L, Q, V; *S. cucphuongana*: D, J, O, T, Y; *S. longiceps*: E, H, M, R, W.

*Sogana cysana* sp. nov.

urn:lsid:zoobank.org:act:99C20B3A-EF16-458C-BBB4-B5E2B6DDE439

(Figs 2–5)

ETYMOLOGY. The species epithet refers to the type locality, Chu Yang Sin National Park in Central Vietnam, with “cys” formed from the initials of “Chu Yang Sin”.

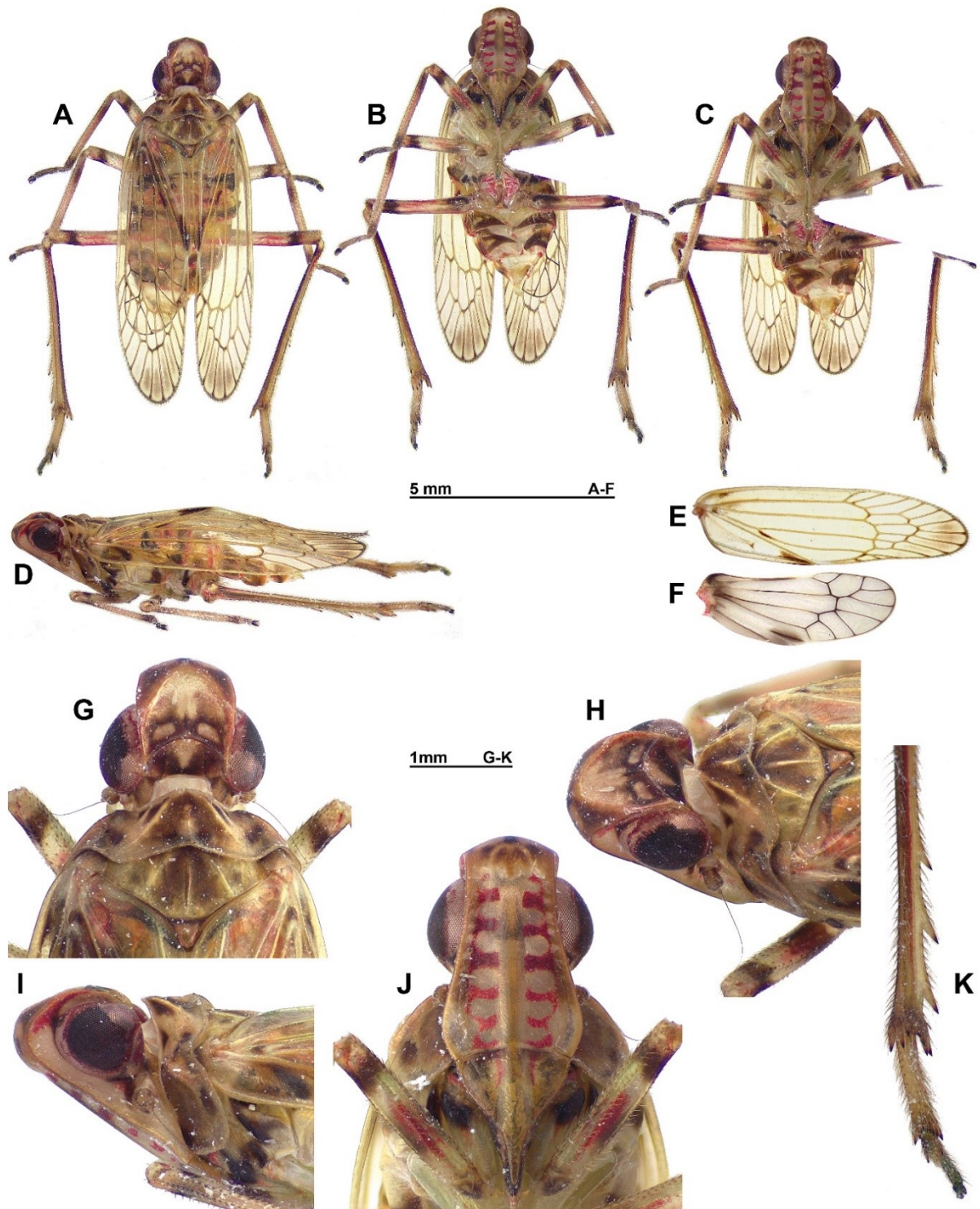


Fig. 2. *Sogana cysana* sp. nov., holotype ♂ (RBINS). A, habitus dorsal view. B, habitus, ventral view. C, habitus, perpendicular view of frons. D, habitus, lateral view. E, right tegmen. F, right posterior wing. G, head and thorax, dorsal view. H, head and thorax, laterodorsal view. I, head and thorax, lateral view. J, frons, perpendicular view. K, distal portion of left posterior leg, ventral view.



