Zootaxa 4018 (4): 563–572
www.mapress.com/zootaxa/
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Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

http://dx.doi.org/10.11646/zootaxa.4018.4.5
http://zoobank.org/urn:lsid:zoobank.org:pub:0DEFFE93-514F-4329-8B7D-6A376776CCC1

A new Asian genus of the tribe Elicini (Hemiptera: Fulgoromorpha: Tropiduchidae) with two new species from Vietnam

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Abstract

A new genus *Connelicita* **gen. nov.** with 2 new species (*C. backyensis* **sp. nov**. and *C. haiphongensis* **sp. nov.**) of Tropiduchidae Elicini from Vietnam are described and illustrated. The Chinese species *C. lungchowensis* (Chou et Lu, 1977) **comb. nov.** is transferred into this new genus from the genus *Sassula* (Nogodinidae). A key to species of the new genus distributed in North Vietnam and China (Guangxi) is provided.

Key words: Fulgoroidea, planthoppers, taxonomy, new taxa, Vietnam, China

Introduction

The tribe Elicini Melichar, 1915 was originally erected in the family Lophopidae Stål, 1866 for 6 genera as Elicaini Melichar, 1915 (sic) (Fig. 1). When Fennah (1978) reestablished the tribe Bladinini Kirkaldy, 1907 in the family Nogodinidae Melichar, 1898, he transferred them as a subtribe (Elicina) of nogodinid Bladinini with only 2 genera: *Elica* Walker, 1857 and *Conna* Walker, 1857. In Bladinini, he separated Elicina Melichar, 1915 from Gaetuliina Fennah, 1978 (with 10 genera) according to a more or less distal junction of Pcu and A1 in the clavus of the forewing. A few years later, Fennah (1984) recharacterized the nogodinid subtribe Gaetuliina and transferred 18 genera in it from the family Issidae Spinola, 1839. Finally, Gnezdilov (2013) rejected Fennah's separation of Elicina and Gaetiluliina (Fennah, 1984) and synonymized the two subtribes in the Tropiduchidae Stål, 1866. Accordingly, this taxon was reevaluated and moved to the tribal rank in the subfamily Elicinae Melichar, 1915. Figure 1 presents a graphical summary of this historical review of Elicini since establishment by Melichar (1915) as provided by FLOW (Bourgoin, 2015).

Currently, the tropiduchid Elicini contains 29 genera and 123 species (Bourgoin, 2015) and it is widely but disjunctly distributed across all ecoregions of the globe, except in the Palaearctic. In Asia, the tribe is represented by a few genera: *Elica* the type genus of the group, and *Conna* from Malaysia, *Indogaetulia* Schmidt, 1919 from Indonesia and Vietnam, and *Pucina* Stål, 1866 from India, Java and Australia. In the present paper, we describe a new Asian Elicini genus, *Connelicita* **gen. nov.** with two new species and to which we transfer one species previously described in the genus *Sassula* Stål, 1870 (Nogodinidae: Varciini—Fennah, 1978).

Material and methods

Material. The studied specimens belong to the Institute of Zoology, Chinese Academy of Sciences, Beijing, China (IZCAS), Tianjin Museum of Natural History, Tianjin, China (TMNH) and the Muséum National d'Histoire Naturelle, Paris, France (MNHN).

Accepted by A.P. Liang: 20 Aug 2015; published: 17 Sept. 2015

Preparation and illustration. Genitalia were prepared after relaxing specimens in humid conditions for 12 hours to separate abdomens, then boiling them in 10% KOH solution about 5 minutes stained by chlorazol black (CAS No. 1937–37–7) for staining the translucent membranous ectodermic genital structures based on the method introduced by Carayon (1969). The final observation was done in glycerin.

Photographs were done in MNHN-Paris using a Nikon EOS 6OD camera attached to a Nikon SMZ 1500 stereomicroscope and further refined with the Combine ZP software and in Yangling, China using a Leica DFC camera attached to a Leica M205A stereomicroscope and further processed with LAS V3.7 software. The historical graphical summary was provided by FLOW (Bourgoin, 2015).

Terminology follows respectively Bourgoin (1987, 1993), Bourgoin et al. (2014) and Wang et al. (2013) for male genitalia, female genitalia, wing venation and sensory structures.

