



TAXONOMIC STUDIES ON VESPID WASPS (HYMENOPTERA: VESPOIDEA: VESPIDAE) OF SUNDERBANS BIOSPHERE RESERVE, WEST BENGAL, INDIA. PART 1

P. GIRISH KUMAR AND GAURAV SHARMA

Zoological Survey of India, M- Block, New Alipore, Kolkata, West Bengal- 700 053, India

E-mail: kpgiris@gmail.com; drgaurav.zsi.india@gmail.com

INTRODUCTION

The Sunderbans area is composed of a group of Islands from the mouth of the river Hooghly on the west and extending up to the river Meghna in the east, covering North and South 24 Parganas districts of West Bengal in India and Khulna and Barishal districts in Bangladesh. It lies approximately 87° 51' - 91° 30' east longitude and 21° 31' - 22° 30' north latitude. It is considered as the largest single mangrove belt of the world, comprising an area of 9827 sq. km of which 4264 sq. km comes under India. In 1989, the Government of India declared the entire Indian Sunderbans (9630 sq. km; mangrove belt plus nearby villages) as Sunderbans Biosphere Reserve. Due to its unique ecosystem, it has also been declared a World Heritage site in 1989. It is the largest estuary delta in the world with extremely rich diversity of aquatic and terrestrial flora and fauna.

Vespidae is a cosmopolitan family of order Hymenoptera (Insecta) but predominantly found in tropical region. Adults are usually black or brown but are often extensively marked with yellow or white. They are minute to large (6-28 mm) in size. Most species are solitary but many are social. Solitary wasps nesting either in soil, in pre-existing cavities (such as abandoned mud nest of other hymenopterans or beetle tunnels in wood) or in free mud nests which they build themselves. Social wasps often make spectacular paper nests and defend their colony vigorously by stinging.

Bingham (1897) and Das & Gupta (1989) made valuable contributions on Vespidae from India and its adjacent countries. The knowledge on vespid fauna of Sunderbans Biosphere Reserve is very scanty and fragmentary. An attempt has been made here to provide a consolidated account on the fauna of the family Vespidae from Sunderbans Biosphere Reserve.

MATERIAL AND METHODS

The systematic account on the vespid fauna of Sunderbans Biosphere Reserve is given below based on the collections from different localities of the Biosphere Reserve. The entire materials studied here are added to the "National Zoological Collections" of the Zoological Survey of India, Kolkata (NZC).

The following abbreviations used in the text for the Museums: BMNH = Natural History Museum, London, UK; HMUG = Hunterian Museum, University of Glasgow, Scotland, UK; MCZ = Museum of Comparative Zoology, Harvard University, Cambridge, U.S.A.; MNHN = Muséum national d'Histoire naturelle, Paris, France; NHRM = Naturhistoriska Riksmuseet, Stockholm; RMNH = Nationaal Natuurhistorisch Museum (formerly Rijksmuseum van Natuurlijke Historie), Leiden, The Netherlands; NZC = National Zoological Collections of Zoological survey of India, Kolkata, India; ZMB = Zoologisches Museum der Humboldt Universität, Berlin, Germany; ZMUC = Zoologisk Museum, Københavns Universitet, Denmark;

ZMUK = Zoological Museum, University of Kiel, Germany; ZMUU = Zoological Museum, Uppsala University, Uppsala, Sweden.

Abbreviations used for the terms: H = Head; M = Mesosoma; S1-S7 = Abdominal sterna 1 to 7; T1-T7 = Abdominal terga 1 to 7.

SYSTEMATIC ACCOUNT

Family VESPIDAE

Subfamily POLISTINAE

Tribe **Polistini**

Genus **Polistes** Latreille, 1802

Subgenus **Polistes (Gyrostoma)** Kirby, 1828

1. *Polistes (Gyrostoma) olivaceus* (De Geer, 1773)

Subgenus **Polistes (Polistella)** Ashmead, 1904

2. *Polistes (Polistella) stigma tamula* (Fabricius, 1798)

Tribe **Ropalidiini**

Genus **Ropalidia** Guérin-Méneville, 1831

3. *Ropalidia brevita* Das & Gupta, 1989
4. *Ropalidia cyathiformis* (Fabricius, 1804)
5. *Ropalidia jacobsoni* (du Buysson, 1908)

Subfamily VESPINAE

Genus **Vespa** Linnaeus, 1758

6. *Vespa affinis affinis* (Linnaeus, 1764)
7. *Vespa tropica haematodes* Bequaert, 1936

Subfamily EUMENINAE

Genus **Allorhynchium** van der Vecht, 1963

8. *Allorhynchium argentatum* (Fabricius, 1804)
9. *Allorhynchium metallicum* (de Saussure, 1852)

Genus **Anterhynchium** de Saussure, 1863

10. *Anterhynchium (Anterhynchium) abdominale abdominale* (Illiger, 1802)

Genus **Antodynerus** de Saussure, 1855

11. *Antodynerus flavescens flavescens* (Fabricius, 1775)

Genus **Delta** de Saussure, 1855

12. *Delta conoideum* (Gmelin, 1790)
13. *Delta esuriens* (Fabricius, 1787)
14. *Delta pyriforme pyriforme* (Fabricius, 1775)

Genus **Oreumenoides** Giordani Soika, 1961

15. *Oreumenoides edwardsii* (de Saussure, 1852)

Genus **Rhynchium** Spinola, 1806

16. *Rhynchium brunneum brunneum* (Fabricius, 1793)
17. *Rhynchium carnaticum* (Fabricius, 1798)
18. *Rhynchium haemorrhoidale haemorrhoidale* (Fabricius, 1775)

Genus **Subancistrocerus** de Saussure, 1855

19. *Subancistrocerus sichelii* (de Saussure, 1855)

Genus **Xenorhynchium** van der Vecht, 1963

20. *Xenorhynchium nitidulum* (Fabricius, 1798)

1. ***Polistes (Gyrostoma) olivaceus***
(De Geer, 1773)
(Image 1)

1773. *Vespa olivacea* De Geer, 582. Type: Sex not mentioned, America (NHRM).

1989. *Vespa hebraeus*: Mandal & Nandi, 32 (Sunderbans).

1989. *Polistes (Megapolistes) olivaceus*: Das & Gupta, 53 (Sunderbans).

1996. *Polistes (Gyrostoma) olivaceus*: Carpenter, 55.