TYPE MATERIAL. VIETNAM: holotype ♂ (Figs 2, 3): Coll. I.R.Sc.N.B., Vietnam, Dak Lak prov., Chu Yang Sin N.P., 650-1000m, 12°27'24"N 108°22'15"E, 9-15.viii.2019, GTI Project, Leg. J. Constant & J. Bresseel, I.G.: 34.048 (RBINS). Dissected, genitalia in glycerine, right hind wing mounted.

Paratype ♀: same collection data as holotype (VNMN).

NOTE. The female paratype was slightly damaged during collecting; especially, the broken apex of tegmina do not allow taking precise measurements, which are hence not given in description below.

DIAGNOSIS. The species can be separated from the other *Sogana* species by the combination of the following characters:

1. Median carina of vertex departing from basal margin and limited to basal 1/2 of vertex (Fig. 2 G–H).
2. Frons with seven red transverse fasciae interrupted in the middle and linked on external side by longitudinal narrow red line; median carina reaching ventral margin and interrupted before dorsal margin (Fig. 2 J).
3. Clypeus pale yellow-brown with basal narrow red line on each side of median carina and sides black-brown apically (Fig. 2 J).
4. Tegmina with 13 apical cells (Fig. 2 E).
5. Anal tube elongate and narrow with apical margin emarginate with angles pointed in dorsal view (Fig. 3 C).
6. Aedeagus with dorsal process near base, divided in 2 lateral parts curved lateroventrally; right part less developed and ended in a tooth directed caudad; left part with 5 teeth directed caudad, second one from base much larger than others (Fig. 3 E–I).
7. Periandrium with 3 ventral processes near base, directed caudad, with right one slightly shorter than left one, and median one longer and laterally flattened (Fig. 3 E–F, I–J).

Additionally, in the key proposed by LIANG & WANG (2008) combined with the additional couplet provided by CONSTANT (2010), the new species runs to the couplet treating *S. robustocarina* Liang & Wang, 2008 and *S. floreni* Constant, 2010, from which it can be very easily separated by the much less elongate vertex ( $LV/BV = 0.7$ ; in *S. robustocarina*  $LV/BV = 1.1$ ; in *S. floreni*  $LV/BV = 1.2$ ) and by the shape of the anal tube apically emarginated and with pointed apicolateral angles (apical margin oblique in dorsal view in *S. robustocarina* and *S. floreni*).

DESCRIPTION. *Measurements and ratios*: LT: ♂ ( $n = 1$ ): 8.8 mm. LTg/BTg = 3.5; LV/BV = 0.7; LF/BF = 1.5.

*Head*: (Fig. 2 G–J) moderately elongate with apex rounded in dorsal view. Vertex excavate in middle; laterodiscal carinae oblique and strong, joining lateral margin near anterior margin of eye; area between laterodiscal carina and lateral margin of head flat, not excavate; median carina departing from caudal margin and limited to caudal 1/2 of vertex; vertex brown with anteromedian and two basolateral pale yellowish markings. Posterior face of head brown with median triangular pale yellowish marking. Frons straight in lateral view, with dorsal portion projecting anteriorly; median carina yellowish extending to apex of clypeus but not reaching dorsal margin of frons; frons pale yellow-brown with 7 transverse red bands on each side of median carina and linked on external side by longitudinal narrow red line; anterior margin of frons with 3 black-brown markings. Genae pale yellow-brown with narrow red line along dorsal

