



A new species of the genus *Ranatra* Fabricius, 1790 and supplementary data on *Ranatra varipes* Stål, 1861 (Hemiptera: Nepidae: Ranatrinae) from Vietnam

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ABSTRACT

The genus *Ranatra* Fabricius, 1790 is currently represented in Vietnam by nine previously recorded species. Based on specimens collected from Vietnam and detailed morphological examinations, a new species, *Ranatra uminhensis* **sp. nov.** (belonging to the *Ranatra malayana* group), is described, illustrated, and discussed. Additional morphological data for *Ranatra varipes* Stål, 1861 are provided, and DNA barcode (COI) sequences for both species are presented for future reference.

Introduction

Members of the water bugs genus *Ranatra* Fabricius, 1790 (Hemiptera: Nepidae: Ranatrinae) are commonly recognized by their elongate, slender, almost cylindrical bodies, elongated and slender legs, and a yellowish-brown coloration. They are usually found along the margins of still-water environments, nestled among tangles of submerged sticks and vegetation, which they closely resemble.

The species of the genus *Ranatra* are found worldwide, comprising 123 valid species (excluding subspecies), with 69 species recorded in the New World and 54 species in the Old World. No species are shared between the two hemispheres, and nearly half of the global diversity is concentrated in Southeast Asia (Polhemus and Polhemus, 2008, 2013).

The most comprehensive revision of the Oriental *Ranatra* was conducted by Lansbury (1972), who recognized 26 species classified into six species groups (*R. gracilis*, *R. elongata*, *R. malayana*, *R. varipes*, *R. filiformis*, and *R. biroi* groups), along with a preliminary classification based on species groups. Subsequently, Tran and Zettel (2021a)

provided diagnoses for six species groups sensu Lansbury, 1972 and proposed the seventh species group of the genus *Ranatra*, named as the *Ranatra bilobata* group.

Subsequent descriptions of new species and subspecies of the genus *Ranatra* from Southeast Asia have been published by several authors, including Nieser and Chen (1991, 1996), Nieser (1996, 1997), Zettel (1999), Chen et al. (2004), Nieser et al. (2005), Tran and Polhemus (2012), Polhemus and Polhemus (2012, 2013), Tran and Nguyen (2016), Tran and Poggi (2019), and Tran and Zettel (2021a, 2021b), Zettel et al. (2017), all of whom followed the species group framework proposed by Lansbury (1972).

Prior to the present study, nine species of the genus *Ranatra* had been recorded from Vietnam: *Ranatra chinensis* Mayr, 1865 (*Ranatra elongata* group), *Ranatra varipes* Stål, 1861, *Ranatra falloui* Montandon, 1907 (*Ranatra varipes* group), *Ranatra filiformis* Fabricius, 1790 (*Ranatra filiformis* group), *Ranatra gracilis* Dallas, 1850, *Ranatra parmata* Mayr, 1865 (*Ranatra gracilis* group), *Ranatra thai* Lansbury, 1972, *Ranatra nieseri* Tran & Nguyen, 2016 (*Ranatra biroi* group), and *Ranatra bilobata* Tran & Nguyen, 2016 (*Ranatra bilobata* group).

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These included taxa described or reported by Lansbury (1972), such as *R. chinensis* Mayr, 1865 (*R. elongata* group), *R. varipes* Stål, 1861; *R. falloui* Montandon, 1907 (*R. varipes* group), and *R. filiformis* Fabricius, 1790 (*R. filiformis* group). Also, Polhemus and Polhemus (2013) also reported distribution data for *R. gracilis* Dallas, 1850 (*R. gracilis* group). Furthermore, Tran and Polhemus (2012) elevated *R. longipes thai* to full species status, recognizing it as *R. thai* Lansbury, 1972. More recently, Tran and Nguyen (2016) described two new species, *R. nieseri* Tran and Nguyen, 2016 (*R. biroi* group) and *R. bilobata* Tran and Nguyen, 2016 (*R. bilobata* group), and provided first records of *R. parmata* Mayr, 1865 from Vietnam.

This study presents the description of a new species of genus *Ranatra*, along with supplementary data on *R. varipes* Stål, 1861, based on specimens collected in Vietnam and deposited in the Institute of Biology (IB). DNA barcode data (COI) for both species are also provided for future reference.

Materials and methods

Material examined and specimen depository: *Ranatra* specimens were collected using a pond net a 0.5 mm mesh and a 0.5 m² net area, attached to a 180 cm extension rod. At each sampling site, the net was swept across various microhabitats to ensure comprehensive coverage, including different vegetation zones, substrate types, pond and stream banks, and open water areas. Sampling was conducted in both flowing and still waters, typically near the shoreline, around aquatic vegetation, and across diverse bottom substrates. Particular attention was given to sweeping through areas containing submerged plant material, fallen branches, roots, and leaf litter to increase the likelihood of encountering target specimens.

A collection of adult specimens of *Ranatra* from Vietnam was deposited at the Institute of Biology (IB) (Table 1). Each specimen was labeled with identification details and locality data and individually preserved in vials containing 99% ethanol. The right hind leg or right middle leg of each specimen was severed for DNA extraction (which was subsequently used for molecular phylogenetic analysis and DNA barcoding). The remaining body parts were utilized for morphological assessment.

Morphological examination and imaging. The external morphological characteristics of dry-mounted specimens were analyzed using a Nikon SMZ800N stereomicroscope. Examination of the genitalia was prepared as follows. Initially, each male specimen underwent relaxation by being immersed for three days in 70% ethanol. The male genitalia were then separated from the body and immersed in hot 10% KOH solution for five minutes until the fat and musculature were cleared. The endosoma was extracted from the phallosoma using fine tweezers after the phallus was taken out of the pygophore. All parts of the male genitalia were preserved in a genitalia vial filled with propylene glycol and subsequently associated with the pinned specimens. The female genitalia were examined in-situ, without dissection. A Nikon SMZ800N stereomicroscope was employed to investigate genital morphology. Focus stacking was performed with Helicon Focus Pro 8.2.0 (Helicon Soft Ltd., Ukraine), using a sequence of images captured with a Canon EOS Kiss X10 digital camera mounted on a Nikon SMZ 800N stereomicroscope. Image artifacts were removed using the software's retouch function (Kumar et al., 2018).

Morphological terminology, measurement and indices. Morphological terminology followed that of Lansbury (1972), Chen et al. (2004), Polhemus and Polhemus (2013), Tran and Nguyen (2016). The following parts of the bodies were measured for *Ranatra* specimens (Fig. 1), using the software Image-J (<http://imagej.nih.gov/ij/>) based on the direct stacking pictures designed as stated above. The assessment features are stated below, and all dimensions were given in millimeters (List of abbreviations).

