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## Research article

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# *Pukupuku arunachalensis* sp. nov. (Coleoptera, Scarabaeidae, Rutelinae) from Arunachal Pradesh, India

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**Abstract.** A new species of the genus *Pukupuku* Muramoto, 2006 is described from the state of Arunachal Pradesh (Northeast India): *Pukupuku arunachalensis* sp. nov. Relevant diagnostic characters are illustrated and compared with closely related species, *Pukupuku curtus* (Arrow, 1919) and *Pukupuku katurai* (Muramoto, 2002). The distribution of the new species is mapped.

**Keywords.** New species, taxonomy, Northeast India, diagnosis, Palaearctic Region.

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## Introduction

The genus *Pukupuku* Muramoto, 2006 currently includes only two species: the type species *Pukupuku curtus* (Arrow, 1919), known from northern Thailand and Laos (Arrow, 1919; Muramoto, 2002, 2006), and *Pukupuku katurai* (Muramoto, 2002) from northern Vietnam (Muramoto, 2002). Muramoto (2006) proposed the genus *Pukupuku* based on some unique characters which are not shared by the related ruteline genera *Fruhstorferia* Kolbe, 1894, *Masumotokoganea* Hirasawa, 1992, *Didrepanephorus* Wood-Mason, 1878, *Nagainokoganea* Hirasawa, 1992 and *Kibakoganea* Nagai, 1984.

The following diagnostic characters separate *Pukupuku* from the closely related genera: ventroapical process of 4<sup>th</sup> meso- and metatarsomere with a pair of fine long hairs at base, male mandibles more or less produced anteriorly, mentum with a large round hollow at middle, meso and metatibiae unidentate, parameres symmetric and bare, and mandibles with a small tooth in middle (Muramoto 2006). Prokofiev (2013) suggested to synonymize *Pukupuku* with *Kibakoganea*. Nevertheless, the shape of the male

mandibles and parameres are quite different in these two groups of rutelines, and *Pukupuku* should thus be maintained as an independent genus in agreement with Do (2013).

While working on the Rutelinae collection deposited in the collection of the Zoological Survey of India, Kolkata, six specimens of *P. arunachalensis* sp. nov. were studied, described, illustrated and diagnosed. The newly described species was analyzed and illustrated against each generic character proposed by Muramoto for the genus *Pukupuku*. The relevant diagnostic characters of head, pronotum, elytra, pygidium, legs, meso- and metasternum, abdomen and aedeagus are illustrated for both male and female type specimens.

## Material and methods

The material of the new species was collected in Namdapha National Park, currently located in Changlang, district of the state of Arunachal Pradesh, India.

The aedeagus was dissected and cleaned in a KOH solution of 10% for 30 minutes. The specimens were studied using a Leica M205A stereo microscope; measurements and photographs were taken through the microscope using the proprietary software (Leica application suite, V3.8).

The type specimens were deposited in the national zoological collections of the Zoological Survey of India, Kolkata.

The specimens of the newly described species are provided with one red printed label “*Pukupuku arunachalensis* sp. nov., HOLOTYPUS or PARATYPUS, Devanshu Gupta, Kailash Chandra & Aleš Bezděk det. 2016”. Exact label data are cited for the type material. Single slash (/) is used to separate lines within each label. The distribution map was created using the free mapping and geographic data analysis software DIVA-GIS (version 7.5.0, <http://www.diva-gis.org/>).

## Results

Order Coleoptera Linnaeus, 1758  
Suborder Polyphaga Emery, 1886  
Superfamily Scarabaeoidea Latreille, 1802  
Family Scarabaeidae Latreille, 1802  
Subfamily Rutelinae MacLeay, 1819  
Genus *Pukupuku* Muramoto, 2006

*Pukupuku arunachalensis* sp. nov.