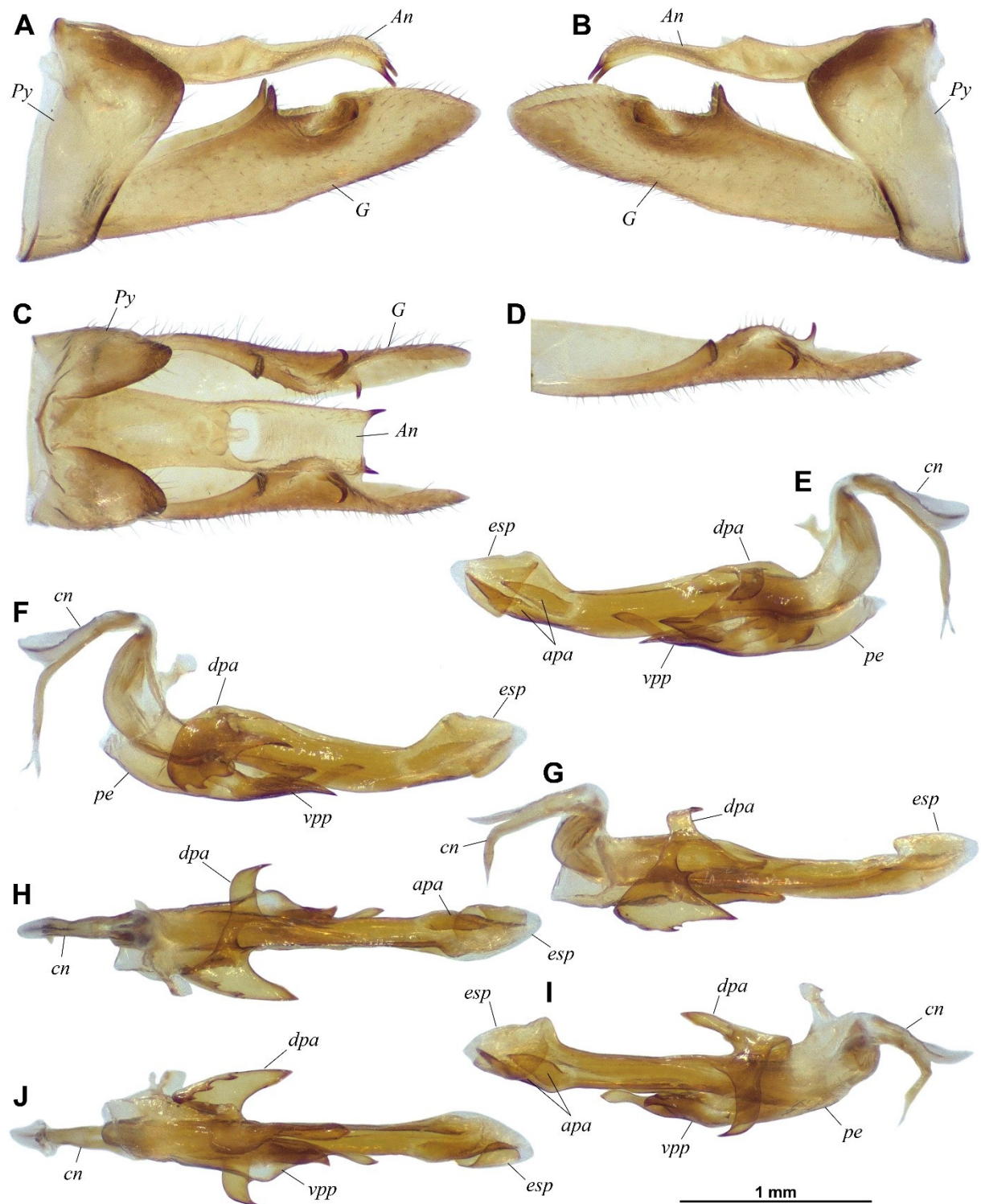


Fig. 3. *Sogana cysana* sp. nov., holotype ♂. A, pygofer, anal tube and gonostyli, left lateral view. B, pygofer, anal tube and gonostyli, right lateral view. C, pygofer, anal tube and gonostyli, dorsal view. D, left gonostylus, dorsal view. E, aedeagus, right lateral view. F, aedeagus, left lateral view. G, aedeagus, left laterodorsal view. H, aedeagus, dorsal view. I, aedeagus, left laterodorsal view. J, aedeagus, ventral view.

*An*: anal tube – *apa*: apical process of aedeagus – *cn*: connective – *dpa*: dorsal process of aedeagus – *esp*: ear-shaped process of aedeagus – *G*: gonostylus – *ldp*: left dorsal process of aedeagus – *pe*: perianthrium – *Py*: pygofer – *vpp*: ventral process of perianthrium.

margin, slightly anteriorly to eye and brown marking at base of antennae. Clypeus pale yellow-brown with basal narrow red line on each side of median carina and sides black-brown apically.

