



Study of Paper wasps (Hymenoptera: Vespidae: Polistinae) of Bhutan

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ABSTRACT: A total of nine Polistinae species are documented of which eight are new records for Bhutan.

Keywords: Polistinae, paper wasps, *Gyrostoma*, *Polistella*, *Ropalidia*, Bhutan.

INTRODUCTION

Subfamily Polistinae is commonly known as paper wasps. Numerous taxonomic work has been done on Polistinae documenting about 221 species under *Polistes* genera (Tan, Achterberg, Duan, & Chen, 2014) and about 180 species under genus *Ropalidia* (Kojima, Lambert, Nguyen, & Saito, 2007) worldwide and also in Himalayan region. However, Polistinae fauna of Bhutan has been scarcely studied. Only one species, *Polistes (Polistella) adustus* Bingham 1897 was reported (Nguyen, Kojima, & Saito, 2011). In this paper three species from subgenus *Gyrostoma*, two species from subgenus *Polistella* and four species from genus *Ropalidia* are documented; of which eight species are new record for Bhutan.

MATERIAL AND METHODS

Specimens were collected from different Districts in Bhutan during the year 2014–2016. Specimens were killed with Ethyl Acetate and observed under stereoscopic microscope. Photographs were taken with Nikon D5100 with attached AF-S Micro Nikkor 40 mm macro lens. Measurements were taken with digital Vernier caliper nearest to 0.01 mm. Identifications were based on the keys and descriptions provided by Carpenter & Nguyen (2003), Das & Gupta (1989), Kojima, Lambert,

Nguyen & Saito (2007), Kumar & Sharma (2014, 2015), Kumar (2010), Nguyen *et al.* (2011), Nguyen, Kojima, Saito, & Carpenter (2006), Tan, Achterberg, & Chen (2014), Tan, Achterberg, Duan & Chen (2014). The specimens were deposited in Zoology Museum, Sherubtse College, Kanglung, Bhutan.

Taxonomic account

Subfamily: Polistinae

Genus: *Polistes*

Subgenus: *Gyrostoma & Polistella*

1. *Polistes (Gyrostoma) tenebricosus sulcatus* Smith (Fig. 1)

Diagnosis: Clypeus dorsolaterally extending somewhat far beyond the anterior tentorial pits; pronotal fovea present; pronotal carina lamellate ventrad to fovea; parastigma (prestigma) of forewing shorter than the ventral margin of pterostigma; metasoma uniformly reddish brown to dark brown; malar space of female shorter than distance from inner edge of one antennal socket to outer edge of other socket; dorsal episternal groove present while epicnemial carina absent; Parastigma of fore wing shorter than the ventral margin of pterostigma. Measurement: ♀: 23.79 – 25.7 mm; ♂: 28.77 mm.

