

FAUNA OF RAJASTHAN, INDIA, HYMENOPTERA

by

O. B. CHHOTANI AND K. K. RAY

Zoological Survey of India, Calcutta

(With 1 table and 4 text-figures)

I. INTRODUCTION

(a) *General*

The state of Rajasthan is situated in the North-western part of the Indian Union. It has an area of approximately 3,38,107 square km., of which the western three-fifths forms the Great Indian Desert.

The fauna of this ecologically important, large portion of the Indian subcontinent has been almost unknown, until the Zoological Survey of India started conducting a general faunistic survey in a systematic and detailed manner in the year 1956. Since then a number of parties of the department have surveyed and collected in the state, as a result of which a large collection of the representative fauna was made available for study. The present study is the continuation of the study of the fauna of the state and is based on the Hymenoptera collections received through these surveys. The collection comprises of several hundred examples. As many as 46 species belonging to 31 genera and 12 families are recorded in this paper here from these collections.

A species, new to science, of the genus *Iswara* Westwood (Thynnidae), and the male of *Cataglyphis bicolor setipes* (Forel) (Formicidae), are described.

(b) *Acknowledgements*

Grateful thanks are due to Dr. A. P. Kapur, Director and Shri K. S. Pradhan, Superintending Zoologist, Zoological Survey of India, for their valuable suggestions and interest in the present study.

(c) Abbreviations used

Alt.,	—	Altitude above mean sea-level.
Coll.,	—	Collected by.
Colln.,	—	Collection.
Dist.,	—	District.
Ex(s).	—	Example(s).
Lat.,	—	Latitude.
Long.,	—	Longitude.
Z.S.I.,	—	Zoological Survey of India, Calcutta (India)

II. TOPOGRAPHY, CLIMATE, ETC. OF RAJASTHAN

The state of Rajasthan lies approximately between 23°10' and 30°30' N. latitudes and 69°50' and 78°25' E. longitudes. It has an area of about 3,38,107 square km., and is divided into two unequal, climatically different halves by the Aravalli Hills which cut across it diagonally south-west to north-east. The north-western portion, thus separated, forms a part of the Great Indian Desert and the south-eastern portion forms the hilly and wetter area.

The plains are very hot and dry during the summers and very cold and dry in winters. The hilly areas have moderate and wetter climate. The rainfall is very scanty in the desert portion (15-35 cm.) and fairly good in the hilly areas (60-150 cm.).

The vegetation is scrub forest, thorny bushes and trees at places in the desert region and thick forests of tall and long trees in the hilly Aravallis.

III. HISTORY AND PRESENT KNOWLEDGE OF
HYMENOPTERA OF RAJASTHAN

(a) History

In the "Fauna of British India (Hymenoptera) volume I", published in the year 1897, there is no specific record of the occurrence of any Hymenoptera from Rajasthan. The first available reference, in the literature, on the record of any such insects, from the state of Rajasthan, is that of Nurse (1902), who described *Chrysis abuensis* (Chrysididae) from Mount Abu.

In the "Fauna of British India (Hymenoptera) volume II" (ants and cuckoo wasps), published subsequently in the year 1903, apart from the species *Chrysis abuensis* Nurse, there is a specific mention of the occurrence of only one more species i.e., *Holopyga indica* Mocsary (Chrysididae), from Rajasthan.

Nurse (1903 *a* & *b* ; 1904 ; 1909) described a number of species of the families Pompilidae, Sphecidae, Eumenidae, Colletidae and Apidae from Mount Abu.

Aiyar (1916 *a* & *b* ; 1917), in his catalogue of wasps and bees, records, from Rajasthan, as many as 23 species (Pompilidae, 2 ; Sphecidae, 12 ; Eumenidae, 2 ; Colletidae, 1 ; and Apidae, 6) described after the publication of the Fauna series. Most of these species are those described by Nurse (1903—1909), Cameron (1907 ; 1908 *a* & *b*) and Turner (1912), all of which are again from Mount Abu and are as follows :—

Family : POMPILIDAE

Salius avidus Nurse, *Pompilus julius* Nurse

Family : SPHECIDAE

Astata absoluta Nurse, *A. compta* Nurse, *Tachytes dilwara* Nurse, *T. flagellata* Nurse, *T. shiva* Nurse, *Trypoxylon responsum* Nurse, *Psen refractus* Nurse, *Gorytes impudens* Nurse, *G. intrudens* Nurse, *Stizus coloratus* Nurse, *Cerceris dolosa* Nurse, *C. abuensis* Turner.

Family : EUMENIDAE

Odynerus hostis Nurse, *O. proclusus* Nurse

Family : COLLETIDAE

Prosopis montana Nurse

Family : APIDAE

Halictus abuensis Cameron, *Nomia abuensis* Cameron, *N. collina* Cameron, *Heriades tenuis* Nurse, *Sphecodes abuensis* Nurse, *S. tantalus* Nurse.

Aiyar (1916 *a* & *b* ; 1917) does not include *Coelioxys perseus* Nurse (Family Apidae), and *Tachytes astuta* Nurse and *Cerceris protea* Turner (Family Sphecidae), which he probably overlooked. These 3 species are again from Mount Abu. Turner (1912), recorded *Cerceris vischnu* Cameron also from Mount Abu.

Since the publication of Aiyar's catalogue and until recently, only one more species, viz. *Scolia cyanipennis* Fabr., of wasps and bees has been recorded by Betrem (1928) from Rajasthan and that again from Mount Abu.

Apart from the wasps and bees, Cameron (1905; 1907) described the following 8 parasitic Hymenoptera from Rajasthan, all of which were from Mount Abu.

Family : ICHNEUMONIDAE

Metopius pulchripes Cameron, *M. rufus* Cam., *Campoplex nursei* Cam., *Eutanyacra alboannulata* Cam.

Family : CHALCIDIDAE

Onchochalcis nursei Cam., *Chalcis megaspila* Cam.

Family : EVANIIDAE

Gasteruption abuense Cam.

Family : BRACONIDAE

Disophrys laticeps Cam.

In the "Fauna of British India (Hymenoptera)" volume III for Ichneumonidae (Ichneumones Deltoidei), the following 7 species are recorded from Rajasthan, all again from Mount Abu.