Molecular data preparation. DNA was isolated from each specimen's right hind leg or right mid leg by the Chelex-TE-ProK protocol (Satria et al.,

2015). The mitochondrial COI gene fragments were examined using the primer set LCO1490 and HCO2180. Polymerase chain reaction (PCR) amplification, cycle sequencing reaction, sequencing using ABI PRISM 3130xl (Applied Biosystems), and sequence assembly using ChromasPro 1.7.6 (Technelysium Pty Ltd., Australia) were executed using the methods of Satria et al. (2015). The PCR thermal situation for the COI gene fragment, comprised of initial denaturation at 94 °C (2 min), denaturation at 94 °C (30 s), annealing at 48.5 °C (30 s), and extension at 72 °C (45 s) for 35 cycles, with final extension at 72 °C (7 min) (Forero and Weirauch, 2012). COI sequences were effectively obtained from 5 samples of *R. uminhensis* Truong and Nguyen sp. nov. and 3 samples of *R. varipes* Stål, 1861.

List of abbreviations

AL	length of anterior lobe of pronotum
AW	anterior width of pronotum
BL	body length
HW	humeral width of pronotum
IW	interocular width
Lal	length of antennal segment I
LalI	length of antennal segment II
LalIII	length of antennal segment III
LCF	length of coxa of fore leg
LFF	length of femur of fore leg
LFH	length of femur of hind leg
LFM	length of femur of middle leg
LH	length of head
LM	length of metasternum
LO	length of operculum
LPo	length of posternum
LPr	length of prosternum
LS	length of scutellum
LTaF	length of tarsi fore leg
LTaH	length of tarsi hind leg
LTaM	length of tarsi middle leg
LTf	length of tibia fore leg
LTH	length of tibia hind leg
LTM	length of tibia middle leg
PA	posterior width of abdomen
PL	pronotal length
PLm	length of posterior lobe
PW	posterior pronotal width
RS	length of respiratory siphon
WB	width of body
WE	maximal width of eye
WFal	femur width across larger tooth (including tuft of setae)
WFb	femur width at basal half
WFl	width of larger tooth
WFs	width of smaller tooth
Wft	femur width at base of larger tooth
WH	width of head
WHE	Width across eyes
WS	width of scutellum

Results and discussion

Taxonomy

Family Nepidae Latreille, 1802
 Subfamily Ranatrinae Douglas & Scott, 1865
 Genus *Ranatra* Fabricius, 1790
Ranatra uminhensis Truong & Nguyen sp. nov.

Table 1

The data of specimens used in this study. Abbreviations and symbols: n/a: no data; IB, Institute of Biology, Vietnam Academy of Science and Technology, Vietnam; VinhU, Vinh University, Vietnam; *, tentatively held by the corresponding author, Truong Xuan Lam.

Morphospecies	Specimen code	Collecting date	Locality	Sex	Accession numbers	Depository
					COI	
<i>Ranatra uminhensis</i> Truong and Nguyen sp. nov. [Holotype]	TXL53	16.x.2023	Vietnam, Kien Giang	♂	PV263141	IB*
<i>Ranatra uminhensis</i> Truong and Nguyen sp. nov. [Paratype]	TXL53A01	19.x.2023	Vietnam, Kien Giang	♂	n/a	IB*
<i>Ranatra uminhensis</i> Truong and Nguyen sp. nov. [Paratype]	TXL53A02	20.xi.2023	Vietnam, Kien Giang	♂	n/a	IB*
<i>Ranatra uminhensis</i> Truong and Nguyen sp. nov. [Paratype]	TXL53A03	22.x.2024	Vietnam, Kien Giang	♀	n/a	IB*
<i>Ranatra uminhensis</i> Truong and Nguyen sp. nov. [Paratype]	TXL53A04	23.x.2024	Vietnam, Kien Giang	♂	n/a	IB*
<i>Ranatra varipes</i> Stål, 1861	TXL54	16.viii.2023	Vietnam, Ha Tinh	♂	PV263140	IB*
<i>Ranatra varipes</i> Stål, 1861	TXL54B01	16.viii.2023	Vietnam, Ha Tinh	♂	n/a	IB*
<i>Ranatra varipes</i> Stål, 1861	TXL54B02	6.iii.2024	Vietnam, Ha Tinh	♂	n/a	VinhU