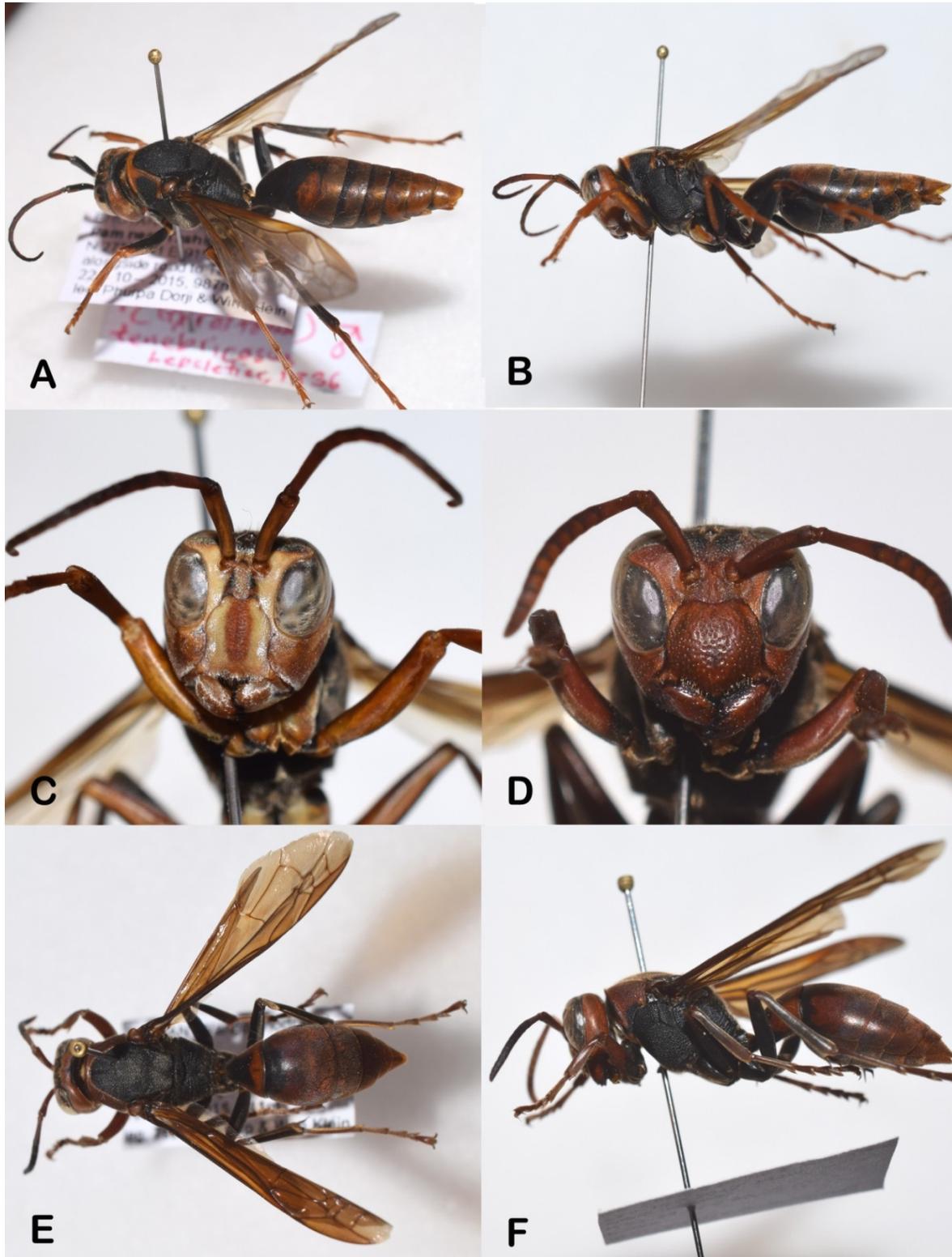


Fig.1. *Polistes (Gyrostoma) tenebricosus sulcatus*: A & B -Dorsal and lateral view of male; C & D -Frontal view of male and female; E & F -Dorsal and lateral view of female.

Materials examined: Pam, Tashigang (27.31139°N and 91.53694°E, Alt. 987m): 1♂ and 2♀ collected by Phurpa Dorji & Win Klien on 22.x.2015 near the Pam village; Gyelpoishing, Mongar (27.0066°N and 90.14°E, Alt. 565 m): 2♀ collected by Tshering Nidup, Thinley Gyeltshen & Phurpa Dorji on 17.vi.2015 near Dam area; Pinsa, Wangdi Phodrang (27.23722°N and 90.05417°E, Alt. 741m): 2♀ collected by Tshering Nidup & Wim Klien on 08.x.2015 along the highway; Pekashing, Chukha (26.83333°N and 89.45°E, Alt. 293 m): 5♀ collected by Tshering Nidup & Wim Klien on 08.x.2015 along the high way to Pasakha; Kanglung, Tashigang (27.28722°N and 91.52167°E, Alt. 1823m): 2♀ collected by B. Sc. Life Science I semester students on 24.x.2015 in and around Sherubtse College campus; Nangkor, Pema Gatshel (27.02111°N and 91.34583°E, Alt. 1434 m): 1♀ collected by Tshewang Dendup & Tshering Nidup on 12.vii.2015 near by the village; Pangbang, Zhemgang (26.85288°N and 90.9739°E, Alt. 222m): 2♀ collected by Phurpa Dorji, Thinley Gyeltshen & Tshering Nidup on 17.iv.2016 from Andalathang near Drengmey Chu and Mange Chu confluence; Autsho, Lhuentse (27.43722°N and 91.17389°E, Alt. 863 m): 1♀ collected by Phurpa Dorji, Kinzang Chophel & Thinley Gyeltshen on 08.v.2016 near the river bank.

Distribution: Bhutan (Tashigang, Mongar, Wangdi Phodrang, Chukha, Pema Gatshel, Zhemgang, Lhuentse); China, India, Nepal, Vietnam, Myanmar, Indonesia, Philippines (Das & Gupta, 1983; Tan, Achterberg, Duan, *et al.*, 2014)

Remarks: New record for Bhutan.

2. *Polistes (Gyrostoma) olivaceus* (De Geer, 1773) (Fig. 2: A – D)

Diagnosis: Clypeus latero-dorsally extending somewhat far beyond the anterior tentorial pits; pronotal carina lamellate ventrad to fovea; body generally yellow; dorsal episternal groove and epicnemial carina both present; mesopleuron weakly and sparsely punctate medially; body always with black pattern and at least dorsal sulcus of clypeus black. Measurement: ♀: 18.16 - 21.35 mm