*Thorax*: (Fig. 2 G–J) pronotum brown with yellowish markings on disc along carinae and behind eyes and darker markings basally on each side of median carina and on lateral fields; anterior margin bisinuate, rounded and carinate in middle; posterior margin bisinuate, emarginate in middle; median carina weakening anteriorly, extending only on caudal 2/3; black impressed point on each side of median carina; lateral carinae strong, yellowish; paranotal lobes rounded caudoventrally. Mesonotum pale yellow-brown with median carina and area comprised between discal carinae brown; discal carinae joining anteriorly, median carina rather smooth, not reaching anterior and posterior margins; 4 darker spots along posterior margin; scutellum brown with base black-brown; tegulae yellow-brown; lateral pleura of mesothorax with black-brown markings aligned with the markings on anterior coxae and clypeus.

*Tegmina*: (Fig. 2 A, D–E) elongate, subhyaline with veins slightly darker; weak black-brown marking near base of postcostal cell; small brown patch at base of median cell; vein  $CuA_2$  dark brown on basal 1/6; elongate black-brown marking at apical angle of clavus including apex of vein  $Pcu+A_1$ ; vein  $PCu$  distally slightly forked and brown. Veins  $ScP+R$  and  $MP$  not forked before nodal line;  $CuA$  forked once before nodal line, at about basal 1/4 of tegmen. Four subapical and 13 apical cells; apical cells 6–9 infuscate on distal 2/3.

*Hind wings*: (Fig. 2 F) hyaline with veins mostly dark brown, slightly notched at  $CuP$  apex; infuscate along vein  $CuP$ ; 8 apical cells.



Fig. 4. *Sogana cysana* sp. nov., habitat in Chu Yang Sin National Park, August 2019. © Jérôme Constant.

Legs: (Fig. 2 A–D, K) pale yellow-brown with base and apex of pro- and mesotibiae slightly infusate; all femora with dark brown ante-apical ring, with irregular reddish marking in middle portion and with darker zone near base; base of pro- and mesocoxae brown; metatibiae with 3 lateral and 7 apical spines; first hind tarsomere with 9 apical spines. Metatibiotarsal formula: (3) 7/9/2.

*Abdomen*: brown with terminalia darker.