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Figs 1–33

## Diagnosis

The newly described species can be easily distinguished by its unique structure of aedeagus, shape and size of mandibles which are sharply pointed at end with a small tooth in middle at outer edge (in lateral view), and four times as long as clypeus, pronotum smooth without setae, pygidium smooth (setae absent in male, present in female). See Table 1 for detailed differential characters separating *P. arunachalensis* sp. nov. from *P. curtus* and *P. katurai*.

## Etymology

The name *arunachalensis* refers to the Northeastern Himalayan state of India, Arunachal Pradesh.

**Table 1.** Differential characters (males) of *Pukupuku arunachalensis* sp. nov., *Pukupuku curtus* (Arrow, 1919) and *Pukupuku katsurai* (Muramoto, 2002).

Species / character	<i>Pukupuku arunachalensis</i> sp. nov.	<i>Pukupuku curtus</i> (Arrow, 1919)	<i>Pukupuku katsurai</i> (Muramoto, 2002)
Shape of mandibles	Sharply pointed at end, with a small tooth in middle at outer edge (in lateral view) (Fig. 5)	Curved upward toothed at outer edge (Fig. 34)	Curved upward and slightly inward near apex, with a long tooth before middle of upper surface (Muramoto 2002: fig. 2)
Size of mandibles	Four times as long as clypeus, 16.0 mm (Figs 4–5)	Not long, 3.0 mm in length (Fig. 34)	Twice as long as length of clypeus, 4.0–4.5 mm (Muramoto 2002: figs 1–2)
Sculpture of pronotum	Entirely smooth, without setae (Fig. 7)	Densely covered with minute setae	Densely covered with minute setae
Pygidium	Smooth, setae absent in male; in female with long setae	Impunctate covered with long setae	Coriaceous, posterior margin with a row of setae
Aedeagus	Symmetrical, differently shaped (Figs 20–22)	Symmetrical, differently shaped (Muramoto 2002: fig. 6)	Symmetrical, differently shaped (Muramoto 2002: fig. 3)
Length (including mandibles)	32.0 mm	18–19.5 mm	20.5–21 mm
Length (excluding mandibles)	20.0 mm	15–16.5 mm	16.5 mm
Width	19.0 mm	9–9.5 mm	11 mm
Distribution	Arunachal Pradesh (Figs 23–24)	Laos, North Thailand	Vietnam (Cao Bang)



**Figs 1–2.** *Pukupuku arunachalensis* sp. nov. 1. Holotype, ♂, habitus, dorsal view. 2. Paratype, ♀, habitus, dorsal view.

## Material examined

### Holotype

INDIA: ♂ labeled: “INDIA, Arunachal Pradesh / Namdapha / Tirap / Mizo / Vijay Nagar / 4 Oct. 1985 / collected S. Biswas” (ZSI Registration Number: 21630/H4A).

### Paratypes

INDIA: 2 ♂♂ and 3 ♀♀, same locality data as holotype (ZSI Registration Number: 21630/H4A to 21635/H4A).

### Type locality

INDIA: Arunachal Pradesh state, Tirap district (now in Changlang district), Vijay Nagar, Namdapha National Park.

### Type depository

Deposited in the collections of the Zoological Survey of India, New Alipore, Kolkata.

### Description (holotype, Figs 1, 3–24)

MEASUREMENTS. Total body length of males (excluding mandibles): 20.0–21.0 mm (holotype 20.0 mm), total body length of females: 19.0–20.0 mm.

DETAILED MEASUREMENTS. Mandibular horn: length 16.0 mm. Clypeus: length 4.0 mm, inter ocular distance (distance between inner sides of each eye) 5.8 mm. Pronotum: length 9.9 mm, maximum width 17.5 mm. Pygidium: length 4.5 mm, width 12.5 mm. Elytra: length 18.4 mm, maximum width 19.3 mm. Aedeagus: length 7.6 mm, maximum width 2.5 mm; Parameres: length 3.0 mm, maximum width 2.2 mm.