Materials examined: Aman Resort, Punakha (27.6325°N and 89.8152°E, Alt. 1254 m): 1♀ collected by Tshering Nidup, Thinley Gyeltshen & Phurpa Dorji on 15.v.2015 near along the Phochu bank; Bajo Thango, Wangdi Phodrang (27.51528°N and 89.88722°E, Alt. 1218m): 2♀

collected by Phurpa Dorji & Wim Klien on 27.x.2015 near along the highway; Doksum, Trashy Yangtse (27.4395°N and 91.5816°E, Alt. 864 m): 2♀ collected by Tshering Nidup & Phurpa Dorji on 06.vi.2015 along the highway to Tashi Yangtse; Gyelpoishing, Mongar (27.0066°N and 90.1400°E, Alt. 565 m): 1♀ collected by Tshering Nidup, Thinley Gyeltshen & Phurpa Dorji on 17.vi.2015 near Dam area; Ranglung, Tashigang (27.5261°N and 89.8727°E, Alt. 893 m): 1♀ collected by Tshering Nidup, Thinley Gyeltshen & Phurpa Dorji on 17.vi.2015 near Lungten Zampa bridge; Highway towards Trongsa (27.44861°N and 90.45333°E, Alt. 2398 m): 1♀ collected by Phurpa Dorji & Tshewang Dendup; Bangtar, Samdrup Jongkhar (27.8977°N and 91.6852°E, Alt. 258 m): 1♀ collected by Tshering Nidup & Phurpa Dorji on 19.vii.2015 along the highway to Dewathang; Sarpang Tar, Sarpang (26.87056°N and 90.265°E, Alt. 331m): 1♀ collected by Tshering Nidup and Wim Klien on 13.x.2015 in the town; Tingtibi, Zhemgang (27.1425°N and 90.69194°E, Alt. 631m): 1♀ collected by Tshering Nidup and Wim Klien on 14.x.2015 in the village; Chenerey, Tashigang (27.31917°N and 91.33214°E, Alt. 758 m): 2♀ collected by Phurpa Dorji, Thinley Gyeltshen & Tshering Nidup on 10.iv.2016 from river bank; Autsho, Lhuentse (27.43722°N and 91.17389°E, Alt. 863 m): 2♀ collected by Phurpa Dorji, Kinzang Chophel & Thinley Gyeltshen on 08.v.2016 from river bank; Gyelpoishing, Mongar (27.0066°N and 90.1400°E, Alt. 565 m): 1♀ collected by Phurpa Dorji, Kinzang Chophel & Thinley Gyeltshen on 08.v.2016 from Dam area; Fawan, Lhuentse (27.48556°N and 91.18278°E, Alt. 953 m): 2♀ collected by Phurpa Dorji, Kinzang Chophel & Thinley Gyeltshen on 08.v.2016 near water fall.

Distribution: Bhutan (Punakha, Wangdi Phodrang, Trashy Yangtse, Mongar, Tashigang, Trongsa, Samdrup Jongkhar, Sarpang, Zhemgang, Lhuentse); Madagascar; Reunion; Mauritius; Tanzania; Seychelles; Chagos Archipelago; Egypt; Oman; Iran; Afghanistan; India; Sri Lanka; Nepal; Hongkong; Myanmar; Philippines; Vietnam; Laos; Cambodia; Thailand; Malaysia; Singapore; Indonesia; Marianas; New Caledonia; Fiji; Tonga; Samoa; Society Is; Tuamotu; Marquesas. (Carpenter, 1996; Das & Gupta, 1983)

