



Taxonomic study of social vespid wasps (Hymenoptera: Vespidae: Vespinae & Polistinae) in Bhutan

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ABSTRACT. The social vespid wasps (Hymenoptera: Vespidae: Vespinae and Polistinae) was studied in Bhutan during 2014-2016. A total of fifteen species were collected and identified that all of them are reported as new records from Bhutan: *Vespa vivax* Smith, *V. velutina variana* van der Vecht, *V. fumida* van der Vecht, *Dolichovespula lama* (du Buysson), *Vespula flaviceps* Smith, *V. nursei* Archer, *V. vulgaris* (Linnaeus), *V. structor* (Smith), *Polistes (Polistella) nigritarsus* (Cameron), *Parapolybia varia* (Fabricius), *P. nodosa* van der Vecht, *Ropalidia artifex* (de Saussure), *R. stigma* (Smith), *R. ornateps* (Cameron) and *R. rufoplagiata gravellyi* (Dover & Rao). Diagnostic characters and geographical distribution of all species are presented.

Key words: Hornets, Yellow jackets, Paper wasps, New records, Bhutan

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Introduction

Wasps of the subfamilies Vespinae and Polistinae are known as hornets and yellow jackets, and paper wasps, respectively. The adults visit flowers searching for sugar-rich food materials as they feed on it. They help in pollinating the flowers. Besides, adults also predate on insects to feed their developing larvae. Though ecologically important, the social wasps have been scarcely studied in Bhutan.

Vespa fumida van der Vecht, 1959 had been reported from Padong, Bhutan (Carpenter & Kojima, 1997; Das & Gupta, 1989), *Dolichovespula xanthicinta* (Archer,

1981) (Archer, 1999, 2006), *Polistes (Polistella) adustus* Bingham, 1897 (Nguyen, Kojima & Saito, 2011), *Polistes (Gyrostoma) tenebricosus sulcatus* Smith, 1852, *Polistes (Gyrostoma) olivaceus* (De Geer, 1773), *Polistes (Gyrostoma) rothneyi sikkimensis* van der Vecht, 1968, *Polistes (Polistella) santoshae* Das & Gupta, 1989, *Ropalidia fasciatus* (Fabricius), *R. rufocollaris* (Cameron, 1900), *R. jacobsoni* (du Buysson) and *Ropalidia santoshae* Das & Gupta, 1989 (Dorji, Klein & Nidup, 2016) were recorded previously from Bhutan. In this study, three *Vespa*, four *Vespula*, one *Dolichovespula*, four *Ropalidia*, two *Parapolybia* and one *Polistes* species are reported as new records from Bhutan.

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Material and methods

During the survey in the year 2014 – 2016, adult specimens were collected, mounted dry and morphologically examined with stereoscopic microscope (Olympus, Tokyo). Nikon D3300 with attached AF-S Micro Nikkor 40 mm macro lens was used for taking photographs, digital Vernier caliper nearest to 0.01 mm used for the measurements of body length, and Garmin eTrex 10 for coordinates (DMS) and elevation (meters above sea level). Identification was based on the keys and descriptions provided by Archer, 1989, 2012; Bingham, 1897; Carpenter & Nguyen, 2003; Das & Gupta, 1989; Kumar & Sharma, 2014, 2015; Mahmood, Ullah, Aziz, Hasan & Inayatullah, 2012; Nguyen, Kojima & Saito, 2011; Nguyen, Saito, Kojima & Carpenter, 2006; Tan, Achterberg, Duan & Chen, 2014. The specimens were deposited in National Biodiversity Centre Bhutan (NBCB), Serbithang, Bhutan.

Results

1. *Vespa vivax* Smith, 1870 (Fig. 1: A, B & C)

Diagnosis: Pretegula carina incomplete and pronotal carina much interrupted by the pronotal pit; clypeus without black markings; punctures on the basal clypeus widely separated so that a large surface without punctures is present; 2nd and 5th metasomal tergites black with 2nd tergites having a narrow apical yellow or orange band; vertex not black; thorax and propodeum black.

Materials examined: NBCB-00082 & NBCB-00083, 7.viii.2016, 2 ♀♀, Dumcho, Haa, Bhutan (27°21'46.5"N & 89°17'48.1"E, 2635 m), Leg.: Tshering Nidup & Wim Klein; NBCB-00084, NBCB-00085, NBCB-00086, NBCB-00087 & NBCB-00088, 16.viii.2016, 5 ♀♀, Lamaigonpa, Bumthang, Bhutan (Ugyen Wangchuk Institute for Conservation and Environment (UWICE) compound around the *Apis cerana* hives, 27°32'31.6"N &

90°43'34.8"E, 2826 m), Leg.: Phurpa Dorji & Wim Klein.

Distribution: India, Nepal, Northern Myanmar, Thailand, China and Taiwan (Archer, 2012; Das & Gupta, 1989), new record for Bhutan.

2. *Vespa velutina variana* van der Vecht, 1957 (Fig. 1: D, E & F)

Diagnosis: Second metasomal tergum black with a yellow or orange band on the apical margin; head and pronotum mainly orange-yellow, pale brown or reddish brown; upper part of the gena not black; mesoscutum black with two stripes, not continuous from the anterior to posterior margins; third and fourth metasomal terga with an apical broad orange-yellow band or mainly orange-yellow; mesoscutellum entirely yellow-brown; fifth and sixth metasomal terga dark-brown.

Materials examined: NBCB-00089, 31.viii.2016, 1 ♀, Wangbama, Thimphu, Bhutan (27°18'45.75"N & 89°34'36.28"E, 2235 m), Leg.: Phurpa Dorji & Wim Klein.

Distribution: Myanmar, Laos, Vietnam (Das & Gupta, 1989), new record for Bhutan.