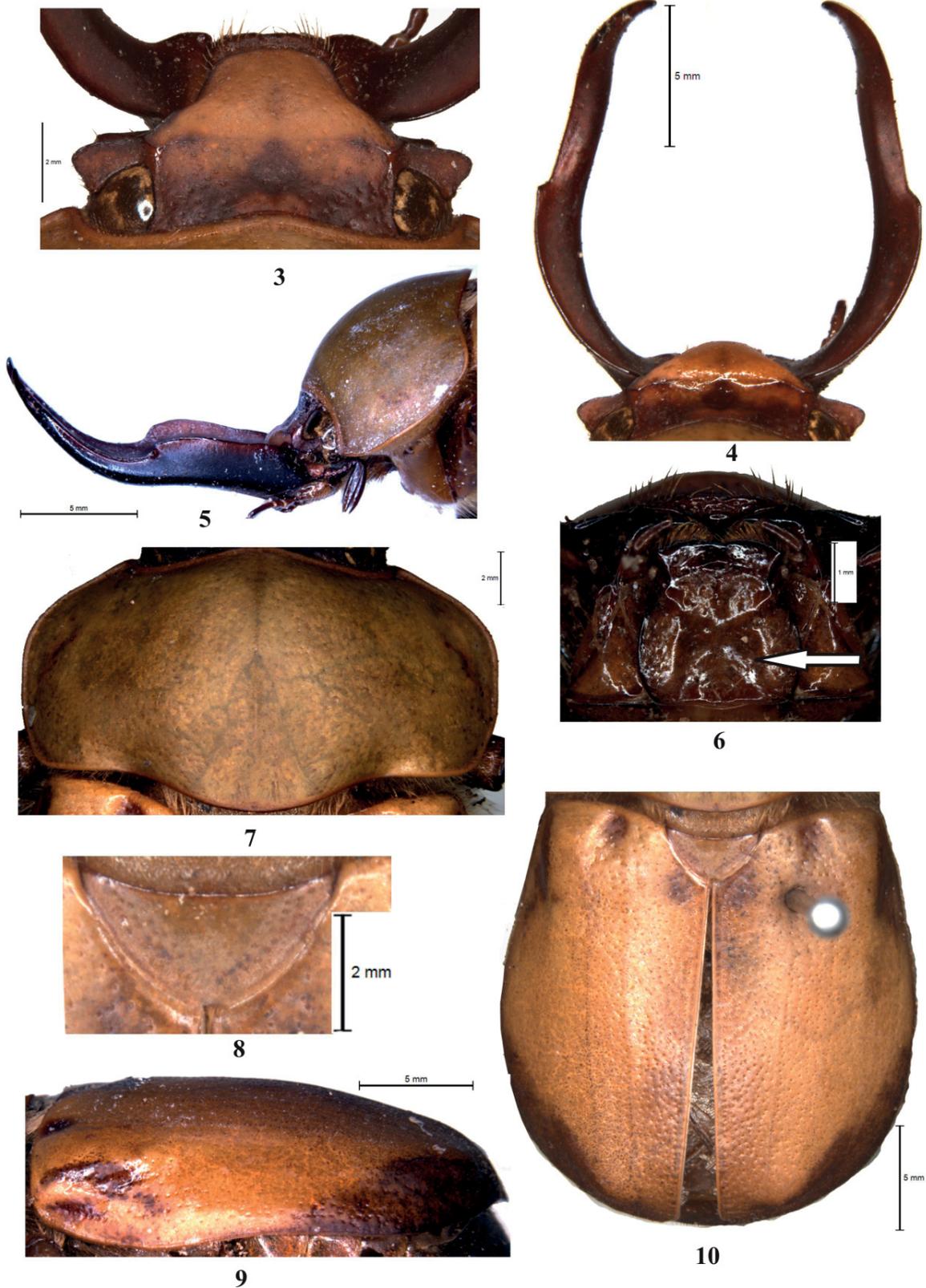
BODY. Broadly oval and convex.