Remarks: New record for Bhutan

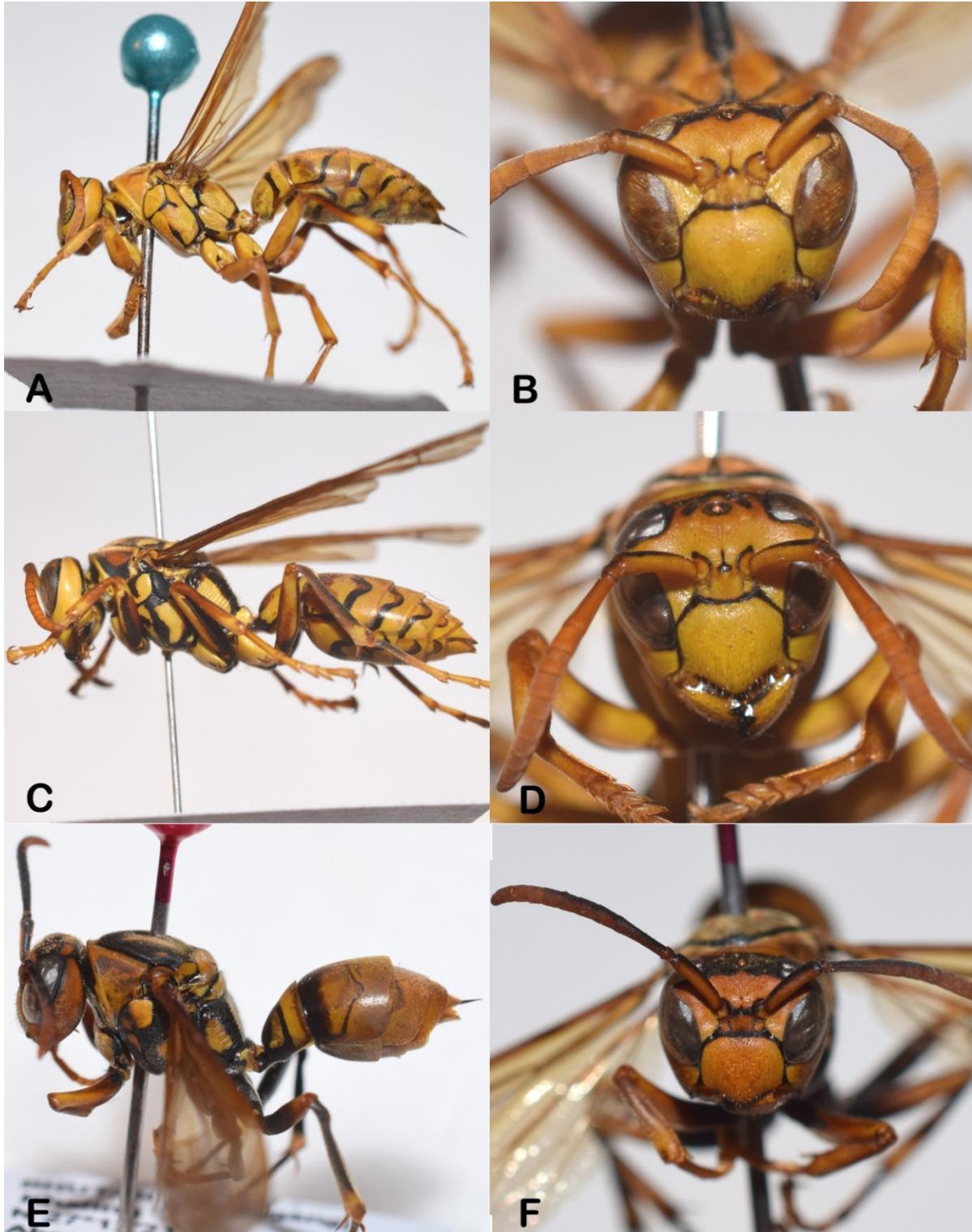


Fig. 2. *Polistes (Gyrostoma) olivaceus* (light form): A & B - Lateral and frontal view; *Polistes (Gyrostoma) olivaceus* (Dark form): C & D - Lateral and Frontal view; *Polistes (Gyrostoma) rothneyi*: E & F - Lateral and frontal view.

3. *Polistes (Gyrostoma) rothneyi sikkimensis van der Vecht* (Fig. 2: E & F)

Diagnosis: Clypeus latero-dorsally extending somewhat far beyond the anterior tentorial pits; pronotal carina lamellate ventrad to fovea; body black or dark brown with yellow pattern; mesopleuron strongly and densely punctate medially; yellow apical part of first tergite parallel-sided laterally; occipital carina in female complete, reaching the base of mandible. Measurement: ♀: 16.5 – 22.2 mm.

Materials examined: Khaling, Tashigang (27.2058°N and 91.6033°E, Alt. 2073 m): 1♀ collected by Tshering Nidup & Phurpa Dorji on 01.x.2015 in the village above the Khaling town; Aman Resort, Punakha (27.6325°N and 89.8152°E, Alt. 1254 m): 1♀ collected by Tshering Nidup, Thinley Gyeltshen & Phurpa Dorji on 15.v.2015 near along the Phochu bank; Autsho, Lhuentse (27.43722°N and 91.17389°E, Alt. 863 m): 1♀ collected by Phurpa Dorji, Kinzang Chopel & Thinley Gyeltshen on 08.v.2016 from river bank.

Distribution: Bhutan (Tashigang, Punakha, Lhuentse); China; India; Nepal (Carpenter, 1996; Das & Gupta, 1983).

Remarks: New record for Bhutan.

4. *Polistes (Polistella) adustus Bingham 1897* (Fig. 3: A & B)

Diagnosis: gaster black with reddish-brown or red bands; scutellum more or less raised, elevated from the level of mesoscutum; second gastral sternite rounded at base, propodeum with round lateral edges; apical margin of first to fifth gastral tergites with broad red band; legs not completely black. Measurement: ♀: 9.4 – 11.2 mm; ♂: 11.23 – 12.6 mm.

Materials examined: Detchenpelrithang, Bumthang (27.51722°N & 90.80111°E, Alt. 2483 m): 1♂ collected by Tshering Nidup & Wim Klein on 17.x.2015 along the highway near Chorten; Khaling, Tashigang (27.2058°N and 91.6033°E, Alt. 2073 m): 4♀ & 1♂ collected by Tshering Nidup & Phurpa Dorji on 01.x.2015 in the village above the Khaling town; Bunagu, Chukha (27.15°N & 89.54167°E, Alt. 2264 m): 5♂ collected by Tshering Nidup & Wim Klein on 06.x.2015 near the restaurant along highway; Serbithang, Thimphu (27.42278°N & 89.65139°E, Alt. 2450 m): 1♀ & 2♂ collected by Wim Klein on 04.x.2015 along the highway; Thakorling, Tsirang (26.96111°N & 90.17639°E, Alt. 1690 m): 1♂ collected by Tshering Nidup & Wim Klein on 13.x.2015 along the highway.