Diagnosis: Female: Size (H+M+T1+T2): 13-20 mm. Body yellow with variable black markings and few reddish markings; some are dark form with extensive black markings while others are pale forms with less extensive black markings. Black markings as follows: basal and apical margin of clypeus narrowly, mandibular teeth, a short line on raised part of interantennal space, a mark above each antennal socket, a band on vertex (sometimes narrow line), occiput, a line on scape and flagellum above (often only scape apically above), in front of pronotal carina, a mark on pronotum ventrally towards propleuron (often absent), mesoscutum (except a longer median and

two shorter lateral yellow lines, sometimes an incomplete median line), almost all the thoracic sutures (sometimes faint), a line along the median groove of propodeum (sometimes two marks on sides), T1 narrowly at base (sometimes absent), T2-T5 and S2-S5 with bisinuate marks, a line below coxae (sometimes absent), another line on hind tibiae above (sometimes faint). The reddish markings as follows: pronotum partly dorsally, two curved lines on propodeum on sides, T2 at base and legs partly. Clypeus densely finely punctate, with a few larger scattered punctures interposed; supraclypeal area, interantennal space, inner orbit including ocular sinus almost smooth; frons, vertex and temple with fine scattered punctures; malar space with moderately larger and close punctures; occipital carina incomplete; pronotum sparsely finely punctate; mesoscutum almost impunctate; scutellum, metanotum and metapleuron impunctate; mesopleuron behind epicnemial carina and above sternopleural suture with scattered fine punctures; propodeum with distinct striations without distinct lateral edge; gaster almost impunctate, covered with short velvety pubescence; S1 transversely striated.

Male: Size (H+M+T1+T2): 17 mm. Similar to female except clypeus not touching eye; temple wider; proximal tooth of mandible short; apical gastral sternite with bluntly projecting tubercle on each side; apophyses long, narrow and flattened at apex like a spatula, shiny and devoid of pubescence.

Material examined: INDIA, West Bengal, S-24 Parganas district, Sunderbans Biosphere Reserve, Canning, 1♂, 11.xi.1993, Coll. N.P. Debdudd, NZC Regd. No. 12176/H3; Bagabadpur, 1♀, 25.xi.2007, Coll. P. Girish Kumar, NZC Regd. No. 12179/H3; Murir Jhabri, 1♀, 30.iii.2008, Coll. P. Girish Kumar, NZC Regd. No. 12180/H3; Netidhopani, 1♀, 31.iii.2008, Coll. P. Girish Kumar, NZC Regd. No. 12181/H3; Canning, 9♀, 29.vii.2013 to 6.viii.2013, Coll. Gaurav Sharma & Party, NZC Regd. Nos. 14491/H3 to 14599/H3; Pakhirala, 2♀, 2.viii.2013, Coll. Gaurav Sharma & Party, NZC Regd. Nos. 14600/H3 & 14601/H3;

Dobanki, 1♀, 3.viii.2013, Coll. Gaurav Sharma & Party, NZC Regd. No. 14602/H3; Birajnagar, 1♀, 5.viii.2013, Coll. Gaurav Sharma & Party, NZC Regd. No. 14603/H3.

Distribution: India: Andhra Pradesh, Arunachal Pradesh, Assam, Gujarat, Himachal Pradesh, Jammu & Kashmir, Jharkhand, Karnataka, Madhya Pradesh, Manipur, Meghalaya, Nagaland, Odisha, Rajasthan, Sikkim, Tripura, Uttarakhand, Uttar Pradesh, West Bengal. *Elsewhere:* Afghanistan, Amirantes, Australia, Bangladesh, Cambodia, Chagos Archipelago, Chile (introduced), China, Egypt, Fiji, Indonesia, Iran, Japan (?), Laos, Madagascar, Malaysia, Marianas, Marquesas, Mauritius, Myanmar, Nepal, New Caledonia, New Zealand, Oman, Pakistan, Philippines, Reunion, Samoa, Seychelles, Singapore, Society Is., Sri Lanka, Tanzania, Thailand, Tongas, Tuamotu Archipelago, U.S.A., Vietnam.

2. *Polistes (Polistella) stigma tamula*

(Fabricius, 1798)

(Image 2)

1798. *Vespa tamula* Fabricius, 263. Type Female, "in India Orientali, Dom Daldorff" (ZMUK).

1983. *Polistes (Polistella) stigma tamula*: Das & Gupta, 414.

Diagnosis: Female: Size (H+M+T1+T2): 10-11 mm. Body predominantly reddish with some black markings and the following yellow markings: clypeus, mandible, a broad line along inner orbit up to lower half of ocular sinus, a line on temple bordering eye margin, malar space, basal and apical margin of pronotum narrowly, a line on scutellum at base, another on metanotum at base, a mark on subtegular area, an elongated mark on mesepisternum at top and another in the middle of apico-lateral margin in front of metapleuron, raised ventral margin of mesepisternum and ventral metapleuron each, a mark on dorsal metapleuron, two lines on mesosternum, two broad curved marks on propodeum, apical valvula entirely, fore coxa in front entirely, marks on middle coxa in front and two lines on hind coxa below, T1 except broad reddish mark at base, apical broad band on T3 and S3, fourth gastral segment almost

entirely, S1 and a narrow band on T2 apically. S1 without distinct margin at base; T1 about as long as wide.

Material examined: INDIA, West Bengal, S-24 Parganas district, Sunderbans Biosphere Reserve, Bagmara, 1 ♀, 12.iii.1990, Coll. R.A. Khan & Party, NZC Regd. No. 14735/H3; Sudhanyakhali, 1 ♀, 1.iv.2008, Coll. P. Girish Kumar, NZC Regd. No. 14736/H3; Dobanki, 2 ♀, 3.viii.2013, Coll. Gaurav Sharma & Party, NZC Regd. Nos. 14604/H3 & 14605/H3.

Distribution: India: Chhattisgarh, Delhi, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Maharashtra, Meghalaya, Odisha, Pondicherry, Sikkim, Tamil Nadu, Uttarakhand, Uttar Pradesh, West Bengal. *Elsewhere:* Sri Lanka.

Remarks: It is the first record of this species from Sunderbans Biosphere Reserve.

3. *Ropalidia brevita* Das & Gupta, 1989
(Image 3 & 21)

1989. *Ropalidia (Anthreneida) brevita* Das & Gupta, 121.

Holotype Male, Delhi: University ridge (NZC).

Diagnosis: Female: Size (H+M+T1+T2): 11-13 mm. Body red with the following yellow portions: antennal scape below, a band on clypeus at apex, mandible (except at tip), inner orbit below ocular sinus (sometimes faint), pronotum anteriorly, two marks on metanotum (sometimes fused), two enlarged marks on apical half of propodeum, a faint mark on sides of mesosternum, fore and middle coxae in front, a line on lateral side of hind coxa, tarsal segments of all legs (highly variable), a narrow apical band on T1 and a broad apical band on T2. In some portions black patches are mixed with reddish body. The extents of yellow and black markings are variable. T1 proportionally wider with its maximum width in dorsal view nearly half as wide as that of T2.

Male: Similar to female in size and general appearance. Clypeus, supraclypeal area, inter antennal space, inner orbit below ocular sinus are completely yellow. Male terminal antennal flagellomeres less strongly curved and bluntly

pointed at apex, approximately twofold as long as its basal width; aedeagus not spatulate apically.

Material examined: INDIA, West Bengal, S-24 Parganas district, Sunderbans Biosphere Reserve, Haldibari, 1 ♂, 11.ix.1983, Coll. S.S. Saha & Party, NZC Regd. No. 14746/H3; Burirdabri, 2 ♀, 29.iii.2008, Coll. P. Girish Kumar, NZC Regd. Nos. 14747/H3 & 14748/H3; Dobanki, 2 ♀, 3.viii.2013, Coll. Gaurav Sharma & Party, NZC Regd. Nos. 14606/H3 & 14607/H3.