HEAD (Figs 3–6). Glabrous, entirely smooth without any hairs dorsally. Clypeus trapezoidal, convergent in basal half, anterior clypeal margin slightly arcuate with few short and long hairs, anterior angles rounded, surface with few scattered punctures in middle and at sides, slightly convex in middle, clypeofrontal suture nearly absent with only small carina at each side, vertex with moderately large rugopunctuation. Area near each eye smooth and shining. Eye canthus spatulate, wide near end and small at base, surface smooth. Labrum straight with long hairs at margin. Mentum with a rather large rounded hollow at middle. Mandibles flat and broad at base, sharply pointed at end with a small tooth in middle (in lateral view), almost four times as long as length of clypeus.

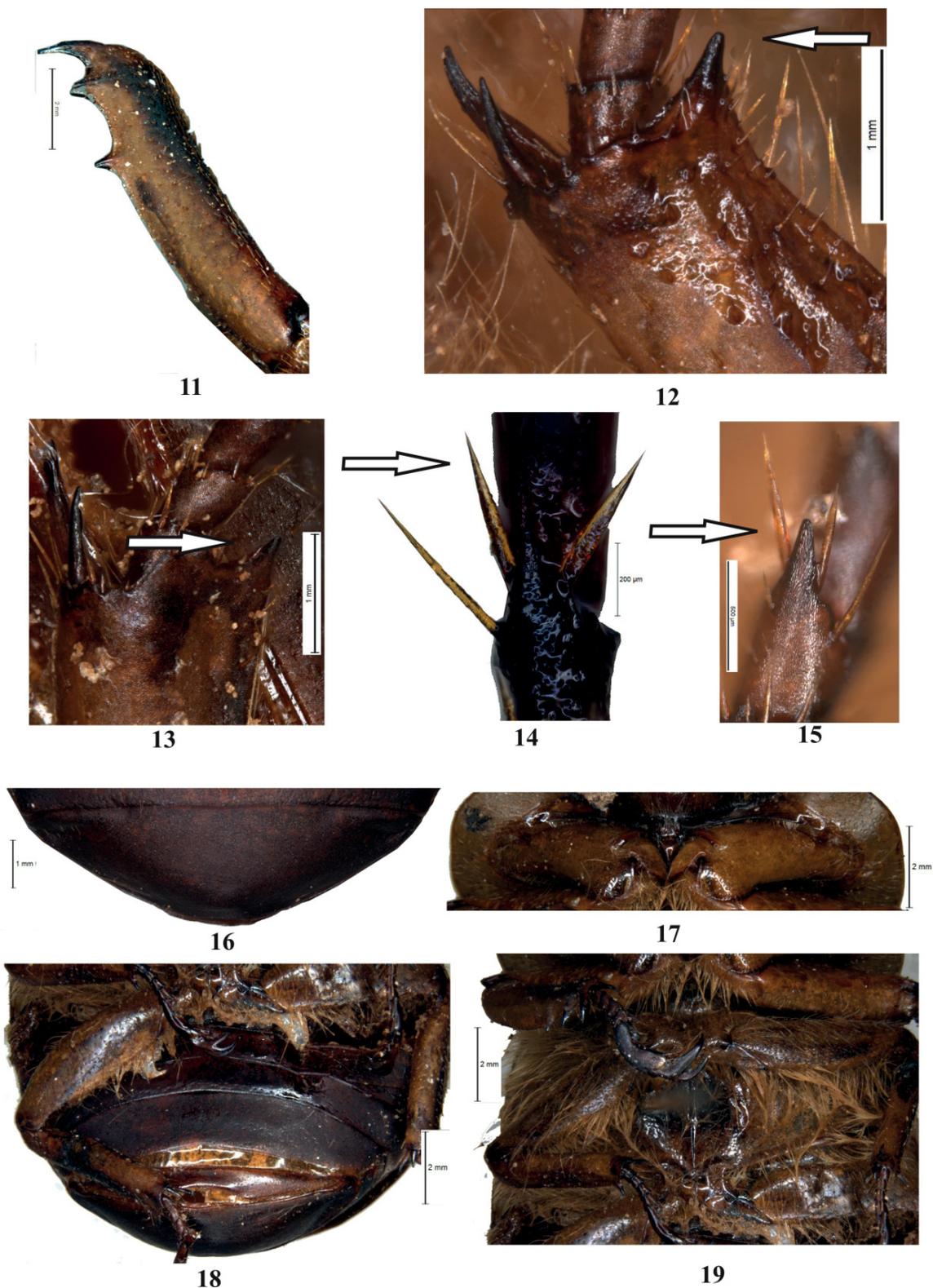
PRONOTUM (Fig. 7). Convex, 1.9 times as wide as long, widest before middle, without any hairs or setae on dorsal surface, with rather small but indistinct punctures in middle, laterally smooth, narrowly marginate except near base, base distinctly lobed before scutellum, anterior, lateral, and hind angles rounded.