Metopius pulchripes Cameron, *M. rufus* Cam., *Campoplex confusus* Forst. (Syn. *C. nursei* Cam.), *Henicospilus merdarius* Grav., *Agrypon varitarsum* Wesmael, *Angitia fenestralis* Holmg. *Pristomerus marginicollis* Cameron.

Of these above Ichneumonidae, *Metopius pulchripes* Cameron has been treated as a synonym of *Metopius (Metopius) rufus* Cameron and *Campoplex nursei* Cameron, *Henicospilus merdarius* Grav., *Agrypon varitarsum* Wesmael and *Angitia fenestralis* Holmgren have been transferred to the genera *Dusona*, *Enicospilus*, *Labrorychus* and *Diadegma*, respectively, by Townes, Townes and Gupta (1961), in their catalogue of the Indo-Australian Ichneumonidae.

Since the publication of Fauna of British India for Ichneumonidae there is no record of any Ichneumons from Rajasthan.

Only one species of Braconidae i.e., *Disophrys laticeps* Cameron, is known from Rajasthan. Aiyar (1924) in the catalogue of braconid wasps, described from the Indian region, does not include this species,

The family Chalcididae was so far represented by 2 species, *Chalcis megaspila* Cam. and *Onchochalcis nursei* Cam., described by Cameron (1907) Mani (1938), in his catalogue of Chalcididae, transferred *Chalcis megaspila* to the genus *Brachymeria*.

The Evaniidae is represented by the species *Gasteruption abuense* Cameron, which Mani (1939), refers to the genus *Trigonofoenus*.

All these records of Hymenoptera, from Rajasthan, were from south-eastern, wetter portion of the state. The desert area remained practically unexplored. There is a single reference (Pruthi and Bhatia, 1952) on the insects of the desert part of the state, in which the following 4 species are recorded :—

Family : APIDAE

Xylocopa fenestrata (Fab.), *Megachile vigilance* Smith

Family : VESPIDAE

Polistes hebraeus (Fabr.)

Family : MUTILLIDAE

Mutilla durga Smith

Thus 45 species of Hymenoptera were so far known from Rajasthan, most of which came from Mount Abu in the Aravalli Hills in the south-eastern portion of the state. The desert region of the state had remained practically unexplored as far as the insects of order Hymenoptera are concerned.

(b) *Present knowledge*

The Zoological Survey of India has conducted several extensive surveys of western, eastern and central portions of the state during the years 1956-61. The present work is based on the material of Hymenoptera collected during these surveys and made available to us for our study. Fortysix species belonging to 31 genera, distributed in 12 families of the order Hymenoptera are recorded. Out of these only two viz., *Polistes hebraeus* Fabr. and *Xylocopa (Otenoxylocopa) fenestrata* (Fabr.) were already known from Rajasthan. All others are new records for Rajasthan.

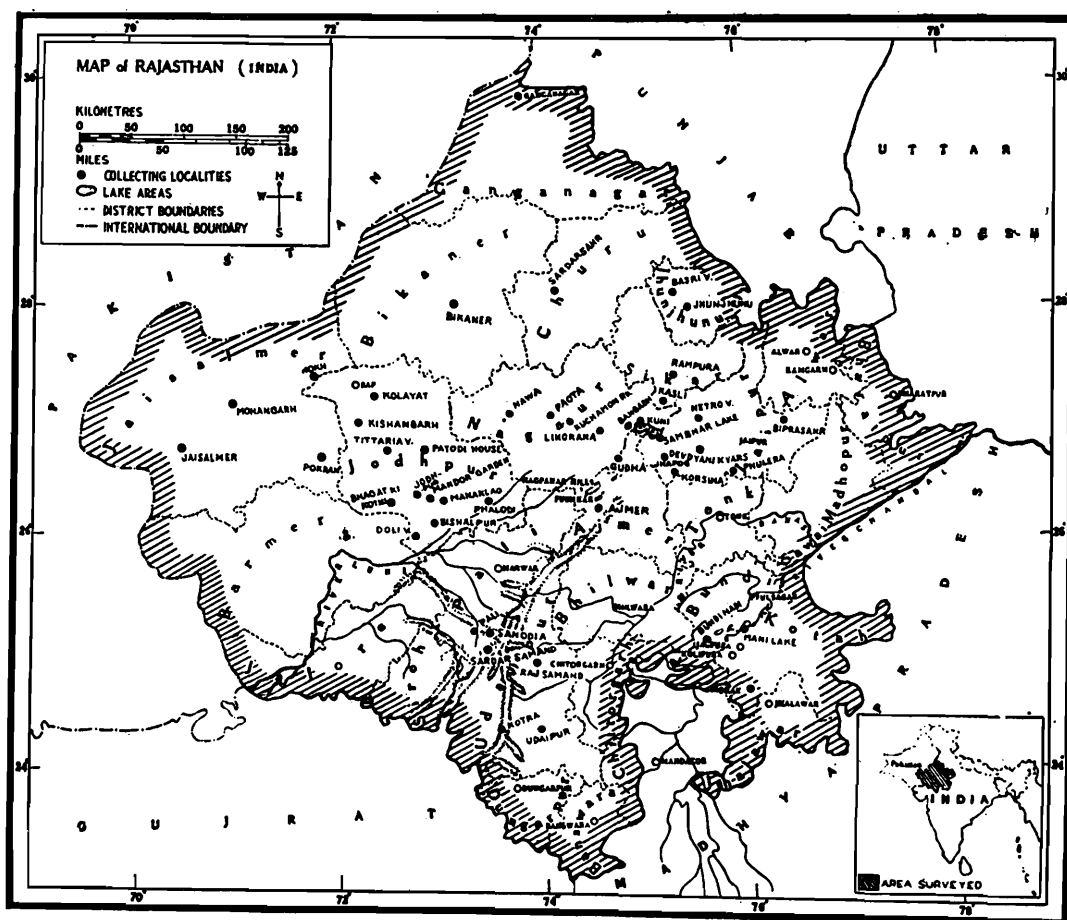
It may be noted that the species, occurring in higher alti-

tudes *i.e.*, Mount Abu in the Aravallis, already recorded in the literature, are not found in the plains, showing thereby the ecological adjustment of different species to different climatic and topographic conditions.