Distribution: Bhutan (Bumthang, Tashigang, Chukha, Thimphu, Tsirang); India; Nepal; China (Das & Gupta, 1989; Nguyen *et al.*, 2011)

5. *Polistes (Polistella) santoshae* Das & Gupta 1989 (Fig. 3: C & D)

Diagnosis: Gaster black with reddish-brown or red bands; scutellum more or less raised, elevated from the level of mesoscutum; second gastral sternite angular at base, propodeum with sharp lateral edges; propodeum shiny and with sharp striations; postscutellum with a carina at base; Female second gastral tergite with a broad apical band having a median incision. Measurement: ♀: 12.8 – 13 mm; ♂: 11.72 – 12.76 mm.

Materials examined: Kapatapsa, Wangdi Phodrang (27.71083°N and 89.765°E, Alt. 1476 m): 1♀ collected by Wim Klein & Phurpa Dorji on 26.x.2015 around the village; Sithikhet & Ninzoegang, Tsirang (27.00667°N and 90.14°E, Alt. 1256 m): 1♀ collected by Tshering Nidup & Wim Klein on 12.x.2015 along the farm road; Bajo Thango, Wangdi Phodrang (27.51528°N and 89.88722°E, Alt. 1218 m): 1♀ collected by Phurpa Dorji & Wim Klein on 27.x.2015 near along the highway; Kanglung, Tashigang (27.28722°N and 91.52167°E, Alt. 1823 m): 1♀ & 1♂ collected by B. Sc. Life Science I semester students on 24.x.2015 in and around Sherubtse College campus; Kanglung, Tashigang (27.28722°N and 91.52167°E, Alt. 1823 m): 2♂ collected by Phurpa Dorji & Tshering Nidup on 28.ix.2015 in and around Sherubtse College campus; Detchenpelrithang, Bumthang (27.51722°N & 90.80111°E, Alt. 2483 m): 1♂ collected by Tshering Nidup & Wim Klein on 17.x.2015 along the highway near Chorten; Chuzomsa, Wangdi Phodrang (27.50541°N & 89.9604°E, Alt. 1362 m): 1♀ collected by Wim Klein on 16.vi.2012 from garden guest house; Yongkola, Mongar (27.30694°N & 91.16417°E, Alt. 1553 m): 1♂ collected by Phurpa Dorji & Wim Klein on 23.x.2015 near Yongkola Hotel below the road; Trashithang, Gasa (27.74583°N & 89.73278°E, Alt. 1614 m): 1♀ collected by Phurpa Dorji & Wim Klein on 26.x.2015 around a small shop below the road to Gasa.

Distribution: Bhutan (Wangdi Phodrang, Tsirang, Tashigang, Bumthang, Mongar, Gasa); India; Nepal; Vietnam (Das & Gupta, 1989; Nguyen *et al.*, 2011)