Distribution: India: Assam, Delhi, Goa, Haryana, Himachal Pradesh, Karnataka, Kerala, Odisha, Rajasthan, Sikkim, Uttarakhand, Uttar Pradesh, West Bengal.

Remarks: It is the first record of this species from Sunderbans Biosphere Reserve.

4. *Ropalidia cyathiformis* (Fabricius, 1804)
(Image 4 & 22)

1804. *Eumenes cyathiformis* Fabricius, 289. Type: Female, Java (ZMUC).

1941. *Ropalidia cyathiformis*: Vecht, 104, 112, 158.

Diagnosis: Female: Size (H+M+T1+T2): 6.5-7 mm. Body reddish brown with the following yellow markings: mandible except a reddish brown spot at base and at teeth, clypeus except a median irregular transverse mark, supraclypeal area, inter antennal space continued up to a short distance on frons, a broad line along inner orbit up to ocular sinus, a broad line on temple, ventral side of antenna, pronotum broadly at base and at apical margin towards mesoscutum, two large marks on sides of scutellum and metanotum, an elongated spot on the upper half of mesopleuron, two large marks on propodeum separated by median dark brown line, inner side of tegula, fore and middle coxae almost entirely, hind coxa on sides, a line on all femora and tibia, metatarsi of all legs, rest of the legs partly, apical margin and lateral sides of gastral petiole, T2 and S2 narrowly at apex, and a large mark on each side of T2 at base. Wings transparent hyaline with stigma yellow and apical half of radial cell dark reddish brown. First metasomal segment short, in lateral view with dorsal margin arising from posterior margin of

basal slit for reception of metasomal suspensory ligament; second segment in lateral view vertically cut off posteriorly.

Material examined: INDIA, West Bengal, S-24 Parganas district, Sunderbans Biosphere Reserve, Baradapur, 3 ♀, 25.xi.2007, Coll. P. Girish Kumar, NZC Regd. Nos. 14743/H3 to 14745/H3.

Distribution: India: Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Goa, Karnataka, Kerala, Maharashtra, Uttarakhand, West Bengal (new record). *Elsewhere:* Bali, Java, Lombok, Malay Peninsula, Myanmar, Nepal, Pakistan, Philippine Islands, Sri Lanka, Sulawesi, Sumba, Thailand, Vietnam.

Remarks: It is the first record of this species from West Bengal.

5. *Ropalidia jacobsoni* (du Buysson, 1908)
(Image 5 & 23)

1908. *Icaria jacobsoni* du Buysson, 123. Type: Female, Java: Djakarta (= Batavia) (RMNH).

1983. *Ropalidia jacobsoni jacobsoni*: Das & Gupta, 418.

2007. *Ropalidia jacobsoni*: Kojima *et al.*, 386.

Diagnosis: Female: Size (H+M+T1+T2): 6-7 mm. Body reddish brown with yellow and black markings. Yellow markings as follows: mandible except at tip and at base brown, clypeus except the characteristic black mark, a mark on inter antennal space, inner orbit up to ocular sinus broadly, ventral side of antenna, a narrow line along pronotal carina, basal and lateral margin of scutellum broadly, two large marks on metanotum, a small mark on the upper part of mesopleuron just below subtegular area, two broad marks on propodeum separated by broad black line along the median groove, inner side of tegula, fore and mid coxae in front, a line on hind coxa laterally, another line below fore femur, a small mark on middle femur laterally, a narrow line on all tibiae above, fore and mid basi-tarsi above, T2 with a large mark on each side at base and a broad apical band on T2 and S2, become narrow towards middle on S2. Black markings as follows: a mark on clypeus at base, supraclypeal area, a large circular spot above each antennal socket, a

mark around each ocellus, occiput, basal area of anterior face of pronotum, margins of mesoscutum narrowly but apical margin towards scutellum broadly, a narrow vertical line on scutellum up to one-third from base, propleuron, dorsal metapleuron, ventral metapleuron apically towards mesopleuron broadly, mesosternum, a broad median line separating the two yellow marks and basal and apical margin of propodeum narrowly. Wings transparent hyaline with apical half of radial cell brown, stigma yellow. Median furrow of propodeum distinct; T1 in lateral view with dorsal margin more strongly convex in posterior half, highest slightly posterior to level of posterior margin of the sternum.

Male: Similar to the female but differs in having clypeus (except its basal margin narrowly) black; supraclypeal area and a line on temple, and mesosternum, yellow. Size (H+M+T1+T2): 6-7 mm.

Material examined: INDIA, West Bengal, S-24 Parganas district, Sunderbans Biosphere Reserve, Gosaba, 1 ♀, 12.iii.1990, Coll. R.A. Khan & Party, NZC Regd. No. 14737/H3; Burirdabri, 3 ♀ & 2 ♂, 29.iii.2008, Coll. P. Girish Kumar, NZC Regd. Nos. 14738/H3 to 14742/H3; Dobanki, 1 ♀, 3.viii.2013, Coll. Gaurav Sharma & Party, NZC Regd. Nos. 14608/H3; Sudhanyakhali, 15 ♀, 3.viii.2013, Coll. Gaurav Sharma & Party, NZC Regd. Nos. 14609/H3 to 14623/H3.

Distribution: India: Assam, Delhi, Karnataka, Kerala, Maharashtra, Rajasthan, Tamil Nadu, Uttarakhand, West Bengal (new record). *Elsewhere:* Bangka, Java, Lombok, Myanmar, Sulawesi, Sumatra.

Remarks: It is the first record of this species from West Bengal.

6. *Vespa affinis affinis* (Linnaeus, 1764)
(Image 6 & 24)

1764. *Apis affinis* Linnaeus, 417, F, des. "in *Calidis regionibus*" (ZMUU).

1936. *Vespa affinis affinis*: Bequaert, 347.

Diagnostic characters: Sterile female: Size: 16-23 mm. Head red with a dark patch between

antennae and at base of clypeus; mesosoma black with large reddish mark on each side of prothorax; T1 & T2 orange yellow, T1 brownish at base and with a small dark spot in the middle of horizontal part close to apical margin; S1 and basal spot on S2 dark brown. Apical margin of clypeus less hairy and with short broadly rounded lobes on each side of the median emargination; punctures on vertex, temple, mesoscutum, scutellum, metanotum, metapleuron and propodeum small and crowded; body hairs fine, shorter and comparatively dense.

Material examined: INDIA, West Bengal, S-24 Parganas district, Sunderbans Biosphere Reserve, Canning, 3 ♀, 31.vii.2013 to 6.viii.2013, Coll. Gaurav Sharma & Party, NZC Regd. Nos. 14625/H3 to 14627/H3; Pakhirala, 1 ♀, 2.viii.2013, Coll. Gaurav Sharma & Party, NZC Regd. No. 14628/H3; Gosaba, 2 ♀, 4.viii.2013, Coll. Gaurav Sharma & Party, NZC Regd. Nos. 14629/H3 & 14630/H3.