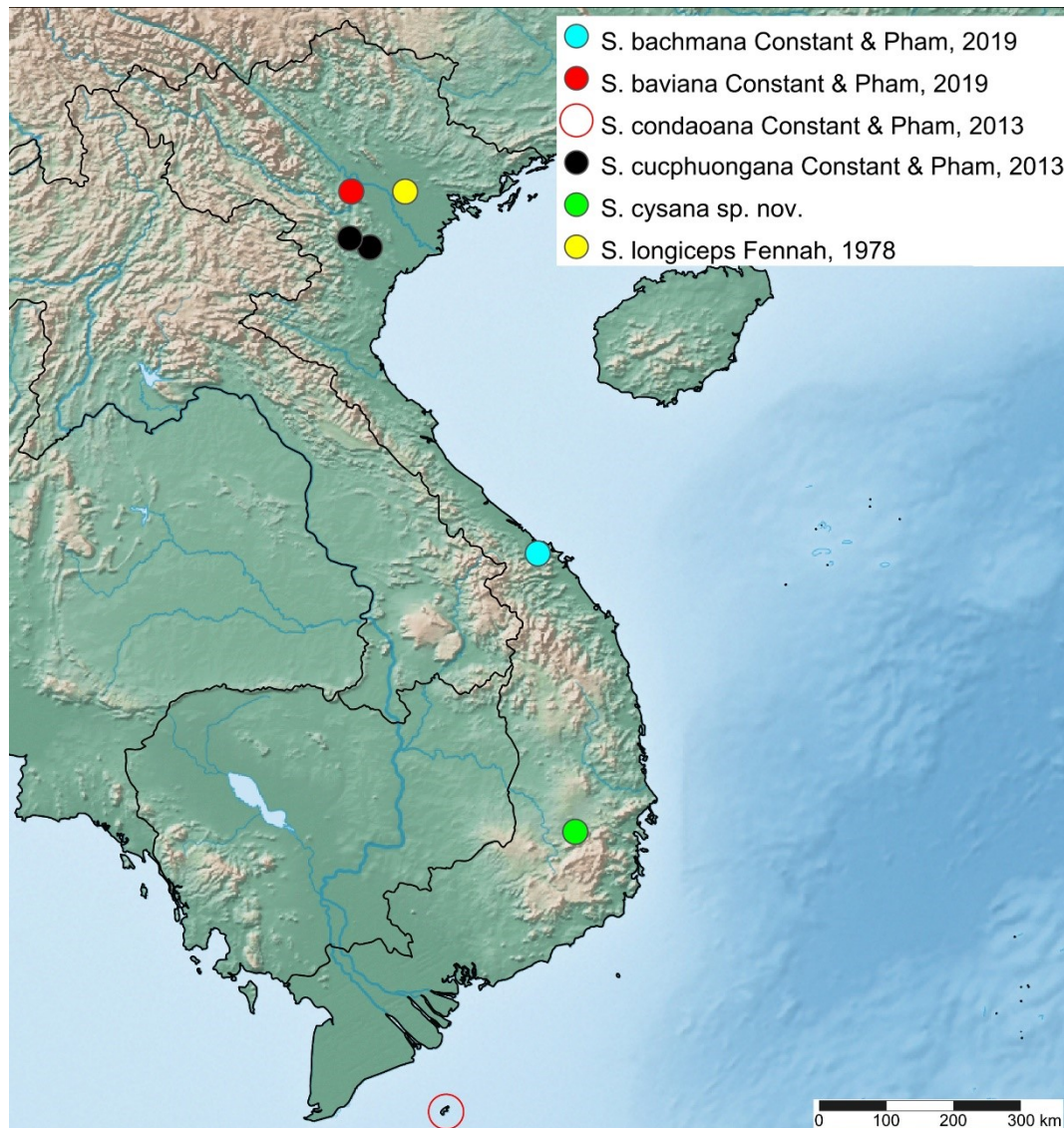


Fig. 5. *Sogana* spp. of Vietnam, distribution map.

*Terminalia* ♂: (Fig. 3) pygofer with posterior margin roundly projecting on dorsal 3/4 in lateral view, 1.75 times higher than long in lateral view; anterior and posterior margins sinuate in lateral view (Fig. 3 A–B); posterior margin deeply V-shaped notched in dorsal view (Fig. 3 C). Gonostyli (Fig. 3 A–D) very elongate, about 4.25 longer than high in lateral view (measured without dorsal process), laterally compressed, with apex narrowly rounded; 3 hooked processes on dorsal margin slightly posteriorly to half length; basal one directed dorsally, middle one directed lateroventrally, caudal one directed centrally. Aedeagus (Fig. 3 E–J) asymmetrical, elongate and narrow, with a dorsal process near base, divided in 2 lateral parts, one left and one right, curved lateroventrally; right part of dorsal process less developed than left one, and ended in a tooth directed caudad; left part of dorsal process with 5 teeth directed caudad, second one

from base much larger than others; perianthrium with 3 ventral processes near base, directed caudad, with right one slightly shorter than left one, and median one longer and laterally flattened; dorsal ear-shaped process at apex, coiled on right side and covering 2 apical teeth directed dorsocaudad. Anal tube (Fig. 3 A–C) elongate and narrow, about 4.1 times longer than wide in dorsal view, slightly widening at level of epiproct in dorsal view, rather strongly sinuate with apex pointing ventrally in lateral view; apex emarginate in dorsal view with apical angles pointed; anal column situated slightly beyond half length.

**BIOLOGY.** The specimens were collected in mountain tropical evergreen forest, at 800–1000m in altitude (Fig. 4).

**DISTRIBUTION.** Vietnam: Dak Lak Province, Chu Yang Sin National Park (Fig. 5).

### Discussion

More than 40% (6 out of 14) of the species of *Sogana* were described from Vietnam, mostly in the recent years in the framework of our Global Taxonomy Initiative project which allowed building the relevant expertise on this genus combined with an up-to-date systematics, keys to rapid recognition and description of new species (CONSTANT & PHAM, 2013, 2019). As already stated in our previous treatment of the genus (CONSTANT & PHAM, 2019), the high species diversity of the genus in Vietnam probably only mirrors the lack of efforts in collecting and studying the Tropiciduchidae, and more generally the planthopper fauna in most Southeast Asian countries.

The Vietnamese fauna of Tropiciduchidae now counts 21 species, including 6 species of the genus *Sogana* alone, representing 28.5% of the species of the Tropiciduchidae of the country. These figures represent only a fraction of the real diversity of Tropiciduchidae of Vietnam, which contains numerous additional new species and new genera awaiting description, e.g. in the collections of RBINS and VNMN (CONSTANT & PHAM, unpublished data).

