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First record of three species of Termitidae (Blattodea: Isoptera) from India along with first description of worker caste of *Ahmaditermes pyricephalus* Akhtar

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Abstract

An addition to the existing 308 species and 53 genera of termites (Blattodea: Insecta), 3 species of termites under the family Termitidae namely *Odontotermes hainanensis* (Light) (subfamily Macrotermitinae), *Pericapritermes semarangi* (Holmgren) (subfamily Termitinae) and *Ahmaditermes pyricephalus* Akhtar (subfamily Nasutitermitinae) are hereby reported for the first time from India. Except, *O. hainanensis,* the rest two species are endemic to the Oriental region. Diagnostic characters of all three species are provided along with digital images. The worker caste of *A. pyricephalus* Akhtar has been described and imaged for the first time.

Keywords: India, Manipur, New Record, Termitidae, West Bengal

Introduction

Termites are one of the most widespread eusocial insects with a distinct division of labour (Roisin, 2000; Eggleton, 2001). Amongst 3105 species and 330 genera (living and fossil) of termites across the world, only 308 species and 53 genera are present in India (Rajmohana *et al.* 2019; Basak *et al.*, 2020a; Basak *et al.*, 2020b; Amina *et al.* 2020; Ipe *et al.*, 2020; Amina and Rajmohana 2022; Ranjith *et al.*, 2022a; Ranjith *et al.*, 2022b; Ranjith *et al.*, 2022c; Sengupta *et al.*, 2022; Das and Choudhury 2023). With 34 genera and 209 species, Termitidae is the largest family in India as well as globally (Krishna *et al.*, 2013; Rajmohana *et al.*, 2019). As a result of recent faunistic explorations, three species belonging to the family Termitidae are hereby reported as new additions to the list of Indian termites. The species are *Odontotermes hainanensis* (Light, 1924) (subfamily Macrotermitinae), *Pericapritermes semarangi* (Holmgren, 1913) (subfamily Termitinae) and *Ahmaditermes pyricephalus* (Akhtar 1975) (subfamily Nasutitermitinae). Diagnostic characters of all three species are provided along with good-quality digital images. The worker caste of *A. pyricephalus* Akhtar has been described for the first time with adequate images.

Material and Methods

Specimens were collected by active searching in the field from West Bengal and Manipur as a part of faunal explorations by the Zoological Survey of India, Kolkata. All the collected specimens were preserved in 80% alcohol. All measurements were taken with the help of a Leica EZ4 microscope, keeping the specimens in 80% alcohol. Identification was according to Chhotani (1997). All the diagnostic characters and measurements, follow Chhotani, 1997. Images are taken using a Leica 205A stereo microscope fitted with a Leica DFC500 camera which was processed in extended focus software LAS Version 3.6.

Results

Systematic Account

1. Family TERMITIDAE

Subfamily NASUTITERMITINAE

Ahmaditermes pyricephalus (Akhtar, 1975)

