

**NOTES ON GENUS *Laccotrephes* Stål, 1866 (Hemiptera: Nepidae: Nepinae)
FROM VIETNAM, WITH THE DESCRIPTION OF THE FEMALE OF
Laccotrephes longicaudatus Nieser, Zettel & Chen, 2009**

**Tran Thi Phuong Uyen^{1,2}, Nguyen Quang Cuong^{1,3}, Ryndevich Sergey⁴,
Nguyen Thi Hanh³, Truong Xuan Lam^{1,3,*}**

¹Graduate University of Science and Technology, VAST, Vietnam

²National Foundation for Science and Technology Development, Vietnam

³Institute of Ecology and Biological Resources, VAST, Vietnam

⁴The Baranovichi State University, Belarus

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ABSTRACT

A taxonomic study of the genus *Laccotrephes* Stål, 1866 from Vietnam is presented. Four species of the genus *Laccotrephes* have been identified in Vietnam: *Laccotrephes pfeiferiae* (Ferrari, 1888), *Laccotrephes longicaudatus* Nieser, Zettel & Chen, 2009, *Laccotrephes simulatus* Montandon, 1913 and *Laccotrephes grossus* (Fabricius, 1787). The female of the species *Laccotrephes longicaudatus* Nieser, Zettel & Chen is described for the first time. A key to the species of genus *Laccotrephes* known from Vietnam is also provided.

Keywords: Nepidae, Nepinae, *Laccotrephes*, *Laccotrephes longicaudatus*, water scorpion, taxonomy, Vietnam.

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*Corresponding author email: txlam.iebr@gmail.com

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INTRODUCTION

The genus *Laccotrephes* Stål, 1866 is the dominant genus of the subfamily Nepinae of the family Nepidae of the order Hemiptera. It is a large genus, with about 66 species (exclusive of subspecies) occurring throughout the Paleotropical and southern Palearctic regions, with the vast majority of species endemic to Africa (Keffer, 2004; Polhemus & Polhemus, 2008). The most recent works in this group are those of Polhemus & Keffer (1999), Keffer (2004), Zettel (2008), and Nieser et al. (2009), but no current revision of this genus is available for Southeast Asia, making species determinations problematic within the genus as a whole.

In Vietnam, four species of *Laccotrephes* have been recorded prior to this study: The species *Laccotrephes grossus* (Fabricius, 1787) (Nieser et al., 2005), species *Laccotrephes longicaudatus* Nieser, Zettel & Chen, 2009 (Nieser et al., 2009), the *Laccotrephes pfeiferiae* (Ferrari, 1888) and *Laccotrephes simulatus* Montandon, 1913 (Polhemus et al., 2013). In this study, based on specimens deposited in the Institute of Ecology and Biological Resources (IEBR), Ha Noi, Vietnam, the female of the species *Laccotrephes longicaudatus* Nieser, Zettel & Chen is described for the first time. A key to the species of *Laccotrephes* in Vietnam is also produced.

MATERIAL AND METHODS



Figure 1. The survey and collection habitat. (a) Kon Ka Kinh National Park in Gia Lai province; (b) Nam Xuan Lac Habitat and Species Conservation Area in Bac Kan province; (c) Phia Oac - Phia Den National Park in Cao Bang province

The material examined in the present study is deposited in the collection of the IEBR, Ha Noi, Vietnam. Specimens were collected from Phia Oac - Phia Den National Park (NP) in Cao Bang province, Nam Xuan Lac Habitat and Species Conservation Area (HSCA) in Bac Kan province, and Kon Ka Kinh National Park in Gia Lai province (Figs. 1a–1c). The adult morphological and colour characters were observed on pinned and dried specimens using stereo-microscopes. Measurements of body parts were made using an ocular micrometre attached to these microscopes. Total body length, the maximum width of the body, the maximum width of the body, pronotum width, inner hemelytral commissure, siphons length follow Keffer (1996). All measurements are in millimetres and presented as the mean or the range with the mean (Appendix 1). Photographs were made with a Nikon SMZ 800N Digital Stereo Microscope, using Helicon Focus 7 software, photo plates were compiled using Adobe Photoshop CS6.

RESULTS

Genus *Laccotrephes* Stål, 1865

Laccotrephes Stål, Hem. Afr. iii, p. 186 (1865); id. Hem. Fabr. i, p. 134 (1868).

Nepa (part.) Ferrari, Ann. Hofmus. Wien, iii, pp. 162 & 163 (1888).

Type species: *Laccotrephes fabricii* Stål, 1868. An Ethiopian species.

Diagnosis. Body oblong or elongate subovate, dorsoventrally flattened, pronotum about as long as broad sometimes a little shorter than broad a little narrowed anteriorly; its anterior margin about twice as broad as head; abdominal parasternites visible, not concealed by ventral laterotergites; head distinctly narrower than pronotum and partly enclosed in the anterolateral pronotal angles; scutellum slightly longer than broad. Respiratory siphon longer than the distance between the apex of the scutellum and the base of the wing membrane along the inner margin of the hemelytra (hemelytral commissure).