3. *Vespa fumida* van der Vecht, 1959 (Fig. 1: G, H & I)

Diagnosis: Pretegula carina complete and pronotal carina little interrupted by the pronotal pit; laterally, punctures on the second metasomal tergum not so large and generally with distances between punctures larger than puncture diameters; first metasomal tergum short, as seen from above, less than half as long as wide; metasoma quite similar to *V. analis nigrans* and *V. mandarinia magnifica* in having 1st–5th metasomal tergites black but *V. fumida* doesn't have the apical bands on metasomal tergites; lateral apical margin of clypeus not produced as a triangular projection but semicircular in shape; clypeus strongly swollen in the basal two-thirds, sloping steeply to the apical margin so that in lateral view the clypeus appears strongly convex.

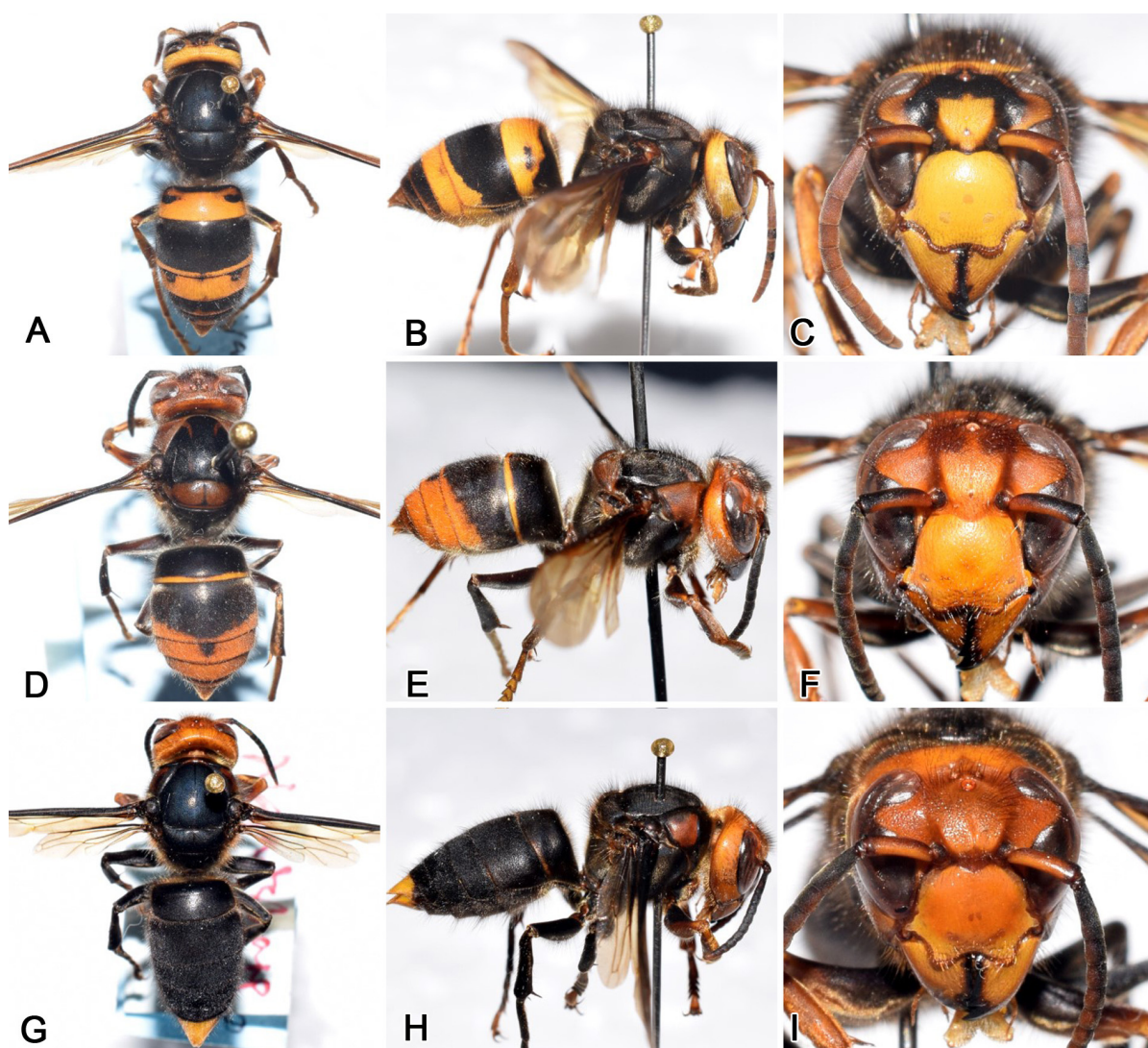


Figure 1. A., B. & C.: Dorsal, lateral & frontal view of *Vespa vivax*; D., E. & F.: Dorsal, lateral and frontal view of *V. velutina variana*; G., H. & I.: Dorsal, lateral & frontal view of *V. fumida*.

Materials examined: NBCB-00090, 18.viii. 2016, 1 ♀, Ngatshang, Mongar, Bhutan (27°18'24.5"N & 91°19'56.6"E, 1936 m), Leg.: Phurpa Dorji & Wim Klein.

Distribution: Nepal, India and Northern Myanmar (Archer 2012), new record for Bhutan.

Remarks: *Vespa fumida* had been reported from Padong, Bhutan (Carpenter & Kojima, 1997; Das & Gupta, 1989). However, going by the present geographical location, Padong is in Indian state of Sikkim, not in Bhutan. Therefore, this species is treated as new record for Bhutan.

4. *Dolichovespula lama* (du Buysson, 1903) (Fig. 2: A, B & C)

Diagnosis: Lower lateral pronotum not rugose; ocular sinus often mainly yellow; apical lateral angles of the clypeus prominent triangular projection; dorsal yellow stripes present on the pronotum, lateral yellow spot present on the mesoscutellum and metanotum; no punctures are present on the centre of the clypeus.