Distribution: India: Arunachal Pradesh, Assam, Bihar, Himachal Pradesh, Karnataka, Kerala, Maharashtra, Meghalaya, Nagaland, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh, West Bengal. *Elsewhere:* China, Indonesia, Japan (in Ryukyu Island), Laos, Malaysia, Myanmar, Papua New Guinea, Philippines, Singapore, Sri Lanka, Taiwan, Thailand, Vietnam, New Zealand.

Remarks: It is the first record of this species from Sunderbans Biosphere Reserve.

7. *Vespa tropica haematodes* Bequaert, 1936 (Image 7)

1936. *Vespa tropica* var. *haematodes* Bequaert, 336, 338. Holotype: Female, India: "Kooloo" (MCZ).

1989. *Vespa cincta* Fabricius: Mandal & Nandi, 32. (Sunderbans).

Diagnosis: Sterile female: Size (H+M+T1+T2): 20.5 mm. Head and antenna reddish brown; pronotum dorsally and scutellum reddish brown; mesoscutum anteriorly with two short reddish mark; apical margin of clypeus brownish; legs partly reddish brown; gaster blackish brown to black except T2 yellow with a slight brown

area basally and S2 yellow with a large brown area basally. Body rather margin hairy; apical margin of clypeus with a broad emargination, its apico-lateral angle triangular; lower vertical area of pronotum with strong transverse ridges near pronotal pit.

Material examined: INDIA, West Bengal, S-24 Parganas district, Sunderbans Biosphere Reserve, Canning, 1 ♀, 30.vii.2013, Coll. Gaurav Sharma & Party, NZC Regd. No. 14631/H3.

Distribution: India: Bihar, Haryana, Himachal Pradesh, Karnataka, Kerala, Odisha, Pondicherry, Sikkim, Tamil Nadu, Tripura, Uttarakhand, West Bengal. *Elsewhere:* China, Myanmar, Nepal, Pakistan, Sri Lanka, Vietnam.

8. *Allorhynchium argentatum* (Fabricius, 1804) (Image 8)

1804. *Vespa argentata* Fabricius, 260. Type: Male, "Sumatra" (ZMUC).

1963. *Allorhynchium argentatum*: Vecht, 60 (list), fig. 5a.

Diagnosis: Male: Body length (H+M+T1+T2) 11 mm. Body entirely black except clypeus almost entirely yellow and a yellow line in between antennal toruli and inner eye margin; tarsal claws blackish brown; wings dark with purple reflections. Clypeus broadly pyriform, apex truncate and emarginate; median area of clypeus not strongly punctate, diameter of punctures almost equal or less than the distance between punctures, interspaces not carinate; antenna with last article hooked apically and almost reaches apex of 10th segment in curved position; pronotal carina strong, complete; epicnemial carina distinct at lower half; outer vein of third submarginal cell of forewing anteriorly very close to apex of marginal cell; T1 and T2 with medium size, closely arranged and moderately dense punctures, interspaces in average equal to punctures, of almost uniform density and thickness except at lateral and apical portions strongly punctured.

Material examined: INDIA: West Bengal, S-24 Parganas district, Sunderbans Biosphere Reserve, Jibantala, 1 ♂, 30.vii.2013, Coll. Gaurav Sharma & Party, NZC Regd. No. 14654/H3.

Distribution: India: Assam, Karnataka, Kerala, Meghalaya, Sikkim, Tamil Nadu, Uttarakhand, Uttar Pradesh, West Bengal. **Elsewhere:** Indonesia (Sumatra, Java, Bali, Borneo, Sulawesi), Laos, Malaysia, Nepal, Pakistan, Philippines, Singapore, Thailand.

Remarks: It is the first record of this species from Sunderbans Biosphere Reserve.

9. *Allorhynchium metallicum* (de Saussure, 1852)
(Image 9)

1852. *Rygius metallicum* de Saussure, 114. Lectotype: Female, Bengal (MNHN).

1963. *Allorhynchium metallicum*: Vecht, 60 (list).

Diagnosis: Female: Body length (H+M+T1+T2) 10-12 mm; Body entirely black except a yellow line in between antennal toruli and inner eye margin; tarsal claws blackish brown; wings fusco-hyaline, broadly dark fuscous with purplish reflections along costal margin of forewing. Median area of clypeus not strongly punctate, diameter of punctures almost equal or less than the distance between punctures, interspaces not carinate; T1 and T2 with very small and sparse punctures except at lateral and apical portions strongly punctured.

Material examined: INDIA: West Bengal, S-24 Parganas district, Sunderbans Biosphere Reserve, Canning, 2 ♀, 31.vii.2013, Coll. Gaurav Sharma & Party, NZC Regd. Nos. 14652/H3 to 14653/H3.

Distribution: India: Assam, Delhi, Gujarat, Lakshadweep Islands, Madhya Pradesh, Maharashtra, Sikkim, Tamil Nadu, West Bengal. **Elsewhere:** Indonesia (Borneo, Moluccas), Maldives Islands, Malaysia (Sarawak), Myanmar, Pakistan, Sri Lanka, Taiwan.

Remarks: It is the first record of this species from Sunderbans Biosphere Reserve.

10. *Anterhynchium (Anterhynchium) abdominale abdominale* (Illiger, 1802)
(Image 10)

1802. *Vespa abdominalis* Illiger, 192, Syntype, "Bengalen" (? ZMB).

1963. *Anterhynchium abdominale*: Vecht, 75, fig. 5e.

Diagnosis: Male: Size (H+M+T1+T2) 10.5 mm. Head and mesosoma black except clypeus almost entirely and scape in front yellow; metasoma dull orange-red with variegated black markings. Brown colouration as follows: ventral side of antenna and tarsal segments. Wings dark fuscous with purple reflections. Antenna with the last segment hooked apically and almost reaches the apex of tenth antennal segment in curved position; clypeus with weak punctures, frons, posterior face and lateral sides of pronotum, mesoscutum and scutellum strongly, closely and rugosely punctate; T1 almost smooth with minute scattered punctures on lateral sides; basal two thirds of T2 very finely and shallowly punctate; the narrow basal part of S1 smooth; apical tip of aedeagus rounded, parallel spines elongate without hairs.

Material examined: INDIA: West Bengal: S-24 Parganas district, Sunderbans Biosphere Reserve, Sagar Islands, 1 ♂, 17.vi.1977, Coll. R. C. Basu & Party, 13311/H3.

Distribution: India: Chhattisgarh, Kerala, Rajasthan, Sikkim, Tamil Nadu, Uttar Pradesh, West Bengal. **Elsewhere:** Myanmar, Pakistan, Sri Lanka.

11. *Antodynerus flavescens flavescens* (Fabricius, 1775)
(Image 11)

1775. *Vespa flavescens* Fabricius, 370. Lectotype: Male, "In India Orientali" (ZMUC).

2013. *Antodynerus flavescens flavescens* (Fabricius, 1775): Girish Kumar & Carpenter, 271 (Sunderbans: Sagar Island).