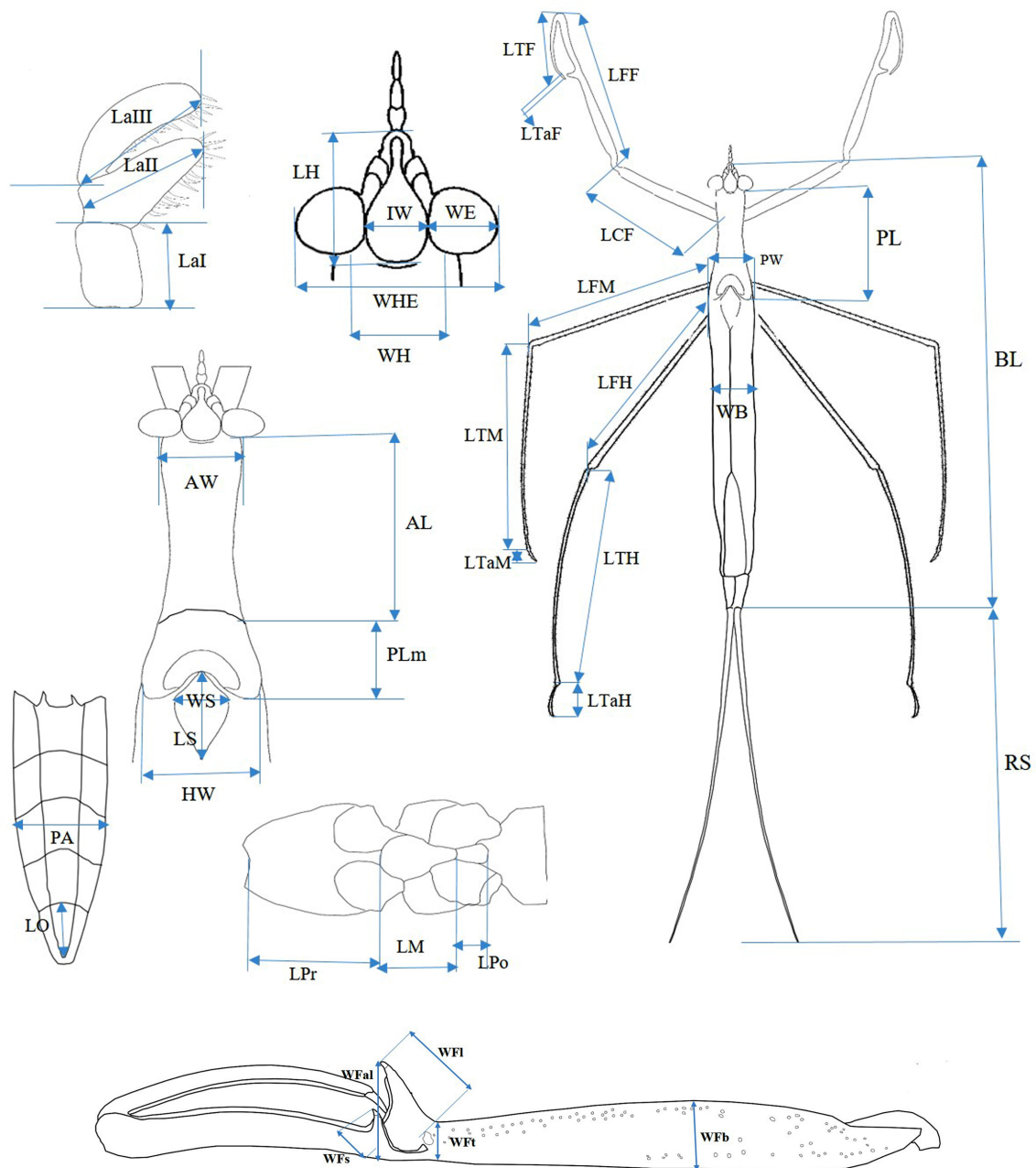


Figure 1. Measurement characters of *Ranatra* species. Drawing based on *Ranatra uminhensis* Truong and Nguyen sp. nov., holotype, ♂, TXL53.

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Material examined. Holotype. 1♂; TXL53; Vietnam, Kien Giang Province, U Minh Thuong National Park; 9°33.124' N; 105°05.214' E; 16.x.2023; XL Truong leg.; IB. **Paratypes.** 1♂; TXL53A01; Kien Giang Province, U Minh Thuong National Park; 9°33.184' N; 105°05.318' E; 19.x.2023; XL Truong leg.; IB. 1♂; TXL53A02; Kien Giang Province, U Minh Thuong National Park; 9°36.224' N; 105°05.511' E; 20.xi.2023; DD Nguyen leg.; IB. 1♀; TXL53A03; Kien Giang Province, U Minh Thuong National Park; 22.x.2024; XL Truong leg.; IB. 1♂; TXL53A04; Kien Giang Province, U Minh Thuong National Park; 9°35.528' N; 105°05.616' E; 23.x.2024; XL Truong leg.; IB.

Description.

General colouration: dorsum of body dark brown and darker than legs and abdomen, except ventral side of fore coxa brown.

Size: Males: body length 34.05–35.87 mm, length of respiratory siphon 27.12–28.71 mm, ratio of siphon length/body length 0.76–0.78. Female: body length 37.27 mm, length of respiratory siphon 30.08 mm; ratio of siphon length / body length: 0.81.

Structural characteristics (male) (Figs. 2A, B, 3, 4, 5):

Head (Figs. 2A, B; 3B, C; 5B, C, K): in lateral view, vertex slightly higher than eye, conical tubercle with a small tubercle at the top; eyes dark brown, with red ventral side; maximal width of eye subequal to interocular width (1: 1.05–1.07); lora swollen but not raised above

clypeus; width across eyes more than 1.5 times head length (1.62–1.66: 1); clypeus surpassing lora, bears short, stout, long setae along midline longitudinal, long setae present apex of tylus; lateral sides of vertex with long setae.

Antenna (Figs. 3A; 5A): The length of antennal segment I short; the antennal segment II and III with many short setae; antennal segment II with finger-like projection; length of antennal segment II shorter than length antennal segment III; ratio of length of LaI: LaII: LaIII=1.00: 1.44–1.59: 1.68–1.83.

Thorax (Figs. 3B, C; 5B, C): Length of anterior lobe of pronotum approximately 1.70–1.76 times length of posterior lobe when measured along midline; in lateral view, anterior margin slightly raised; ratio of humeral width / anterior width: 1.40–1.49; posterior lobe with humeri broadly rounded; dorsum of the posterior lobe with many coarse punctures. Scutellum with length twice its width (1.00: 1.93–2.13), holotype: length 2.13 times width, with two transverse depressions towards apex.

Legs (Figs. 2A, B, 3E, 5E): Legs slender and long, anterior femur with some irregular small black spots. Fore femur with two teeth, larger tooth on outer face, smaller tooth situating immediately anterior of flexor side of femur (Figs. 3E, 5E); the edges of the larger tooth and smaller tooth covered short, thick hairs with forming a mane; tooth apex covered with longer setae; ratio of femur width at basal half / femur width at base of larger tooth: 1.74–1.84 (holotype 1.79); ratio of femur width across larger tooth (including tuft of setae) / femur width at basal half: 1.40–1.42 (holotype 1.40); ratio of femur width across larger tooth (including tuft of setae) / femur width at base

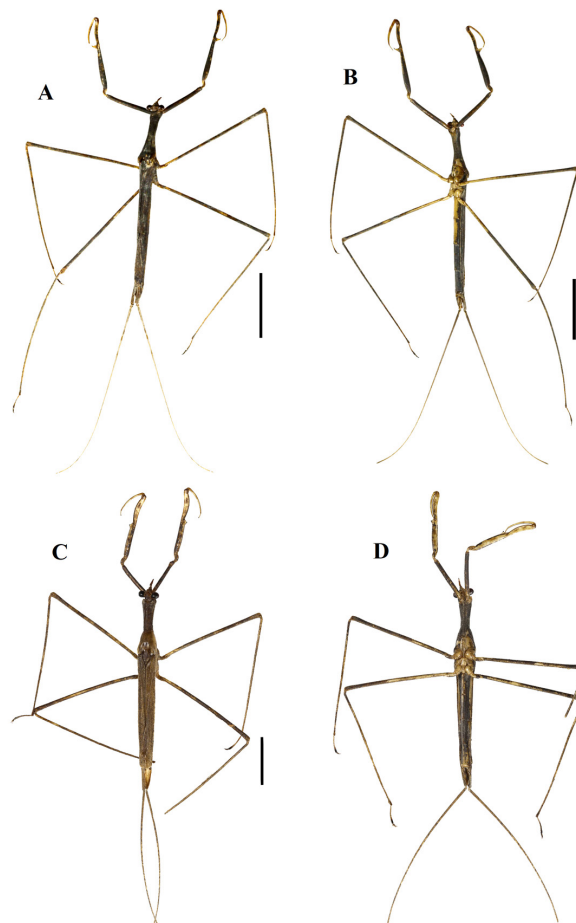


Figure 2. Habitus images of morphospecies *Ranatra uminhensis* Truong & Nguyen sp. nov. and *Ranatra varipes* Stål, 1861. A. dorsal view, B. ventral view (*Ranatra uminhensis* Truong & Nguyen sp. nov., ♂, TXL53); C. dorsal view, D. ventral view (*Ranatra varipes* Stål, 1861, ♂, TXL54). Scale bar: 10 mm for A, B; 5 mm for C, D.

