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First record of the tropiduchid planthopper genus *Sogana* Matsumura, 1914 from Cambodia with one new species (Hemiptera: Fulgoromorpha: Tropiduchidae)

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Front cover: *Sogana chartieri* sp. nov., male holotype in Tatai, 6.IX.2016 (photograph © G. Chartier).

First record of the tropiduchid planthopper genus *Sogana* Matsumura, 1914 from Cambodia with one new species (Hemiptera: Fulgoromorpha: Tropiduchidae)

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Abstract

A new species of *Sogana* Matsumura, 1914, *S. chartieri* sp. nov. is described from Cambodia from one male specimen collected in Tatai, Koh Kong Province. Illustrations of the holotype and male genitalia as well as photographs of the live specimen and a distribution map are provided. The genus *Sogana* is recorded for the first time from Cambodia and now contains 11 species.

Keywords: Fulgoroidea, Auchenorrhyncha, South Cardamom Forest, Indochina, deforestation.

Introduction

The family Tropiduchidae is a rather small group of Fulgoromorpha, with 660 species according to the FLOW database (Fulgoromorpha Lists On the Web – BOURGOIN, 2019), representing only 4.8 % of the species of Fulgoromorpha. The Cambodian fauna of Tropiduchidae is extremely poorly known, currently containing only one recently described species, *Lukabales ecarinatus* Stroinski & Szvedo, 2015. As a comparison, FLOW lists 18 species of Tropiduchidae for Vietnam, 4 for Thailand and 48 for China (BOURGOIN, 2019). The identification of recent material from Cambodia in the collections of RBINS, in the framework of the Global taxonomic Initiative (GTI) project “A step further in the entomodiversity of Cambodia”, allowed the discovery of one new species of the Tropiduchidae genus *Sogana* Matsumura, 1914. This genus was placed by FENNAH (1982) in the tribe Isporisini Fennah, 1982, together with three other genera from Southeast Asia: *Eilithya* Distant, 1912, *Isporisa* Walker, 1857 and *Isporisella* Baker, 1927. The genus *Sogana* presently contains 10 species (LIANG & WANG, 2008; CONSTANT, 2010; CONSTANT & PHAM, 2013) distributed in Southeast Asia, with five of them described from countries adjacent to Cambodia: three from Vietnam: *S. longiceps* Fennah, 1978, *S. condaoana* Constant & Pham, 2013 and *S. cucphuongana* Constant & Pham, 2013 (CONSTANT & PHAM, 2013) and two from Laos: *S. clara* Liang & Wang, 2008 and *S. pseudohopponis* Liang & Wang, 2008 (LIANG & WANG, 2008). The current alarming rate of destruction of the forests and other natural habitats in Cambodia (F.A.O., 2007; SOUTER *et al.*, 2016) makes it extremely urgent to document the biodiversity of this country that is part of the Indo-Burma biodiversity hotspot (MITTERMEIER *et al.*, 2004). The aim of this paper is to describe a new species of Tropiduchidae, *Sogana chartieri* sp. nov., as an addition to the biodiversity of Cambodia.

Material and methods

The 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 wings venation follows BOURGOIN *et al.* (2015).

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 specimen 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 the collection:

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

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

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

SPECIES INCLUDED AND TYPE LOCATION

Sogana chartieri sp. nov. (Cambodia)
Sogana clara Liang & Wang, 2008 (Laos)
Sogana condaoana Constant & Pham, 2013 (Vietnam)
Sogana cucphuongana Constant & Pham, 2013 (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)

***Sogana chartieri* sp. nov.**

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Figs 1–5

ETYMOLOGY. The species epithet is a patronym dedicated to Mr Gerard “Gee” Chartier (Tatai, Cambodia) who collected the type specimen, in acknowledgment for his involvement in the progress of the knowledge of the Cambodian entomofauna.