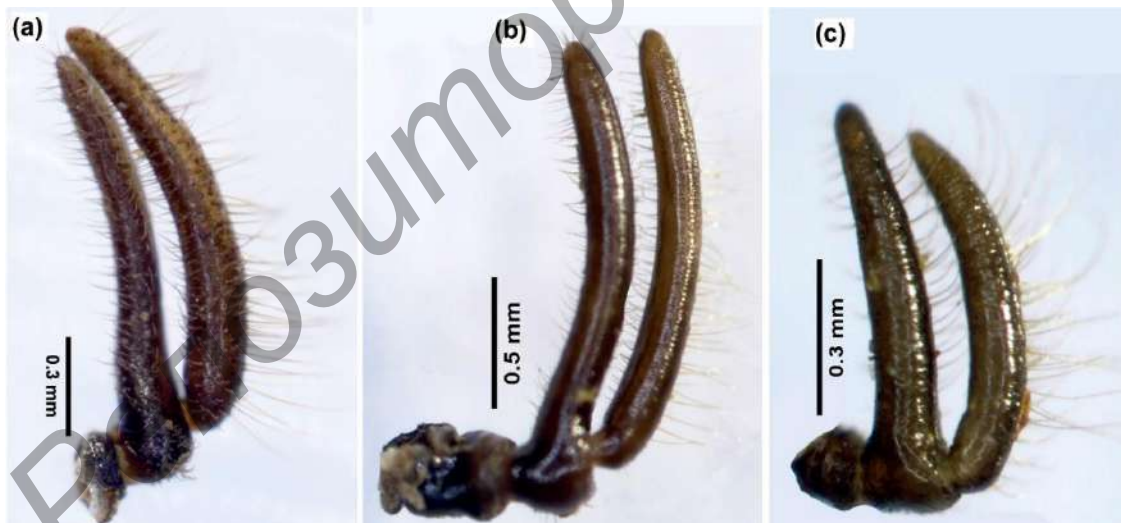


Figure 2. Antenna of some species of genus *Laccotrephes*. (a) *Laccotrephes pfeifferiae* (Ferrari, 1888); (b) *Laccotrephes* sp.; (c) *Laccotrephes longicaudatus* Nieser, Zettel & Chen, 2009

Laccotrephes grossus (Fabricius, 1787)

Nepa grossa Fabricius, 1787: 277.

Nepa kohlii Ferrari, 1888: 180–181.

Laccotrephes grossus Lundblad 1933a: 21

(synonymizes *L. kohlii* with *L. grossus*); Polhemus 1995: 15 (checklist, distribution); Polhemus & Keffer 1999: 3.

Laccotrephes grossus (Fabricius): 203 (Nieser et al., 2005).

Material examined. VIETNAM: no information.

Distribution. India, Sri Lanka, Thailand, Vietnam, Malaysia, Sumatra, China, Japan (Nieser et al., 2005).

The species *Laccotrephes grossus* (Fabricius, 1787) has been recorded by (Nieser et al., 2005) with distribution in Vietnam.

***Laccotrephes simulatus* Montandon, 1913**

Laccotrephes simulatus Montandon, 1913: 122–123. *Laccotrephes simulatus* Polhemus, 1995: 15. *Laccotrephes simulatus* Nieser et al., 2009: 15.

Material. VIETNAM: N. Tonkin, Quang-Ninh province, Tien-Yen, 1914, leg. A.

Bonnet, 1 ♀ (the National Museum of Natural History, Paris, France); “Conchinchine, Kouranne”, leg. Eydoux, 1 ♂ (the National Museum of Natural History, Paris, France) (Nieser et al., 2009).

Distribution. China (Montandon, 1913), Malaysia, Sri Lanka, China, Vietnam, Sumatra, Borneo, and the Philippines, Singapore (Lundblad, 1933; Fernando & Cheng, 1974; Nieser et al., 2009; Polhemus & Polhemus, 2013).

The species *Laccotrephes simulatus* Montandon, 1913 has been recorded by (Nieser et al., 2009; Polhemus & Polhemus, 2013) with distribution in Vietnam.