Materials examined: NBCB-00111 & NBCB-00112, 16.viii.16, 2 ♀♀, Lamaigonpa, Bumthang, Bhutan (UWICE campus,

27°32'31.6"N & 90°43'34.8"E, 2826 m), Leg.: Phurpa Dorji & Wim Klein; NBCB-00113, 11.viii.16, 1 ♀, Dawakha, Wangdiphodrang, Bhutan (27°35'39.51"N & 89°52'19.59"E, 1235 m), Leg.: Tshering Nidup & Wim Klein; NBCB-00114, 13.viii.16, 1 ♀, Phobjikha, Wangdiphodrang, Bhutan (way towards Pelella Pass, 27°30'45.7"N & 90°10'15.2"E, 3213 m), Leg.: Tshering Nidup & Wim Klein; NBCB-00115, 17.viii.16, 1 ♀, Phrumshengla Pass, Phrumsengla National Park, Mongar, Bhutan (27°24'05.2"N & 90°59'44.81"E, 3755 m), Leg.: Phurpa Dorji & Wim Klein.

Distribution: India, China (Archer, 1999, 2006, 2012; Carpenter & Kojima, 1997; Das & Gupta, 1989), new record for Bhutan.

Remarks: *D. lama* has been reported between 3350 m and 4200 m above sea level (Archer, 2006). New record for Bhutan with new altitudinal range (1235 m above sea level).

5. *Vespula flaviceps flaviceps* Smith, 1870 (Fig. 2: D-I)

Diagnosis: Occipital carina distinct laterally extending for less than $\frac{3}{4}$ of the lateral length of the head and weak or absent near the base of mandible; Light colored ocular sinus not deeply penetrated by a medial black projection; black bar on the clypeus does not reach the apical margin; cubital vein IIa as long as or longer than IIb; middle and hind tarsi brown; yellow apical bands on metasomal tergites usually broad and very often irregular; 1st tergite with a pair of short yellow lines at base of its horizontal face.

Materials examined: NBCB-00096, 20.vii.16, 1 ♀, Riserboo, Trashigang, Bhutan (27°07'17.86"N & 91°33'01.86"E, 1901 m), Leg.: Phurpa Dorji & Wim Klein; NBCB-00097, 14.ix.14, 1 ♂, Kanglung,

Trashigang, Bhutan (27°17'11.25"N & 91°31'25.32"E, 1861 m), Leg.: Phurpa Dorji.

Distribution: India, Pakistan, Nepal, Myanmar, Laos, China, Taiwan, Korea, Russia, Thailand, Japan (Archer, 2012; Das & Gupta, 1989; Mahmood et al., 2012), new record for Bhutan.

6. *Vespula nursei* Archer, 1981 (Fig. 3: A, B & C)

Diagnosis: Hind tibiae without long erect hairs; anterior angles of the clypeus bluntly produced in females; mesoscutum entirely black; large punctures on mesoscutum with the distance between them generally greater than the puncture diameter; metasoma with reddish brown markings; oculo-malar space short; occipital carina long occupying about 70% of the lateral length of the head; clypeus largely yellow with three black spots; metanotum with two yellow spots.

Materials examined: NBCB-00091 & NBCB-00092, 11.viii.16, 2 ♀♀, Dawakha, Wangdiphodrang, Bhutan (27°35'39.51"N & 89°52'19.59"E, 1235 m), Leg.: Tshering Nidup & Wim Klein; NBCB-00093, 10.viii.16, 1 ♀, Taba, Thimphu, Bhutan (27°31'02.8"N & 89°38'34.8"E, 2379 m), Leg.: Tshering Nidup & Wim Klein; NBCB-00094, 17.viii.16, 1 ♀, Tangsibji, Bumthang, Bhutan (27°30'05.3"N & 90°51'59.5"E, 3399 m), Leg.: Phurpa Dorji & Wim Klein; NBCB-00095, 30.viii.16, 1 ♀, Sangaygang, Thimphu, Bhutan (27°28'45.04"N & 89°35'47.17"E, 2834 m), Leg.: Phurpa Dorji & Wim Klein; NBCB-00110, 25.viii.2016, 1 ♀, Chumey, Bumthang, Bhutan (27°30'11.91"N & 90°45'53.06"E, 2692 m), Leg.: Phurpa Dorji.

Distribution: India, Pakistan, China, Philippines (Archer, 2012; Das & Gupta, 1989; Mahmood et al., 2012), new record for Bhutan.