Including the species recorded here, in the present paper, it is seen that, in all, 89 species of Hymenoptera are now known from the whole state of Rajasthan. It is very likely that more species may come to light with the further intensive surveys.

IV. LIST OF COLLECTING STATIONS

Collections of Hymenoptera were made from 47 localities, distributed over 14 districts of Rajasthan. A list of the collecting stations, together with the altitudes (above mean sea-level) and the approximate latitudes and longitudes, is given in Table 1.



Text-fig. 1. Map of Rajasthan showing Collecting Stations,

TABLE 1.—List of Collecting Stations for Hymenoptera of Rajasthan

Sl. No.	Location	Altitude (above mean sea- level in m.)	Latitude	Longitude	District in which situated
1.	Ajmer	483 m.	26°27'	74°42'	Ajmer
2.	Bangadh	—	27°13'	75°00'	Nagaur
3.	Bikaner	224 m.	28°01'	73°22'	Bikaner
4.	Basri village	—	25°14'	75°20'	Jhunjhunu
5.	Bhagat-ki-kothi	—	25°40'	72°00'	Jodhpur
6.	Bishalpur	—	26°10'	73°15'	Jodhpur
7.	Biprasahr	—	27°15'	76°25'	Jaipur
8.	Bundi Nadi	366 m.	25°27'	75°41'	Bundi
9.	Condoneer (?)	—	—	—	—
10.	Devdyani Kyars	—	26°55'	75°13'	Jaipur
11.	Doli village	—	26°00'	72°40'	Jodhpur
12.	Gudha	—	26°55'	75°25'	Nagaur
13.	Jhapog	—	26°55'	75°02'	Jaipur
14.	Jaisalmer	—	26°55'	70°57'	Jaisalmer
15.	Jodhpur	—	26°18'	73°04'	Jodhpur
16.	Jhunjhunu	—	28°06'	75°24'	Jhunjhunu
17.	Kasli	—	27°30'	75°00'	Sikar
18.	Kuni	—	27°00'	75°11'	Nagaur
19.	Kishangarh	—	27°09'	72°24'	Jodhpur
20.	Kolayat (ca. 50 km. of Bikaner)	—	27°50'	72°58'	Bikaner
21.	Korsina (ca. 10 km. Sw of Jhapog)	—	26°55'	75°02'	Jaipur
22.	Kotra	—	24°55'	78°20'	Udaipur
23.	Kuchamon Road	—	27°00'	74°55'	Nagaur
24.	Lihorana	—	27°02'	75°25'	Nagaur
25.	Mani Lake	—	25°45'	76°05'	Kotah
26.	Mohangarh (ca. 130 km. NE of Jaisalmer)	—	27°20'	71°15'	Jaisalmer
27.	Mandor Garden	—	26°20'	73°00'	Jodhpur
28.	Monaklao	—	26°20'	73°05'	Jodhpur
29.	Nawa	297 m.	27°11'	73°41'	Nagaur
30.	Netro Village	—	27°25'	75°50'	Jaipur
31.	Nokh	178 m.	27°33'	72°15'	Jaisalmer
32.	Paota	—	27°20'	74°35'	Nagaur
33.	Phalodi	—	26°40'	73°55'	Jodhpur
34.	Pali	—	25°46'	73°25'	Pali
35.	Palidung	—	—	—	—
36.	Patodi House	—	26°40'	73°00'	Jodhpur
37.	Pokran	—	26°52'	71°56'	Jaisalmer
38.	Phulera	—	26°52'	75°16'	Jaipur
39.	Rajsamand	—	25°00'	73°50'	Udaipur
40.	Rampura	—	27°40'	75°20'	Sikar
41.	Sambhar Lake	—	26°54'	75°13'	Jaipur
42.	Sanodia	—	25°40'	74°05'	Pali
43.	Sardarsahr	—	28°30'	74°29'	Churu
44.	Sardar Samand	—	25°00'	72°55'	Udaipur
45.	Sriganga nagar	—	29°55'	73°55'	Ganganagar
46.	Tittaria Village	—	26°55'	72°50'	Jodhpur
47.	Udaipur	753 m.	24°30'	73°50'	Udaipur

V. SYSTEMATIC ACCOUNT

Family (I) MUTILLIDAE

Genus (1) *Apterogyna* Latreille1. *Apterogyna mutilloides* Smith

1855. *Apterogyna mutilloides* Smith, F., *Cat. Hym. B.M.*, 3: 64. ♀, ♂
 1897. *Apterogyna mutilloides*: Bingham, C.T., *Fauna Brit. India* (Hym.), 1: 2. ♀, ♂
 1902. *Apterogyna mutilloides*: Andre, E., *Gen. Insect.* (Mutillidae), 1: 6.

(a) *Material examined*.—3 ♂ ♂, Nawa, coll. T. G. Vazirani, 10.v.1958.

(b) *Measurements*.—♂ Total body length 13-14 mm.; wing expanse 22-23 mm.

(c) *Distribution*.—Rajasthan : Nawa (Dist. Nagaur). Elsewhere : India : Allahabad (U.P.) and North-West Provinces.

2. *Apterogyna nigra* Dover

1924. *Apterogyna nigra* Dover, C. *Ent. month. Mag.*, (3) 60: 255.

(a) *Material examined*.—1 ♂, Tittaria village, coll. J. S. Bhatti, 21.v.1962.

(b) *Measurements*.—♂ Total body length 13 mm.; wing expanse 28 mm.

(c) *Distribution*.—Rajasthan : Tittaria village. Elsewhere : Quetta (Pakistan), type-locality.

(d) *Remarks*.—The species *Apterogyna nigra* Dover was described from Quetta, Pakistan. It is recorded from India for the first time.

Genus (2) *Trogaspidia* Ashmead3. *Trogaspidia sexmaculata* (Swederus)

1787. *Mutilla sex-maculata* Swederus, P. (nec Smith), *Nouv. Act. Hoim.*, 8: 286.
 1897. *Mutilla sex-maculata*: Bingham, C.T., *Fauna Brit. India* (Hym.), 1: 25. ♀.
 1902. *Mutilla sexmaculata*: Andre, E., *Gen. Insect.*, (Mutillidae), 1: 41.
 1960. *Trogaspidia sexmaculata*: Hammer, K., *Rec. Indian Mus.*, 58 (1): 14.