Diagnosis: Female: Size (H+M+T1+T2) 9-11 mm. Body brownish red with yellow, white and black marks. Usually brownish red colour mixed with yellow and white marks in many areas. Generally the yellow colour as follows: mandible except at lateral and apical margins brown, basal and lateral sides of clypeus (rarely entirely yellow), interantennal space (rarely brown or black), inner and outer eye margins, lower sides of temple and occiput, ventral side of scape, tegula

except inner white margin (sometimes entirely yellow or yellowish brown), T2 except at base black, S2 almost entirely. Generally the white (sometimes whitish yellow) markings as follows: throughout pronotal carina, inner side of tegula, sides of scutellum, posterior side of metanotum, a spot on mesopleuron below tegula. Black markings as follows: inner side of ocellar area (sometimes absent), basal area of tergites which are more prominent on T2 and T3, area in between S1 and S2. Legs pale brown inter mixed with yellow. Wings hyaline with pterostigma and apex of median cell yellow and a dark infumation at apex of radial cell. Median area of propodeum with a shallow narrow fovea from which median carina runs to orifice, without distinct transverse striae; postero-lateral margin of propodeum rounded, without a strong transversely carinate projection, below that with evanescent transverse striae; frons sparsely punctured, diameters of punctures less than distance between punctures; ocellar area almost smooth without punctures; vertex with moderately strong punctures except at middle and area towards occipital carina smooth.

Male: Size (H+M+T1+T2) 8.5-9.5 mm. Colour pattern is almost same as that of female except clypeus entirely and a transverse band at lower frons yellow. Antenna with last atricle hook-like, almost reaching to the base of eleventh antennal segment in curved position; apical tip of aedeagus rounded, parallel spines elongate without hairs. Other characters almost same as in female.

Material examined: INDIA: West Bengal, S-24 Parganas district, Sunderbans Biosphere Reserve, Sagar Island, 1 ♀, 17.vi.1977, Coll. R.C. Basu & Party, NZC Regd. No. 14161/H3; Canning, 3 ♀ & 4 ♂, 31.vii.2013 to 6.viii.2013, Coll. Gaurav Sharma & Party, NZC Regd. Nos. 14645/H3 to 14651/H3.

Distribution: India: Andhra Pradesh, Assam, Bihar, Chhattisgarh, Delhi, Goa, Gujarat, Karnataka, Kerala, Maharashtra, Manipur, Odisha, Pondicherry, Tamil Nadu, Uttarakhand, Uttar Pradesh, West Bengal. *Elsewhere:* Bangladesh.

12. *Delta conoideum* (Gmelin, 1790)

(Image 12)

1787. *Vespa conica* Fabricius, 293. Syntype: Female. China (BMNH).

2006. *Delta conoideum*: Gusenleitner, 694.

Diagnosis: Female: Size 23-26 mm. Head yellow except mandibles and antenna reddish, a broad transverse band across the apex between the top of eyes black, black mark extends behind the vertex to occiput; thorax dark red with black patches on mesoscutum, metapleuron and median area of propodeum, propleuron entirely black; legs pale reddish; gaster dark red with base of the T2 and a short transverse medially interrupted band on its middle above black; forewing basally flavohyaline and apically fuscohyaline, with a slight purplish reflection. Clypeus pyriform, its apex truncate; gaster smooth and shining with the surface minutely aciculate.

Male: Size (H+M+T1+T2) 22 mm. Colour pattern is almost same as that of female. Antenna with last atricle hook-like.

Material examined: INDIA: West Bengal, S-24 Parganas district, Sunderbans Biosphere Reserve, Pakhirala, 2 ♀, 2-3.viii.2013, Coll. Gaurav Sharma & Party, NZC Regd. Nos. 14634/H3 & 14635/H3; Birajnagar, 2 ♀ & 1 ♂, 5.viii.2013, Coll. Gaurav Sharma & Party, NZC Regd. Nos. 14636/H3 to 14638/H3.

Distribution: India: Arunachal Pradesh, Maharashtra, Odisha, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal. *Elsewhere:* China, Myanmar, Nepal, Pakistan, Sri Lanka.

Remarks: It is the first record of this species from Sunderbans Biosphere Reserve.

13. *Delta esuriens* (Fabricius, 1787)

(Image 13)

1787. *Vespa esuriens* Fabricius, 293, Syntype, Sex not mentioned, India (BMNH).

1992. *Delta esuriens*: Giordani Soika, 62.

2012. *Delta esuriens* (Fabricius): Girish Kumar, 58 (Matla: Gorosthan Ghori; Agarhati).

Diagnosis: Female: Size (H+M+T1+T2)

17 mm. Head yellow to brownish yellow with following black markings: a broad band on vertex including upper half of frons extending behind vertex to outer side of temple and to occiput, a black mark on anterior tentorial pit extending to subantennal suture to dorsal side of antennal scrobe and touches to the black band on frons and vertex; antennae light reddish; mandible yellow except at margins yellowish brown; pronotum almost entirely yellow except at anterior apex of anterior face of pronotum black; mesoscutum black except a large brown area posteriorly; scutellum light red; metanotum yellow, propleuron black or blackish brown; mesopleuron yellow to brownish yellow except mesepimeron brown to blackish brown and mesosternum black; metapleuron light red to reddish brown; propodeum light red except at basolateral apex near to lateral corner with yellow markings; legs light reddish with highly variable yellow markings; petiole light reddish except at base black, at subapically a black band and then a yellow band; T2 basally light reddish then a black band and remaining apical half yellow; S2 light red except at apex with a yellow band; all remaining visible part of gastral segments yellow, with their bases (when drawn out) black. Wings flavohyaline with a narrow subapical dark infumation on forewing. Clypeus smooth; frons and ocular sinus closely and strongly punctured; pronotum strongly and closely punctured except anterior face almost smooth; mesoscutum, scutellum and metanotum strongly and closely punctured; mesepisternum densely punctate; metapleuron almost smooth; propodeal dorsum strongly punctured except at dorsolateral angle with scattered punctures; ventral area of propodeum strongly punctured except the inner concavity with scattered punctures; lateral areas of propodeum almost smooth; petiole and gaster almost smooth.

Male: Size (H+M+T1+T2) 15.5 mm. Last antennal segment hooked apically, hook long, curved and pointed, in curved position it almost reaches the apex of ninth antennal segment; 3rd-6th gastral sternites with few large hairs; 7th with a deep median longitudinal groove; Genitalia with

apical tip of aedeagus bulb-like; parameral spine elongate with moderately large hairs subapically. Other characters almost same as in female.

Material examined: INDIA: West Bengal: S-24 Parganas district, Matla, Gorosthan Ghori, 1♂, 18.x.1965, Coll. A.N.T. Joseph & Party, 5178/H3; S-24 Parganas district, Agarhati, 1♀, 3.vi.1978, Coll. M. Prasad & Party, 13090/H3.

Distribution: India: Andhra Pradesh, Arunachal Pradesh, Chhattisgarh, Delhi, Gujarat, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Maharashtra, Manipur, Meghalaya, Odisha, Rajasthan, Tamil Nadu, Uttarakhand, Uttar Pradesh and West Bengal. *Elsewhere:* Arabia, Australia, Indonesia (Borneo, Java), Iran, Iraq, Laos, Mauritius, Myanmar, Pakistan, Philippines, Sri Lanka, Thailand, Timor.