1975. Akhtar, Bull. Dept. Zool. Univ. Panjab, Art. 7: 128-131, 193

Ahmaditermes pakistanicus Chaudhry 1972

1972. Chaudhry, *et al.* Termites of Pakistan (Final Tech. Rep. xiv + 70+ 3 pp. + 3 pls)

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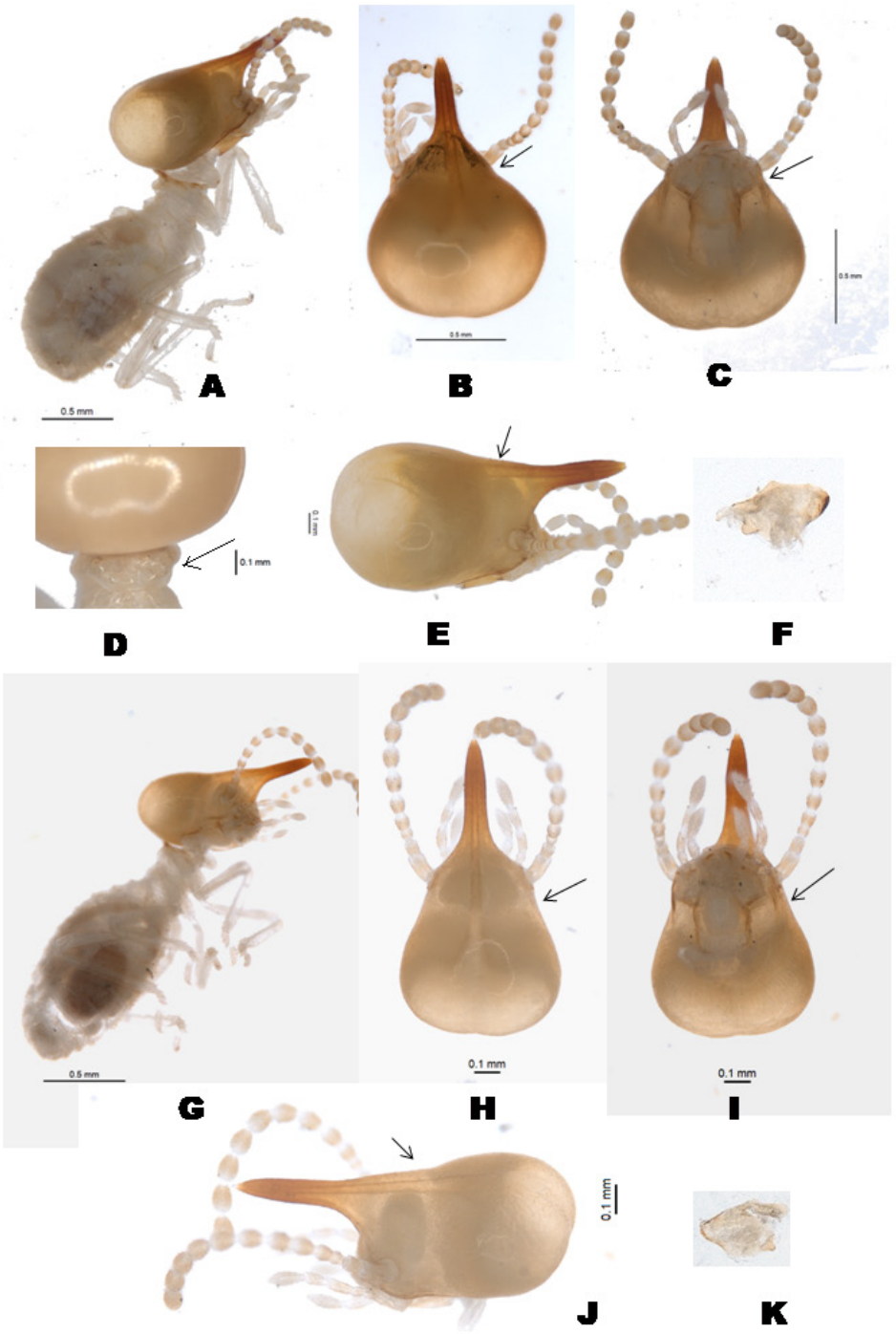

Figure 1. ***Ahmaditermes pyricephalus*** Akhtar 1975: **Soldier: Major**: **A.** Whole body; **B.** Head capsule: Dorsal View (arrow showing site of constriction); **C.** Head Capsule: Ventral View (arrow showing site of constriction); **D.** Pronotum; **E.** Head capsule lateral view (arrow showing hump at rostrum); **F.** Mandible; **Minor**: **G.** Whole body; **H.** Head capsule: Dorsal View (arrow showing site of constriction); **I.** Head Capsule: Ventral View (arrow showing site of constriction); **J.** Head capsule lateral view (arrow showing hump at rostrum); **K.** Mandible.

Material examined: 14 Soldiers, 6 Workers (ZSI/4933/H11), India: Manipur: Tamenglong: Ziladjang Forest (924.91091°N, 093.38423° E, 259.3 m), 31. iii. 2019, Coll. B. Baraik, Extracted from: Decaying tree stump.

Diagnosis: Soldier (Figure 1A, Table 1) *Major*: Head yellowish to pale brown; moderately hairy; two pairs of long hairs present; a pair at the vertex and another pair a little behind the base of rostrum, rostrum reddish brown; with numerous small hairs; longer hairs at tip, antennae pale yellow, pronotum yellowish; brownish tinge in anterior lobe, legs and abdomen yellowish white; abdominal tergites moderately hairy.