SCUTELLAR PLATE (Fig. 8). Triangular, base carinate, lateral sides curved, apex rounded, densely punctate on sides with a line of punctures.

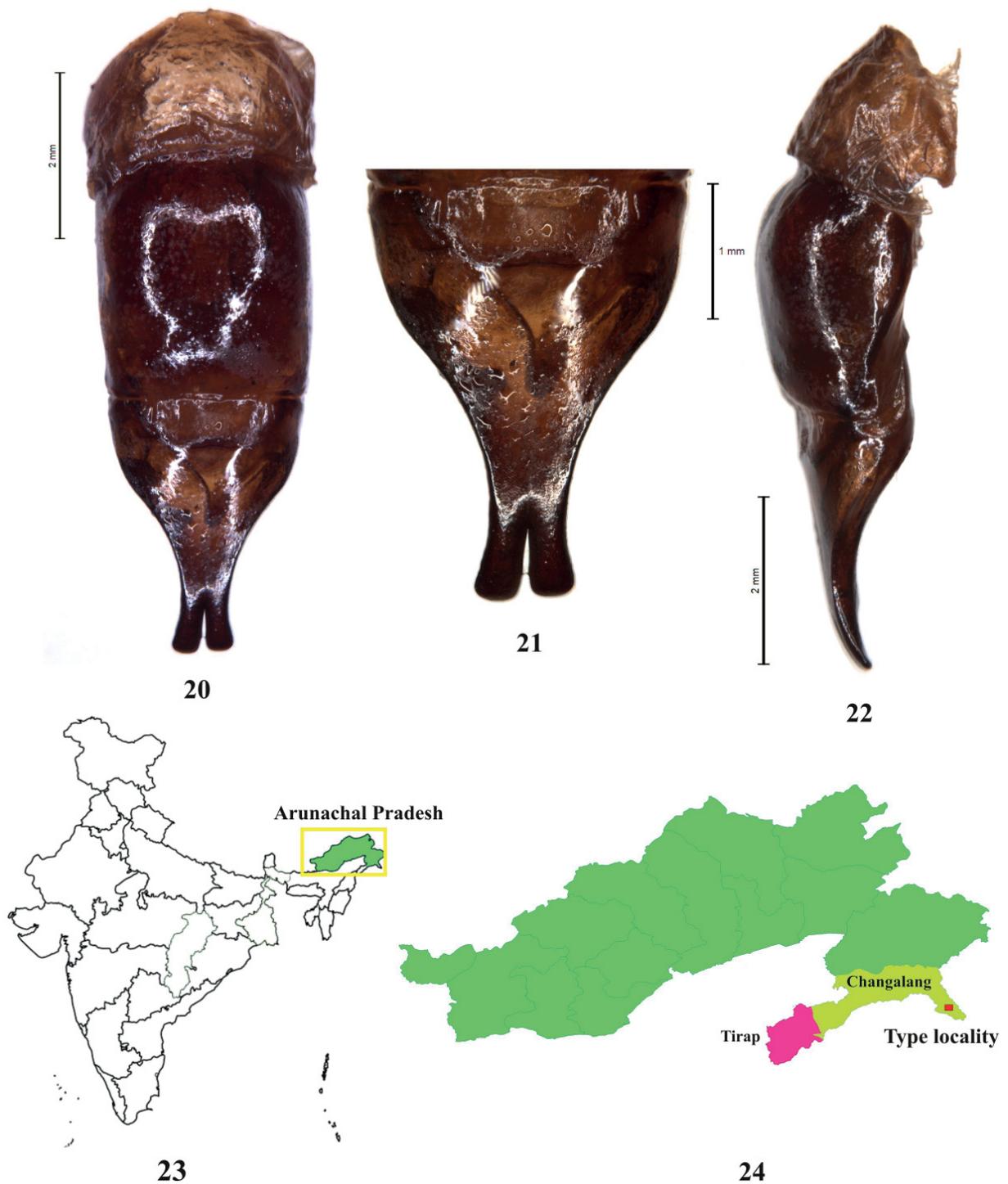
ELYTRA (Figs 9–10). Convex, almost as wide as long, widest at middle; rather densely and closely punctate near sutural margins from base to apex, rather sparsely and finely punctate in middle and at lateral sides, entirely yellow with a brown spot behind scutellar apex near sutural margin, brown pit at base in middle, two transverse bands, one large and one small, at lateral side on humeral umbone (in lateral view), apex with a large brown band on each elytron.