14. *Delta pyriforme pyriforme*

(Fabricius, 1775)

(Image 14)

1775. *Vespa pyriformis* Fabricius, 371, Syntype, China (?).

1991. *Delta pyriforme pyriforme*: Krombein, 8.

2012. *Delta pyriforme pyriforme*: Girish Kumar & Lambert Kishore, 274 (Sunderbans: Bagabadpur).

Diagnosis: Female: Size (H+M+T1+T2) 26 mm. Head yellow, a broad transverse black band between the eyes on the vertex through ocellar area; occiput mostly black; antenna reddish brown; pronotum entirely and mesoscutum anteriorly yellow; tegula, parategula, scutellum and metanotum reddish brown; propleuron black; mesopleuron, metapleuron, propodeum and legs reddish brown with variegated black markings; the sutures between scutellum, metanotum and propodeum black; petiole and basal third of the second gastral segment reddish brown, the former black at base and with a subapical black band, the middle of the later black, its posterior third and the visible part of the remaining abdominal segments yellow. Wings deep flavohyaline with a narrow infumation on the apical margin of forewing. Clypeus smooth; frons and ocular sinus closely and strongly punctured; vertex and temple with

scattered minute punctures; pronotum strongly and closely punctured except anterior face almost smooth; mesoscutum and metanotum strongly and closely punctured; scutellum punctured except at posterior margin smooth; mesepisternum densely punctate; epicnemium, lower margin and posterior margin of mesopleuron smooth; metapleuron almost smooth; upper part of propodeum strongly punctured except at dorsolateral angle smooth; lower part of propodeum strongly punctured except the inner concavity almost smooth; lateral areas of propodeum almost smooth; gaster almost smooth with minute scattered punctures.

Material examined: INDIA: West Bengal: S-24 Parganas district, Sunderbans, Bagabadpur 1 ♀, 24.xi.2007, Coll. P. Girish Kumar, NZSI Regd. No. 13219/H3.

Distribution: India: Andaman & Nicobar Islands, Andhra Pradesh, Arunachal Pradesh, Assam, Chhattisgarh, Delhi, Gujarat, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Odisha, Pondicherry, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh, West Bengal. *Elsewhere:* Bhutan, Cambodia, China, Hawaii, Hong Kong, Indonesia, Malaysia, Moluccas, Myanmar, Nepal, New Guinea, Sri Lanka, Taiwan, Thailand, Vietnam.

15. *Oreumenoides edwardsii*

(de Saussure, 1852)

(Image 15)

1852. *Eumenes edwardsii* de Saussure, 60. Syntype: Female, Les Indes-Orientales, Bombay (MNHN).

1961. *Oreumenoides edwardsii*: Giordani Soika, 245.

2011. *Oreumenoides edwardsii*: Girish Kumar, 16 (Sunderbans Biosphere Reserve: Sudhanyakhali).

Diagnosis: Female: Size (H+M+T1+T2) 14-16 mm. Body ferruginous red with yellow and black markings. Yellow markings as follows: at the clypeus, a triangular mark on interantennal space, inner margin of lower eye extends up to ocular sinus, a narrow line on outer margin of eye, a spot on ventral side of antennal attachment, a short line on middle of the pronotum, a spot on tegula

apically, parategula, lower half of metanotum, a small spot on antero-lateral side of propodeum, a small spot on postero-lateral corner of propodeum, propodeal valvula, a streak on outer side of tibiae and basitarsi, a yellow mark on outer side of fore, mid and hind femora, a streak on each side just after middle of petiole, two subapical spots and two spots on postero-lateral corner on the same above, two lateral oval spots basally and a broad band apically on T2, two spots postero-laterally on T3, a narrow band on S2 apically, a broad band on S3 and S4 apically (sometimes fifth and sixth also). Black markings as follows: frons except inner ocular sinus, vertex, temple except ocular margin of eye, occiput, mesoscutum except an M-shaped ferruginous brown marking, apical margin of scutellum, basal half of metanotum, axillary fossa, suture between metanotum and propodeum, median groove of propodeum, mesepimeron largely, ventral side of mesosoma, base and middle of petiole above, middle of second gastral tergite, a broad longitudinal band from base up to middle of S2, two lateral spots on S2 subapically (sometimes faint, appears to be blackish brown). Forewing almost hyaline with some brown infumation anteriorly, a distinct brown infumation on radial cell at distal half. Clypeus apex emarginate with two lateral triangular tooth-like projections, almost smooth, upper margin emarginate.

Male: Body length 14-16 mm. Last antennal article minute, not coiled apically; parameral spine with moderately large hairs. Other characters almost same as in female.

Material examined: INDIA: West Bengal, S-24 Parganas district, Sunderbans Biosphere Reserve, Sudhanyakhali, 1 ♀, 1.iv.2008, Coll. P. Girish Kumar, NZC Regd. No. 12395/H3; Birajnagar, 1 ♀ & 2 ♂, 5.viii.2013, Coll. Gaurav Sharma & Party, NZC Regd. Nos. 14639/H3 to 14641/H3.

Distribution: India: Chhattisgarh, Delhi, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Pondicherry, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal. *Elsewhere:* Myanmar, Nepal, Pakistan, Thailand.

16. *Rhynchium brunneum brunneum*

(Fabricius, 1793)

(Image 16)

1793. *Vespa brunnea* Fabricius, 264. Syntype: sex not mentioned, "Tranquebariae, India (HMUG)".

1808. *Rhynchium brunneum*: Spinola, 189.

Diagnosis: Female: Body length (H+M+T1+T2) 15 mm. Body brownish red with the following black marks: a spot on interantennal space, a vertical line on lower frons, around ocelli, occiput, a large triangular mark on mesoscutum in front, a transverse line along its apex, propleuron, mesopleuron (except brownish red below tegula), metapleuron, propodeum in the middle and lateral sides below, basal two thirds of T1 and basal half of T2, S1 and S2 almost entirely, base of S3. Legs brownish red with variegated black markings. Wings yellowish hyaline, deeper and darker towards base; apical margin of forewing slightly infumated; clypeus strongly convex, pyriform, apical third with a broad medial vertical groove, extreme apex truncate, apex of truncated portion slightly incised, with moderately deep punctures, larger punctures on middle and smaller on sides.

Material examined: INDIA: West Bengal, S-24 Parganas district, Sunderbans Biosphere Reserve, Pakhirala, 1 ♀, 3.viii.2013, Coll. Gaurav Sharma & Party, NZC Regd. No. 14633/H3.

Distribution: India: Arunachal Pradesh, Bihar, Jharkhand, Maharashtra, Meghalaya, Odisha, Sikkim, Tamil Nadu, Uttarakhand, West Bengal. **Elsewhere:** Afghanistan, Cambodia, China, Guam, Indonesia, Iran, Iraq, Malaysia, Marquesas Island, Myanmar, Nepal, New Britain, Pakistan, Society Islands, Taiwan, Thailand.