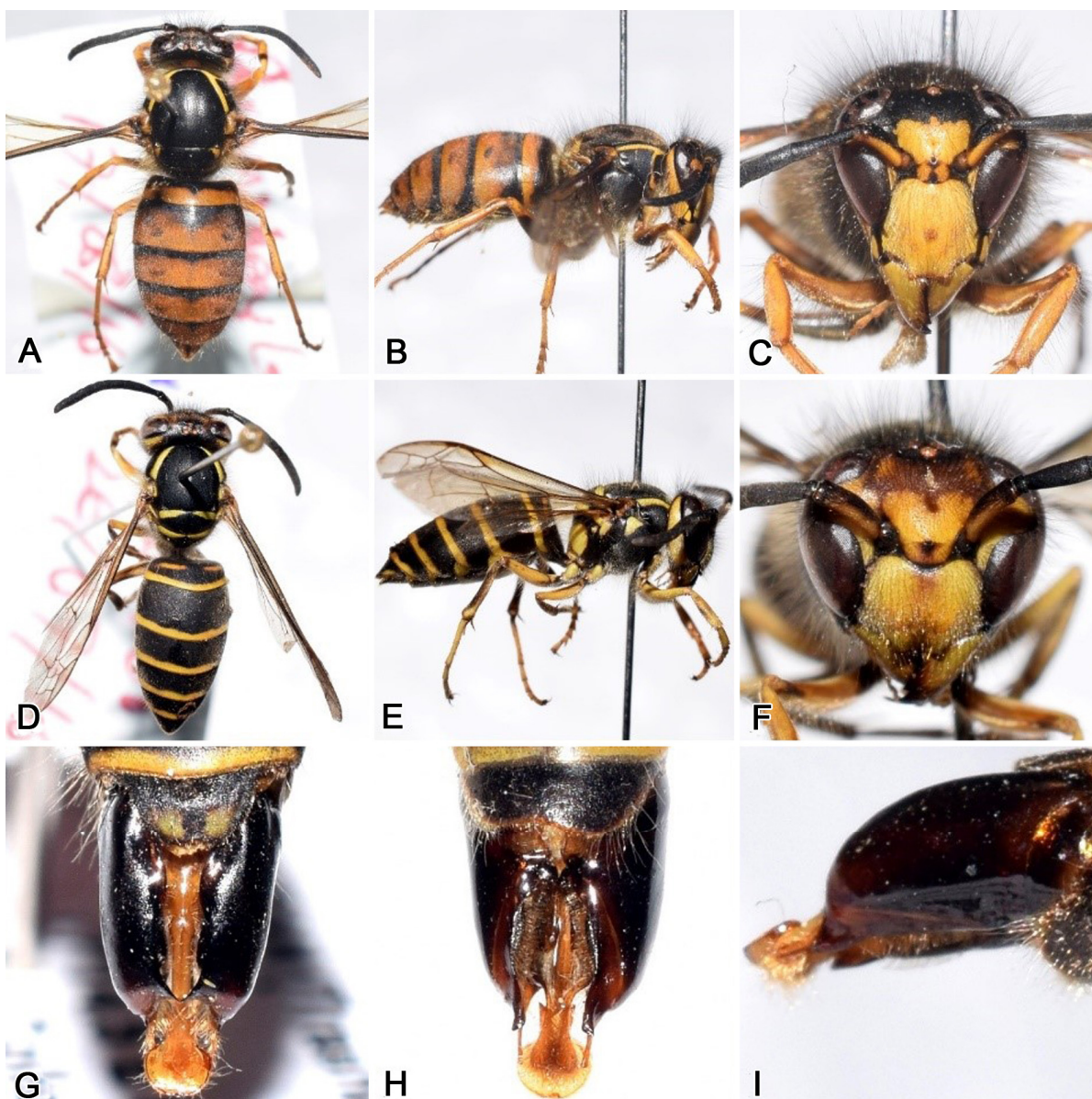


Figure 2. A., B. & C.: Dorsal, lateral & frontal view of *Dolichovespula lama*; D., E. & F.: Dorsal, lateral and frontal view of female *Vespula flaviceps*; G., H. & I.: Dorsal, ventral & lateral view of *V. flaviceps* male genitalia.

7. *Vespula structor* (Smith, 1870) (Fig. 3: D, E & F)

Diagnosis: Body covered with long erect hairs, dense on vertex, sides of scutellum, sides of propodeum and apical margins of metasomal tergites 4-6; cubital vein Ila longer than IIb; occipital carina reaching the base of mandible; 1st metasomal tergite without a median black mark; metasomal tergites orange-colored, with basal margins

of all tergites black; black bands narrow, produced angularly back in the middle and irregularly notched on their posterior margins; clypeus yellow, without black marking; reduced yellow markings on the mesonotum; femora apically, tibiae and tarsi yellow.

Materials examined: NBCB-00102, NBCB-00103 & NBCB-00104, 11.viii.16, 3 ♀♀, Dawakha, Wangdiphodrang, Bhutan

(27°35'39.51"N & 89°52'19.59"E, 1235 m), Leg.: Tshering Nidup & Wim Klein; NBCB-00105 & NBCB-00106, 13.viii.16, 2 ♀♀, Phobjikha, Wangdiphodrang, Bhutan (27°30'45.7"N & 90°10'15.2"E, 3213 m), Leg.: Tshering Nidup & Wim Klein; NBCB-00107 & NBCB-00108, 16.viii.16, 2 ♀♀, Lamaigonpa, Bumthang, Bhutan (UWICE campus, 27°32'31.6"N & 90°43'34.8"E, 2826 m), Leg.: Phurpa Dorji & Wim Klein; NBCB-00109, 8.viii.16, 1 ♀, Haa, Bhutan (27°22'35.4"N & 89°18'40.8"E, 3375 m), Leg.: Tshering Nidup & Wim Klein.

Distribution: India, Nepal, Laos, Myanmar, China (Archer, 2012; Das & Gupta, 1989), new record for Bhutan.

8. *Vespula vulgaris* (Linnaeus, 1857) (Fig. 3. G, H & I)

Diagnosis: Cubital vein IIa longer than IIb; occipital carina weak near the base of mandible; 1st metasomal tergite with arrow-shaped median black mark; metasomal tergites yellow with apical black bands; third mandibular teeth straight along its mesal margin; genal band with a black medial interruption; clypeus with club-shaped black mark; propodeum smooth.

Materials examined: NBCB-00098 & NBCB-00099, 11.viii.16, 2 ♀♀, Dawakha, Wangdiphodrang, Bhutan (27°35'39.51"N & 89°52'19.59"E, 1235 m), Leg.: Tshering Nidup & Wim Klein; NBCB-00100, 8.viii.16, 1 ♀, Haa, Bhutan (27°22'35.4"N & 89°18'40.8"E, 3375 m), Leg.: Tshering Nidup & Wim Klein; NBCB-00101, 17.viii.16, 1 ♀, Tangsibji, Bumthang, Bhutan (27°30'05.3.4"N & 90°51'59.5"E, 3399 m), Leg.: Phurpa Dorji & Wim Klein.

Distribution: Europe (Including Iceland), Sakhalin Island, Belarus, Moldova, Georgia, Kazakhstan, Russia, Turkey, Iran, Korea, Japan, Mongolia, China, India, New Zealand, South-East Australia, Argentina, St. Helena (Archer, 2012; Das & Gupta, 1989), new record for Bhutan.

9. *Polistes* (*Polistella*) *nigritarsus* (Cameron, 1900) (Fig. 4. A, B & C)

Diagnosis: Forewing with a subapical fuscous cloud; first metasomal tergum not angled at based; clypeus about as wide as long (29:30); in female lateral margin of clypeus along inner eye margin as long as malar space; propodeum without lateral edges; apical tarsus almost black; propodeum with weak striations and shallow median groove; anal lobe of hind wing separated from the rest of the wing membrane by a wide gap; body narrow, reddish-brown with predominant yellow bands or marks.

Materials examined: NBCB-00001, 4.viii.16, 1 ♀, Pasakha, Chukha, Bhutan (27°30'05.3.4"N & 90°51'59.5"E, 3399 m), Leg.: Tshering Nidup & Wim Klein.