### Acknowledgments

We thank Prof. Dr Thierry Bourgoïn and Dr Adeline Soulier-Perkins (Muséum National d'Histoire Naturelle, Paris, France) for reviewing the manuscript; Miss Mado Berthet (RBINS) for improving the plates of habitus and genitalia; Mr Joachim Bresseel (RBINS) and Miss Nguyen Thi Man, Miss Thi Thu Huong Nguyen, Mr Van Dat Nguyen, Mr Thanh Trung Vu (VNMN), for their help and permanent enthusiasm with the collecting trip in Vietnam; the authorities of Chu Yang Sin National Park for their support; Dr Patrick Grootaert, Dr Marie-Lucie Susini Ondafe and Dr Luc Janssens de Bisthoven (RBINS) for supporting our Global Taxonomy Initiative project in Vietnam. This paper is a result of the 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 also supported by the Vietnam National Foundation for Science and Technology Development (NAFOSTED) under the grant number 106-NN.05-2016.04, Vietnam and the Project TN17/T06 of the National Programme Tay Nguyen 2016–2020 for the second author.

### References

- BOURGOÏN T., 2020. - FLOW (Fulgoromorpha Lists on The Web): a world knowledge base dedicated to Fulgoromorpha. V.8, updated [IV.2020]. <http://hemiptera-databases.org/flow/> [accessed April 6th, 2020].
- BOURGOÏN 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.
- 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: 11–27.
- CONSTANT J., 2010. - *Sogana* from the Greater Sunda (Hemiptera: Fulgoromorpha: Tropiciduchidae). *Zootaxa*, 2693: 63–68.

- CONSTANT J., 2019. - First record of the tropiduchid planthopper genus *Sogana* Matsumura, 1914 from Cambodia with one new species (Hemiptera: Fulgoromorpha: Tropiduchidae). *Belgian Journal of Entomology*, 82: 1–11.
- CONSTANT J. & PHAM H.T., 2013. - Two new species of *Sogana* Matsumura, 1914 (Hemiptera: Fulgoromorpha: Tropiduchidae) with an identification key to the hitherto known species from Vietnam. *Annales Zoologici*, 63(1): 71–77.
- CONSTANT J. & PHAM H.T., 2019. - The planthopper genus *Sogana* Matsumura, 1914 in Vietnam: Two new species, new records and identification key (Hemiptera: Fulgoromorpha: Tropiduchidae). *Belgian Journal of Entomology*, 85: 1–19.
- DISTANT W.L., 1916. - *The Fauna of British India, including Ceylon and Burma. Rhynchota 6 (Homoptera: Appendix)*. Taylor & Francis, London. pp. 17–145.
- FENNAH R.G., 1978. - Fulgoroidea (Homoptera) from Vietnam. *Annales Zoologici*, 34(9): 207–279.
- FENNAH R.G., 1982. - A tribal classification of the Tropiduchidae (Homoptera: Fulgoroidea), with the description of a new species on tea in Malaysia. *Bulletin of Entomological Research*, 72: 631–643.
- LALLEMAND V., 1942. - Notes sur quelques espèces recueillies par le R. Piel (Musée Heude, Shanghai) et le R. P. de Cooman (Hoa Binh, Tonkin). *Notes d'Entomologie Chinoise*, 9(4): 69–77.
- LIANG A.-P. & WANG R.R., 2008. - A review of the Oriental planthopper genus *Sogana* Matsumura, 1914 (Hemiptera: Fulgoromorpha: Tropiduchidae) with description of three new species. *Zootaxa*, 1732: 29–44.
- MATSUMURA S., 1914. - Beitrag zur kenntnis der Fulgoriden Japans. *Annales Historico-Naturales Musei Nationalis Hungarici*, 12: 261–305.
- MELICHAR L., 1914. - Monographie der Tropiduchiden. *Verhandlungen des naturforschenden Vereines in Brünn*, 53: 1–145.
- METCALF Z.P., 1954. - *General Catalogue of the Homoptera. Fasc. IV. Fulgoroidea. Part 11. Tropiduchidae*. North Carolina State College, Raleigh, NC, USA. 167 pp.
- SHORTHOUSE D.P., 2010. - SimpleMappr, an online tool to produce publication-quality point maps. [Retrieved from <http://www.simplemappr.net>. Accessed February 15, 2020].
- TSAUR S.-C., 1990. - Tropiduchidae of Taiwan (Homoptera: Fulgoroidea), supplement. *Bulletin of the Institute of Zoology, Academia Sinica*, 29(4), 243–248.
-