Remarks: New record for Bhutan

Subfamily: Polistinae

Genus: *Ropalidia*

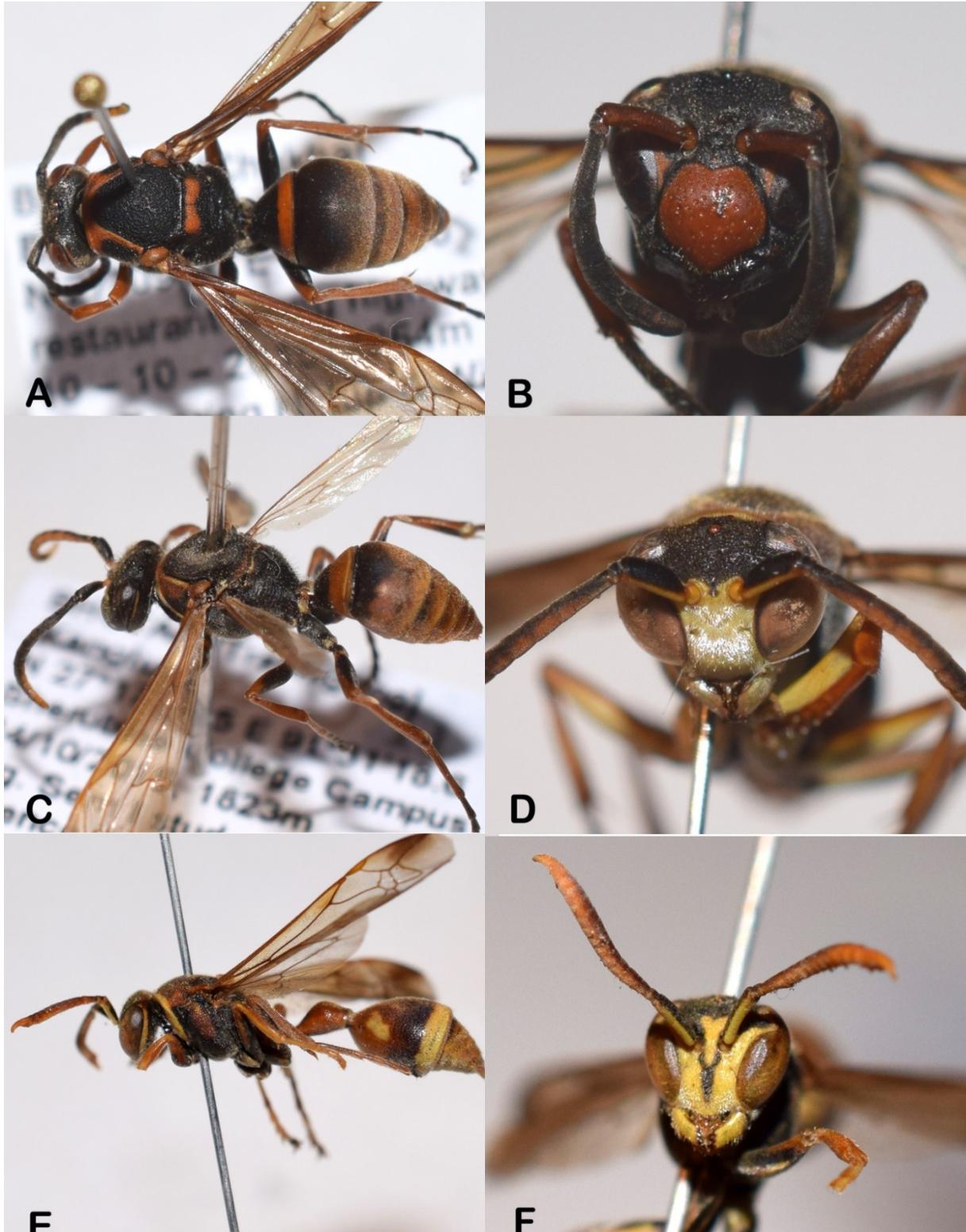


Fig. 3. *Polistes (Polistella) adustus*: A & B - Lateral and Frontal view; *Polistes (Polistella) santoshae*: C & D - Lateral and Frontal view; *Ropalidia fasciatus*: E & F- Lateral and Frontal view.

6. *Ropalidia fasciata* (Fabricius) (Fig. 3: E & F)

Diagnosis: Propodeum without pair of raised vertical carina anteriorly; propodeal orifice relatively broad, more or less rounded above; propodeal valvula large, obscuring most of propodeal orifice in lateral view; second gastral tergite petiolate at base; basal angle of second submarginal cell less than 90°; apical two-thirds of radial cell dark brown; length between ocellus and eye less than twice as long as length between posterior ocelli; antenna of male with tyloids, apical two thirds of apical antennal segment gradually narrowed and curved at apex; first flagellomere of female antenna comparatively short, less than 2.5x as long as its apical width. Measurement: ♂: 11.92 mm.

Materials examined: Toebi Rongchu, Wangdi Phodrang (27.52611°N and 89.87278°E, 1226 m): 4♂ collected by Tshering Nidup, Phurpa Dorji & Thinley Gyeltshen on 28.i.2015 below the road to Punakha.

Distribution: Bhutan (Wangdi Phodrang); China; Bali; Bangka; Borneo; Flores; India; Java; Kariman Djava I.; Myanmar; Nepal; Nias; Malay Peninsula; Sumatra; Timor; Palawan; Ryukyu Islands; Philippines; SriLanka; Taiwan; Thailand; Vietnam (Tan 2014)

Remarks: New record for Bhutan

7. *Ropalidia jacobsoni* (du Buysson) (Fig. 4: A & B)

Diagnosis: Propodeum without pair of raised vertical carina anteriorly; second gastral tergite and sternite fused, suture only visible at base; propodeum smooth and median groove wider with median groove distinct; ventral metapleuron smooth; wings transparent hyaline, radial cell relatively shorter and wider at base, apical half with dark brown cloud; second gastral tergite with broad apical yellow band; gastral petiole without apical bands; temple narrower than eye in profile. Measurement: ♀: 7.87 mm.

Materials examined: Pasakha, Chukha (26.85222°N and 89.44583°E, Alt. 389 m): 2♀ collected by Tshering Nidup & Wim Klien on 08.x.2015 near Police station; Khaling, Tashigang (27.20583°N and 91.60333°E, Alt. 2073 m): 1♀ collected by Tshering Nidup & Phurpa Dorji on 01.x.2015 in the village above the Khaling town.