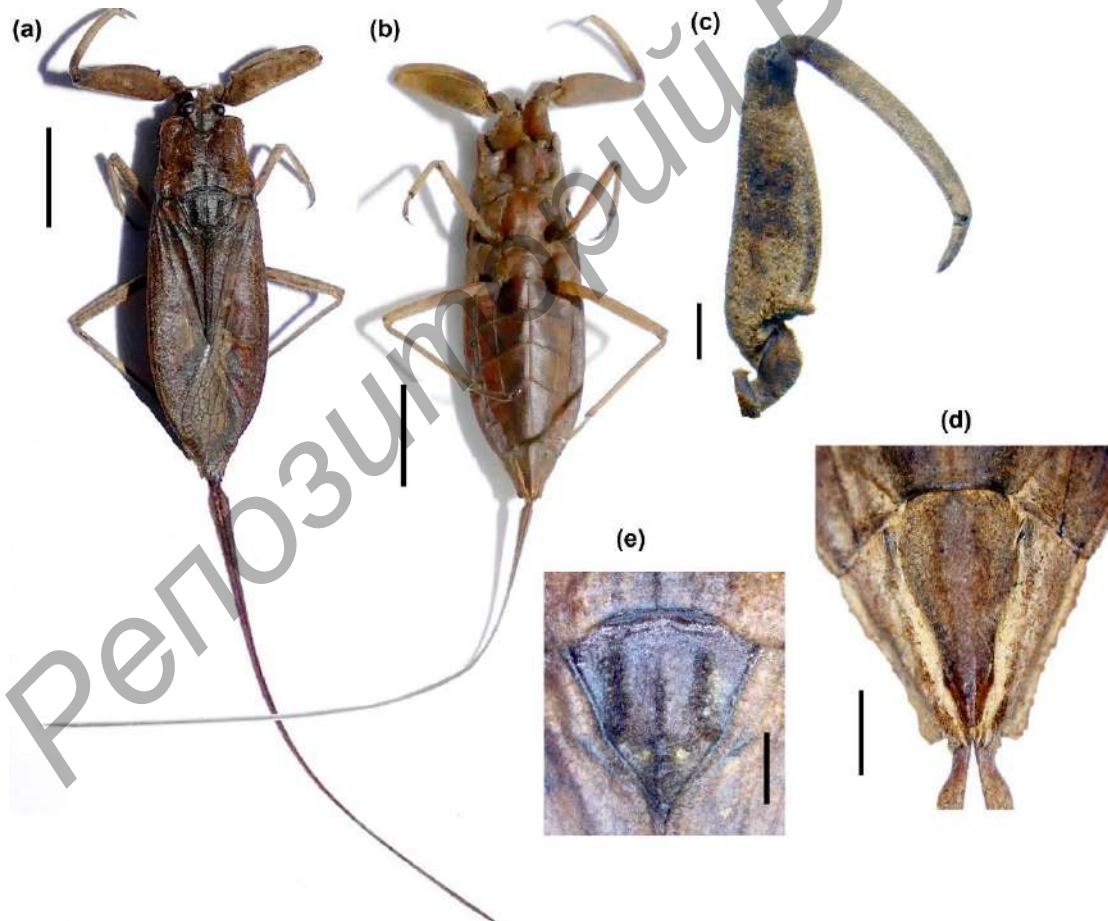


Figure 3. *Laccotrephes longicaudatus* Nieser, Zettel & Chen, 2009 (Female). (a), (b) habitus; (c) foreleg; (d) apical part of abdomen; (e) scutellum. (a),(e) dorsal view; (b) ventral view; (c) lateral view; (d) posteroventral view. Scale bars: 5 mm for Figs. a, b; 1 mm for Figs c, d, e.

***Laccotrephes longicaudatus* Nieser, Zettel & Chen, 2009 (Figs. 2c, 3a–3e)**

Laccotrephes longicaudatus Nieser, Zettel & Chen, 2009: 17.

Material examined. VIETNAM: **Cao Bang** province: 1 female, Phia Oac - Phia Den NP., H = 879 m, 22°36'39''N, 105°54'40''E, 10.V.2021, Truong Xuan Lam; **Gia Lai** province: 1 female, Kon Ka Kinh NP., H = 512 m, 14°10'58''N, 108°20'38''E, 25.III.2022, Truong Xuan Lam.

Laccotrephes longicaudatus Nieser, Zettel & Chen, 2009 was described by Nieser et al. (2009) based on 2 male specimens from Hoa Binh, Dong Nai provinces, Vietnam. In this study, the female of this species is described for the first time as above.

Description of female. By general small, rather elongate species (Fig. 3a) with respiratory siphon distinctly longer than body. Colouration dark brown dorsally, forelegs uniformly dark brown with femur and tibia lacking annulations, middle and hind femora and tibiae yellowish brown mottled with darker brown. Length of body 18.86–19.48, width of body 4.89–5.12, length of siphon 24.60–26.40, The length from apex of scutellum to base of wing membrane 10.99–13.79. Head and pronotum with tufts of short bristles, very few on base of wing membrane.

Head, measurements: Head about 1.1 times as wide as long (1.83: 1.68). Clypeus and lora well recognizable; carina on vertex well developed, with distinct depression in front of midway between eyes, anterior part of carina higher than posterior part. Median length of head 1.83–2.0, width of head 1.68–1.73, length of head behind eyes 0.68–0.71. Eyes in lateral view extending above level of median carina; length of eye 0.61–0.73, width of eye 0.53–0.57, distance between eyes 0.81–0.85. Antenna (Fig. 2c), length of segments III slightly shorter than segment II (1:0.91); segment III distally with the number long hairs about 52–55, about 1.5–1.8 times as long as width of segment (0.12–0.15/0.22–0.23); ventral and proximal surface of segment III and distal, ventral and proximal surface of

segment II thickly beset with shorter hairs, about 2–2.5 as long as width of segment (0.12–0.13/0.05–0.06). Length of segments II antenna 0.73–0.77, length of segments III antenna 0.67–0.71.

Pronotum, measurements: anteromedian tubercles well developed, comparatively acute; submedian carinae broad and dorsally blunt; transverse groove laterally deep and wide, medially shallow and narrow. Lateral margins of pronotum very slightly concave, nearly straight, diverging posteriorly. Prosternal carina with blunt tooth anteriorly. Scutellum (Fig. 3e), hayfork-shaped carinae low, especially anteriorly poorly differentiated. Median length of pronotum 2.43–2.56; median length of anterior lobe of pronotum 1.51–1.53; median length of posterior lobe of pronotum 0.95–1.08; width of anterior lobe of pronotum 3.67–3.72; width of posterior lobe of pronotum 4.45–4.51; humeral width of pronotum 4.82–5.04; max width of pronotum 6.01–6.61. Length of prosternum 2.25–2.56; length of metasternum 2.0–2.34; length of posternum 1.04–1.33.

Abdomen (Fig. 3b): Abdomen almost parallel-sided in anterior two-thirds, posteriorly convergent. Apical part of abdomen of female Figure 3d. Posterior width of abdomen 4.02–4.57; basal width of abdomen 4.78–4.85; length of 2 abdominal sterna 0.98–1.17; length of 3 abdominal sterna 1.0–1.49; length of 4 abdominal sterna 1.12–1.69; length of 5 abdominal sterna 1.21–1.80; length of 6 abdominal sterna 2.42–2.94; length of operculum 2.32–2.78.

Fore leg (Fig. 3c): Femur with very distinct and comparatively acute proximal tooth, without subdistal tooth in femoral groove. Length of femur of fore leg 4.90–5.03; width of femur of fore leg 1.30–1.61; length of segments of foreleg: femur/tibia/tarsus/claw 4.90–5.03/4.09–4.12/0.79–0.81/0.90–0.12; length of segments of middleleg: femur/tibia/tarsus/claw 3.68–3.72/3.45–3.50/1.15–1.26/0.50–0.53; length of segments of hindleg: femur/tibia/tarsus/claw 5.34–5.39/5.07–5.10/1.27–1.30/0.70–0.71.

Distribution. Vietnam (Hoa Binh, Cao Bang, Gia Lai, Dong Nai).