(a) *Material examined*.—1 ♀; Ajmer, coll. S. Biswas, 17.viii.1965.

(b) *Measurements*.—♀. Total body length 14 mm.

(c) *Distribution*.—Rajasthan : Ajmer. Elsewhere : India : Punjab ; Allahabad (Uttar Pradesh) ; Barrackpore (West Bengal) ; and Bombay.

Family (II) THYNNIDAE

Genus (3) *Iswara* Westwood

The genus *Iswara* was described by Westwood (1851, p. 233) and placed in the family Thynnidae. Smith (1873 p. 253) while describing the species *Iswara fasciatus*, Bingham (1897) and Friese (1911, p. 15) also referred the genus to Thynnidae. Turner (1909) placed it in the family Scoliidae and (1910, p. 105) did not include it in the family Thynnidae. Betrem (1928), however, does not include this genus in his monograph on the Indo-Australian Scoliidae and mentions that the genus belongs to the relationship line of Börner's (1919) Mutillidae group.

Due to this controversy in the assignment of the genus and as it is not possible for us at the moment to place the genus with definiteness to a particular family, we have followed Westwood (1859), Bingham (1897) and Friese (1911), vide *Supra*.

4. *Iswara luteus* Westwood

1850. *Iswara luteus* Westwood, J. O., *Trans. ent. Soc., Lond.* 1850 : 233. ♂

1897. *Iswara luteus*: Bingham, C.T., *Faun. Brit. India (Hym.)*, 1 : 55. ♂ .

(a) *Material examined*.—14 ♂♂ as follows :—(i) Coll. T. G. Vazirani (1.iv to 17.v.1958) Gudha : (6 ♂♂) ; Sambhar Lake (1 ♂) ; Korsina (1 ♂) ; Phulera (1 ♂) (ii) Coll. J. S. Bhatti, 21.v.1961, Tittaria village (5 ♂♂)

(b) *Measurements*.—♂ Total body length 14.5-16 mm. ; wing expanse 13-15 mm.

(c) *Distribution*.—Rajasthan : Gudha, Korsina, Phulera, Sambhar Lake and Tittaria village. Elsewhere : Western India and Sind (Pakistan)

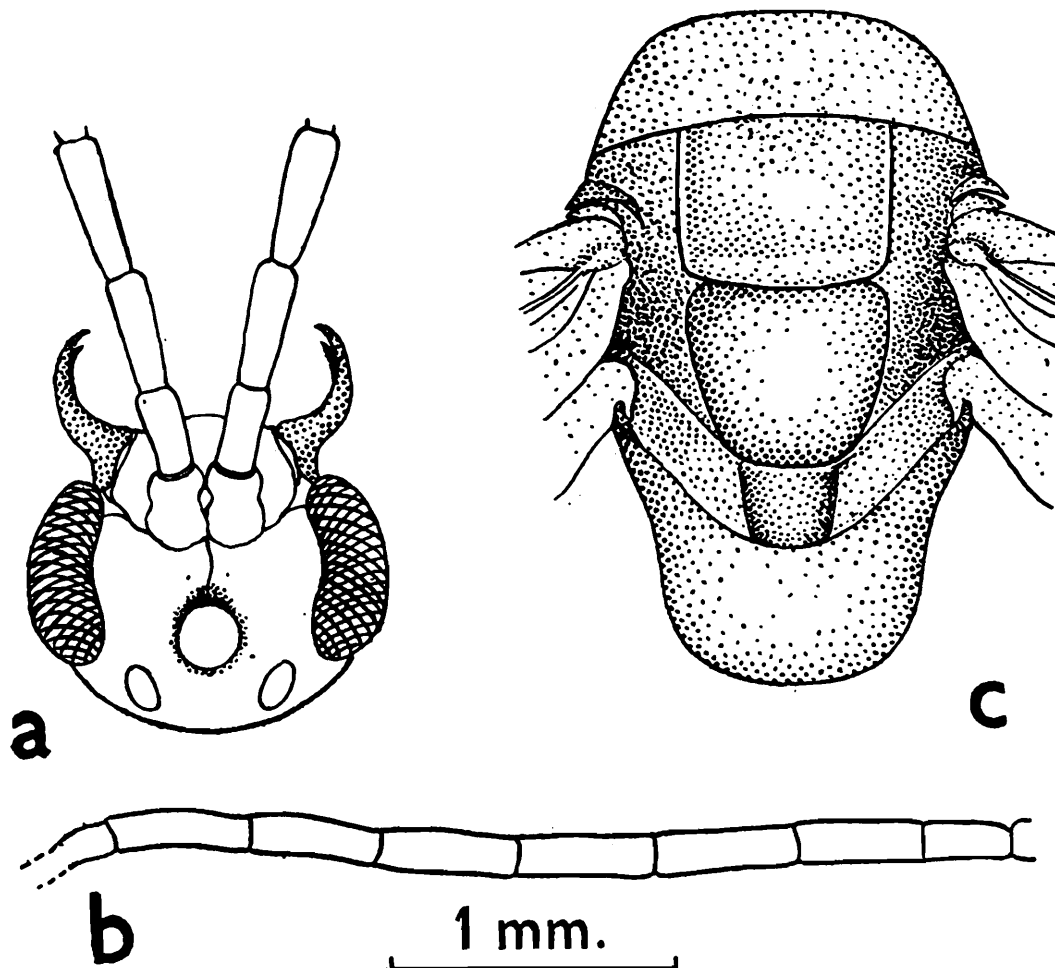
5. *Iswara rajasthanicus* sp.n.

(Text-figs. 2 and 3)

(a) *Material examined*.—3 ♂♂ Tittaria village, coll. J. S. Bhatti, 21.v.1962.

(b) *Description*.—♂ *General*: Head-capsule generally and eyes black; frons, antennae, scutellum, metanotum and legs pale brown; clypeus pale yellow; mandibles dark brown, paler basally; pronotum pale yellow in basal half, transparent in apical half; mesonotum brown with two pale brown longitudinal stripes; wings transparent; median segment and abdomen brownish, apical portions of median segment and of 1-6 abdominal segments pale yellow; pale yellow area on the abdominal segments wider medially. Head with a few, sparse and shallow punctures; thorax and abdomen smooth. Clypeus, bases of mandibles, head around cervix, legs and abdomen with pale yellow pilosity.