Table 1. Measurements of attributes of soldier caste of *A. pyricephalus* Akhtar

Attributes	***A. pyricephalus* (Major)**	***A. pyricephalus* (Minor)**
Head Length (with rostrum)	1.45-1.54	1.08-1.23
Head Length (without rostrum)	1.00-1.08	0.70-0.78
Head width (maximum)	0.95-1.07	0.60-0.68
Pronotum length	0.20-0.25*	0.10-0.12
Pronotum width	0.45-0.50*	0.29-0.32

Head pear-shaped; constriction present behind antennae (Figure 1B, C); postero-lateral parts highly convexed; weak hump present at base of rostrum (Figure 1E), rostrum short, cylindrical and slender. antennae 13 segmented; segment 3 slightly longer than 2, mandibles vestigial; spine-like process absent (Figure 1F), pronotum saddle-shaped (Figure 1D); a weak notch present on anterior margin.

Minor (Figure 1G): Head yellowish brown; numerous small hairs, one pair of long hairs at vortex, one more pair at base of rostrum sometimes present, rostrum reddish brown, antennae pale yellowish, legs and abdomen yellowish white.

Head small; pear shaped; constricted behind antennae (Figure 1H, I); postero-lateral parts less convexed than major soldier; posterior margin with a median depression; weak hump present at the base of rostrum (Figure 1J), rostrum cylindrical, antennae 12 segmented, segment 2 equal to 3, mandibles vestigial (Figure 1K), pronotum saddle-shaped, a median weak notch on anterior margin; posterior margin without any notch.

Description

Worker (Figure 2A, Table 2): Head capsule pale to castaneous yellow, paler anteriorly, antennae pale yellowish, body and legs whitish, head and body moderately hairy. Monomorphic.

Table 2. Measurements of attributes of worker caste of two *species O. hainanensis* (Light) *and A. pyricephalus* Akhtar

Attributes	***O. hainanensis* (major)** (After Chhotani, 1997)	***O. hainanensis* (minor)** (After Chhotani, 1997)	***A. pyricephalus*** (Present Study)
Total body length	2.65-3*	2-2.35*	3-4
Head length to tip of labrum	1.62	0.96	-
Head length to base of mandible	0.85-1.00*	0.60-0.65*	0.70-0.80
Head width (maximum)	1.45	0.82	0.80-0.95
Postclypeus length	0.20	0.15-0.20*	0.15-0.20
Postclypeus width	0.50	0.40-0.45*	0.35-0.45
Pronotum length	0.36	0.20-0.25*	0.15-0.25
Pronotum width	0.60	0.45-0.55*	0.40-0.50

Imago: Unknown

Head capsule sub rounded (Figure 2B), epicranial suture distinct, fontanelle plate well indicated, antennae 14 segmented; segment 2 and 3 almost subequal; segment 3 shortest, postclypeus swollen; scanty hairs present, pronotum saddle shaped; anterior margin with a distinct median notch; posterior margin without any distinct notch, left mandible with one apical and three marginal teeth (Figure 2C); an acute angle between apical tooth and anterior margin of M1+2; third marginal tooth small,

distinct, separated from second marginal by a small 'c' gap, right mandible with first marginal tooth almost equal to apical tooth; second marginal tooth smaller; tip blunt (Figure 1E), molar plate well developed with 6 distinct ridges (Figure 1F).

Distribution: India: Manipur (present study), *Elsewhere:* Bangladesh; China: Hunan, Yunnan.

Remarks: 22 species are reported under genus *Ahmaditermes* globally, of which only 2 species *Ahmaditermes emersoni* (Maiti, 1977) and *Ahmaditermes sikkimensis* Mukherjee and Maiti, 2008 are known from India. The present study adds *Ahmaditermes pyricephalus* to the list. The species is endemic to Oriental region. Members of this genus are not documented as pests. The hitherto unknown worker caste is described for the first time. The right mandible molar plate ridges in worker castes are prominent thereby indicating that they belong to the Type II feeding group (Donovan *et al.*, 2001). *A. pyricephalus* workers have six prominent ridges on molar plate. Type II members have a wide range of food habits starting from wood, grass and leaf litter to microepiphytes. As per Bignell *et al.*, 2010 the mandibular structure is of grinding type, as the left molar plate is concave and the right one being convex, they rub each other to grind up the fibrous food materials like dead wood or other plant materials.