Discussion. The morphological characteristics of female of *L. longicaudatus* is similar to male of *L. longicaudatus* (Nieser et al., 2009) from Vietnam as: Colouration dark brown dorsally, forelegs uniformly dark brown with femur and tibia lacking annulations, middle and hind femora and tibiae yellowish brown mottled with darker brown, venter medium brown. Antennal segment III very slightly shorter than segment II, outer margin bearing numerous long setae,

the lengths of these setae 1.5× the width of the segment, inner margin bearing scattered shorter setae, lengths of these setae about two-thirds as long as the width of the segment. Prosternal keel with an angular projection anteriorly. Length of respiratory siphon 1.5× longer than the length of the body. But length body of female (19.48) more than male (19.0 mm in male), width of body 5.12 mm of female (5.0 mm of male), length of long hairs about 1.5–1.8 times as long as width of segment of female (length of long hairs 1.5 times as long as width in male).

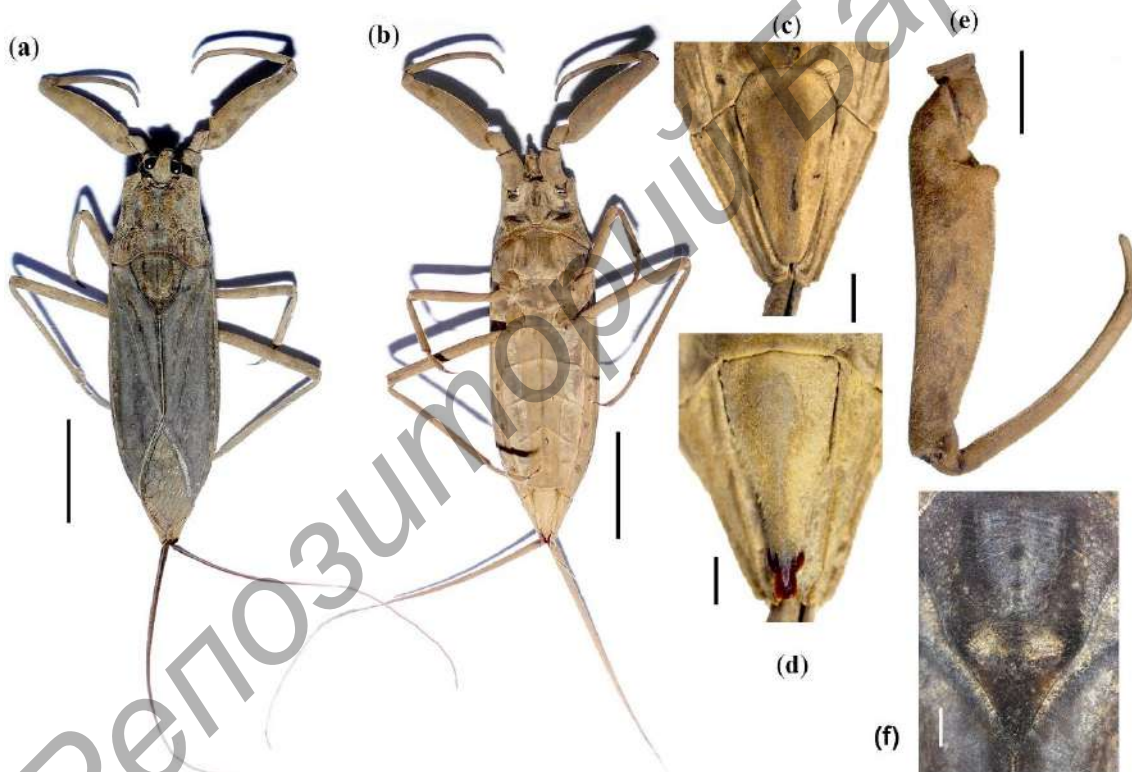


Figure 4. *Laccotrephes pfeiferiae* (Ferrari, 1888). (a), (b) habitus of male; (c) apical part of abdomen male; (d) apical part of abdomen female; (e) foreleg of male; (f) scutellum of male.

(a), (f) dorsal view; (b) ventral view; (c), (d) posteroventral view; (e) lateral view.

Scale bars: 10 mm for Figs. a, b; 1.5 mm for Figs. c, d; 3 mm for Fig. e; 1 mm for Fig. f.

Laccotrephes pfeiferiae (Ferrari, 1888)
(Figs. 2a, 4a–4f, 6e, 6f)

Nepa robusta var. *pfeiferiae* Ferrari,
1888: 187.

Laccotrephes robustus: Lundblad, 1933
(in part).

Laccotrephes pfeifferae: Nieser & J.
Polhemus, 1998: 22.

Laccotrephes pfeiferae: J. Polhemus & Keffer, 1999: 2.

Laccotrephes pfeiferiae: Polhemus et al., 2013: 40.

Material examined. VIETNAM: **Bac Kan** province: 2 males, 5 females, Nam Xuan Lac HSCA, H = 812 m, 20°17'148"N, 105°31'182"E, 31.X.2021, Truong Xuan Lam.

Diagnosis and measurements (male). By general large body (Fig. 4a). Length of respiratory siphon less than the length of the body. Length of body 35.54–40.11; width of body 10.99–13.58; length of siphon 31.71–34.93. The length from apex of scutellum to base of wing membrane 21.65–23.15. Head about 1.3 times as wide as long (3.80: 2.91). Median length of head 2.91–3.26; width of head 3.80–4.12; width across eyes 3.48–3.89; length of eye 1.24–1.56; width of eye 1.05–1.26; distance between eyes 1.40–1.89; length of posterior eyes of head 1.0–1.56. Antenna (Fig. 2a). Antennal segment III slightly shorter than segment II (1: 0.95), outer margin bearing numerous long setae, segment III distally with the number long hairs about 61–75, the lengths of these setae approximately 2 as long as the width of the segment (0.13–0.19/ 0.26–0.40), inner margin bearing a dense and regularly spaced row of shorter setae, these setae about one-half the width of the segment. Length of segments II antenna 1.33–1.56; length of segments III antenna 1.28–1.45. Prosternal keel raised to form a somewhat acute tumescence set back slightly from anterior margin when viewed laterally. Median length of pronotum 6.39–6.89; median length of anterior lobe of pronotum 3.84–4.12; median length of posterior lobe of pronotum 2.28–3.0; width of anterior lobe of pronotum 7.52–8.14; width of posterior lobe of pronotum 9.72–10.05; humeral width of pronotum 7.15–8.06; max width of pronotum 10.08–0.89. Length of prosternum 4.59–5.14; length of metasternum 4.66–5.10; length of posternum 2.97–3.45. Scutellum (Fig. 4f), hayfork-shaped carinae low, especially anteriorly. Abdomen (Fig. 4b). Posterior width of abdomen 9.93–10.13; basal width of abdomen 10.82–11.45. Length of 2