Head: Head with eyes round, a little broader than long and as wide as thorax; cheeks not well developed. Eyes fairly

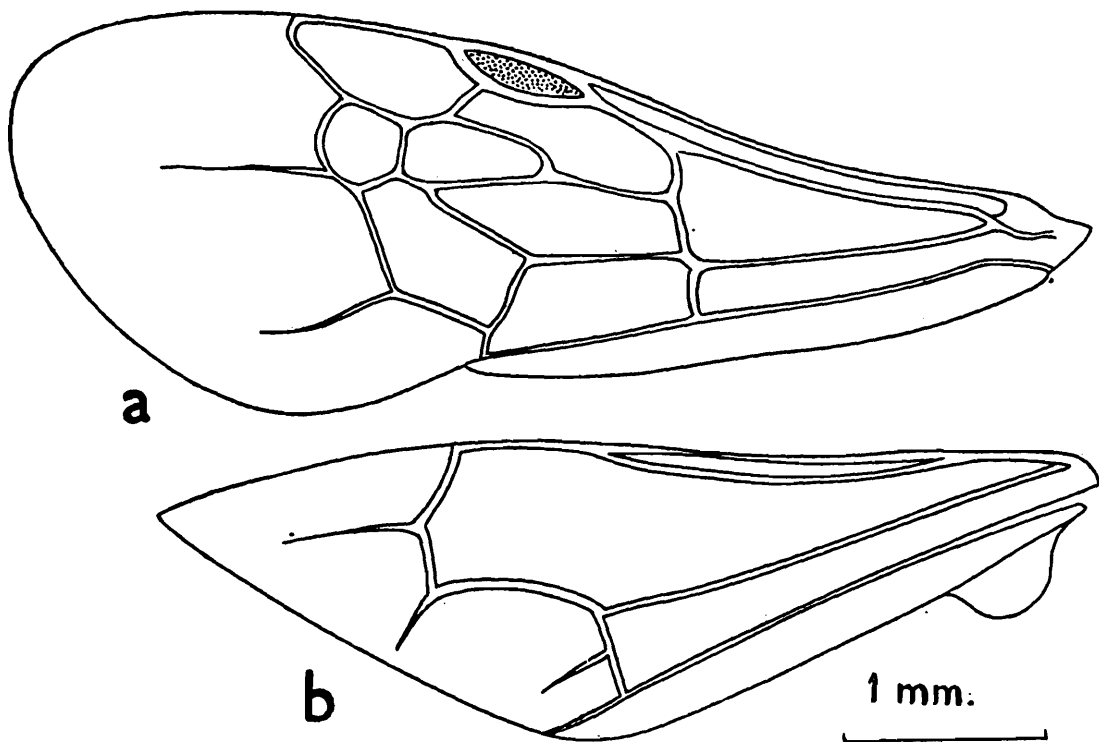


Text-fig. 2. *Iswara rajasthanicus* sp.n., Paratype.—a. Head, front view; b. Antenna, in part; c. Thorax, dorsal view.

large, oval, somewhat broader anteriorly and weakly emarginate on inner margins a little behind antennae. Ocelli large and shining; the median one anteriorly and the lateral ones on outer sides somewhat sunk in. Antennae thin and long; broken in the specimens examined; scape small and short; pedicel thick and larger than scape, flagellum setaceous with thin and long segments. Clypeus, transversely subovate, fairly swollen and with several long yellow bristles. Labrum concealed. Mandibles curved, slender, narrowing apically into an acute apex and with a minute tooth on inner margin in apical fourth.

Thorax: Thorax oblong. Pronotum transverse, reaching upto the base of wings laterally. Mesonotum squarish, with a ridge on lateral and posterior margins; scutellum quadrate, somewhat swollen and narrowed posteriorly; postscutellum like the scutellum but narrower. Metanotum transverse. Median segment rounded, posteriorly inclining and apilose. Legs thin and long; tarsi 5-jointed; claws bifid.

Wings: Moderately long. Forewing: Stigma large, transverse and brown; costal cell narrowly elongate; radial cell elongately transverse, not clearly appendiculated; 1st cubital cell narrowly elongate; 2nd irregularly rectangular, smaller than 1st and receiving the 1st recurrent on its lower side, a little away from its middle; 3rd cubital subquadrate, about



Text-fig. 3. *Iswara rajasthanicus* sp.n., Paratype.—a. Left forewing, dorsal view; b. Left hind wing, dorsal view.

half of 2nd and receiving the 2nd recurrent at the junction of lower and apical veins; 1st discoidal cell elongately rectangular, a little longer than 1st cubital; 2nd discoidal roughly pentagonal; basal elongately triangular; 1st subbasal elongately rectangular; 2nd also elongately rectangular but shorter than 1st; apical not clearly marked; anal long and narrow. Hind-wing: Costal cell long and linear, extending upto a little beyond the middle of wing-membrane; radial, cubital and discoidal cells incomplete; radial, cubital, discoidal and anal nervures short, not reaching upto the apex; anal lobe fairly large.

Abdomen: Elongate, narrowed towards apex. Tergites 2-6 with semicircular impression. Anal segment with an upcurved spine.

♀. Not known.

Measurements (in mm.) of *Iswara rajasthanicus* sp.n.

	Range (3 exs.)	♂ Holotype
1. Total body length (without antennae) C.	7.0-8.0	7.00
2. Head width with eyes	1.23-1.4	1.23
3. Long diameter of eye	0.70-0.90	0.70
4. Short diameter of eye	0.50-0.57	0.50
5. Diameter of median ocellus	0.23-0.25	0.23
6. Diameter of lateral ocelli	0.20-0.23	0.20
7. Length of mandibles	0.50-0.53	0.50
8. Length of forewing C.	4.2-5.0	4.2
9. Length of abdomen C.	3.83-4.2	3.83

(c) *Type-specimens*: Holotype: A male vide "material" above Z.S.I. Reg. No. 6014/H₃, in National Zoological Collections, Zoological Survey of India, Calcutta.

Paratypes: 2 males vide "material" above also in Z.S.I., Calcutta.