Distribution: India, Vietnam (Das & Gupta, 1989; Nguyen & Carpenter, 2016), new record for Bhutan.

10. *Parapolybia varia* (Fabricius, 1787) (Fig. 4. D, E & F)

Diagnosis: Occipital carina incomplete; smaller wasps, body rarely exceeding 14 mm in workers; mesoscutum with 2 yellowish bands laterally; clypeus not divided in two, brown mark only present on the dorsal side; ground color brown with conspicuous yellow markings; interocular distance equal at clypeus and vertex.

Materials examined: NBCB-00002, NBCB-00003 & NBCB-0004, 8.x.15, 3 ♀♀, Pasakha, Chukha, Bhutan (26°51'7.99"N & 89°26'44.99"E, 389 m), Leg.: Tshering Nidup & Wim Klein; NBCB-00005 & NBCB-00006, 18.iv.16, 2 ♀♀, Nganglam, Pema-gatshel, Bhutan (around Alabari village, 26°49'45.12"N & 91°14'17.63"E, 349 m), Leg.: Phurpa Dorji, Tshering Nidup & Thinley Gyeltshen; NBCB-00007, 14.x.2015, 1 ♀, Tingtibi, Zhemgang (27°08'33"N & 90°41'30.98"E, 631 m), Leg.: Tshering Nidup

and Wim Klein; NBCB-00008, NBCB-00009 & NBCB-00010, 28.ix.2014, 3 ♂♂ and NBCB-00011 to NBCB-00019, 9 ♀♀, Kanglung, Trashigang (27°17'13.99"N & 91°31'18.01"E, 1823 m), Leg.: Phurpa Dorji & Tshering Nidup; NBCB-00020, 24.x.2015, 1 ♂ and NBCB-00021, NBCB-00022, NBCB-00023 & NBCB-00024, 4 ♀♀, Kanglung, Trashigang (27°17'13.99"N & 91°31'18.01"E, 1823 m), Leg.: B. Sc. Life Science I semester students; 01.x.2015, NBCB-00025 & NBCB-00026, 2 ♂♂ and NBCB-00027, NBCB-00028 & NBCB-00029, 3 ♀♀, Khaling, Trashigang (27°12'20.99"N & 91°36'11.99"E, 2073 m), Leg.: Tshering Nidup & Phurpa Dorji; NBCB-00030 & NBCB-00031, 12.x.2015, 2 ♀♀, Sithikhet & Ninzoegang, Tsirang (27°00'24.01"N & 90°08'24"E, 1256 m), Leg.: Tshering Nidup & Wim Klein; NBCB-00032, 26.x.2015, 1 ♂, Kapatapsa, Wangdi Phodrang (27°42'38.99"N & 89°45'54"E, 1476 m), Leg.: Wim Klein & Phurpa Dorji; NBCB-00032, 10.iv.2016, 1 ♀, Trashigang (27°20'42.1"N & 91°34'25.2"E, 795 m), Leg.: Phurpa Dorji, Tshering Nidup & Thinley Gyeltshen; NBCB-00033, 26.x.2015, 1 ♀, Trashithang, Gasa (27°44'44.99"N & 89°43'58.01"E, 1614 m), Leg.: Phurpa Dorji & Wim Klein; NBCB-00034, 11.x.2016, 1 ♀, Basochu Project, Wangdi Phodrang, (27°30'27"N & 89°45'09"E, 1020 m), Leg.: Tshering Nidup & Wim Klein.

Distribution: India, Nepal, Myanmar, Thailand, Malaysia, Borneo, Sulawesi, Sumbawa, Sumba, Philippines, China, Hong Kong, Korea and Japan (Das & Gupta, 1989), new record for Bhutan.

11. *Parapolybia nodosa* van der Vecht, 1966 (Fig. 4. G, H & I)

Diagnosis: Occipital carina incomplete; smaller wasps, body rarely exceeding 14

mm in workers; mesoscutum (ms) uniformly coloured in red; clypeus divided in two with a brown mark enlarged ventrally; ground colour dark brown with conspicuous white markings; interocular distance less at clypeus than at vertex.

Materials examined: NBCB-00035, 15.iv.2016, 1 ♀, Pangbang, Zhemgang (Klawagang stream, 26°50'36.6"N & 90°59'34.69"E, 390 m), Leg.: Phurpa Dorji, Thinley Gyeltshen & Tshering Nidup; NBCB-00036, 19.vii.2015, 1 ♀, Bangtar, Samdrup Jongkhar (27°53'51.72"N & 91°41'6.72"E, 258 m), Leg.: Tshering Nidup & Phurpa Dorji; NBCB-00037, 12.vii.2015, 1 ♀, Nangkori, Pema Gatshel (27°01'16"N & 91°20'44.99"E, 1434 m), Leg.: Tshewang Dendup & Tshering Nidup.

Distribution: India, Nepal, Myanmar, Thailand, China, Hong Kong and Taiwan (Das & Gupta, 1989), new record for Bhutan.

12. *Ropalidia artifex* (de Saussure, 1953) (Fig. 5. A, B & C)

Diagnosis: Mesopleuron with a distinct epicnemial carina; propodeum without a pair of carinae at base; second metasomal tergite and sternite not fused; median groove of propodeum not so deep, obsolete at base; second metasomal tergite strongly raised apically in the middle.

Materials examined: NBCB-00038 & NBCB-00039, 26.x.2015, 2 ♂♂, Kapatapsa, Wangdi Phodrang (27°42'38.99"N & 89°45'54"E, 1476 m), Leg.: Wim Klein & Phurpa Dorji.

Distribution: India, Myanmar, Borneo, Malay Peninsula, Vietnam, Java (Das & Gupta, 1989; Tan, Achterberg & Chen, 2014), new record for Bhutan.