2. Family TERMITIDAE
Subfamily MACROTERMITINAE

Odontotermes hainanensis (Light, 1924)
Termes hainanensis Light, 1924

1924. Light, China J. Sci. Arts, 2(1-4): 54 (Key); 251-254 (Description of sp.) Holotype: Repository not known. Type-locality: Kachek, Hainan, China.

Odontotermes (Odontotermes) hainanensis (Light): 1949. Snyder, Smiths. misc. Colls., **112**: 229.

Material examined: 6 Soldiers, 12 Workers (ZSI/4984/H11), India: West Bengal: Digha: Amrabati Park (21° 37'21" N, 87° 30' 14" E), 18. iv. 2019, Coll. R. Sengupta, Extracted from: Decaying wood

Diagnosis: Soldier (Figure 3A, Table 3): Head yellowish to partly brownish; antennae light yellow, uniformly coloured; mandibles basally yellow with reddish tinge and distally dark brown to black.

Head capsule broadly oval; strongly converging anteriorly (Figure 3C), antennae 15-16 segmented; segment 3 in 15 segmented antennae and 4 in 16-segmented antennae smallest, labrum tongue-shaped with a narrow tip, mandibles thin, sabre-shaped (Figure 3E); left mandible with a prominent tooth; right mandible

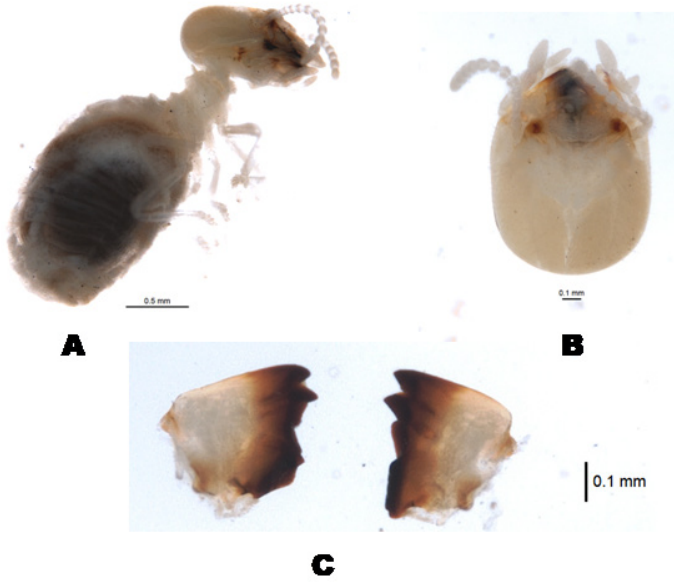

Figure 2. ***Ahmaditermes pyricephalus*** Akhtar 1975: **Worker**: **A.** Whole body; **B.** Head capsule (Dorsal view); **C.** Mandibles.

Table 3. Measurements of attributes of soldier caste of 2 species - *O. hainanensis* (Light) and *P. semarangi* (Holmgren)

Attributes	*O. hainanensis*	*P. semarangi*
Head Length to base of mandibles	1.04-1.28	1.60-1.97
Head width (maximum)	0.94-1.12	0.85-1.04
Left mandible length	0.61-0.73	1.02-1.16
Right mandible length	0.50-0.65*	0.90-1.04
Head-mandibular index(mandible length/head length to base of mandible)	0.57	0.57-0.68
Tooth distance from tip	0.17-0.22	-
Tooth index (tooth distance/ left mandible length)	0.27-0.30	-
Postmentum length	0.59-0.79	1.0-1.30
Postmentum width (maximum)	0.46-0.52	0.31-0.33
Postmentum width (minimum)	-	0.13-0.21
Pronotum length	0.41-0.49	0.22-0.31
Pronotum width	0.64-0.77	0.51-0.75

*Ranges measured for the first time in the present study (N = 5)

with a small, rudimentary tooth, postmentum sides strongly convex (Figure 3D), pronotum saddle shaped (Figure 3B); prominent emargination at anterior and posterior margin.