TYPE MATERIAL. CAMBODIA: holotype ♂: Coll. I.R.Sc.N.B., Cambodia, Koh Kong prov., Tatai, 11°35'13"N 103°05'50"E, 6.IX.2016, leg. G. Chartier, I.G.: 33.551 (RBINS). Dissected, genitalia in glycerine; right hind wing mounted, glued on cardboard.

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

1. median carina of vertex reaching anterior margin, furcate on basal 1/3 and reaching posterior margin.
2. frons with five red transverse fasciae interrupted in the middle and median carina interrupted before the basal and apical margins
3. clypeus black-brown with large central yellow-brown marking.
4. tegmina with 13 apical cells.
5. anal tube elongate and narrow with apex more or less rounded.
6. aedeagus with 2 pointed processes dorsally; processes without additional teeth.
7. perandrium ventrally with a broad, hook-shaped and apically rounded process.

Additionally, (1) in the key proposed by LIANG & WANG (2008) used with the addendum provided by CONSTANT (2010), the species runs to *S. clara* Liang & Wang, 2008, from which it can be separated by the more elongate vertex ($LV/BV = 0.75$; in *S. clara* $LV/BV = 0.82$) and frons ($LF/BF = 1.6$; in *S. clara* $LF/BF = 1.49$), by the shape of the anal tube more or less rounded apically (obliquely cut in *S. clara*) and by the absence of small teeth on the dorsal processes of the aedeagus (with many small teeth apically in *S. clara*); (2) in the key proposed by CONSTANT & PHAM (2013), the species runs either to *S. cucphuongana* Constant & Pham, 2013 or *S. condaoana* Constant & Pham, 2013 from which it can be separated by the number of apical cells of tegmina (13 in *S. chartieri*; 18 or more in both other species); the number of transverse red bands on frons (5 in *S. chartieri*; 7 in both other species) and the dorsal processes of the aedeagus straight, pointed, without additional teeth (numerous additional teeth in *S. condaoana*; processes strongly furcate in *S. cucphuongana*).

DESCRIPTION.

Measurements and ratios: LT: ♂ (n = 1): 7.7 mm. LTg/BTg = 3.0; LV/BV = 0.75; LF/BF = 1.6.

Head: (Fig. 1 G–I) vertex elongate with apex rounded in dorsal view; latero-discal carinae oblique, well marked, joining lateral margin at half of eye length; vertex excavate between carinae; median carina broad and furcate on basal third; vertex pale yellow-brown with elongate dark brown marking at base of anterolateral depression and angular dark brown marking at laterobasal angles of vertex; posterior face of head with two black-brown rather large spots. Frons elongate, straight in lateral view; median carina extending to apex of clypeus but weakly marked on short distance near base and before anterior margin; pale yellow-brown with 5 transverse red bands interrupted in middle; anterior margin of frons with 3 black-brown patches. Genae pale yellow-brown with curved dark brown marking at antero-dorsal angle. Clypeus black brown with large central pale yellow-brown patch. Labium pale yellow, reaching hind coxae.