abdominal sterna 1.56–2.10; length of 3 abdominal sterna 2.97–3.56; length of 4 abdominal sterna 3.11–3.89; length of 5 abdominal sterna 3.04–3.68; length of 6 abdominal sterna 6.02–7.01; length of operculum 5.07–6.03. Fore leg (Fig. 4e), length of femur of fore leg 10.73–11.37; width of femur of fore leg 2.10–2.47. Length of segments of foreleg: femur/tibia/tarsus/claw 10.73–11.37/7.67–8.26/1.88–2.08/0.19–0.23; length of segments of middleleg: femur/tibia/tarsus/claw 7.59–7.93/5.21–6.02/2.19–2.86/1.06–1.52; length of segments of hindleg: femur/tibia/tarsus/claw 11.71–12.16/10.98–11.90/2.86–3.66/1.58–2.01. Apical part of abdomen female (Fig. 4d) and apical part of abdomen male (Fig. 4c). Male paramere with apex bearing a massive, blunt, recurved distal hook with an acute apex (Figs. 6e, 6f).

Distribution. India (Ferrari, 1888), Thailand, Malaysia, Sumatra, Java, Borneo, Sulawesi, Islands, China, Laos, Burma, Singapore (Nieser & Polhemus, 1998; Chen et al., 2005; Polhemus & Polhemus, 2013), Vietnam (Dak Nong, Bac Kan).

Discussion. The morphological characteristics of male of *L. pfeiferiae* in this study is similar to male of *L. pfeiferiae* (Keffer, 2004; Polhemus & Polhemus, 2013) from Vietnam by the main characters: Length of body; width of body; the antennal segment III with more numerous 60–80 long setae; the prosternal carina from anterior to the right varying from virtually flat in anterior and posteriorly slight less elevated; prosternal keel with an angular projection set back slightly from anterior margin when viewed laterally; the carina on the head in lateral view without or hardly interrupted at the level of the anterior third of the eye; scutellum, hayfork-shaped carinae low, especially anteriorly; male paramere with apex bearing a massive, blunt, recurved distal hook with an acute apex.

***Laccotrephes* sp. (Figs. 2b, 5a–5e, 6a–6d)**

Material examined. VIETNAM: **Bac Kan** province: 3 males, Nam Xuan Lac HSCA, H = 812 m, 20°17'148"N, 105°31'182"E, 31.X.2021, Truong Xuan Lam.

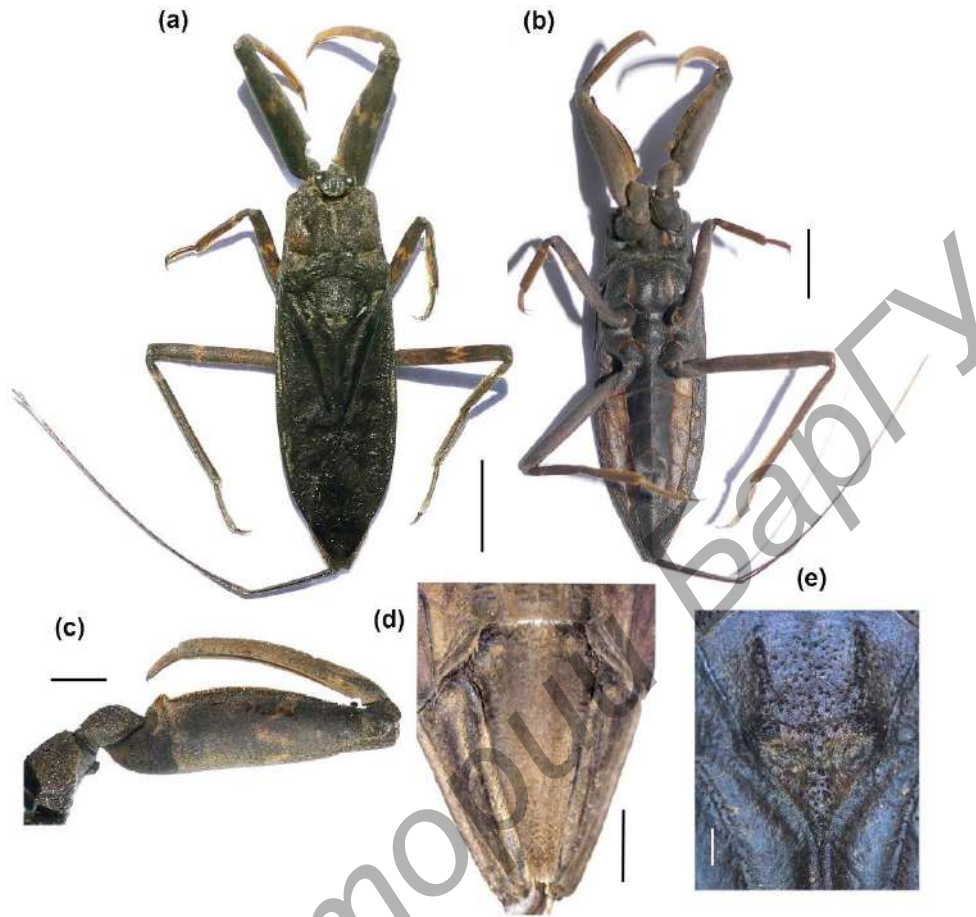


Figure 5. *Laccotrephes* sp. (male). (a), (b) habitus; (c) Foreleg; (d) Apical part of abdomen; (e) scutellum. (a), (e) Dorsal view; (b) Ventral view; (c) Lateral view; (d) Posteroventral view. Scale bars: 10 mm for Figs a, b; 3 mm for Fig. c; 2 mm for Fig. d; 1 mm for Fig. E