Worker (Table 3): Dimorphic

Worker major (Figure 3F): Head pale yellow; body creamy white; head-capsule subsquarish (Figure 3H); sides almost parallel; maximum width below antennae; antennae 17 segmented; segment 3 shortest, postclypeus swollen, pronotum saddle shaped.

Worker minor (Figure 3G): Same as worker major but smaller in size. Antennae 16 segmented, segment 4 shortest.

Imago: Unknown

Distribution: India: West Bengal (present study), *Elsewhere*: Cambodia; China: Anhui, Fujian, Guangdong, Guangxi, Hainan, Yunnan; Myanmar (Burma), Thailand; Vietnam.

Remarks: Genus *Odontotermes* has the highest representation among all termites taxa in India and is also widespread (Krishna *et al.*, 2013). *O. hainanensis* is an addition to the list of 42 species of the genus recorded earlier from India. Eight species under this genus are listed as major pests (Krishna *et al.*, 2013, Shanbhag and Sundararaj, 2013). *O. hainanensis* is one of the minor pest species and are reported to attack sugar cane, fruit trees, forest trees and field crops (Krishna *et al.*, 2013). The species is largely Oriental, except for one distribution record in Palearctic China.

3. Family TERMITIDAE
Subfamily TERMITINAE

Pericapritermes semarangi (Holmgren, 1913)
Capritermes semarangi Holmgren, 1913

1913. Holmgren, *K. Svenska Vetensk.-Akad. Handl.,* **50**(2): 247. 1m, S and W. Syntypes in Riksmus., Stockholm. Type-locality: Semarang, Java, Indonesia.

Capritermes sumatrensis John, 1925

1925. John, *Treubia*, **6**(3-4): 415-416.

Material examined: 2 Soldiers (ZSI/ 4824/H11), India: West Bengal: Jalpaiguri: Chapramari WLS, (26.89944° N, 88.84118° E, 217.2 m), 31. x. 2018, Coll. B. Baraik, Extracted from: Soil under sal log.