Remarks: It is the first record of this species from Sunderbans Biosphere Reserve.

17. *Rhynchium carnaticum* (Fabricius, 1798)

(Image 17)

1798. *Vespa carnatica* Fabricius, 261. Syntype, sex not mentioned, Tranquebariae, India (ZMUC).

1852. *Rhynchium carnaticum*: de Saussure, 112.

Diagnosis: Female: Size (H+M+T1+T2) 13-16 mm. Body brownish red with the following black marks: a spot on interantennal space, a vertical line on lower frons, around ocelli, occiput, a triangular mark on mesoscutum in front, a transverse line along its apex, lateral sides of propleuron, epicnemium, propodeum in the middle, basal area of T1, at the base of T2, in between S1 and S2, base of S3. Legs brownish red with variegated black markings. Wings yellowish hyaline, deeper and darker towards base; apical margin of forewing slightly infumated. Mesoscutum posteriorly and scutellum almost impunctate with few sparse punctures on posterior sides; metanotum somewhat compressed medially; T2-T5 with very minute sparse and shiny punctures on $\frac{3}{4}$ area and S2-S4 with distinct punctures, the diameter of most of the punctures less than interspace.

Material examined: INDIA: West Bengal, S-24 Parganas district, Sunderbans Biosphere Reserve, Lakshmikantapur, 1 ♀, 15.x.1965, Coll. S. P. Chakraborty & Party, NZC Regd. No. 5274/H3; Canning, 1 ♀, 6.viii.2013, Coll. Gaurav Sharma & Party, NZC Regd. No. 14632/H3.

Distribution: India: Rajasthan, Tamil Nadu, West Bengal. **Elsewhere:** Indonesia (Sumatra), Sri Lanka.

18. *Rhynchium haemorrhoidale*

haemorrhoidale (Fabricius, 1775)

(Image 18)

1775. *Vespa haemorrhoidalis* Fabricius, 366, Type male, "ad Cap. b. Spei" (BMNH).

1852. *Rhynchium haemorrhoidale*: de Saussure, 1852, 109.

Diagnosis: Female: Size (H+M+T1+T2) 15 mm. Body black with the following reddish brown marks: antenna, mandibles except at margin, clypeus, a broad transverse mark on lower frons, inner eye margins, extending towards posterior ocelli and towards vertex, temple and lower portion of occiput, pronotum almost entirely except lateral margins, tegula almost entirely, a spot on mesopleuron below tegula, apical half and remaining portions of fore femora, apical margin

of T2 and the visible parts of remaining tergites, apical margins of S2 to S4 and visible parts of S5 & S6. Wings yellowish hyaline, deeper and darker towards base. Clypeus with moderately deep punctures; frons closely, strongly and rugosely punctured; vertex strongly punctured except at shallow postocellar fovea and area towards occipital carina; mesoscutum posteriorly and scutellum almost impunctate with few sparse punctures on posterior sides; metanotum somewhat compressed medially; T1-T5 and S2-S4 with distinct punctures, the diameter of most of the punctures less than interspace.

Male: Size (H+M+T1+T2) 13 mm. Colour pattern is almost same as that of female except clypeus, a transverse band at lower frons and scape ventrally yellow. clypeus more elongate and the apex between two teeth slightly emarginate; antenna with the last segment hook like, almost reaches the apex of tenth antennal segment in curved position; mid femur basally emarginate; stiff and stout hairs forms spine-like structures at the apical margin of S7. Other characters almost same as in female.

Material examined: INDIA: West Bengal: S-24 Parganas district, Sunderbans Tiger Reserve, Gosaba, 1 ♀ & 1 ♂, 12.ix.1983, Coll. S. S. Saha & Party, NZC Regd. Nos. 13785/H3 & 13851/H3.

Distribution: India: Karnataka, Tamil Nadu, West Bengal. *Elsewhere:* Throughout the Oriental Region, from Iran to New Guinea, Australia, Borneo, Indonesia (Batavia, Buitenzorg, Flores, Java, Korinchi Valley, Krakatau, Sumatra), Malaysia (Malaya), Myanmar, New Guinea, Singapore, Sri Lanka, Taiwan. A questionable record from the Cape Province of the Cape of Good Hope of the Republic of South Africa.

19. *Subancistrocerus sichelii*

(de Saussure, 1855)

(Image 19)

1855. *Odynerus sichelii* de Saussure, 206, male, Indes Orientales (MNHN).

1965. *Subancistrocerus sichelii* : Iwata, 105.

Diagnosis: Female: Size (H+M+T1+T2) 6.75

mm. Body black with pale yellowish white and brown colouration. Pale yellowish white colouration as follows: mandible towards base, a curved line on the clypeus at base, a spot between the antennae, a thick line on the scape ventrally, a small spot on the ocular sinus, a spot behind the eye on upper surface of temple, two small spots on pronotum dorsally, rarely two spots on tegula, parategula, a small spot on pointed apical lamella of sub marginal carina of propodeum, a transverse band on the apical margin of the T1, a slightly broader band on the apical margin of T2 and S2. Brown colouration as follows: mandible except basal area, pedicel and flagellar segments ventrally; wings hyaline. Clypeus with moderately deep punctures; frons closely, strongly and rugosely punctured; anterior face of pronotum with two close set but well separated deeply impressed fovea at middle; T1 with two transverse carinae, both carinae close together at crest of declivity, the space between them laterally depressed, smooth, shining and marked with stout keels, both carinae strongly pronounced.

Material examined: INDIA: West Bengal, S-24 Parganas district, Sunderbans Biosphere Reserve, Biraj Nagar, 1 ♀, 5.viii.2013, Coll. Gaurav Sharma & Party, NZC Regd. No. 14642/H3.

Distribution: India: Andaman & Nicobar Islands, Arunachal Pradesh, Assam, Bihar, Karnataka, Maharashtra, Meghalaya, Odisha, Sikkim, Tripura, Uttarakhand, West Bengal. *Elsewhere:* Bangladesh, Myanmar, Sri Lanka, Thailand.

Remarks: It is the first record of this species from Sunderbans Biosphere Reserve.

20. *Xenorhynchium nitidulum*

(Fabricius, 1798)

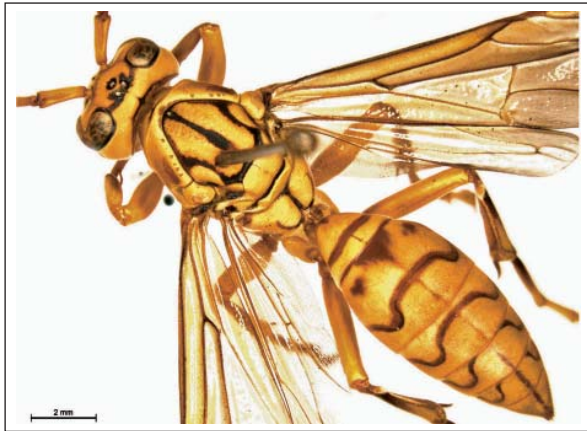
(Image 20)

1798. *Vespa nitidula* Fabricius, 262, Syntype, sex not mentioned, India Orientalis (ZMUK).