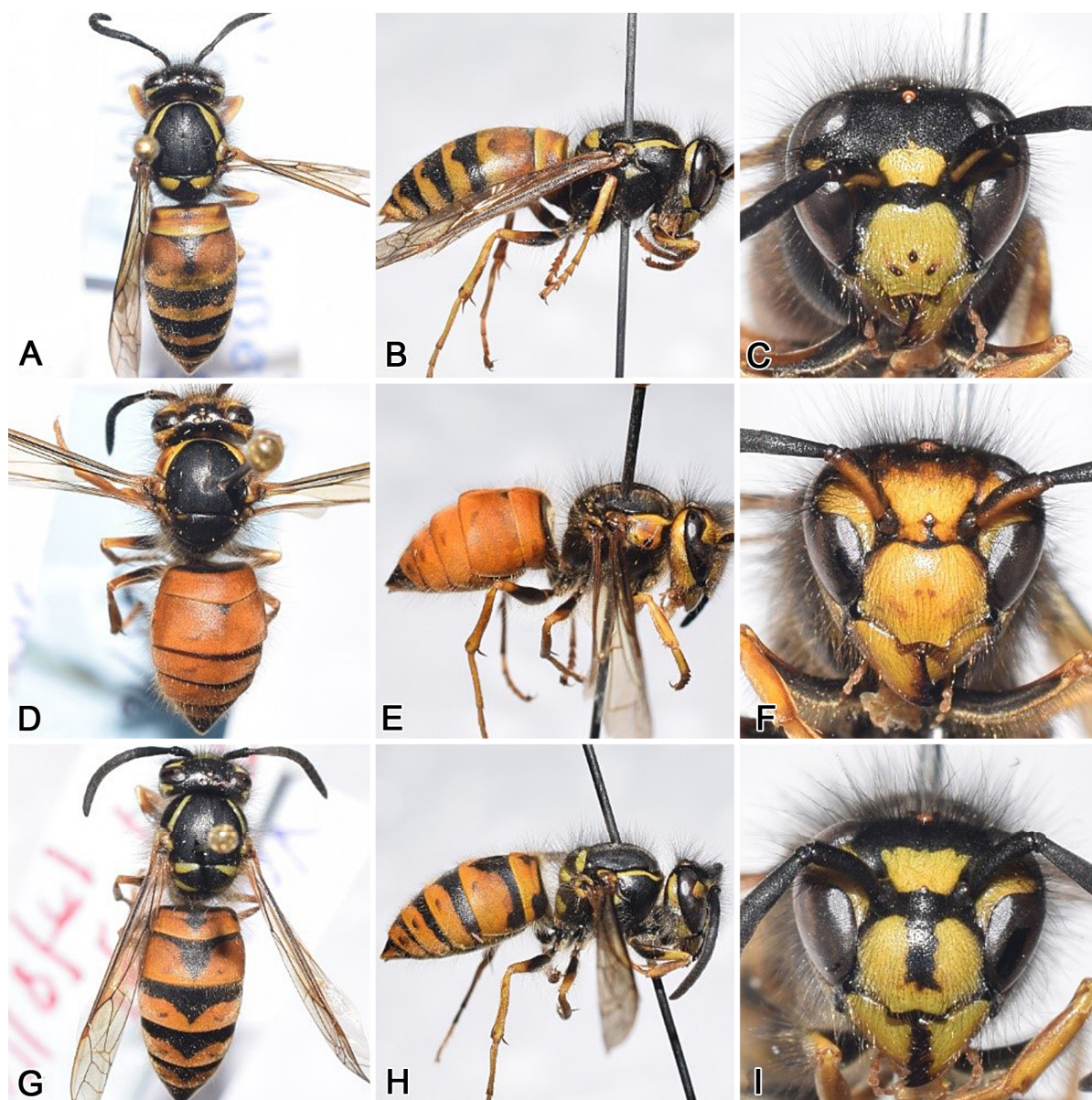


Figure 3. A., B. & C.: Dorsal, lateral & frontal view of *Vespula nursie*; D., E. & F.: Dorsal, lateral and frontal view of *V. structor*; G., H. & I.: Dorsal, lateral & frontal view of *V. vulgaris*

13. *Ropalidia stigma* (Smith, 1858) (Fig. 5. D, E & F)

Diagnosis: Metapleuron ventrally smooth; female clypeus yellow with a dark arrow-shaped mark medially; first metasomal tergite partly yellow basolaterally; second sternite usually with a pair of large yellow spots; antennal scape with a yellow line below; inter-antennal

space yellow; clypeus yellow at base; temple with a broad yellow line; yellow spots at the base of second metasomal tergite and sternite large.

Materials examined: NBCB-00040 & NBCB-00041, 08.v.2016, 2 ♀♀, Fawan, Lheuntse (27°29'8.02"N & 91°10'58.01"E, 953 m), Leg.: Phurpa Dorji, Kinzang Chopel & Thinley Gyeltshen; NBCB-

00042, 10.iv.2016, 1 ♀, Trashigang (27°20'42"N & 91°34'25"E, 795 m), Leg.: Phurpa Dorji, Thinley Gyeltshen & Tshering Nidup; NBCB-00043, 17.iv.2016, 1 ♀, Pangbang, Zhemgang (Andalathang near Drengmey Chu and Mange Chu confluence, 26°50'46.43"N & 90°56'44.63"E, 113 m), Leg.: Phurpa Dorji, Thinley Gyeltshen & Tshering Nidup; NBCB-00044 & NBCB-00045, 09.x.2015, 2 ♀♀, Rinchening, Chukha (26°51'24.01"N & 89°24'18"E, 600 m), Leg.: Tshering Nidup & Wim Klein; NBCB-00046 & NBCB-00047, 08.x.2015, 2 ♀♀, Pekashing, Chukha (26°49'59.99"N & 89°27'00"E, 293 m), Leg.: Tshering Nidup & Wim Klein; NBCB-00048, 14.x.2015, 1 ♀♀, Tingtibi, Zhemgang (27°08'33"N & 90°41'30.98"E, 631 m), Leg.: Tshering Nidup and Wim Klein; NBCB-00049, 08.x.2015, 1 ♀, Pasakha, Chukha (Pasakha Industrial area, 26°51'7.99"N & 89°26'44.99"E, 329 m), Leg.: Tshering Nidup & Wim Klein; NBCB-00050 & NBCB-00051, 26.x.2015, 2 ♂♂, Kapatapsa, Wangdi Phodrang (27°42'38.99"N & 89°45'54"E, 1476 m), Leg.: Phurpa Dorji & Wim Klein; NBCB-00052, 12.x.2015, 1 ♂ & NBCB-00060, 1 ♀, Sithikhet & Ninzoegang, Tsirang (27°00'24.01"N & 90°08'24"E, 1256m), Leg.: Tshering Nidup & Wim Klein.