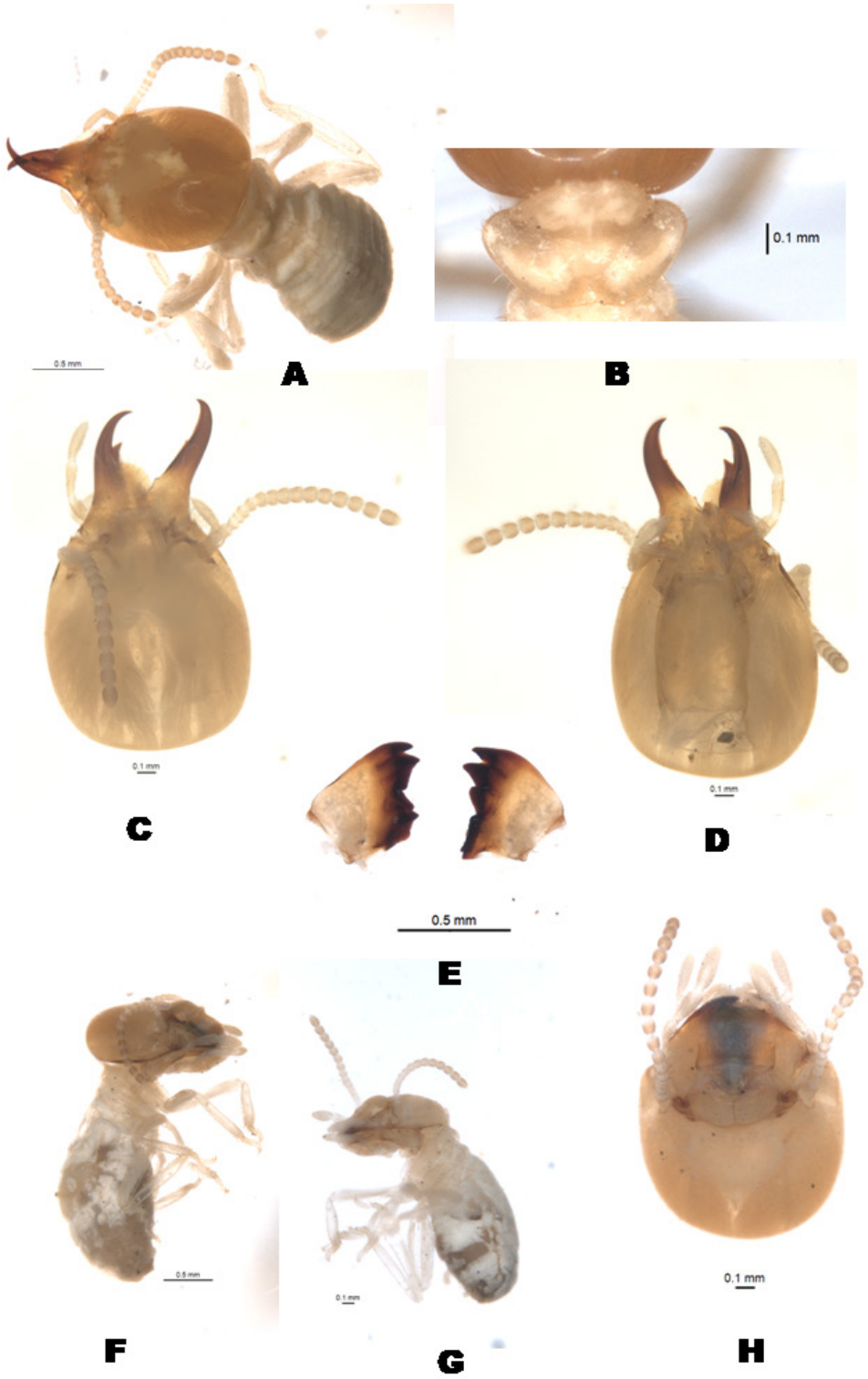

Figure 3. ***Odontotermes hainanensis*** (Light, 1924): **Soldier: A.** Whole body; **B.** Pronotum; **C.** Head capsule (Dorsal view); **D.** Head capsule (Ventral View); **Worker: E.** Mandibles; **F**. Whole body (major); **G.** Whole body (minor); **H.** Head capsule (dorsal).