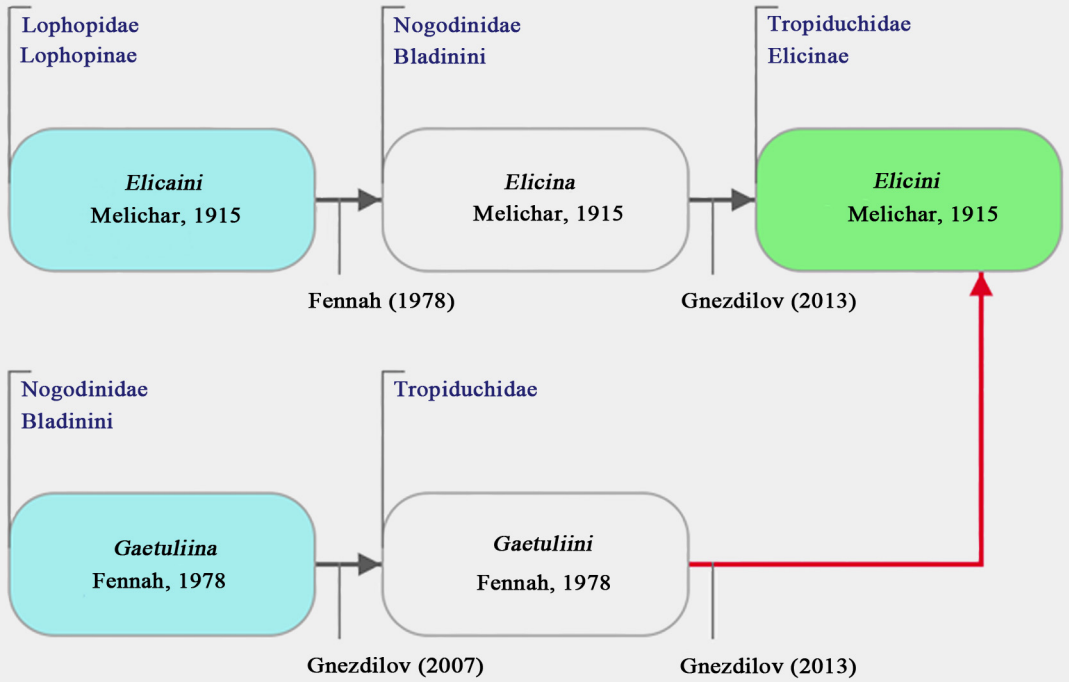


FIGURE 1. Graphical summary of taxon concept Elicini Melichar, 1915: each box corresponds to a major step in the evolution of the taxon; red color arrow indicates a synonymy (according to FLOW, Bourgoin, 2015)..

Taxonomy

Family Tropiduchidae Stål, 1866

Subfamily Elicinae Melichar, 1915

Tribe Elicini Melichar, 1915

Connelicita Wang et Bourgoin, gen. nov.

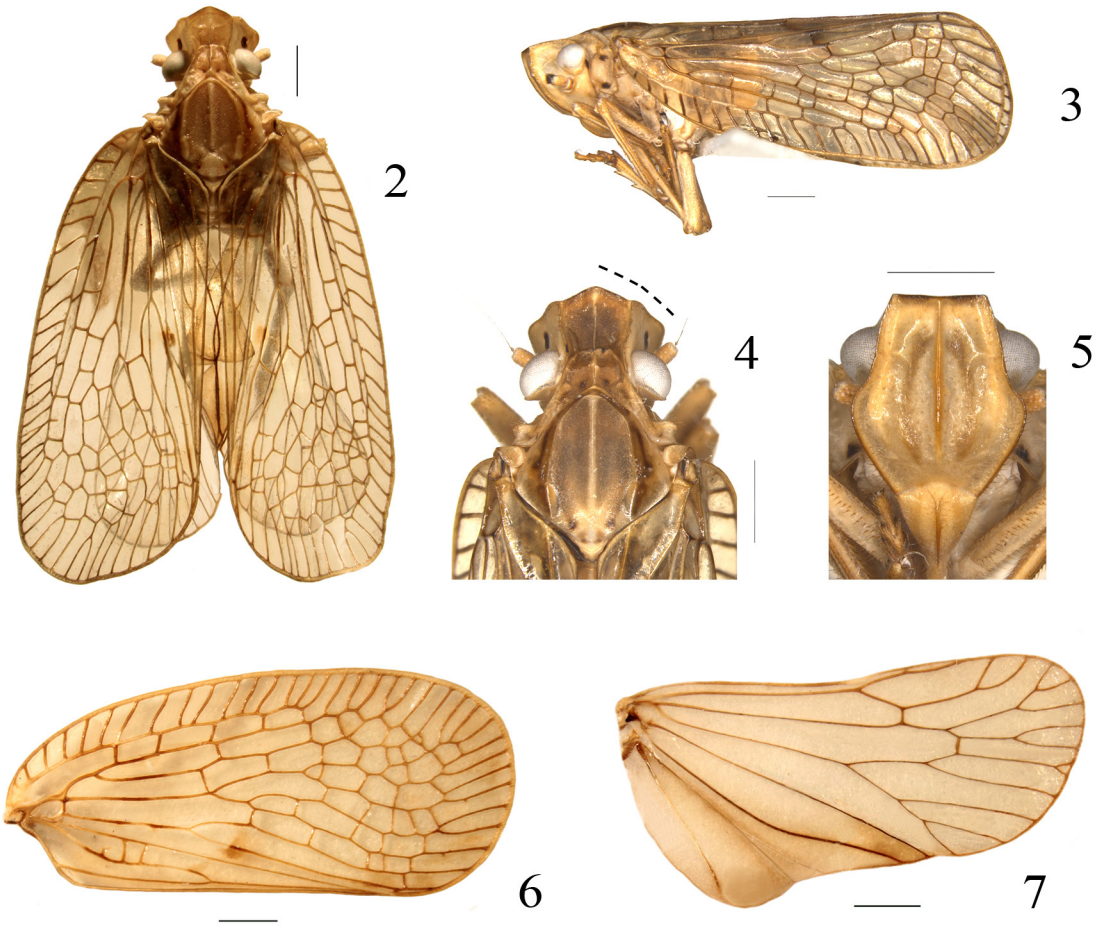
Type species. *Connelicita backyensis* sp. nov., here designated.

Etymology. The Latin name refers to a free concatenation between the genus names *Conna* Walker, 1857 and *Elica* Walker 1857. Gender feminine.

Diagnosis. Head capsule with frons widely developed below compound eyes level; antero-dorsal part of genae visible in dorsal view. Tegmina with costal area more than 16 cells longer than wide, ScP regularly straight and presence of 2–3 veinlets *pcu-cup*.