Distribution: Bhutan (Chukha, Tashigang); India; Myanmar; Sumatra; Bangka; Java; Lombok; Sulawesi (Das & Gupta, 1989, Kojima *et al.*, 2007) after Sulawesi.

Remarks: New record for Bhutan

8. *Ropalidia rufocollaris* (Cameron, 1900) (Fig. 4: C & D)

Diagnosis: Propodeum without pair of raised vertical carina anteriorly; second gastral tergite and sternite not fused; propodeal valvula large, obscuring most of propodeal orifice in lateral view; propodeum finely striate, barely depressed antero-medially or if depressed, only as fine median furrow; propodeum with yellow marks confluent basally and black laterally; second gastral tergite petiolate at base; basal angle of second submarginal cell less than 90°; length between ocellus and eye more than 2.5x as long as length between length between posterior ocelli; female clypeus reddish or blackish brown and yellow apically; mesoscutum entirely black; second gastral tergite with characteristic yellow mark at base. Measurement: ♀: 10.6 –11.69 mm; ♂: 10.6 – 11.5 mm.

Materials examined: Pangbang, Zhemgang (26.83098°N and 90.94875°E, Alt. 137 m): 3♀ collected by Phurpa Dorji, Thinley Gyeltshen & Tshering Nidup on 15.iv.2016 from Manas National Park; Rinchending, Chukha (26.85028°N and 89.39583°E, Alt. 405 m): 1♂ collected by Tshering Nidup & Wim Klein on 07.x.2015 around College of Science and Technology Guest house; Tingtibi, Zhemgang (27.1425°N and 90.69194°E, Alt. 631 m): 1♀ collected by Tshering Nidup and Wim Klien on 14.x.2015 in the village; Berti, Zhemgang (27°09'26"N and 90°40'03"E, Alt. 531 m): 1♂ collected by Tshering Nidup and Wim Klien on 14.x.2015 along the road; Bangtar, Samdrup Jongkhar (27.8977°N and 91.6852°E, Alt. 258 m): 1♀ collected by Tshering Nidup & Phurpa Dorji on 19.vii.2015 along the highway to Dewathang; Pangbang, Zhemgang (26.8435°N and 90.99297°E, Alt. 390 m): 1♀ collected by Phurpa Dorji, Thinley Gyeltshen & Tshering Nidup on 15.iv.2016 from Klawagang stream; Nganglam, Pema Gatshel (26.8292°N and 91.23823°E, Alt. 349 m): 1♀ collected by Phurpa Dorji, Thinley Gyeltshen & Tshering Nidup on 18.iv.2016 from Alabari village.

Distribution: Bhutan (Zhemgang, Chukha, Samdrup Jongkhar, Pema Gatshel); China (Tibet), India, Laos, Myanmar, Thailand, Vietnam (Tan 2014)

Remarks: New record for Bhutan.

9. *Ropalidia santoshae* Das & Gupta, 1989 (Fig. 4: E & F)

Diagnosis: Propodeum without pair of raised vertical carina anteriorly; second gastral tergite and sternite not fused; propodeal valvula large,