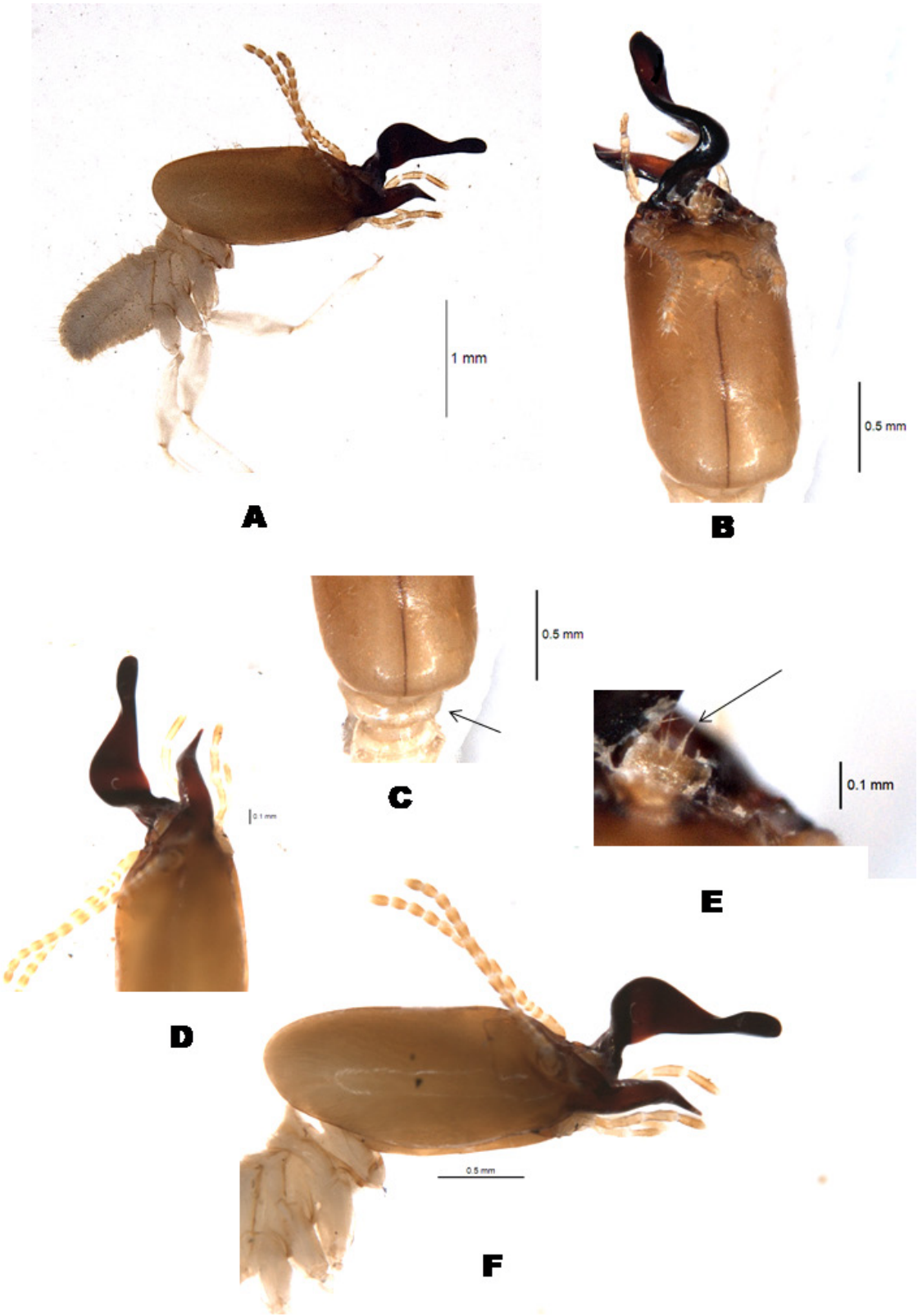

Figure 4. ***Pericapritermes semarangi*** (Holmgren, 1913): **Soldier: A.** Whole body; **B.** Head capsule (Dorsal view); **C.** Pronotum; **D.** Mandibles; **E.** Labrum; **F.** Head capsule (Lateral view).

Diagnosis: Soldier (Figure 4A, Table 3): Head castaneous yellow; few hairs present, mandibles dark brown, antennae pale yellow, body creamy white, pronotum with yellow tinge, body densely hairy.

Head-capsule subrectangular, sides substraight; median suture extends a little behind fontanelle (Figure 4B); fontanelle very small, antennae 14 segmented, segment 2 little larger than 3, 4 shortest, anterior margin of labrum substraight; lateral points not extended much, mandibles asymmetrical (Figure 4E); left mandible strongly twisted at middle; right blade like (Figure 4D), postmentum elongated, club shaped; pronotum saddle shaped (Figure 4C); anterior margin very weakly emarginated; posterior margin without any emargination.

Imago: Not collected in the present study. Description available in Chhotani, 1997.

Worker: Not collected in the present study. Description available in Chhotani, 1997.

Distribution: India: West Bengal (present study). *Elsewhere:* Bangladesh; Brunei; China: Guangdong, Hainan, Yunnan; Indonesia: Java, Kalimantan, Sumatra; Malaysia: Mainland, Sabah; Myanmar; Thailand.

Remarks: Genus *Pericapritermes* are soil dwellers and they carry no economic significance (Krishna *et al.*, 2013). There are six species reported from India till date (Krishna *et al.*, 2013; Rajmohana *et al.*, 2019; Basak *et al.*, 2020a; Basak *et al.*, 2020b; Amina and Rajmohana, 2020). *P. semarangi* is a new addition. Though an endemic, the species is widely distributed in the Oriental region.

In the present study, the species was collected from soil under a log along with a species of *Pseudocapritermes* Kemner, indicating niche sharing among the two.

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