Description. HEAD**.** Head with compound eyes almost as wide as thorax (Figs 4, 24, 33). Vertex as long as broad or slightly broader than long in midline; anterior and lateral margins carinated elevated; anterior margin

distinctly anteriorly produced (Figs 4, 24, 33); disc of vertex flattened with median carina present on basal 4/5 of disc. Frons approximately as long in midline as widest part below antenna level; margins carinated, anterior one straight (Figs 5, 25, 34); disc of frons with elevated median carina not reaching frontoclypeal sulcus, sublateral carinae absent (Figs 5, 25, 34); strongly widened below eyes. Compound eyes rounded, supported by ventro-posterior callus. Lateral ocelli present, median absent. Antenna with pedicel elongate, about 1.6 times as long as wide, pedicel trichoid sensilla type I and II present. Anterodorsal part of genae particularly developed and well visible in dorsal view (Figs 4, 24, 33). Frontoclypeal suture dorsally convex (Figs 5, 25, 34). Clypeus with median keel-shape carina, without lateral carinae (Figs 5, 25, 34). Apical segment of rostrum shorter than subapical one, reaching intermediate coxae.

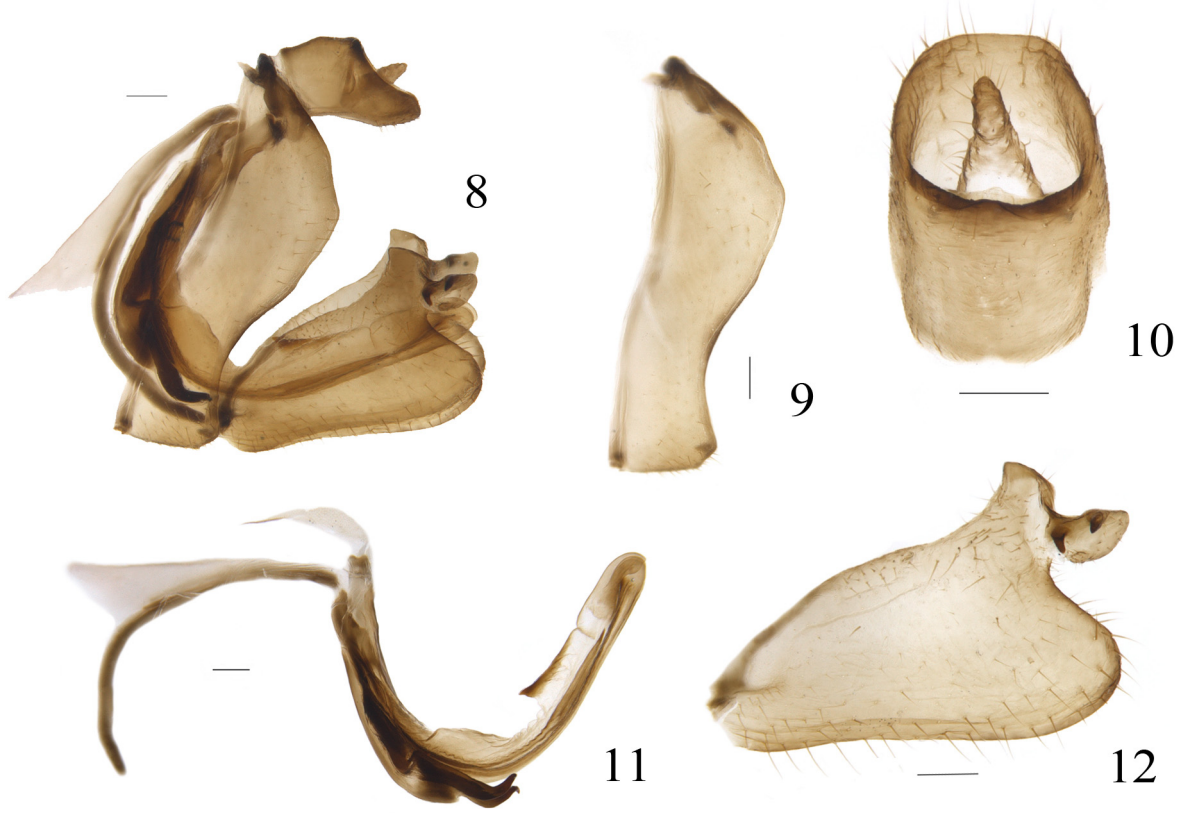


FIGURES 2–7. *Connelicita haiphongensis* **gen. et sp. nov.** (2) habitus, dorsal view; (3) same, lateral view; (4) head and thorax, dorsal view; (5) frons, frontal view; (6) forewing; (7) hindwing. Scale bars = 1 mm. Line in dots indicates vertex and gena anterior margin respective direction as used in the key.

THORAX. Pronotum shorter than vertex in midline, strongly produced anteriorly; anterior margin straight, surpassing middle level or upper margin of compound eyes (Figs 4, 24, 33); posterior margin reaching compound eyes lower margin (Figs 4, 24, 33); median carina complete from anterior to posterior margin, lateral pronotal postocular eminences present (Figs 4, 24, 33), with strong setae. Mesonotum broad, obviously longer than wide, wider than cumulative length of vertex and pronotum; tricarinated and carinae elevated, connected at upper margin and reaching almost to posterior margin (Figs 4, 24, 33).

Tegmina. Forewings flattened, transparent and elongated, distinctly longer than width, costal margin and postclaval margin nearly parallel, distal margin rounded (Figs 6, 26, 32). Costal area well developed, with a row of 16 or more cells longer than wide, no pterostigma (Figs 6, 26, 32). Postcostal area narrower than costal area, with 4–7 transverse veinlets. Veins ScP+R, MP and CuA separated at base, first separation of vein ScP+R near base. Nodal line absent. MP first fork after CuA first fork; MP_1+MP_2 fork surpassing fork of vein MP_3+MP_4. First transverse vein *icua* variable in position (Fig. 26), sometimes absent providing very long cell C5 (Figs 6, 32).