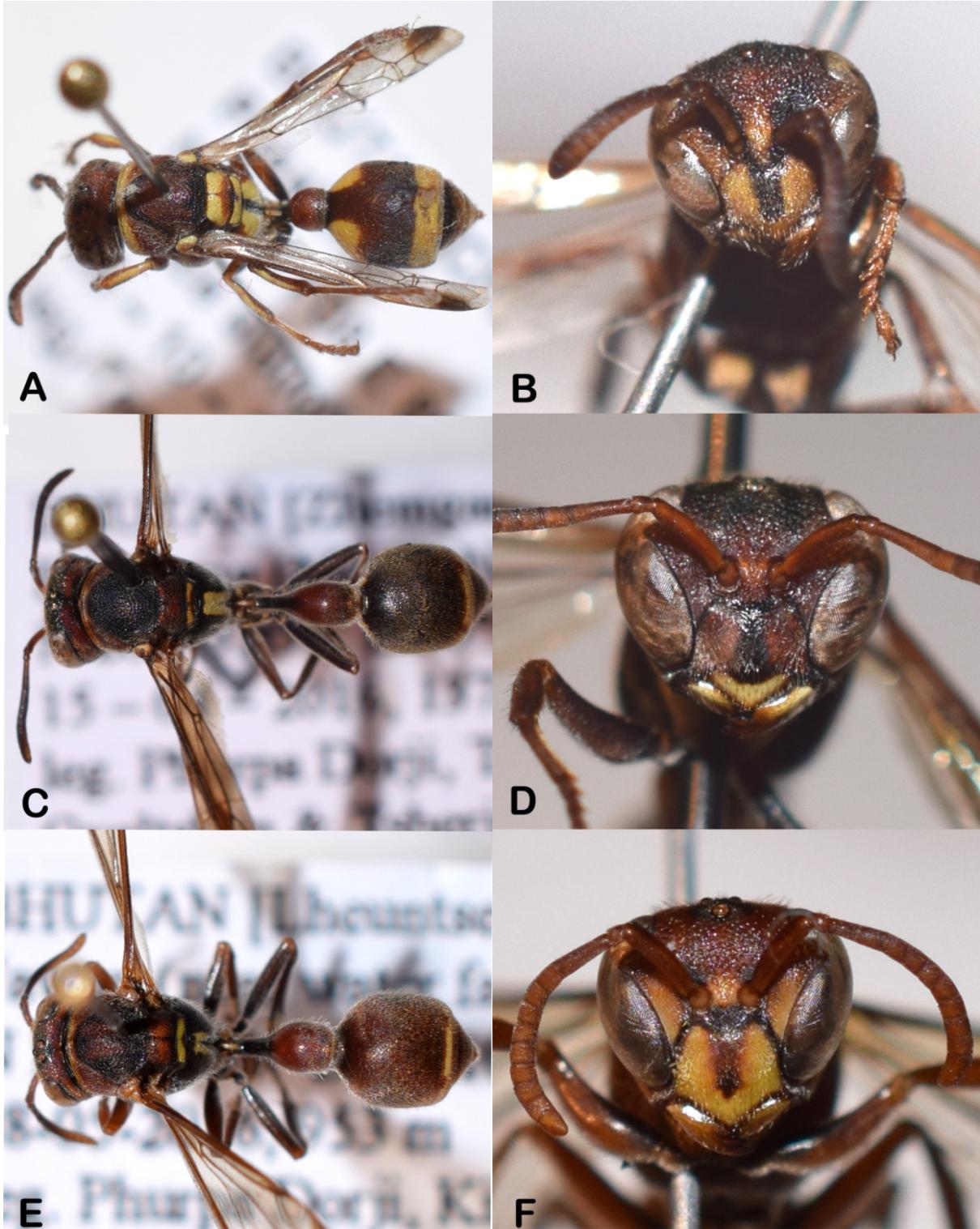


Fig. 4. *Ropalidia jacobsoni*: A & B - Lateral and Frontal view; *Ropalidia rufocollaris*: C & D - Lateral and Frontal view; *Ropalidia santoshae*: E & F - Lateral and Frontal view

obscuring most of propodeal orifice in lateral view; length between ocellus and eye more than 2.5x as long as length between length between posterior ocelli; propodeum reticulate-puncture, anteriorly with distinct median depression, yellow marks absent; scutellum black, slightly convex and without median furrow, strong dense reticulate punctures. Measurement: ♀: 10.06 - 10.68 mm; ♂: 8.11 – 9.88 mm.

Materials examined: Fawan, Lheuntse (27.48556°N and 91.18278°E, Alt. 953 m): 2♀ collected by Phurpa Dorji, Kinzang Chopel & Thinley Gyeltshen on 08.v.2016 from water fall; Bartsham junction, Tashigang (27.345°N and 91.57361°E, Alt. 795 m): 1♀ collected by Phurpa Dorji, Thinley Gyeltshen & Tshering Nidup on 10.iv.2016 along the road to Rangjung; Pangbang, Zhemgang (26.84623°N and 90.94573°E, Alt. 113 m): 1♀ collected by Phurpa Dorji, Thinley Gyeltshen & Tshering Nidup on 17.iv.2016 from Andalathang near Drengmey Chu and Mange Chu confluence; Rinchending, Chukha (26.85667°N and 89.405°E, Alt. 600 m): 2♀ collected by Tshering Nidup & Wim Klein on 09.x.2015; Pekashing, Chukha (26.83333°N and 89.45°E, Alt. 293 m): 2♀ collected by Tshering Nidup & Wim Klein on 08.x.2015 along the high way to Pasakha; Tingtibi, Zhemgang (27.1425°N and 90.69194°E, Alt. 631 m): 1♀ collected by Tshering Nidup and Wim Klein on 14.x.2015 in the village; Pasakha, Chukha (26.85222°N and 89.44583°E, Alt. 329 m): 1♀ collected by Tshering Nidup & Wim Klein on 08.x.2015 from Pasakha Industrial area; Kapatapsa, Wangdi Phodrang (27.71083°N and 89.765°E, Alt. 1476 m): 2♂ collected by Phurpa Dorji & Wim Klein on 26.x.2015 around the village; Sithikhet & Ninzoegang, Tsirang (27.00667°N and 90.14°E, Alt. 1256m): 1♀ and 1♂ collected by Tshering Nidup & Wim Klein on 12.x.2015.

Distribution: Bhutan (Lhuentse, Tashigang, Zhemgang, Chukha, Wangdi Phodrang, Tsirang), China (Tibet), India (Tan 2014).

Remarks: New record for Bhutan.

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