Diagnosis and measurements (male). By general large body (Fig. 5a). Head, pronotum, scutellum, proximal fifth of hemelytron and proximal half of its costal margin beset with tufts of short bristles. Length of body 43.91–45.22; width of body 12.98–13.27; length of siphon 42.83–43.12; inner hemelytral commissure 23.39–24.97. Median length of head slightly less than its width across eyes (0.95:1). Clypeus and lora well recognizable, maxillary plates large, meeting in front of clypeus; median carina on vertex well developed, with distinct transverse depression at level of anterior third of eyes, anterior part of carina higher than posterior part. Eyes in lateral view about even with the level of median carina. Median length of head 3.71–

3.96; width of head 4.02–4.64; width across eyes 3.89–4.02; length of eye 1.43–1.62; width of eye 1.22–1.35; distance between eyes 1.65–1.89; length of posterior eyes of head 1.08–1.13. Antenna (Fig. 2b), Antennal segment III slightly shorter than segment II (0.90:1), length of antennal segment III 1.40–1.45; of antennal segment II 1.54–1.61. Outer margin with long setae, segment III distally with the number long hairs about 44–48, in a single or more or less double row, about 0.85–1.23 times as long as width of length of hairs about 0.17–0.26, width of segment III 0.20–0.22; shorter bristle-like hairs, about half as long as width of segment, more or less evenly dispersed over ventral surface of segments II and III. Pronotum, anterior submedian

tubercles present, blunt; submedian carinae broad and dorsally blunt; transverse groove medially interrupted, laterally of submedian carinae deep and wide, medially shallow and narrow. Lateral margins of pronotum nearly straight, humeral angles round only slightly projecting; humeral width of pronotum less than maximal width (0.85:1). Prosternal carina slightly raised posteriorly and with distinct blunt tooth anteriorly; fringe of setae only posterolaterally, not meeting posteriorly. Scutellum (Fig. 5e), hayfork-shaped carinae well developed except for medioanterior part. Median length of pronotum 6.52–6.81; median length of anterior lobe of pronotum 4.21–4.51; median length of posterior lobe of pronotum 2.31–2.30; width of anterior lobe of pronotum 9.86–10.27; width of posterior lobe of pronotum 11.82–12.36; humeral width of pronotum 9.93–10.26; max width of pronotum 12.14–12.11. Length of prosternum 5.12–5.95; length of metasternum 5.89–6.03; length of posternum 3.01–3.81. Abdomen (Fig. 5b), parallel-sided in anterior two-thirds, posteriorly convergent in males. Posterior width of abdomen 12.82–13.40; basal width of abdomen 13.01–13.33; length of 2 abdominal sterna 1.14–1.82; length of 3 abdominal sterna 2.24–2.93; length of 4 abdominal sterna 3.0–3.81; length of 5 abdominal sterna 2.86–3.41; length of 6 abdominal sternal 5.80–6.42; length of operculum 5.78–6.51.

Fore leg (Fig. 5c), femur with distinct and comparatively acute proximal tooth, femoral groove of male with small but distinct distal tooth; length of femur about 3.8–4.1 times its width. Length of femur of fore leg 14.08–15.52; width of femur of fore leg 3.64–3.78; length of segments of foreleg: femur/tibia/tarsus/claw 14.08–14.52/11.02–11.40/1.89–2.03/0.24–0.26; length of segments of middleleg: femur/tibia/tarsus/claw 10.01–11.12/6.13–6.98/3.01–3.26/1.82–2.00; length of segments of hindleg: femur/tibia/tarsus/claw 15.01–15.75/14.07–14.75/3.97–4.58/1.43–1.89. Apical part of abdomen (Fig. 5d). Male genitalia, Genital capsule and superficial

articular and phallic structure (Figs. 6a–6d), apex of paramere very similar to that of *L. pfeiferiae* (Fig. 6f).

Discussion

In the study, the differences between *Laccotrephes* sp. and *L. pfeiferiae* including: in the antennal segment III, which in *L. pfeiferiae* has more numerous long setae (61–75 setae, Fig. 2a) more than in *Laccotrephes* sp. (44–48 setae, Fig. 2b), setae of *L. pfeiferiae* longer than in *Laccotrephes* sp. (0.26–0.40 mm/0.17–0.26 mm); rate of antenna segments II:III of *L. pfeiferiae* 1.03, of *Laccotrephes* sp.: 1.10; inner hemelytral commissure 23.39–24.97 mm of *Laccotrephes* sp. and 21.65–23.15 mm of *L. pfeiferiae*; scutellum (Fig. 4f), hayfork-shaped carinae low of *L. pfeiferiae*, especially anteriorly of *L. pfeiferiae* and scutellum (Fig. 5e), hayfork-shaped carinae well developed except for medioanterior part of *Laccotrephes* sp.; length of siphon of *Laccotrephes* sp. (42.83–43.12 mm) more than *L. pfeiferiae* (31.71–34.93 mm) and the prosternal carina of *Laccotrephes* sp. is posteriorly more elevated (in lateral view with venter up) than the keel of *L. pfeiferiae*.