Clavus long, surpassing 3/4 of tegmina length and after level of ScP reaching costal margin (Figs 6, 26, 32). Veins Pcu and A1 fused at basal half of clavus (Figs 6, 26, 32), with 2–3 transverse veinlets present between veins CuP and Pcu.



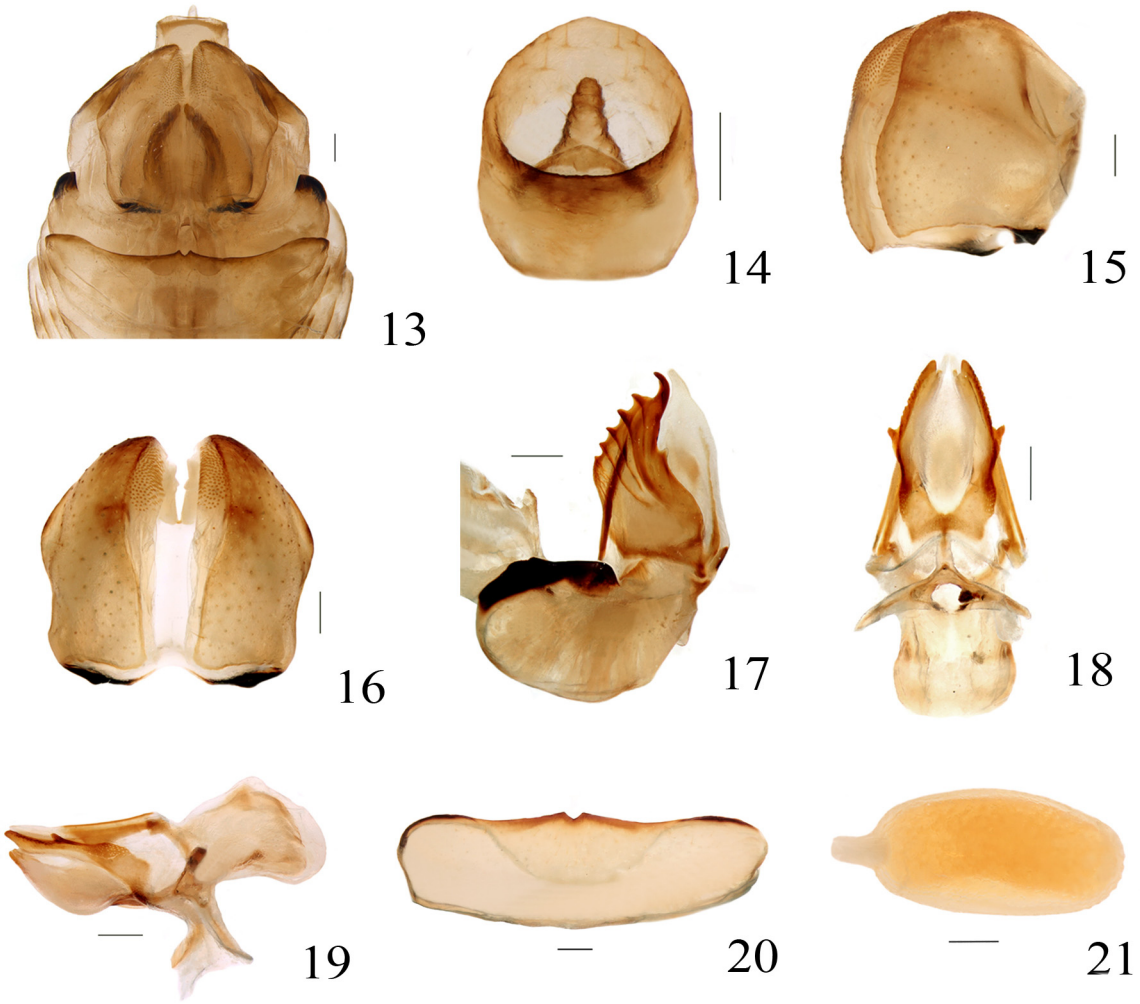
FIGURES 8–12. *Connelicita haiphongensis* **gen. et sp. nov.**, male. (8) terminalia, lateral view; (9) pygofer, lateral view; (10) anal tube, dorsal view; (11) phallic complex, lateral view; (12) gonostylus, lateral view. Scale bars = 0.2 mm.

Legs**.** Pro and meso-legs flattened. Hind tibia a little longer than femora; with 2 lateral spines in apical half and 9–10 small apical spines arranged into a line. First segment of metatarsus asymmetrical, with one large strong apical spine on each side surpassing apical margin of metatarsus I plus one latero-external small spine. Metatarsus II with two strong apical spines. Metatibiotarsal formula: 2/(9-10)/2+1/2.

MALE TERMINALIA**.** Pygofer much longer than wide, anterior margin weakly sinuous, almost straight, posterior margin distinctly protruded caudad, upper part wider than lower one (Figs 8, 27). Gonostylus broaden in apical part, caudo-ventral angle rounded in lateral view (Figs 12, 31), fused at base in ventral view. Capitulum of gonostyles short, with additional lobe in posterior margin, additional lobe of capitulum with two well sclerotized small and sharp spines in upper margin (Figs 12, 31). Anal tube short in lateral view (Figs 8, 27), ventral margin longer than dorsal one. Phallic complex slender and long. Periandrium relatively short and tubular, with pair of ventral processes (Figs 11, 30). Aedeagus longer than periandrium (Figs 11, 30); tooth present in apical half of dorsal margin, pair of lateral bifurcate processes along ventral margin (Figs 11, 30).