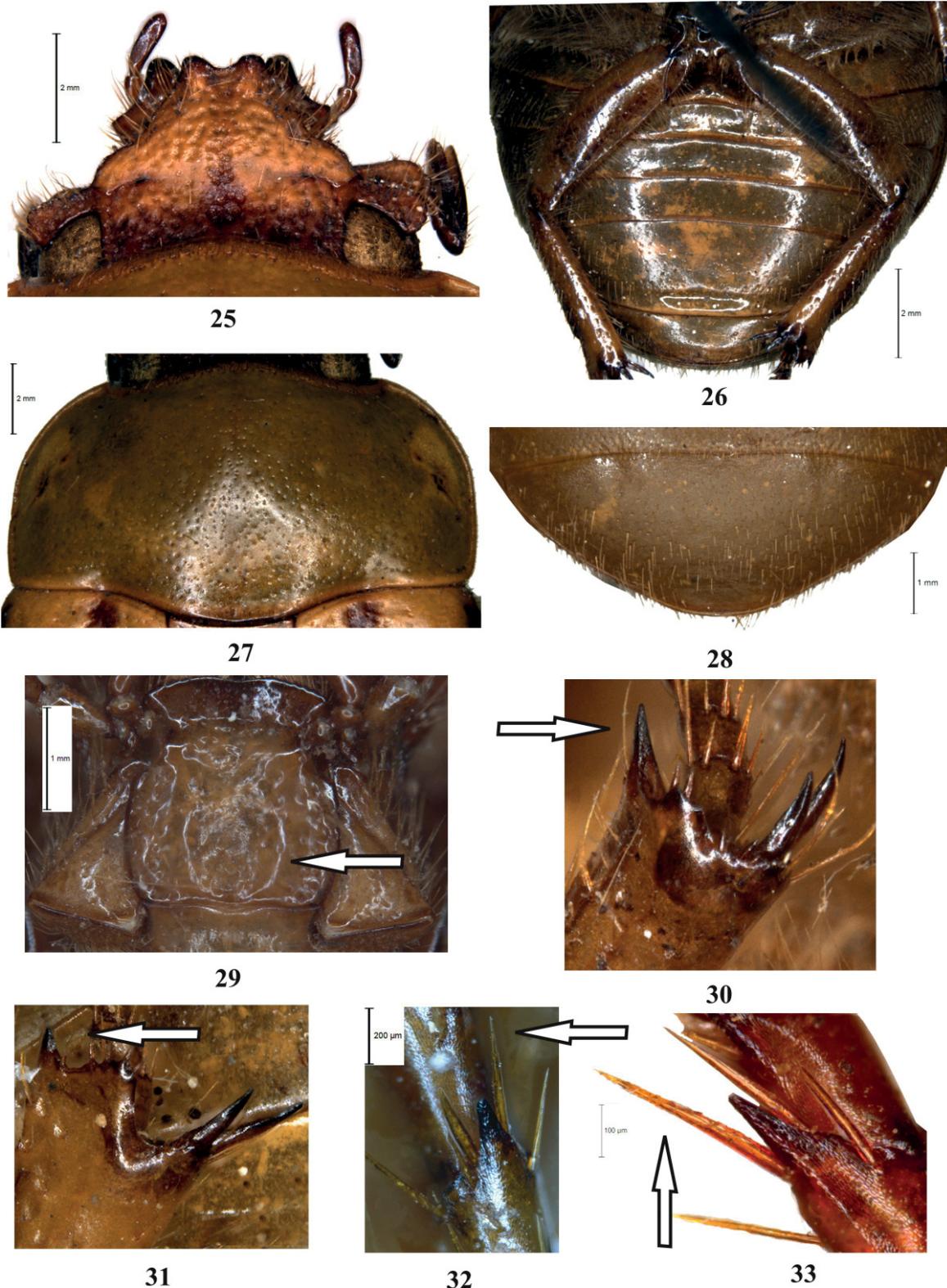
**Figs 3–10.** *Pukupuku arunachalensis* sp. nov., holotype, ♂. **3.** Clypeus. **4.** Mandibular horns (dorsal view). **5.** Mandibular horns (lateral view). **6.** Mentum (arrow indicates the character separating *Pukupuku* from the closely related genera). **7.** Pronotum. **8.** Scutellar plate. **9.** Right elytron (dorsal view). **10.** Elytra.