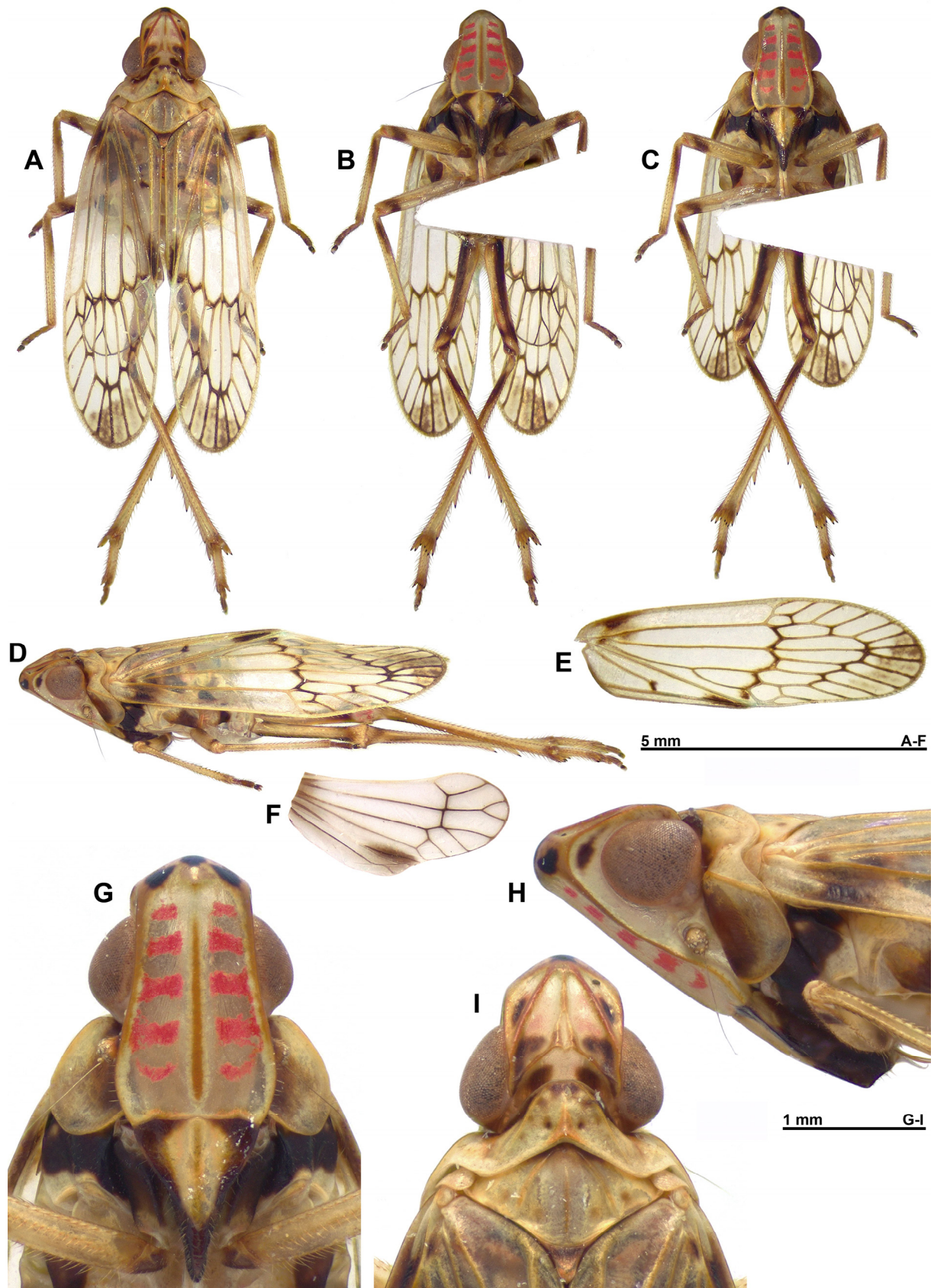


Fig. 1. *Sogana chartieri* sp. nov., holotype ♂. A, habitus dorsal view. B, habitus, ventral view. C, habitus, normal view of frons. D, habitus, lateral view. E, right tegmen. F, right posterior wing. G, frons, normal view. H, head and thorax, lateral view. I, head and thorax, dorsal view.