FEMALE TERMINALIA**.** Anal tube short in lateral view. Female genitalia of fulgoroid-type. Anterior connective lamina of gonapophysis VIII with teeth at outer lateral margin and one tooth in inner lateral margin (Fig. 17). Endogonocoxal process developed and membranous (Fig. 17). Gonocoxa VIII subquadrangular. Posterior connective lamina of gonapophysis IX membranous in medial part and sclerotized in outer part (Fig. 18). Gonospiculum bridge large (Figs 18, 19). Gonoplacs rounded in lateral view (Fig. 15), fused at middle in apical half (Fig. 16), outer margin slightly broadened near middle (Fig. 16).

Distribution. Eastern Asia: North Vietnam, China: Guangxi.



FIGURES 13–21. *Connelicita haiphongensis* **gen. et sp. nov.**, female. (13) terminalia, ventral view; (14) anal tube, dorsal view; (15) gonoplac, lateral view; (16) gonoplac, dorsal view; (17) gonocoxa VIII and gonapophysis VIII, lateral view; (18) gonapophysis IX and gonospiculum bridge, dorsal view; (19) same, lateral view; (20) sternite VII, ventral view; (21) egg. Scale bars = 0.2 mm.

Key to species of genus *Connelicita* Wang et Bourgoin, gen. nov.

1. Anterior margin of vertex slightly convex (Fig. 24); a clear angle between anterior margin of vertex and anterior margin of genae in dorsal view (Fig. 24) . . . . . *C. backyensis* **sp. nov.**
-. Anterior margin of vertex strongly convex (Figs 4, 33); anterior margin of vertex and anterior margin of genae in dorsal view almost in the same line (Fig. 4, 33) 2
2. Vertex with lateral margins from apex narrowing to base (Fig. 4) . . . . . *C. haiphongensis* **sp. nov.**
-. Vertex with lateral margins parallel (Fig. 33) . . . . . *C. lungchowensis* (Chou et Lu, 1977) **comb. nov.**

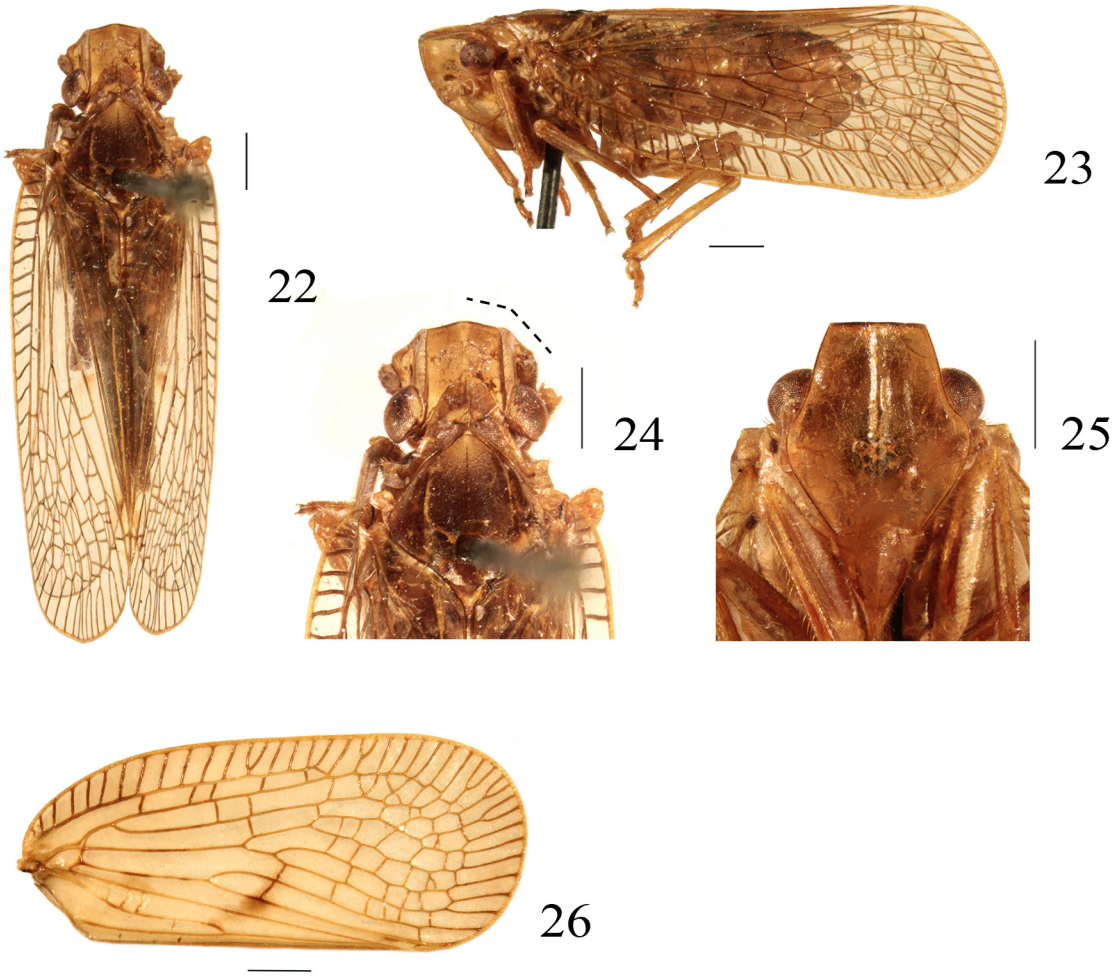
Connelicita backyensis Stroiński et Bourgoin, sp. nov.

(Figs 22–31)

Etymology. The Latin name refers to Vietnamese name of Tonkin (*Bắc Kỳ*), the area where the species was collected.