(d) *Type-locality and Distribution*: India: Tittaria village, Jodhpur District, Rajasthan.

(e) *Comparison*: Only two other species, viz. *luteus* Westw. and *fasciata* Sm. of the genus *Iswara* are known from the Indian subregion from which this species can be differentiated for its smaller size and for having brownish abdomen (yellow with ferruginous bands in *luteus* and black with white bands in *fasciata*).

Family (III) SCOLIIDAE

Genus (4) **Campsomeris** Guerin

6. **Campsomeris annulata** (Fabricius)

1793. *Tiphia annulata* Fabricius, J. C., *Ent. Syst.*, 2: 225. ♀.
 1897. *Elis annulata*: Bingham, C. T., *Fauna. Brit. India (Hym.)*, 1: 96.
 ♀, ♂ (♀ nec. ♂ *vide* Betrem 1928, *infra*).
 1928. *Campsomeris annulata*: Betrem, J. G., *Treubia*, 9: 67, 79, 94.
 ♀, ♂

(a) *Material examined*.—59 examples, coll. T. G. Vazirani, 30.iv.1958-23.v.1958, as follows:—Jhapog (3 ♀♀); Gudha (5 ♂♂ & 17 ♀♀); Bangadh (3 ♀♀); Nawa (5 ♀♀); Sambhar Lake (3 ♂♂, 7 ♀♀); Korsina (4 ♂♂, 10 ♀♀); Phulera (1 ♂) and Lihorana (1 ♀)

(b) *Measurements*.—Total body length (♀ 15-25 mm.; ♂ 13-22 mm.); wing expanse (♀ 28-40 mm.; ♂ 28-36 mm.).

(c) *Distribution*.—Rajasthan: Bangadh; Gudha; Jhapog; Lihorana; Korsina; Nawa; Phulera and Sambhar Lake. Elsewhere: India: N. W. Provinces and southern India. This species is also known to occur in Sikkim, Burma, China, Malaya and Japan.

7 **Campsomeris collaris** (Fabricius)

1775. *Tiphia collaris* Fabricius, J. C., *Syst. Ent.*: 354.
 1897. *Elis thoracica*: Bingham, C. T., *Faun. Brit. India (Hym.)*, 1: 99
 (♀ nec. var., nec. ♂, *vide* Betrem, 1928, *infra*).
 1897. *Elis fimbriata*: Bingham, C. T., *Faun. Brit. India (Hym.)*, 1:
 99. ♀.
 1928. *Campsomeris collaris*: Betrem, J. G., *Treubia*, 9: 75, 79, 126,
 ♀, ♂

(a) *Material examined*.—21 examples as follows:—Coll. A. K. Mukherjee, Sambhar Lake (1 ♂, 3 ♀♀), 11.xi.1958; Gudha (14 ♀♀), 12-19.xi.1957; coll. T. G. Vazirani, Sambhar Lake (3 ♂♂), 21.v.1958.

(b) *Measurements*.—Total body length (♀ 24-28 mm.; ♂ 15-24 mm.); wing expanse (♀ 42-50 mm.; ♂ 30-40 mm.).

(c) *Distribution*.—Rajasthan: Gudha; Sambhar Lake. Elsewhere: This species is very common and is known from almost all over the Indian subcontinent. It is also known to occur in Ceylon and several islands in the Indonesian group of islands. For detailed distribution *vide* Betrem (1928)

8. **Campsomeris marginella** Klug

1810. *Scolia marginella* Klug, F. Beitr. Naturk., II: 2, 4. ♂
 1897. *Elis hirsuta* Bingham, C. T., Faun. Brit. India (Hym.), 1: 98.
 ♀, ♂
 1928. *Campsomeris marginella*: Betrem, J. G., Treubia, 9: 135. ♀, ♂
 (a) *Material examined*.—10 examples, coll. T. G. Vazirani,
 24.iv. to 14.v.1958, as follows:—Gudha (4 ♀♀, 2 ♂♂);
 Sambhar Lake (3 ♀♀); Korsina (1 ♂).
 (b) *Measurements*.—Body length (♀ 10 mm.; ♂ 9 mm.);
 wing expanse (♀ 16 mm.; ♂ 15 mm.).
 (c) *Distribution*.—Rajasthan: Gudha; Korsina and Sam-
 bhar Lake. Elsewhere: India: Calcutta; Trivandrum.

Family (IV) POMPILIDAE

Genus (5) **Pompilus** Fabricius9. **Pompilus analis** (Fabricius)

1781. *Sphex analis* Fabricius, J. C., Spec. Insect., 1: 447.
 1897. *Pompilus analis*: Bingham, C. T., Faun. Brit. India (Hym.), 1:
 150. ♀, ♂
 1897. *Pompilus analis*: Dalla-Torre, C. G. De, Cat. Hym., 8: 272.
 (a) *Material examined*.—1 ♀, Kuchaman Road, coll. T. G.
 Vazirani, 16.ii.1958.
 (b) *Measurements*.—♀. Total body length 19.0 mm.; wing
 expanse 30.0 mm.
 (c) *Distribution*.—Rajasthan: Kuchaman Road. Elsewhere:
 Throughout India, Ceylon, Burma and as far as Celebes.
 (d) *Remarks*.—The species *Pompilus analis* was described
 by Fabricius (1781) in *Spec. Insect.*, 1: 447, and not in *Ent.*
Syst., 2: 209 as given by Bingham (1897).

Family (V) SPHECIDAE

Genus (6) **Larra** Latreille10. **Larra erratica** Bingham

1897. *Larra erratica* Bingham, C. T. Faun. Brit. India (Hym.), 1: 199,
 ♀, ♂
 (a) *Material examined*.—1 ♂, Gudha, coll. T. G. Vazirani,
 25.iv.1958.

(b) *Measurements*.—♂ Total body length 19 mm.; wing expanse 29 mm.

(c) *Distribution*.—Rajasthan : Gudha. Elsewhere : Burma (Tenasserim) and Ceylon.

(d) *Remarks*.—The species *L. erratica* was described from Tenasserim (Burma) and Ceylon. The present record from Rajasthan is new to India.