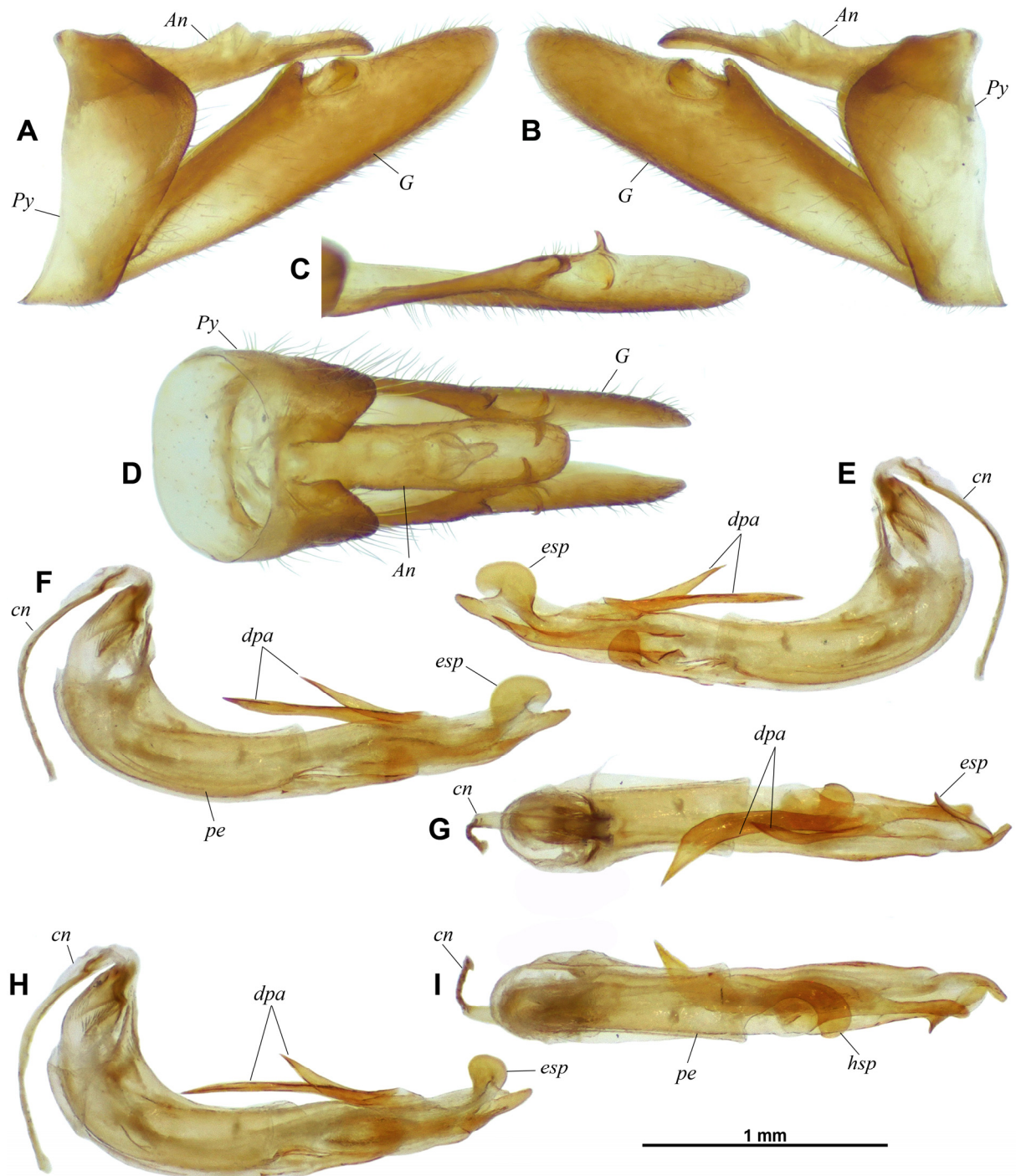


Fig. 2. *Sogana chartieri* sp. nov., holotype ♂. A, pygofer, anal tube and gonostyli, left lateral view. B, pygofer, anal tube and gonostyli, right lateral view. C, left gonostylus, dorsal view. D, pygofer, anal tube and gonostyli, dorsal view. E, aedeagus, right lateral view. F, aedeagus, left lateral view. G, aedeagus, dorsal view. H, aedeagus, left posterolateral view. I, aedeagus, ventral view.