Diagnosis. This new species appears similar to *C. haiphongensis* sp. nov., but differs by the following specific characters: anterior margin of vertex slightly convex (Fig. 24), but strongly convex in *C. haiphongensis* (Fig. 4); aedeagus with large and thick process at apex, directed upward in this species (Fig. 30), absent in *C. haiphongensis*

(Fig. 11); gonostylus with capitulum located at apical 1/3, posterior margin of gonostylus deeply concave forming a groove in apical half (Fig. 31), while in C. *haiphongensis* located at apical 1/4, posterior margin of gonostylus straight in apical half (Fig. 12).



FIGURES 22–26. *Connelicita backyensis* **gen. et sp. nov.** (22) habitus, dorsal view; (23) same, lateral view; (24) head and thorax, dorsal view; (25) frons, frontal view; (26) forewing. Scale bars = 1 mm. Line in dots indicates vertex and gena anterior margin respective direction as used in the key.

Description. Length: male (including forewing) (N=4): 10.5–11.2 mm, forewing: 8.7–9.3 mm.

HEAD. Vertex 0.8 times longer in middle line than wide at base (Fig. 24). Frons 2.0 times longer in middle line than broad at upper margin, 1.0 times longer in middle line than widest part (Fig. 25).

THORAX. Pronotum 3.6 times wider at widest part than long in midline (Fig. 24). Mesonotum 1.0 times wider at widest part than long in midline and 1.5 times longer than cumulative length of vertex and pronotum in midline (Fig. 24). Forewing 2.3 times longer than widest part (Fig. 26).

MALE TERMINALIA**.** Anal tube 1.5 times longer than width in dorsal view, with apical margin almost straight, lateral margins parallel at basal half but narrowing to apex at apical half, epiproct short, located at upper half of anal tube (Fig. 29), ventral margin of anal tube straight in lateral view (Fig. 27). Gonostylus with capitulum located at apical 1/3, posterior margin of gonostylus deeply concave to form a groove in apical half, dorsal margin of capitulum nearly straight, additional lobe of capitulum with two separate spines closely located in basal half (Fig. 31). Pygofer in lateral view with posterior margin deeply inclined posteriorly at upper 1/3 and deeply inclined forward at lower 2/3 (Figs 27, 28). Aedeagus with one large thick process at apex, directed upward (Fig. 30). Ventral process of periandrium sword-shaped (Fig. 30).

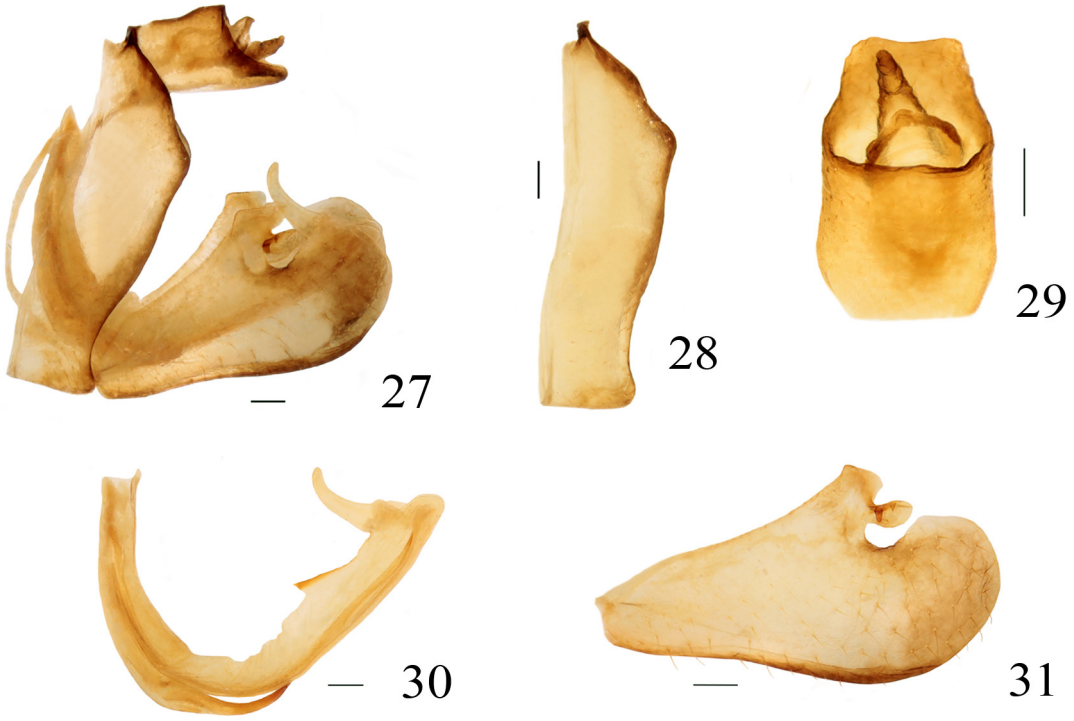
FEMALE. Unknown.

COLORATION. Vertex tawny, with weak median carina tawny, anterior carina black and lateral carinae tawny, lateral margins nearly parallel (Figs 22, 24). Compound eyes brown (Figs 22, 24). Ocelli red. Frons reddish brown,

with median carina reddish brown, anterior and lateral margins brown (Fig. 25). Clypeus reddish brown, with median carina pale brown (Fig. 25). Genae tawny, with a black patch below antenna (Fig. 23). Pronotum tawny, with median carina tawny and two small depressions beside median carina on disc (Fig. 24). Mesonotum brown, with median carina brown (Fig. 24). Forewing with brown spot near middle of vein CuP and vein CuA_2 (Fig. 26). Legs tawny, with apex of spines black.

Type materials. Holotype ♂, Vietnam: Hòa Bình, Tonkin, 1927, Coll.: De Cooman (MNHN). Paratypes: 1♂, Vietnam: Hòa Bình, Tonkin, 1919, Coll.: R. Oberthur (MNHN); 1♂, Vietnam: Hòa Bình, Tonkin, 1919, Coll.: R. Oberthur (MNHN); 1♂, Vietnam: Hòa Bình, Tonkin, 1926, Coll.: De Cooman (MNHN). All specimens deposited in MNHN.