Genus (7) **Motes** Kohl

Subgenus **Motes** Kohl

11. **Motes (Motes) jaculator** (Smith)

1856. *Larrada jaculator* Smith, *F. Cat. Hym. Ins.*, 4: 279. ♀.

1897. *Notogonia jaculatrix*: Bingham, C. T. *Faun. Brit. India (Hym.)*, 1: 203, ♀, ♂

1897. *Larra jaculator*: Dalla-Torre, C. D. de, *Cat. Hym.*, 8: 668.

(a) *Material examined*.—1 ♀, Devdyani, coll. Z.S.I. Party, 25.iv.1957

(b) *Measurements*.—♀. Total body length 15.5 mm.; wing expanse 18.5 mm.

(c) *Distribution*.—Rajasthan : Devdyani. Elsewhere : India : Barrackpore (West Bengal) ; Mussooree (Uttar Pradesh) and Poona (Maharashtra) Burma : Tenasserim ; Pegu Hills.

(d) *Remarks*.—Smith (1856) described this species under the genus *Larrada*. Bingham (1897) transferred it to the genus *Notogonia* Costa. Dalla Torre (1897) treats *Notogonia* as a synonym of *Larra* Fabricius whereas Muesbeck, Krombein and Townes (1951) treat it as a synonym of *Motes* subgenus *Motes*. We have followed the latest work of the latter authors and refer this species to *Motes (Motes)*.

Genus (8) **Sphex** Linnaeus

12. **Sphex aegyptius** Lepeletier

1845. *Sphex aegyptia* Lepeletier, A. L. M.; *Hist. nat. Insect. Hym.*, 3: 356.

1897. *Sphex aegyptius*: Bingham, C. T. *Faun. Brit. India. (Hym.)*, 1: 245. ♀, ♂

1897. *Sphex aegyptius*: Dalla Torre, C. G. de, *Cat. Hym.*, 8: 413.

(a) *Material examined*.—2 examples (1 ♂ , 1 ♀), Sambhar Lake, coll. T. G. Vazirani, 17.v.1958.

(b) *Measurements*.—Total body length (♀ 33 mm. ; ♂ 23 mm.) ; wing expanse (♀ 33 mm. ; ♂ 42 mm.).

(c) *Distribution*.—Rajasthan : Sambhar Lake. Elsewhere : Other than the present record, from India, this species is known from Madras only. It is essentially a middle-east species and is known from Egypt, Syria, Arabia, Ethiopia and Mauritius.

13. *Sphex viduatus* Christ

1791. *Sphex viduata* Christ, J. L. *Naturg. Ins.*, Frankfurt: 305.

1897. *Sphex viduatus*: Bingham, C. T. *Faun. Brit. India (Hym.)*, 1: 252. ♀, ♂

1897. *Sphex viduatus*: Dalla Torre, C. G. de, *Cat. Hym.*, 8: 446.

(a) *Material examined*.—1 ♀, Gudha, coll. T. G. Vazirani, 7.iv.1958.

(b) *Measurements*.—♀. Total body length 20 mm. ; wing expanse 28 mm.

(c) *Distribution*.—Rajasthan : Gudha. Elsewhere : This species has a wide distribution and is known from throughout India, Ceylon, China, Syria, Egypt, Gambia, Sierra Leone and Guinea.

Genus (9) *Bembix* Fabricius

14. *Bembix orientalis* Handlirsch

1893. *Bembix orientalis* Handlirsch, A. *Sitzungsb. Akad. wiss. wien*, 102: 737. ♀, ♂

1897. *Bembix orientalis*: Bingham, C. T. *Faun. Brit. India (Hym.)*, London, 1: 289, ♀, ♂

1897. *Bembix orientalis*: Dalla Torre, C. G. de, *Cat. Hym.*, 8: 510.

(a) *Material examined*.—15 examples, coll. T. G. Vazirani, 28.iv.1958-14.v.1958 as follows :—Nawa (1 ♀) ; Sambhar Lake (1 ♀) ; Lihorana (1 ♂, 1 ♀) ; Gudha (4 ♀♀, 1 ♂) ; Korsina (4 ♂♂, 1 ♀) and Phulera (1 ♀).

(b) *Measurements*.—Total body length (♀ 12-13 mm. ; ♂ 13-15 mm.) ; wing expanse (♀ 22-23 mm. ; ♂ 23-25 mm.).

(c) *Distribution*.—Rajasthan : Gudha ; Korsina ; Lihorana ; Nawa ; and Sambhar Lake. Elsewhere : India : Bengal ; and the Himalayas. Burma : Tenasserim.

Family (VI) EUMENIDAE

Genus (10) **Eumenes** Latreille

15. **Eumenes esuriens** (Fabricius)

1787. *Vespa esuriens* Fabricius, J. C. *Mant. Ins.*, 1 : 293.
1897. *Eumenes esuriens*: Bingham, C. T., *Faun. Brit. India (Hym.)*,
1 : 342. ♀, ♂
1904. *Eumenes esuriens*: Dalla Torre, C. G. de, *Gen. Insect.*
(Vespidae): 22.

(a) *Material examined*.—3 examples as follows:—Coll. T. G. Vazirani (11.iv.1958 to 27.iv.1958); Gudha (2 ♂♂); coll. R. K. Bhatnagar, 8.vii.1960, Bishalpur (1 ♀)

(b) *Measurements*.—Total body length (♀ 18-20 mm.; (♂ 16-18 mm.); wing expanse (♀ 34-37 mm.; ♂ 28-32 mm.)

(c) *Distribution*.—Rajasthan: Bishalpur and Gudha. Elsewhere: This species is widely distributed in India and is known from Burma also.

Family (VII) VESPIDAE

Genus (11) **Polistes** Latreille

16. **Polistes hebraeus** (Fabricius)

1787. *Vespa hebraea* Fabricius, J. C., *Mant. Ins.*, 1 : 292.
1897. *Polistes hebraeus*: Bingham, C. T., *Faun. Brit. India (Hym.)*,
1 : 398. ♀, ♂
1904. *Polistes hebraeus*: Dalla Torre, C. W. de, *Gen. Insect.*
(Vespidae): 70.