**Figs 11–19.** *Pukupuku arunachalensis* sp. nov., holotype, ♂. 11. Protibia. 12. Apical part of mesotibia. 13. Apical part of metatibia. 14. 4<sup>th</sup> mesotarsomere. 15. 4<sup>th</sup> metatarsomere. 16. Pygidium. 17. Prosternum. 18. Abdomen. 19. Meso- and metasternum. (Arrows indicate the character separating *Pukupuku* from the closely related genera).



**Figs 20–24.** *Pukupuku arunachalensis* sp. nov, holotype, ♂. **20.** Aedeagus (dorsal view). **21.** Parameres (dorsal view). **22.** Aedeagus (lateral view). **23.** Map of India. **24.** Map of the state of Arunachal Pradesh showing the type locality.



**Figs 25–33.** *Pukupuku arunachalensis* sp. nov., paratype, ♀. **25.** Clypeus. **26.** Abdomen. **27.** Pronotum. **28.** Pygidium. **29.** Mentum. **30.** Apical part of mesotibia. **31.** Apical part of metatibia. **32.** 4<sup>th</sup> mesotarsomere. **33.** 4<sup>th</sup> metatarsomere. (Arrows indicate the character separating *Pukupuku* from the closely related genera).

LEGS (Figs 11–15). Protibiae tridentate, claws not cleft. Meso- and metatibiae unidentate, outer claw with a ventral tooth respectively, 4<sup>th</sup> tarsomere of both meso- and metatibiae with a single acuminate ventroapical process with a pair of fine long setae.