The morphological characteristics male of *Laccotrephes* sp. is similar to the species *L. robustus* from Philippine (Nieser et al., 2009) by the following characters: The antenna with length of segments II:III = 1.1; The antennal segment III with more about 40–50 medium setae; the prosternal carina from anterior to the right varying with slightly elevated in anterior to blunt and low tooth posteriorly; Scutellum hayfork-shaped carinae well developed except for medioanterior part; male genitalia. However, the differences between *Laccotrephes* sp. and *L. robustus* from Philippine including: Length of body of *Laccotrephes* sp. 43.91–45.22 mm, of *L. robustus* 32.5–39.6 mm; Width of body of *Laccotrephes* sp. 12.98–13.27 mm, of *L. robustus* 10.4–13.2 mm; Length of siphon of *Laccotrephes* sp. 42.83–43.12 mm, of *L. robustus* 33.0–42.8 mm; Median length of

head of *Laccotrephes* sp. 3.71–3.96 mm, of *L. robustus* 3.69 mm; Max width of pronotum of *Laccotrephes* sp. 12.14–12.11 mm, of *L. robustus* 11.7 mm; Length of femur of fore leg of *Laccotrephes* sp. 14.08–14.52 mm, of

L. robustus 14.10 mm; Width of femur of fore leg of *Laccotrephes* sp. 3.64–4.2 mm, of *L. robustus* 3.33 mm.

Distribution. Vietnam (Bac Kan).

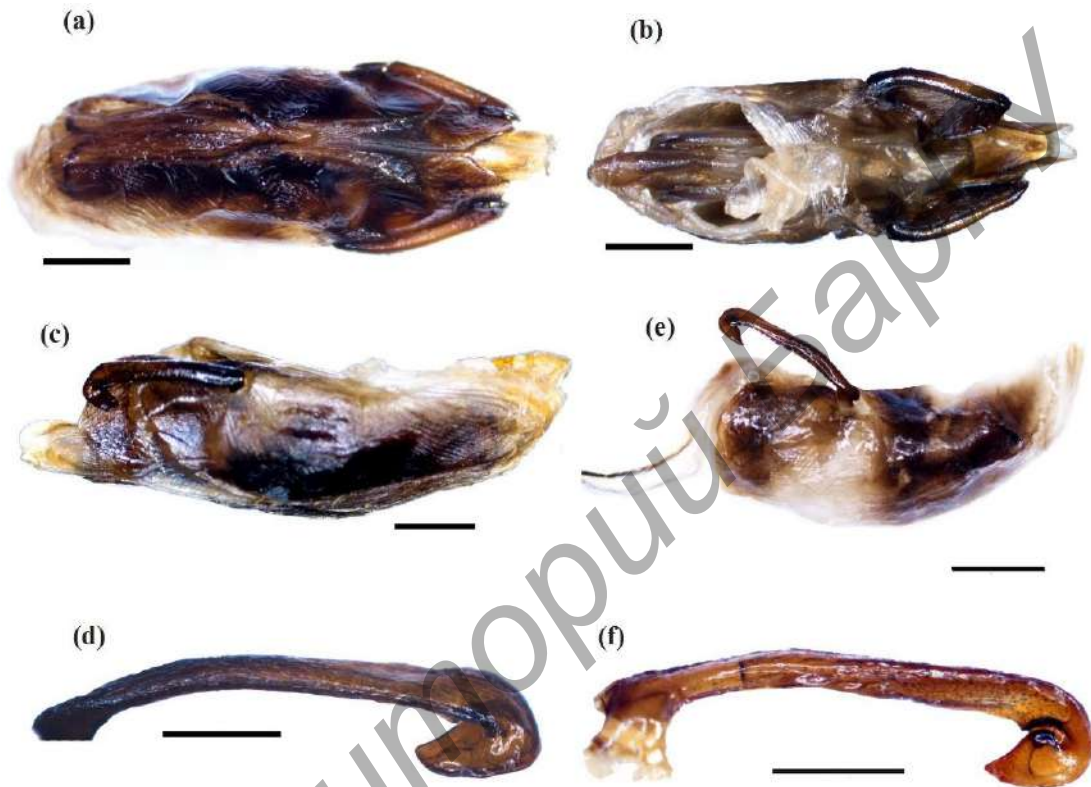


Figure 6. Male genitalia (a–d of *Laccotrephes* sp.; e, f of *Laccotrephes pfeifferiae*). (a) Genital capsule, dorsal view; (b) Genital capsule, ventral view; (c), (e) Genital capsule lateral view; (d), (f) Right paramere, lateral view. Scale bars: 1 mm for Figs a, b, c, e; 0.5 mm for Figs d, f

Key to species of the genus *Laccotrephes* in Vietnam

(Based on the key to species of *Laccotrephes* in Polhemus & Polhemus (2013))

1. The large species; the body length (excluding siphon) more than 25 mm..... 2
 - The small species, body length (excluding siphon) less than 25 mm..... 4
2. The antennal with length of segments II:III = 1.00:0.80; the antennal segment III with numerous about 20–30 long setae; prosternal carina from anterior to the right varying from virtually flat in anterior to sharp and high tooth posteriorly..... *L. grossus* (Fabricius)
 - The antennal with length of segments II:III = 1.00:0.90; the antennal segment III with numerous more than 35 long setae..... 3
3. The length from apex of scutellum to base of wing membrane less than 23 mm; the antennal segment III with more numerous 60–80 long setae (Fig. 2a); scutellum hayfork-shaped carinae low, especially anteriorly (Fig. 4f); length of siphon less than 40 mm; prosternal keel with an angular projection set back slightly from anterior margin when

- viewed laterally..... *L. pfeiferiae* (Ferrari)
 - The length from apex of scutellum to base of wing membrane more than 23 mm; The antenna segment III with more about 40–50 medium setae (Fig. 2b); scutellum hayfork-shaped carinae well developed except for medioanterior part (Fig. 5e); length of siphon more than 40 mm; the prosternal carina from anterior to the right varying with slightly elevated in anterior to blunt and low tooth posteriorly *Laccotrephes* sp.
 4. The antennal segment III with about numerous 25 long setae; prosternal carina from anterior to the right varying from virtually flat to indication of a tooth anteriorly; prosternal keel flat when viewed laterally, lacking an angular anterior projection; length of respiratory siphon less than or equal to that of the body..... *L. simulatus* Montandon
 - The antennal segment III with more numerous 50 long setae (Fig.2c); prosternal carina from anterior to the right varying from virtually flat to blunt tooth anteriorly; prosternal keel with an angular projection anteriorly when viewed laterally; length of respiratory siphon 1.5× that of the body..... *L. longicaudatus* Nieser, Zettel & Chen