Distribution: India, Nepal, Myanmar, Sri Lanka, Philippines, Indochina, Thailand, Malaysia, Vietnam, Sarawak, Indonesia, Kalimantan, China, (Das & Gupta, 1989; Pham, 2014; Tan, Achterberg & Chen, 2014), new record for Bhutan.

14. *Ropalidia ornaticeps* (Cameron, 1900) (Fig. 6. A, B & C)

Diagnosis: Occipital carina evenly curved near middle level of eye yellow except upper half of occipital carina black; clypeus yellow with a small black spot; mesopleuron with extensive yellow pattern as second sternite.

Materials examined: NBCB-00053, NBCB-00054, NBCB-00055 & NBCB-00056, 21.viii.2016, 4 ♀♀, Tshangchuthama, Bangtar, Samdrup Jongkhar, Bhutan (26°53'06.95"N & 91°41'47"E, 370 m), Leg.: Phurpa Dorji and Wim Klein; NBCB-00057, 20.vii.16, 1 ♀, Riserboo, Trashigang, Bhutan (27°07'17.86"N & 91°33'01.86"E, 1901 m), Leg.: Tshering Nidup.

Distribution: China, Cambodia, India, Malaysia, Myanmar, Thailand, Vietnam (Pham, 2014; Tan, Achterberg & Chen, 2014), new record for Bhutan.

15. *Ropalidia rufoplagiata gravelyi* (Dover & Rao, 1922) (Fig. 6. D, E & F)

Diagnosis: Mesopleuron with a distinct epicnemial carina; propodeum without a pair of carinae at base; second metasomal tergite and sternite fused; suture between second metasomal tergite and sternite visibly only at base; metasomal petiole abruptly swollen just after the end of basal slit and about as long as wide, apical margin strongly depresses; median groove of propodeum deep and wide like a cavity, with sharp edge; postscutellum slightly produced apically in the middle; mesoscutum rugoso-punctate; clypeus black with sides and apical margin reddish; no mark on frons and propodeum; postscutellum entirely yellow except for a narrow black basal area.

Materials examined: NBCB-00058, 18.iv.16, 1 ♀, Nganglam, Pemagatshel, Bhutan (around Alabari village, 26°49'45.12"N & 91°14'17.63"E, 349 m), Leg.: Phurpa Dorji, Tshering Nidup & Thinley Gyeltshen; NBCB-00059, 01.x.2015, 1 ♀, Khaling, Trashigang (27°12'20.99"N & 91°36'11.99"E, 2073 m), Leg.: Tshering Nidup & Phurpa Dorji; NBCB-00060, 21.viii.2016, 1 ♀, Tshangchuthama, Bangtar, Samdrup Jongkhar, Bhutan (26°53'06.95"N & 91°41'47"E, 370 m), Leg.: Phurpa Dorji and Wim Klein.



Figure 4. A., B. & C.: Dorsal, lateral & frontal view of *Polistes (Polistella) nigritarsus*; D., E. & F.: Dorsal, lateral and frontal view of *Parapolybia varia*; G., H. & I.: Dorsal, lateral & frontal view of *P. nodosa*.

Distribution: India, Myanmar, Thailand, Malaya, Indonesia (Das & Gupta, 1989; Pham, 2014), new record for Bhutan.

Discussion

15 species are reported as new records for Bhutan. Unlike other 14 species, *Vespa fumida* is treated as new record as the present geographical location of Padong is in the Indian state of Sikkim. Moreover,

during the entire study period, *Vespa fumida* and *Polistes (Polistella) nigritarsus* are reported only from Ngatshang, Mongar and Pasakha, Chukha respectively with single female specimen each. Recording species from single location may indicate its rareness in Bhutan, while *Parapolybia varia* is found commonly throughout Bhutan with altitudes ranging from 349 m to 2073 m.