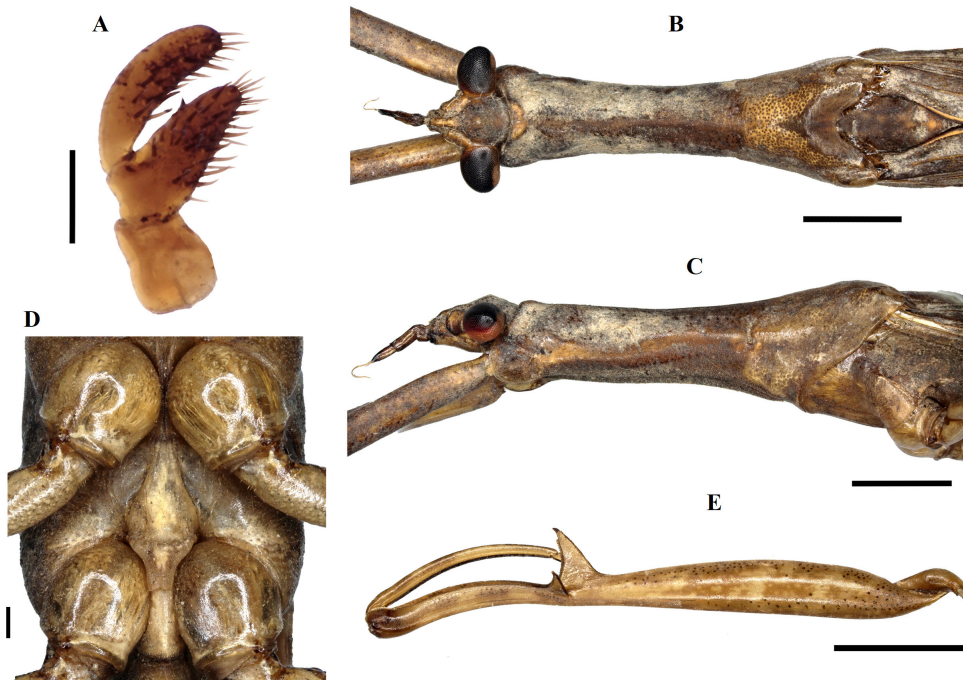


Figure 3. *Ranatra uminhensis* Truong & Nguyen sp. nov., holotype, ♂, TXL53. A. antenna; B. head and prothorax dorsal view; C. head and prothorax lateral view; D. Meso and metasternum; E. left foreleg and femoral teeth, inner view. Scale bar: 0.5 mm for A; 0.3 mm for D, E; 0.2 mm for B, C.

of larger tooth: 2.47–2.63 (holotype 2.51); ratio of width of smaller tooth (WFs)/ femur width at basal half: 0.37–0.39 (holotype 0.39); ratio of length of fore femur: length of fore tibia: length of fore tarsi: 10.96–11.32: 3.88–4.03: 1.00; flexor side of fore femur bearing two teeth located at distal 0.35–0.42 (holotype 0.42). Middle femur subequal in length to hind femur (1.00: 1.02–1.03); in both sexes, hind femur when folded back along body not reaching both tip of operculum and tip of abdomen (excluding siphon). Middle tibia shorter than middle femur (1.00: 1.10–1.11), hind tibia longer than hind femur (1.11–1.12: 1.00); middle and hind femora with sparsely distributed long, thin, pale setae on posterior margins along their entire length; middle and hind tibiae with dense fringe of long setae on posterior margins along their entire length. Ratio of length of middle femur: length of middle tibia: length of middle tarsi: 5.97–5.99: 6.09–6.14: 1.00. Ratio of length of hind femur: length of hind tibia: length of hind tarsi: 6.00–6.07: 6.72–6.74: 1.00.

Meso and metasternum (Figs. 3D, 5D): Mesosternum with carina oblong in shape, rounded anterior margin, broad in the medially, projection between middle and hind coxae with deep transverse groove, narrow along mesosternum; metasternum with strongly raised longitudinal, anterior margin with a short groove, posterior margin convex, truncate; middle coxae equal to hind coxae; ratio of length of LPo: LM: LPr = 1.00: 1.98–2.13: 3.63–3.87. Space between middle coxae narrower than that between hind coxae. Membrane not reaching posterior margin of tergite 6 (Fig. 2A).

Abdomen long and narrow, apex narrowly round (Fig. 2B). Male operculum slightly shorter than connexivum (Figs. 4A, C; 5G). Distal margin of connexivum of female acutely produced; female operculum (Fig. 4B) reaching end of connexivum and base of respiratory siphon.

Male genitalia: Paramere (Figs. 4F–G, 5J–Q) elongate, tapering in distal third; apical hook of paramere open and strongly curved, with a large tooth-like projection on inner margin of hook (Figs. 4G, 5Q); apex of hook pointed; dorsal surface of paramere almost straight. Phallosome as in Figs. 4D–E, 5H.