An: anal tube – cn: connective – dpa: dorsal process of aedeagus – esp: ear-shaped process of aedeagus – G: gonostylus – hsp: hook-shaped process of periandrium – pe: periandrium – Py: pygofer.

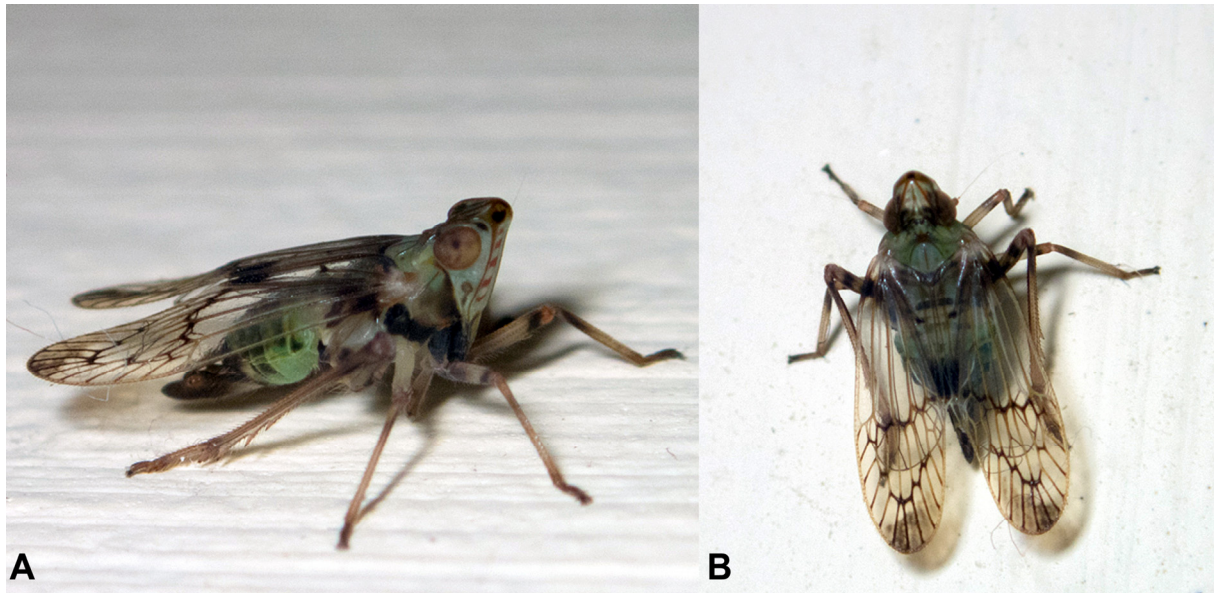


Fig. 3. *Sogana chartieri* sp. nov., holotype ♂ in Tatai, 6.IX.2016 (photograph © G. Chartier). A, lateral view. B, dorsal view.

Thorax: (Fig. 1 A–D, G–I) pronotum pale yellow-brown with irregular brown spots on disc, black impressed point on disc, on each side of median carina and brown patch along anterior margin of lateroventral lobes; posterior margin emarginate; median carina weakening near anterior margin. Mesonotum pale yellow-brown with median and discal carinae joining anteriorly and 4 brownish spots along posterior margin; scutellum slightly darker. Tegulae pale yellow-brown. Lateral pleura of prothorax with black band prolongating the black area on sides of clypeus. Lateral pleura of metathorax with brown markings.

Tegmina: (Fig. 1 E) elongate, subhyaline; black-brown marking near base of postcostal cell, extending in a brown patch at base of radial cell; apex of radial, median and cubital cells narrowly dark brown; elongate black-brown marking at apical angle of clavus; apex of PCu with dark brown marking. Veins ScP+R and MP not forked before nodal line; CuA forked once before nodal line. 7 subapical and 13 apical cells; apical cells 6–10 infusate on distal 2/3;

Hind wings: (Fig. 1 F) hyaline with veins mostly brown; postclaval margin emarginate and infusate along vein CuP.