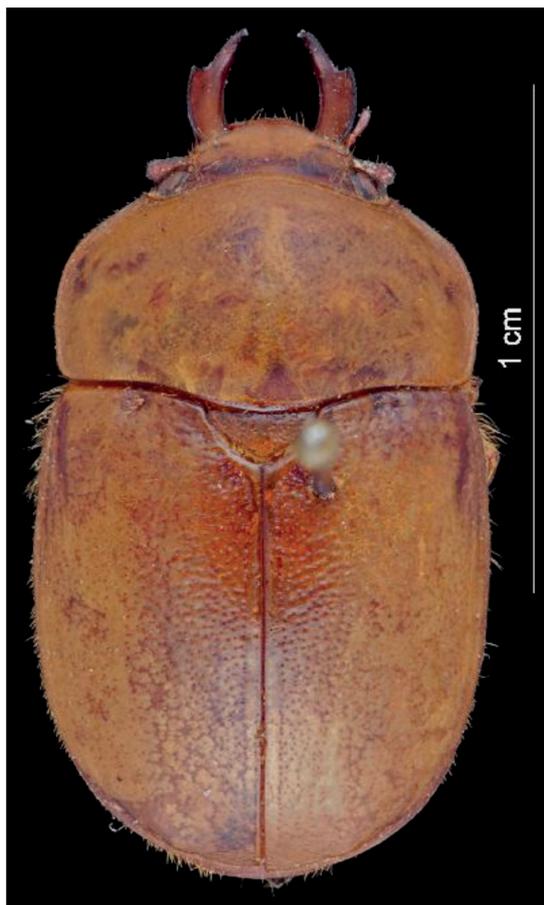
PYGIDIUM (Fig. 16). Triangular, thrice as broad as long, without hairs.

VENTER (Figs 17–19). Ventral surface of thorax and metasternum densely hairy. Prosternum with a small process in middle of posterior margin, posterior face of it flat. Meso- and metasternal processes absent. Abdominal sternites brown black, not abbreviated, smooth without hairs, segments curved in shape.

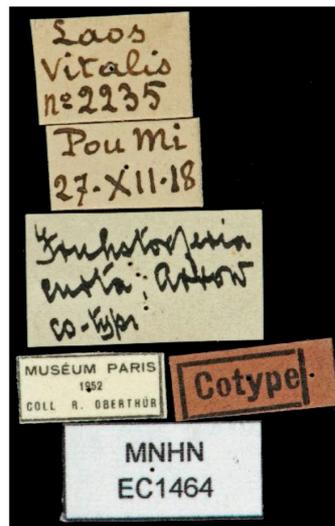
AEDEAGUS (Figs 20–22). Symmetrical, parameres fused at base, rather flat, bare.

SEXUAL DIMORPHISM (Figs 25–33). Females differ from males in the following characters: oval in shape, feeble shining; anterior margin of clypeus bilobed, surface rather strongly rugopunctate, mandibles normally developed (Fig. 25); pronotum rather distinctly and finely punctate (Fig. 27); abdomen yellowish and shining, densely hairy with segments straight, 5<sup>th</sup> segment broadest in middle (Fig. 26); pygidium densely hairy (Fig. 28).

COLOUR. Yellow with brown marking on lateral sides of elytra.



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35

**Figs 34–35.** *Pukupuku curtus* (Arrow, 1919), syntype, ♂. **34.** Habitus (dorsal view). **35.** Attached labels [Source: Muséum national d'Histoire naturelle, Paris (France). Collection: Insects-Coleoptera (EC) Specimen MNHN-EC-EC1464].

### Distribution

So far known only from Vijay Nagar in the state of Arunachal Pradesh, India (Figs 23–24).

### Collecting circumstances

Collected at night by light after dusk.

### Discussion

The genus *Pukupuku* was recently established by Muramoto, including only two species: type of the genus *P. curtus* and *P. katsurai*. *Pukupuku arunachalensis* sp. nov. is the third species described in the genus. Muramoto (2006) mentioned in her paper, while proposing the genus that she did not examine the female, but predicted the female to have unidentate meso- and metatibiae and a ventroapical process of the 4<sup>th</sup> metatarsomere with a pair of fine and long hairs. On examining the females of the newly described species in detail (Figs 25–33), it can be concluded that the females also share the characters proposed for the genus.

So far, there are only two ruteline species with such remarkably hypertrophied male mandibles known from India: *P. arunachalensis* sp. nov. and *Didrepanephorus bifalcifer* Wood-Mason, 1878 reported from Assam (Arrow 1917). *Didrepanephorus bifalcifer* differs from *P. arunachalensis* in having asymmetrical parameres and mandibular horns lacking a tooth in the middle. Moreover, *D. bifalcifer* is densely covered by short, semi-erect hairs dorsally.

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