Measurements (mm) (Suppl. material 1): Males, BL: 34.05–35.87 (holotype: 35.87); RS: 27.12–28.71 (holotype: 27.12); WB: 2.95–2.96 (holotype:

2.95); WB: 2.95–2.96 (holotype: 2.95); PL: 9.05–9.85 (holotype: 9.05); PW: 3.35–3.49 (holotype: 3.35); WH: 1.24–1.36 (holotype: 1.24); LH: 1.75–1.90 (holotype: 1.75); WHE: 2.84–3.11 (holotype: 2.84); WE: 1.01–1.07 (holotype: 1.01); IW: 1.06–1.14 (holotype: 1.06); Lal: 0.22–0.24 (holotype: 0.22); Lall: 0.35–0.36 (holotype: 0.35); Lalll: 0.39–0.41 (holotype: 0.39); AW: 2.01–2.13 (holotype: 2.01); HW: 2.82–3.09 (holotype: 2.82); AL: 5.08–5.16 (holotype: 5.08); PLm: 2.89–2.98 (holotype: 2.89); LCF: 8.43–8.15 (holotype: 8.43); LFF: 11.89–12.35 (holotype: 11.89); LTF: 4.07–4.10 (holotype: 4.07); LTaF: 1.05–1.11 (holotype: 1.05); LFM: 20.18–19.12 (holotype: 20.18); LTM: 20.09–21.19 (holotype: 21.19); LTaM: 2.71–3.37 (holotype: 3.37); LFH: 19.13–19.86 (holotype: 19.86); LTH: 20.50–21.69 (holotype: 21.69); LTaH: 3.09–3.27 (holotype: 3.27); LS: 2.69–2.76 (holotype: 2.69); WS: 1.26–1.36 (holotype: 1.26); PA: 2.19–2.95 (holotype: 2.19); LPr: 2.63–3.19 (holotype: 2.63); LM: 1.45–1.74 (holotype: 1.45); LPo: 0.68–0.88 (holotype: 0.68); LO: 2.83–3.00 (holotype: 2.83); WFaI: 1.43–1.56 (holotype: 1.43); WFI: 1.11–1.23 (holotype: 1.11); WFs: 0.40–0.42 (holotype: 0.40); WFB: 0.99–1.18 (holotype: 0.99); WFT: 0.57–0.67 (holotype: 0.57).

Female: BL: 37.27; RS: 30.08; WH: 1.47; WE: 1.13; IW: 1.22; AW: 2.25; HW: 3.36; AL: 5.23; PLm: 3.07; fore leg: LCF: 9.73, LFF: 4.59; middle leg: LFM: 20.66, LTM: 22.39, LTaM: 3.46; hind leg: LFH: 21.23, LTH: 23.15, LTaH: 3.54.

The classification of seven species groups within the genus *Ranatra* Fabricius, 1790 was initially proposed by Lansbury (1972) and later revised by Tran and Zettel (2021a). However, *Ranatra uminhensis* sp. nov. cannot be assigned to the *R. gracilis* group, *R. elongata* group, *R. varipes* group, *R. filiformis* group, *R. bilobata* group and *R. biroii* group due to distinct differences in the structure of the apical hook of male paramere is characterized by a strongly curved, with large tooth-like projection on the inner margin just before the hook (Figs. 4G, 5Q) (Suppl. material 2). These distinctive morphological characteristics support the exclusion of *Ranatra uminhensis* sp. nov. from the aforementioned groups and justify its placement within the *R. malayana* group.

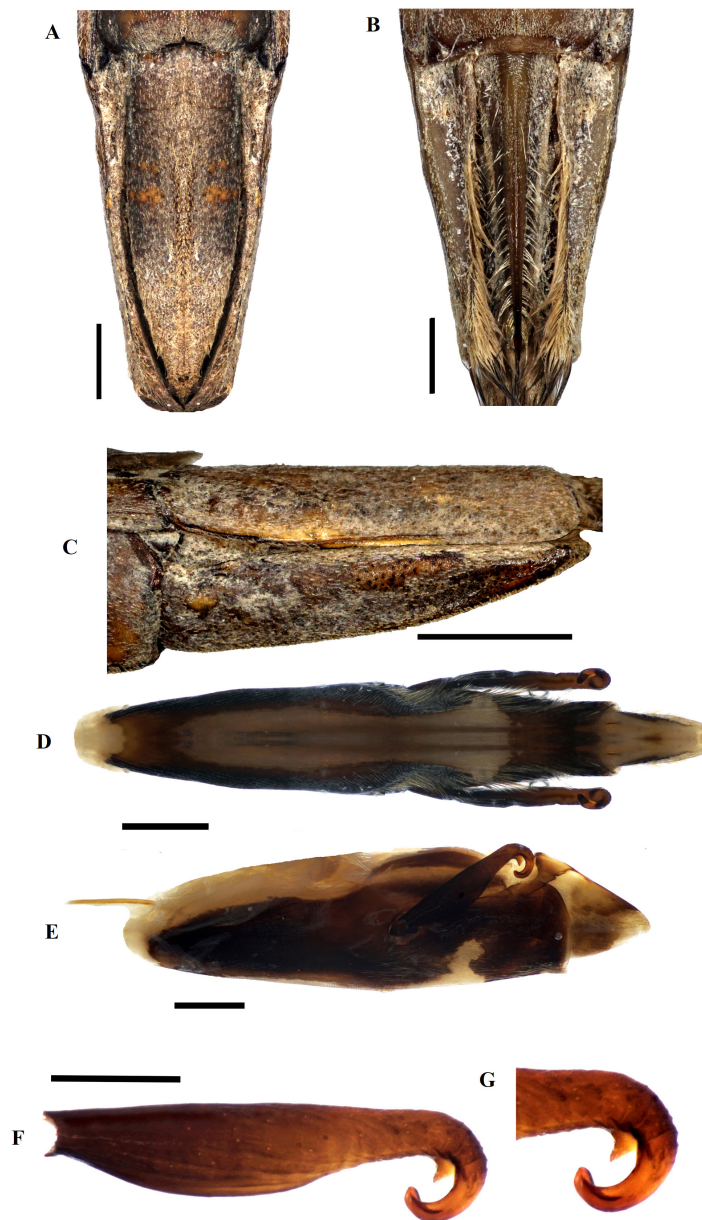


Figure 4. *Ranatra uminhensis* Truong & Nguyen sp. nov. (male, holotype, ♂, TXL53; female, paratype, TXL53A03). A. apex of abdomen of male, dorsal view; B. apex of abdomen of female, dorsal view; C. apex of abdomen of male, lateral view; D. male phallosome, dorsal view; E. male phallosome, lateral view; F. paramere; G. apex of paramere. Scale bar: 1 mm for c; 0.6 mm for A, B; 0.5 mm for D, E; 0.3 mm for F.

Ranatra uminhensis sp. nov. differs distinctly from *R. katsara*, which is known from Thailand (see Nieser, 1997: figs. 1–8). The most evident differences are observed in body size, the ratio between the lengths of the anterior and posterior lobes of the pronotum, the distance between the middle and hind coxae, and the structure of the male parameres.