Distribution. Vietnam: Hòa Bình Province.



FIGURES 27–31. *Connelicita backyensis* **gen. et sp. nov.**, male. (27) terminalia, lateral view; (28) pygofer, lateral view; (29) anal tube, dorsal view; (30) phallic complex, lateral view; (31) gonostylus, lateral view. Scale bars = 0.2 mm.

***Connelicita haiphongensis* Wang et Zhang, sp. nov.**
(Figs 2–21)

Etymology. The Latin name refers to the locality of the species in Haiphong, Vietnam.

Diagnosis. The new species appears similar to *C. backyensis* Stroiński et Bourgoin, sp. nov. but differs in the head capsule shape and male genitalia conformation as indicated in the diagnosis of the type species—*C. backyensis* sp. nov.

Description. Length: male (including forewing) (N=1): 10.2 mm, forewing: 8.1 mm; female (including forewing) (N=2): 10.8–11.0 mm, forewing: 8.8–9.0 mm.

HEAD**.** Vertex 1.1 times longer in middle line than wide at base (Fig. 4). Frons 2.0 times longer in middle line than broad at upper margin, 1.1 times longer in middle line than widest part (Fig. 5).

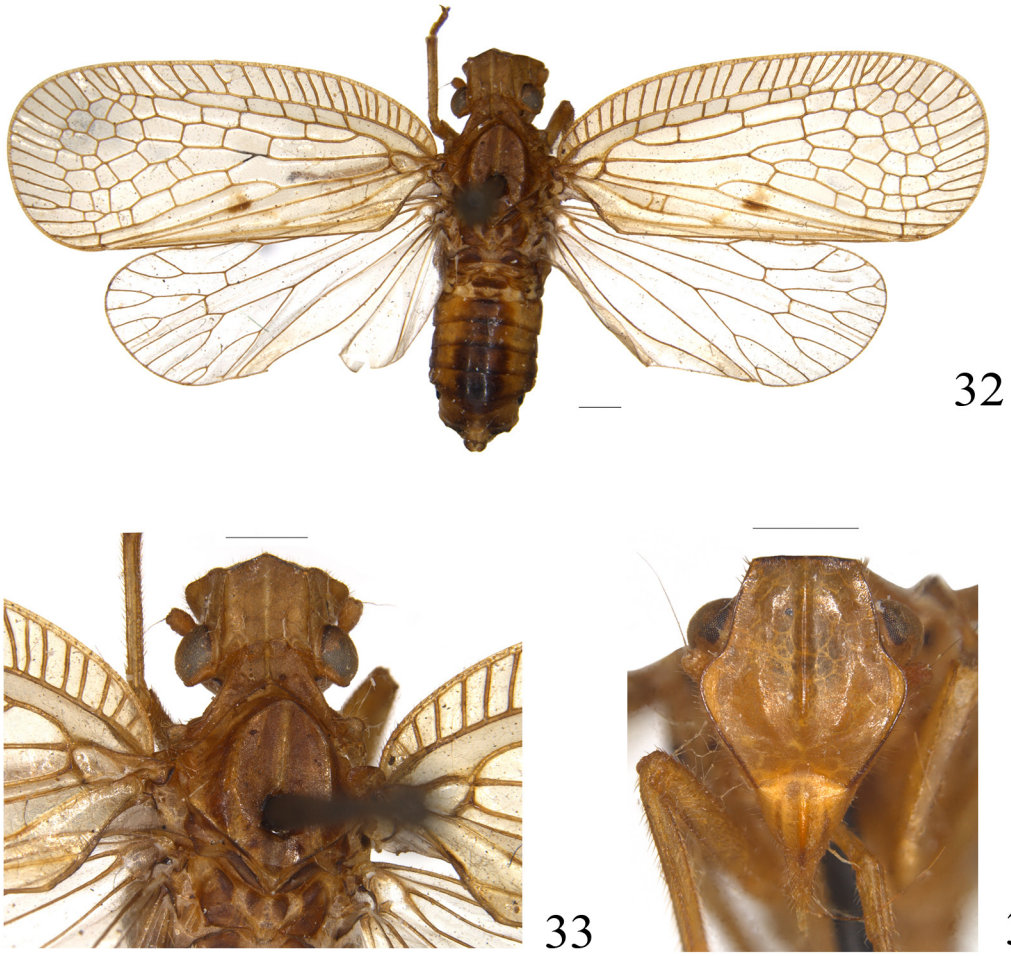
THORAX. Pronotum 4.2 times wider at widest part than long in midline (Fig. 4). Mesonotum 0.9 times wider at widest part than long in midline (Fig. 4) and 1.6 times longer than cumulative length of the vertex and pronotum in midline (Fig. 4). Forewing 2.2 times longer than widest part (Fig. 6).

MALE TERMINALIA**.** Anal tube 1.4 times longer than width in dorsal view, with apical margin almost straight and lateral margin nearly parallel, epiproct short, located at upper half of anal tube (Fig. 10), ventral margin of anal tube slightly sinuate in lateral view (Fig. 8). Gonostylus with capitulum located at apical 1/4, posterior margin of

gonostylus vertically in apical half, dorsal margin of capitulum slightly sloping posteriorly, additional lobe of capitulum with two spines separately in dorsal margin with larger one near base and small one near the middle, both directed downward (Fig. 12). Pygofer in lateral view with posterior margin deeply inclined posteriorly at upper 1/3 and slightly sinuate at lower 2/3 part (Figs 8, 9). Aedeagus smooth at apex (Fig. 11). Ventral process of periandrium hook-like (Fig. 11).