Legs: (Fig 1 A–D) pale yellow-brown with base of procoxae dark brown; base and subapical ring on pro- and mesofemora; pro- and mesotibiae with base brown; metafemora with longitudinal dark brown markings; metatibiae dark brown near base; tibiae III with 3 lateral and 7 apical spines; first hind tarsomere with 8 apical spines. Metatibiotarsal formula: (3) 7/8/2.

Abdomen: greenish yellow with brown markings; terminalia dark brown.

Genitalia ♂: (Fig. 2) pygofer narrow with posterior margin roundly projecting on dorsal 2/3; anterior and posterior margins sinuate in lateral view (Fig. 2 A–B); posterior margin abruptly and deeply notched dorsally. Anal tube (Fig. 2 A–B, D) elongate and narrow, slightly more developed to the right side in dorsal view, with sides subparallel and apex more or less rounded; slightly sinuate in lateral view; anal column at about half length; gonostyli (Fig. 2 A–D) very elongate, laterally compressed, with apex narrowly rounded; 3 hooked processes on dorsal margin slightly posteriorly to half length. Aedeagus (Fig. 2 E–H) elongate and narrow, with 2 pointed elongate processes dorsally projecting dorso-anteriorly (Fig. 2 E–I); processes dorsoventrally flattened; left process shorter and curved to the right, right process longer and stronger, curved to the left and surpassing lateral margin of aedeagus in dorsal

view (Fig. 2 G); subapical ear-shaped process dorsally (Fig. 2 E–F); periandrium (Fig. 2 I) strongly asymmetrical, with left side elongate ventrally, strongly curved to the right in a dorsoventrally flattened, broad hook rounded at apex.

BIOLOGY. The specimen was collected sitting on the wall of a small house (Fig. 3) surrounded by secondary forest. The vegetation at this place is mostly shrubs and small trees, with a rather dense ground cover (Fig. 4).

DISTRIBUTION. Cambodia: Koh Kong Province (Fig. 5).



Fig. 4. *Sogana chartieri* sp. nov., habitat in Tatai (photograph © G. Chartier).



Fig. 5. *Sogana chartieri* sp. nov., distribution map.

Discussion

The fauna of Cambodia currently contains only two species of Tropiduchidae. Both of them were discovered during recent collecting trips in the framework of GTI projects managed by RBINS since 2003, notably in collaboration with the Cambodian Entomology Initiatives at the Royal University of Phnom Penh. The same projects allowed some remarkable progress in the knowledge of other groups of insects in this country, e.g. Odonata (SEEHAUSEN *et al.*, 2016), Hemiptera Fulgoridae (CONSTANT *et al.*, 2016), Hemiptera Cicadidae (LEE, 2010; LEE & SANBORN, 2010), Coleoptera Chrysomelidae (MOHAMEDSAID & CONSTANT, 2007), Coleoptera Cicindelidae (CASSOLA, 2005; WIESNER, 2008, 2013, 2014, 2017, 2018), Diptera Asilidae (TOMASOVIC & CONSTANT, 2017), Diptera Dolichopodidae (TANG *et al.*, 2018), Hymenoptera Chalcidoidea (YEFREMOVA *et al.*, 2018) to name just a few. More tropiduchid species exist in the country (Constant, unpublished) that will need be described in the future. Unfortunately, the current rapid destruction of the forest in Cambodia (F.A.O., 2007) may lead to the eradication of many species before they can be discovered, described and documented. Urgent and radical measures need to be taken to protect efficiently the remaining patches of forest and to accelerate the scientific documentation of the biodiversity. These actions must involve the Cambodian authorities, local communities and NGOs as well as the third countries helping for the development of Cambodia (SOUTER *et al.*, 2016).

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