Ranatra uminhensis sp. nov. also clearly differs from *R. malayana*, which is known from Sulawesi and Borneo (see Lansbury, 1972: figs. 142–152). According to Lansbury (1972), in *R. malayana*, male body length is 26–29 mm and female body length 30 mm; siphon length is approximately 23 mm; the eye is narrower than interocular distance; the anterior lobe of pronotum is twice as long as the posterior lobe; the scutellum is twice as long as broad; the mesosternum is evenly rounded; the metasternum is flat; the space between the middle coxae is broader than that between the hind coxae (see Lansbury, 1972: fig. 144); the female operculum is not reaching the apex of the connexivum (Lansbury, 1972: fig. 147); male operculum is nearly as

long as the connexivum (Lansbury, 1972: fig. 148); the paramere has a short, blunt apical hook; and the phallosome has a long membranous posterior diverticulum (Lansbury, 1972: figs. 150–152). In contrast, in *R. uminhensis*, male body length is 34.05–35.87 mm and female body length is 37.27 mm; siphon length is 27.12–28.71 mm in males and 30.08 mm in the female; the eye width is subequal to the interocular distance (ratio ~1.00:1.05–1.07); the anterior lobe of the pronotum approximately is 1.70–1.76 times the length of the posterior lobe; the scutellum is more than twice as long as broad; the mesosternum has an oblong carina; the area between middle and hind coxae has a distinct transverse groove; the metasternum has a sharply raised longitudinal ridge; the distances between middle coxae and between hind coxae are approximately equal; the female operculum is reaching the apex of the connexivum; and male operculum is slightly shorter than the connexivum; the paramere is elongated, with a strongly curved apical hook terminating in a pointed apex and with a prominent, high

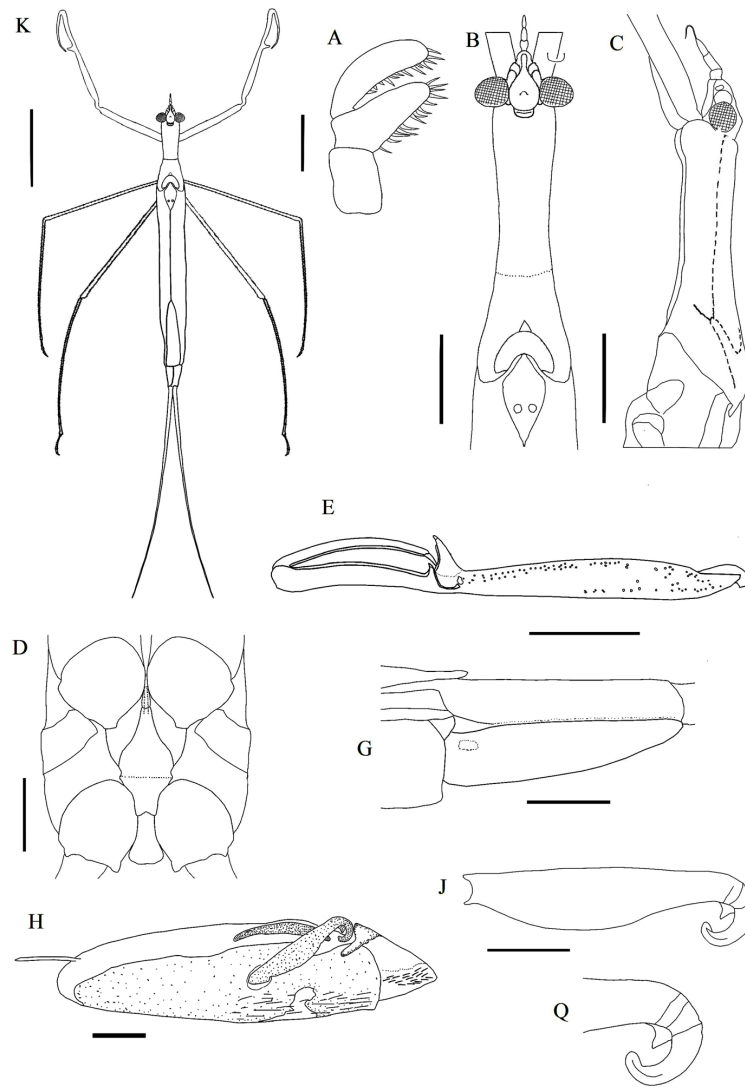


Figure 5. *Ranatra uminhensis* Truong & Nguyen sp. nov., holotype ♂, TXL53. K. habitus, A. antenna, B. head and prothorax dorsal view, C. head and prothorax lateral view, D. Meso and metasternum, E. left foreleg and femoral teeth, inner view, G. apex of abdomen of male, lateral view, H. male phallosome, lateral view, J. paramere, Q. apex of paramere. Scale bar: 10 mm for K; 3 mm for B, C; 2 mm for E; 1 mm for D; 0.5 mm for H; 0.3 mm for J.

tooth-like projection is present on the inner margin at base of the hook (Figs. 4F, G; 5J, Q)

Etymology. The specific epithet refers to its occurrence in U Minh Thuong National Park; an adjective.

DNA barcode. A partial sequence of the mitochondrial gene of cytochrome oxidase subunit I (COI) of the holotype was uploaded to GenBank with accession number PV263141 (Table 1).

Distribution. Vietnam: U Minh Thuong National Park, Tien Giang Province

Ranatra varipes Stål, 1861
(Figs. 6, 7)

Material examined. Vietnam: 1♂; TXL54; Ha Tinh Province, Vu Quang Natural Park; 21°26'18" N, 105°33'24" E; 16.viii.2023, XL Truong leg.; IB. 1♂; TXL54B01; Ha Tinh Province, Vu Quang Natural Park; 21°26'18" N, 105°33'24" E; 16.viii.2023; XL Truong leg.; IB. 1♂; TXL54B02; Ha Tinh Province, Vu Quang Natural Park; 21°33'28" N, 105°33'54" E; 6.iii.2024; TG Phan leg.; VinhU.

Supplementary description.