FEMALE TERMINALIA**.** Anal tube in dorsal view oval (Fig. 14). Hind margin of sternite VII nearly straight, shallowly incised medially (Fig. 20). Anterior connective lamina of gonapophysis VIII with six teeth at outer lateral margin and one tooth in inner lateral margin (Fig. 17). Endogonocoxal process developed and membranous, reaching the same level of the upper margin of gonapophysis VIII (Fig. 17). Gonocoxa VIII subquadrangular. Posterior connective lamina of gonapophysis IX membranous in medial part and sclerotized in outer part, with small tooth near middle each side (Fig. 18). Gonospiculum bridge large (Figs 18, 19). Gonoplacs rounded in lateral view (Fig. 15), fused at middle in apical half (Fig. 16), outer margin slightly broaden near middle, with numerous small teeth at inner side of apex (Fig. 16). Egg oval with long and narrow operculum (Fig. 21).

COLORATION. Vertex yellowish brown, with median carina pale yellow on disc, anterior and lateral carinae brown, lateral margins slightly widen from base to apex (Figs 2, 4). Compound eyes grey (Figs 2, 4). Ocelli red. Frons yellow, with median carina tawny, two brown curved vertical bands beside the median carina, anterior and lateral margins black (Fig. 5). Clypeus yellow, with median carina tawny (Fig. 5). Genae yellow, with black patch below antenna (Figs 3, 4). Pronotum yellowish brown, with median carina pale yellow and two small depressions beside median carina on disc (Fig. 4). Mesonotum yellowish brown, with median and lateral carinae pale yellow, two dark brown vertical bands along lateral carinae and two small brown spots near base (Fig. 4). Forewings with brown spot near middle of vein CuP and vein CuA_2 (Fig. 6). Legs tawny, with apex of spines black.



FIGURES 32–34. *Connelicita lungchowensis* (Chou et Lu, 1977) **comb. nov.**, holotype. (32) habitus, dorsal view; (33) head and thorax, dorsal view; (34) frons, frontal view. Scale bars = 1 mm.

Type materials. Holotype ♂, Vietnam: Cat Ba NP., Hai Phong Provinces, Vietnam Natural Forest, N 20º 48′ 258″, E 107º 00′ 581″, 132m, 2008.VII.17, Coll.: Zheng G., Sac. PD., Li SQ (IZCAS). Paratypes: 2♀♀, same data as holotype. Specimens deposited in IZCAS.

Distribution. Vietnam: Hai Phong Province.

Connelicita lungchowensis (Chou et Lu, 1977) comb. nov.

Sassula lungchowensis Chou et Lu, 1977: 318; Chou *et al.*, 1985: 103.

Material examined. Holotype: 1♀, China: Mt. Daqing, Longzhou, Guangxi Province, 19.VII.1964. Coll.: Shengli Liu (TMNH).

Notes. *Connelicita lungchowensis* was originally described according to one female specimen as a new species of the genus *Sassula* Stål, 1870 in the family Ricaniidae by Chou & Lu (1977). It was considered to be very close to the Burmese species *S. sorurcula* Stål. After Fennah's revision (1978) of Nogodinidae, this genus was transferred into the nogodinid Varciini Fennah, 1978, subtribe Sassulina Fennah, 1978. A careful check of the type specimen of *S. lungchowensis* (Figs 32–34) to complete Chou & Lu's figure (1977, fig. 22) shows the necessity to transfer this species into the new genus described here. This species differs from C. *haiphongensis* Wang et Zhang, sp. nov. by the shape of the vertex. Unfortunately male genitalia are unknown until now.

Discussion

The new genus appears close to *Conna* Walker and *Elica* Walker. Indeed, the *Connelicita* species present a tegmen venation very similar to *Elica* schema (Gnezdilov, 2013, fig. 22) where they differ mainly by an earlier forking of MP in *Elica,* before the level of CuA's fork. However the head capsule conformation is totally different from *Elica* and in turn very similar to *Conna*. From these two genera, *Connelicita* differs by: costal area with more than 16 cells clearly longer than wide with only 14 cells or less more quadrangular in *Conna* and *Elica*; vein ScP regularly straight while clearly sinuous in *Conna* in linking with the veinlet; a basal veinlet *mp-cua* present in *Conna* is absent in *Elica* and *Connelicita* gen. nov.; a strongly bent concave then convex PCu in *Conna* is only slightly concave and convex in *Connelicita* and *Elica*; and there are longer apical cells in *Connelicita* and *Elica* than in *Conna*. From *Elica* and in addition of the later forking of vein MP, *Connelicita* differs by the presence of 2–3 veinlets *pcu-cup* while there is only one such veinlet in *Elica*, and the non-produced head capsule is very similar to what is found in *Conna*.

Unfortunately nothing is known about the biology of this new genus, as with most other Elicini taxa except for a few western United States species, *Dictyssa schuhi* O'Brien, 1986 and *Dyctidea texana* O'Brien, 1986 which are known to occur on Rosales and Ephedrales (O'Brien, 1986).

Acknowledgements

We thank the Institute of Zoology, Chinese Academy of Sciences, Beijing, China (IZCAS) and Tianjin Museum of Natural History, Tianjin, China (TMNH) for loaning specimens. We also thank Prof. J.R. Schrock (Emporia State University, USA) and Prof. WANG Yinglun (Northwest A&F University, Yangling, China) for proofreading this manuscript. This study was supported by the National Natural Science Foundation of China (31372234), the Pilot Project of Standardized Curation, Data Integration and Resource Sharing of Zoological Collections (2005DKA21402) by the Ministry of Science and Technology of China, and China Scholarship Council (201406300104).

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