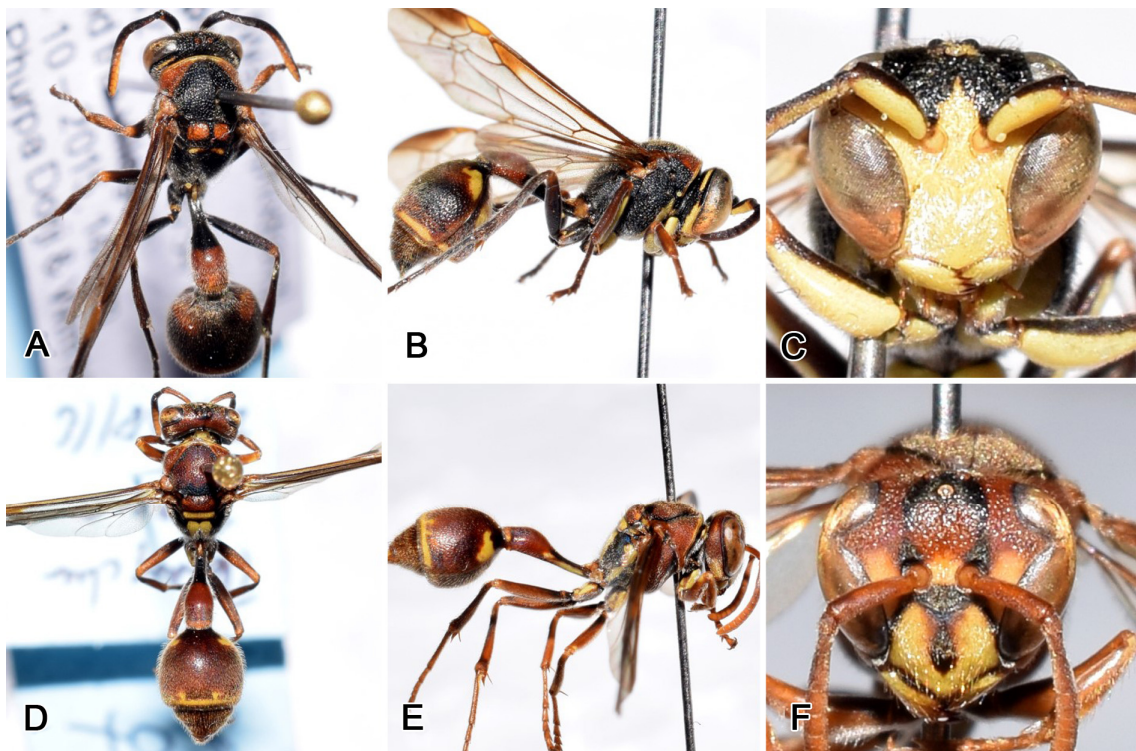


Figure 5. A., B. & C.: Dorsal, lateral & frontal view of *Ropalidia artifex*; D., E. & F.: Dorsal, lateral and frontal view of *R. stigma*.

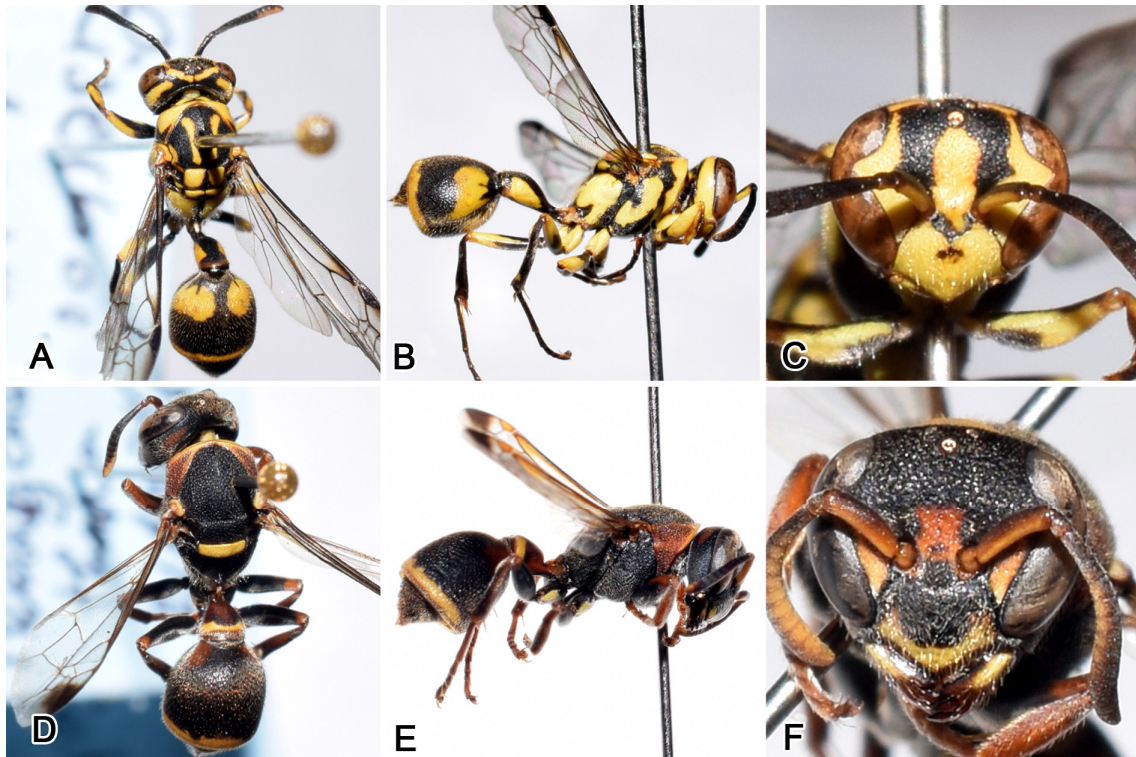


Figure 6. A., B. & C.: Dorsal, lateral & frontal view of *Ropalidia ornatifex*; D., E. & F.: Dorsal, lateral and frontal view of *R. rufoplagiata*.

Dolichovespula lama has been reported from new altitudinal range of 1235 m above sea level. With exception of *Vespula flaviceps*, only females were caught and studied for *Vespula vulgaris*, *V. structor* and *Dolichovespula lama*. Therefore, the study of male specimens and the nest for *Vespula vulgaris*, *V. structor* and *Dolichovespula lama* are recommended.

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Conflict of Interests

The authors declare that there is no conflict of interest regarding the publication of this paper.

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مطالعه رده‌بندی زنبورهای وسپید اجتماعی (Hymenoptera: Vespidae: Vespinae & Polistinae) در بوتان

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چکیده: زنبورهای وسپید اجتماعی (Hymenoptera: Vespidae: Vespinae & Polistinae) در سال‌های ۲۰۱۴-۲۰۱۶ در بوتان مورد بررسی قرار گرفت. در مجموع ۱۵ گونه جمع‌آوری و شناسایی شد که همه آنها به شرح ذیل برای کشور بوتان گزارش جدید بودند. *Vespa vivax* Smith، *V. velutina variana* van der Vecht، *Vespa*، *Dolichovespula lama* (du Buysson)، *V. fumida* van der Vecht، *V. structor*، *V. vulgaris* (Linnaeus)، *V. nursei* Archer، *flaviceps* Smith، *Parapolybia varia* (Smith)، *Polistes (Polistella) nigritarsus* (Cameron)، *Ropalidia artifex* (de Saussure)، *P. nodosa* van der Vecht (Fabricius)، *R. rufoplagiata gravelyi* و *R. ornaticeps* (Cameron)، *R. stigma* (Smith) (Dover & Rao). خصوصیات افتراقی و انتشار جغرافیایی همه گونه‌ها ارایه شده است.

واژگان کلیدی: زنبورهای سرخ، زنبورهای زرد، زنبورهای کاغذساز، گزارش جدید، بوتان.