1963. *Xenorhynchium nitidulum*: Vecht, 111.

Diagnosis: Male: Size (H+M+T1+T2) 14-15 mm. Black except base of clypeus and ventral side of scape whitish yellow, all flagellar segments

PLATE 1



1. *Polistes (Gyrostoma) olivaceus* (De Geer) ♀



2. *Polistes (Polistella) stigma tamula* (Fabricius) ♀



3. *Ropalidia brevita* Das & Gupta ♀



4. *Ropalidia cyathiformis* (Fabricius) ♀



5. *Ropalidia jacobsoni* (Du Buysson) ♀



6. *Vespa affinis affinis* (Linnaeus) ♀

PLATE 2

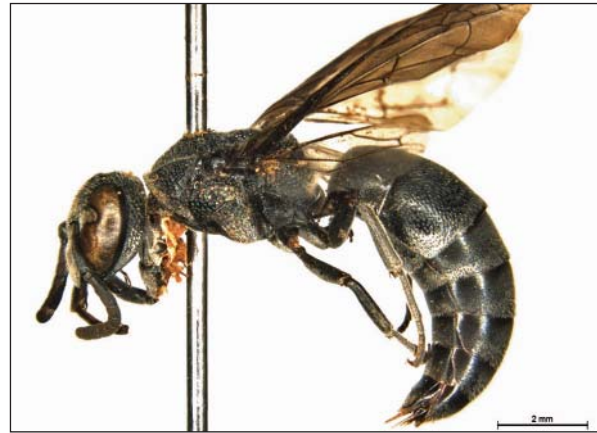
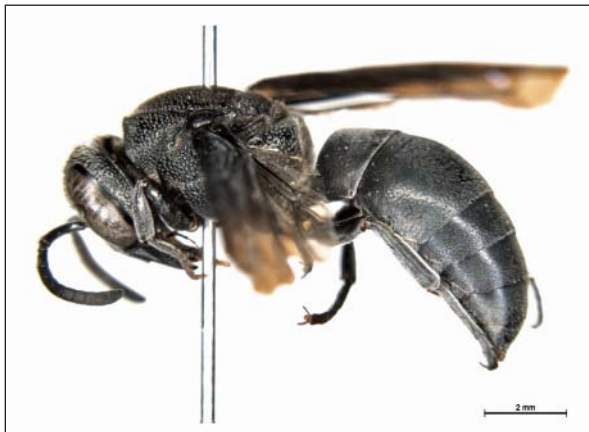
7. *Vespa tropica haematodes* Bequaert ♀8. *Allorhynchium argentatum* (Fabricius) ♂9. *Allorhynchium metallicum* (de Saussure) ♀10. *Anterhynchium (A.) abdominale abdominale* (Illiger) ♂11. *Antodynerus flavescens flavescens* (Fabricius) ♀12. *Delta conoideum* (Gmelin) ♀

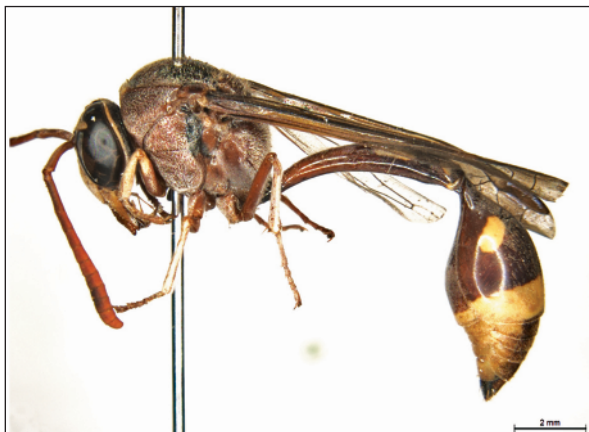
PLATE 3



13. *Delta esuriens* (Fabricius) ♀



14. *Delta pyriforme pyriforme* (Fabricius) ♀



15. *Oreumenoides edwardsii* (De Saussure) ♂



16. *Rhynchium brunneum brunneum* (Fabricius) ♀

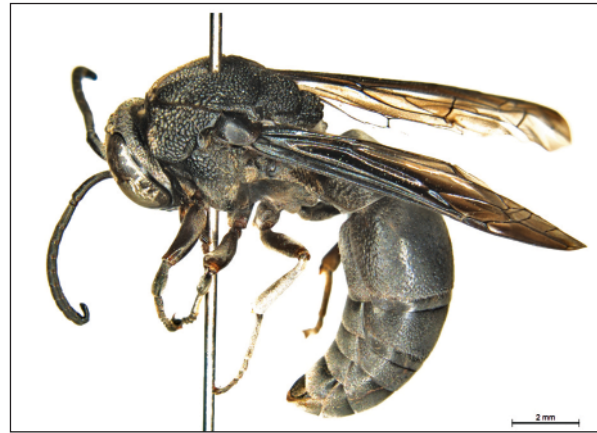


17. *Rhynchium carnaticum* (Fabricius) ♀



18. *Rhynchium haemorrhoidale haemorrhoidale* (Fabricius) ♂

PLATE 4

19. *Subancistrocerus sichelii* (De Saussure) ♀20. *Xenorhynchium nitidulum* (Fabricius) ♂21. Nest of *Ropalidia brevitarsis* Das & Gupta22. Nest of *Ropalidia cyathiformis* (Fabricius)23. Nest of *Ropalidia jacobsoni* (du Buysson)24. Nest of *Vespa affinis affinis* (Linnaeus)

brown ventrally, lower part of ocular sinus brown; antennal hook long and curved, somewhat dilated and flattened in apical half, with rounded apex, in curved position it almost reaches the apex of ninth antennal segment; metanotum strongly raised above the level of adjoining areas of propodeum, the flattened dorsal surface approximately rectangular and about as long as the vertically sloping posterior surface; propodeum with prominent lateral angles, the concave declivity rather sharply separated from dorsal and lateral areas; S7 rather strongly excavated, the concave area finely, granulated punctate and bordered by an arcuate and blunt ridge; parameral spine elongate.

Material examined: INDIA: West Bengal, S-24 Parganas district, Sunderbans Biosphere Reserve, Birajnar, 2♂, 5.viii.2013, Coll. Gaurav Sharma & Party, NZC Regd. No. 14643/H3 & 14644/H3.

Distribution: India: Andhra Pradesh, Bihar, Gujarat, Himachal Pradesh, Jammu & Kashmir, Jharkhand, Karnataka, Kerala, Maharashtra,

Odisha, Pondicherry, Rajasthan, Tamil Nadu, Uttarakhand, Uttar Pradesh, West Bengal. *Elsewhere:* Pakistan.

Remarks: It is the first record of this species from Sunderbans Biosphere Reserve.

SUMMARY

The present paper includes the systematic account of the family Vespidae from Sunderbans Biosphere Reserve. It consists of 20 species belonging to 11 genera and 3 subfamilies. Out of these, 2 species are newly recorded here from West Bengal and 11 species are newly recorded here from Sunderbans Biosphere Reserve.

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