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Appendix 1. The differences of measurement among 3 species of genus *Laccotrephes* in Vietnam

Measurement (mm)	<i>Laccotrephes robustus</i> from Philippine (Nieser et al., 2009)	<i>Laccotrephes</i> sp. (in this study)	<i>Laccotrephes pfeiferiae</i> (Keffer, 2004; Polhemus & Polhemus, 2013)	<i>Laccotrephes pfeiferiae</i> (in this study)	<i>Laccotrephes longicaudatus</i> (Male of Nieser et al., 2009; Polhemus & Polhemus, 2013)	<i>Laccotrephes longicaudatus</i> (Female in this study)
n	20	3	11	7	2	2
Length of body	32.5–39.6	43.91–45.22	35–47	35.54–40.11	16.0–19.0	18.86–19.48
Width of body	10.4–13.2	12.98–13.27	11–14	10.99–13.58	4.5–5.0	4.89–5.12
Length of siphon	33.0–42.8	42.83–43.12	32–40	31.71–34.93	22.0–26.0	24.60–25.40
Inner hemelytral commissure	-	23.74–24.97	-	20.56–22.15	-	10.99–13.79
Median length of head	3.69	3.71–3.96	-	2.91–3.26	1.9	1.83–2.0
Width of head	-	4.02–4.64	-	3.80–4.12	1.7	1.68–1.73
Width across eyes	3.99	3.89–4.02	-	3.48–3.89	-	1.90–2.10
Length of eye	-	1.43–1.62	-	1.24–1.56	0.68–0.72	0.61–0.73
width of eye	-	1.22–1.35	-	1.05–1.26	0.55–0.56	0.53–0.57
Distance between eyes	-	1.65–1.89	-	1.40–1.89	0.84	0.81–0.85
Length of posterior eyes of head	-	1.08–1.13	-	1.0–1.56	0.70	0.68–0.71
Length of II segments antenna	1.57	1.54–1.61	-	1.33–1.56	0.74	0.73–0.77
length of III segments antenna	1.41	1.40–1.45	-	1.28–1.45	0.68	0.67–0.71
The number long hairs in III segments of antenna	40–50	44–48	60–80	61–75	50	52–55
Median length of pronotum	-	6.52–6.81	-	6.39–6.89	2.42–2.54	2.43–2.56
Median length of anterior lobe of pronotum	-	4.21–4.51	-	3.84–4.12	1.50–1.52	1.51–1.53
Median length of posterior lobe of pronotum	-	2.31–2.30	-	2.28–3.0	0.92–1.03	0.95–1.08

Width of anterior lobe pronotum	-	9.86–10.27	-	7.52–8.14	3.55–3.67	3.67–3.72
Width of posterior lobe pronotum	-	11.82–12.36	-	9.72–10.05	4.42–4.47	4.45–4.51
Humeral width of pronotum	10.8	9.93–10.26	-	7.15–8.06	-	4.82–5.04
Max width of pronotum	11.7	12.14–12.11	-	10.08–0.89		6.01–6.61
Posterior width of abdomen		12.82–13.40	-	9.93–10.13	4.52	4.02–4.57
Basal width of abdomen		13.01–13.33	-	10.82–11.45	4.82	4.78–4.85
Length of femur of fore leg	14.10	14.08–14.52	-	10.73–11.37	4.80–4.94	4.90–5.03
Width of femur of fore leg	3.33	3.64–4.2	-	2.10–2.47	1.28–1.58	1.30–1.61
Length of segments of foreleg:femur/tibia/tarsus/claw	-	14.08–14.52/11.02–11.40/1.89–2.03/0.24–0.26	-	10.73–11.37/7.67–8.26/1.88–2.08/0.19–0.23	4.80/4.08/0.77	4.90–5.03/4.09–4.12/0.79–0.81/0.90–0.12
Length of segments of middleleg:femur/tibia/tarsus/claw	-	10.01–11.12/6.13–6.98/3.01–3.26/1.82–2.00	-	7.59–7.93/5.21–6.02/2.19–2.86/1.06–1.52	3.70/3.40/1.25/0.51	3.68–3.72/3.45–3.50/1.15–1.26/0.50–0.53
Length of segments of hindleg:femur/tibia/tarsus/claw	-	15.01–15.75/14.07–14.75/3.97–4.58/1.43–1.89	-	11.71–12.16/10.98–11.90/2.86–3.66/1.58–2.01	10.0/10.0/1.28/0.69	5.34–5.39/5.07–5.10/1.27–1.30/0.70–0.71
Length of prosternum	-	5.12–5.95	-	4.59–5.14	-	2.25–2.56
Length of metasternum	-	5.89–6.03	-	4.66–5.10	-	2.0–2.34
Length of posternum	-	3.01–3.81	-	2.97–3.45	-	1.04–1.33
Length of 2 abdominal sterna	-	1.14–1.82	-	1.56–2.10	-	0.98–1.17
Length of 3 abdominal sterna	-	2.24–2.93	-	2.97–3.56	-	1.0–1.49
Length of 4 abdominal sterna	-	3.0–3.81	-	3.11–3.89	-	1.12–1.69
Length of 5 abdominal sterna	-	2.86–3.41	-	3.04–3.68	-	1.21–1.80
Length of 6 abdominal sterna	-	5.80–6.42	-	6.02–7.01	-	2.42–2.94
Length of operculum	-	5.78–6.51	-	5.07–6.03	-	2.32–2.78

Note: -: no information.