The body length: 20.36–21.64 mm, length of respiratory siphon 15.78–17.09 mm, ratio of siphon length/body length (0.78–0.80)

Head (Figs. 2C, D, 6B, C): maximal width of eye longer than interocular width (1.00: 0.76–0.84); width across eyes longer than almost twice times length of head (1.82–1.96: 1.00)

Antenna (Fig. 6A): Ratio of length of Lal: Lall: LalII = 1.00: 1.61–1.68: 1.88–2.16. Thorax (Figs. 6B, C): The length of anterior lobe about one-third greater than length of posterior lobe when measured along longitudinal midline (1.13–1.20: 1.00); humeral width one-fifth less than anterior width (1.00: 1.03–1.08); ratio of humeral width of pronotum: anterior width of pronotum (1.19–1.21: 1.00). Scutellum (Fig. 6B) with length shorter than twice times its width (1.82–1.88: 1.00). Legs (Figs. 2C, D, 6E): Fore femur relatively broad with a larger tooth at the middle and a smaller tooth at distal, pre-apical teeth absent (Fig. 6E); ratio of femur width across larger tooth (including tuft of setae) / femur width at basal half: 1.02–1.04; ratio of length of fore femur: length of fore tibia: length of fore tarsi: 11.02–13.25: 4.52–5.17: 1.00. Middle femur subequal in

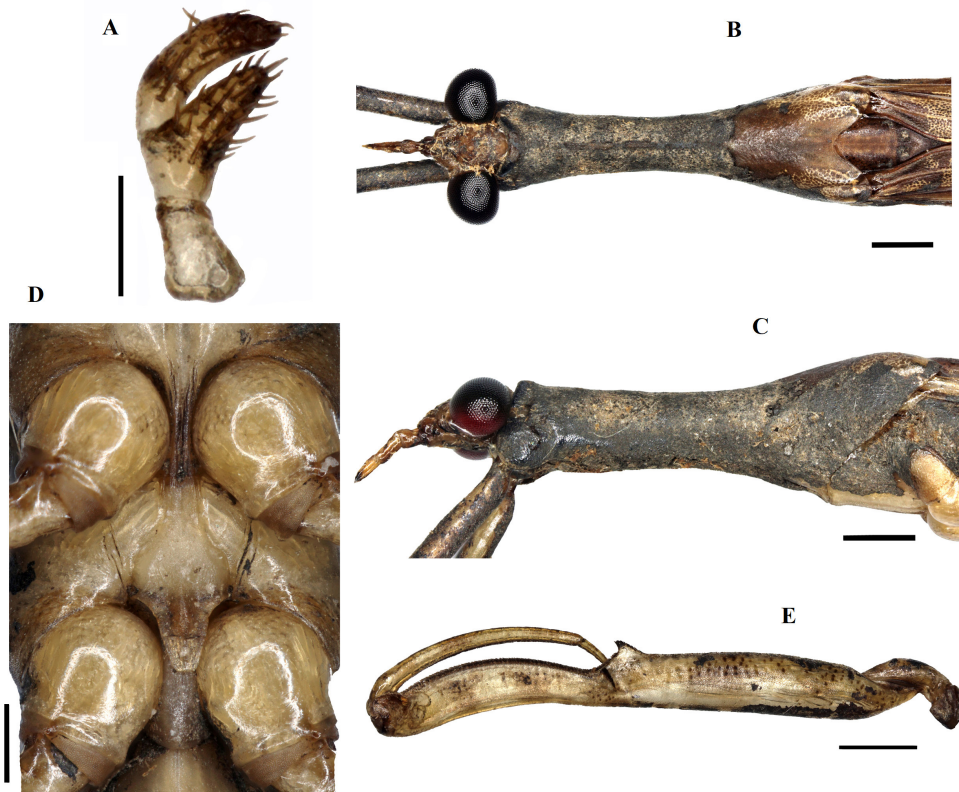


Figure 6. *Ranatra varipes* Stål, 1861, ♂, TXL54. A. antenna; B. head and prothorax dorsal view; C. head and prothorax lateral view; D. Meso and metasternum; E. left foreleg and femoral teeth, inner view. Scale bar: 1 mm for B, C, F; 0.5 mm for D; 0.2 mm for A.

length to hind femur (1.00: 1.01–1.02); length of tibia middle leg longer than length of femur of middle leg: 1.12–1.13: 1.00; ratio of length of middle femur: length of middle tibia: length of middle tarsi: 4.57–4.80: 5.09–5.41: 1.00. Length of tibia hind leg longer than length of femur of hind leg: 1.11–1.12: 1.00; ratio of length of hind femur: length of hind tibia: length of hind tarsi: 4.41–4.85: 4.90–5.39: 1.00.

Meso and metasternum (Fig. 6D): Ratio of length of posternum: length of metasternum: length of prosternum: 1.00: 2.40–2.54: 4.32–4.63. Abdomen long and narrow, apex narrowly round (Fig. 2D). Male operculum slightly shorter than the connexivum, slender, keeled and with pointed apex (Figs. 7A–B).

The paramere (Figs. 7E, G): slender, slightly tapering in the distal fourth near the apex, underside of apex of paramere with a large tilde-shape, with an expanded mushroom-shaped distal process, slight round subapical lobe, without pre-apical before hook. Phallotheca weakly sclerotized as in Figs. 7C, D.

Measurements (mm) (Suppl. material 1): Males, BL: 20.36–21.64; RS: 15.78–17.09; WB: 1.81–2.02; PL: 7.09–7.42; PW: 2.05–2.59; WH: 1.09–1.14; LH: 1.33–1.62; WHE: 2.56–3.01; WE: 10.90–1.08; IW: 0.76–0.82; Lal: 0.16–0.19; Lall: 0.26–0.32; LalII: 0.30–0.41; AW: 1.50–1.68; HW: 1.86–2.06; AL: 3.16–3.52; PLm: 2.36–2.56; LCF: 5.14–5.44; LFF: 6.89–7.05; LTF: 2.69–2.89; LTaF: 0.52–0.64; LFM: 11.43–11.71; LTM: 12.88–13.02; LTaM: 2.38–2.56; LFH: 11.68–11.82; LTH: 12.98–13.14; LTaH: 2.41–2.68; LS: 1.73–1.84; WS: 0.89–1.01; PA: 1.78–1.89; LPr: 2.03–2.41; LM: 1.13–1.32; LPo: 0.47–0.52; LO: 2.10–2.22; WFaI: 0.77–1.82; WFI: 0.31–0.34; WFs: 0.25–0.27; WFb: 0.73–0.74; WFT: 0.64–0.68.

Distribution. Vietnam: Vu Quang National Park, Ha Tinh Province (this study); Dong Nai (Polhemus and Polhemus, 2013), Phuc Son, Annam

(Lansbury, 1973), Quang Binh, Quang Tri (Tran and Nguyen, 2016). Java, Singapore, Malaysia, Sumatra, Burma, India, Ceylon, China, Thailand, Sarawak, Sumatra, Philippines (Lansbury, 1972, 1973; Fernando and Cheng, 1974; Chen et al., 2004; Tran and Nguyen, 2016).

DNA barcode. A partial sequence of the mitochondrial gene of cytochrome oxidase subunit I (COI) of the *R. varipes* Stål, 1861 was uploaded to GenBank with accession number PV263140 (Table 1)

Comments. The specimens listed above are generally consistent with the descriptions of *R. varipes* by Lansbury (1972) and Polhemus and Polhemus (2013). *R. varipes* is supplementary description herein based on newly collected material from Ha Tinh Province, Vu Quang National Park, which provides additional morphological data and DNA barcode (COI) sequences, which have been submitted to GenBank (Accession No.: PV263140).

The specimens of *R. varipes* from Ha Tinh Province exhibit slight morphological differences compared with descriptions by Lansbury (1972) and Polhemus and Polhemus (2013) in the previously described populations: the anterior lobe of pronotum is approximately one-fourth longer than the posterior lobe, and the humeral width is about one-third greater than the anterior width; the paramere is characterized by a slender and shallow incision just below the subapex, a blade-like distal process arising from a small, obtusely angulate subapical lobe (see Lansbury, 1972: figs. 131, 141; Polhemus and Polhemus, 2013: figs. 17–18). In the specimens from Ha Tinh Province, the anterior lobe of pronotum is approximately one-third longer than the posterior lobe (ratio 1.13–1.20: 1.00), and a humeral width of pronotum about one-fifth narrower than the anterior width of pronotum (ratio 1.03–1.08: 1.00); the paramere lacks the slender and shallow incision below the subapex, instead, the

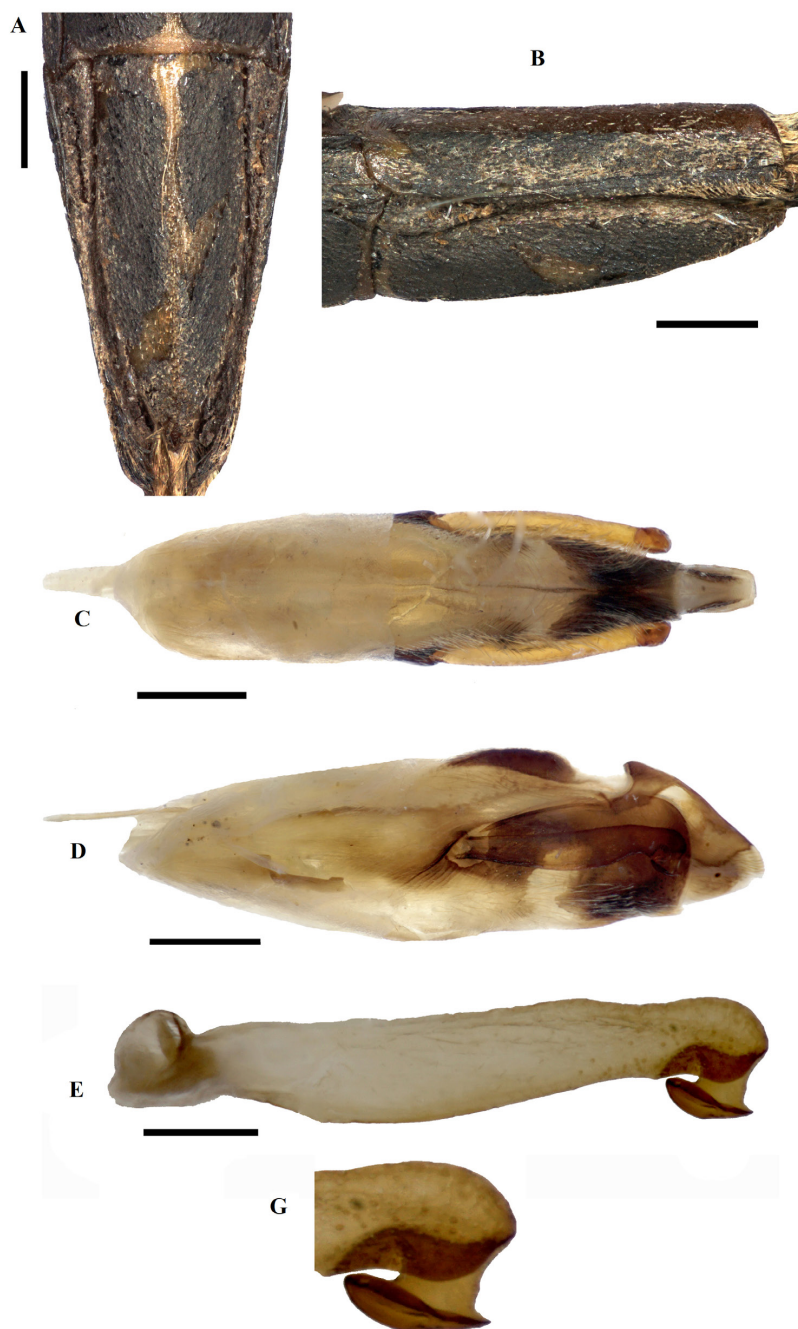


Figure 7. *Ranatra varipes* Stål, 1861, ♂, TXL54. A. apex of abdomen of male, dorsal view; B. apex of abdomen of female, dorsal view; C. apex of abdomen of male, lateral view; D. male phallosome, dorsal view; E. male phallosome, lateral view; F. paramere; G. apex of paramere. Scale bar: 0.5 mm for A, B, C, D; 0.2 mm for F.

apex exhibits a large tilde-shaped structure and a mushroom-shaped distal process, with a slightly rounded subapical lobe (Figs. 7E-G).

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Conflicts of interest

The authors declare that they have no conflicts of interest related to this article

Author contribution statement

PTG (PhD student): Collected specimens, conducted morphological analysis, performed data processing, contributed to drafting the manuscript, and revised the manuscript.

NDD: Collected specimens, designed the research, supported molecular analysis, and revised the final manuscript.

HNL: Performed molecular data analysis, conducted morphometric analyses, contributed to the interpretation of results and discussion, and provided critical comments on the manuscript.

TTNL and NQC: Carried out imaging, contributed to the use of morphological terminology, measurements, and indices.

TXL: Participated in specimen collection, contributed to morphometric and molecular data analyses, conducted species delimitation analyses, contributed to the results and discussion, wrote the manuscript, and took primary responsibility for the manuscript.

All authors have read and approved the final version of the manuscript.

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Supplementary material

The following online material is available for this article:

Table S1 – The measurement of the species *Ranatra uminhensis* sp. nov. and *Ranatra varipes* Stål, 1861 in Vietnam.

Table S2 – The synthesize comparative notes between *Ranatra uminhensis* sp. nov. and species of group in genus *Ranatra*.