(a) *Material examined*.—17 examples as follows:—coll. K. K. Tiwari and S. Biswas, 14.i.1958, Mohangarh (1 ♀); coll. T. G. Vazirani 16.ii-18.iv.1958, Gudha (9 ♀♀, 1 ♂), Kuchamon Road (1 ♀), Korsina (2 ♀♀); coll. A. K. Mukherjee, 21.v.1958, Sambhar Lake (3 ♂♂)

(b) *Measurements*.—Total body length (♀ 20-24 mm.; ♂ 13-16 mm.); wing expanse (♀ 46-48 mm.; ♂ 36-40 mm.)

(c) *Distribution*.—Rajasthan: Gudha; Korsina; Kuchamon Road; Mohangarh; and Sambhar Lake. Elsewhere: This species is common throughout India and Burma. It is also known from Persia, Arabia, Egypt in the Middle East and Isle of France.

Family (VIII) APIDAE

Genus (12) *Megachile* Latreille17 *Megachile amputata* Smith

1857. *Megachile amputata* Smith, F., *J. Proc.Linn.Soc.Zool.*, **2**: 45. ♀.
 1896. *Megachile amputata*: Dalla Torre, C.G.de, *Cat.Hym.*, **10**: 418.
 1897. *Megachile amputata*: Bingham, C. T., *Faun.Brit. India (Hym.)*, **1**: 484. ♀.
 1911. *Megachile amputata*: Friese, H., *Das Tierr.*, **28**: 294, 299. ♀.
 (a) *Material examined*.—5 ♀♀, Gudha, coll. T. G. Vazirani, 8.iii-26.iv.1958.
 (b) *Measurements*.—♀. Total body length 14-15 mm.; wing expanse 18.5-20 mm.
 (c) *Distribution*.—Rajasthan: Gudha. Elsewhere: Sikkim; Tenasserim (Burma) and Borneo.

18. *Megachile creusa* Bingham

1898. *Megachile creusa* Bingham, C.T., *J.Bombay nat.Hist. Soc.*, **12**(1): 125. ♀.
 (a) *Material examined*.—15 ♀♀, Gudha, coll. T. G. Vazirani, 26.iv.1958.
 (b) *Measurements*.—♀. Total body length 11-12 mm.; wing expanse 15.5-17 mm.
 (c) *Distribution*.—Rajasthan: Gudha. Elsewhere: India: Deesa (Gujarat).
 (d) *Remarks*.—This species is not catalogued by Friese (1911).

19. *Megachile lanata* (Fabricius)

1793. *Apis lanata* Fabricius, J. C. *Ent.Syst.*, **2**: 335.
 1896. *Megachile lanata*: Dalla Torre, C.G.de, *Cat.Hym.*, **10**: 435.
 1897. *Megachile lanata*: Bingham, C. T. *Faun.Brit.India (Hym.)*, **1**: 483.
 1911. *Megachile lanata*: Friese, H., *Das Tierr.*, **28**: 297, 305.
 (a) *Material examined*.—1 ♀, Udaipur, coll. K. S. Kushwaha, 15.ii.1968.
 (b) *Measurements*.—♀. Total body length 14 mm.; wing expanse 21 mm.
 (c) *Distribution*. — Rajasthan: Udaipur. Elsewhere: Throughout India, Burma and Ceylon.

Genus (13) **Anthidium** Fabricius

20. **Anthidium orientale** Bingham

1897. *Anthidium orientale* Bingham, C. T. *Faun.Brit.India (Hym.)*, 1: 495. ♀.

1911. *Anthidium orientale*: Friese, H., *Das Tierr.*, 28: 405, 407. ♀.

(a) *Material examined*.—4 ♀♀, Jodhpur, coll. B. Biswas, 14.xii.1956.

(b) *Measurements*.—♀. Total body length 7-7.5 mm.; wing expanse 10-10.5 mm.

(c) *Distribution*.—Rajasthan: Jodhpur. Elsewhere: It is known only from Tenasserim (Burma) The present record is new to India.

21. **Anthidium pulchellum** Klug

1832. *Anthidium pulchellum* Klug, F., *Symb.Phys.,Insect.dec.* 3, pl. xxviii, fig. 11. ♀.

1896. *Anthidium pulchellum*: Dalla Torre, C.G.de., *Cat. Hym.*, 10: 468.

1897. *Anthidium pulchellum*: Bingham, C. T., *Faun.Brit.India, (Hym.)*, 1: 493. ♂.

1911. *Anthidium (Anthidium) pulchellum*: Friese, H., *Das Tierr.*, 28: 331, 352, 404. ♀.

(a) *Material examined*.—6 examples, coll. T G. Vazirani, 6.iv-17.v.1958, as follows :—Gudha (4 ♀♀); Lihorana (1 ♀); Phulera (1 ♂).

(b) *Measurements*.—Total body length (♀ 10 mm.; ♂ 9.5 mm.); wing expanse (♀ 18 mm.; ♂ 17 mm.).

(c) *Distribution*.—Rajasthan: Gudha; Lihorana; Phulera. Elsewhere: India: Bombay. Also Egypt; Nubia (Sudan) and Arabia.

Genus (14) **Ceratina** Latreille

22. **Ceratina viridissima** Guerin

1845. *Ceratina viridis* Guerin (nec. Latr.), *Icon.Règn.Anim., Insect.:* 449, pl. 73, fig. 6.

1896. *Ceratina viridissima*: Dalla Torre, C.G.de. *Cat. Hym.*, 10: 201.

1897. *Ceratina viridissima*: Bingham, C.T., *Faun.Brit.India (Hym.)*, 1: 501. ♀, ♂.

(a) *Material examined*.—28 examples, coll. T G. Vazirani,

24.iv-17.v.1958, as follows :—Gudha (11 ♀♀) ; Nawa (1 ♀) ; Jhapog (1 ♀) ; Lihorana (1 ♀) ; Kuni (6 ♀♀) ; Devdyani (2 ♀♀) and Phulera (6 ♂♂).

(b) *Measurements*.—♀, ♂ Total body length 8-10 mm. ; wing expanse 16-17 mm.

(c) *Distribution*.—Rajasthan : Devdyani ; Gudha ; Jhapog ; Kuni ; Lihorana ; Nawa ; Phulera. Elsewhere : Throughout India, Burma and Ceylon ; also China and Malacca.

Genus (15) *Coelioxys* Latreille

23. *Coelioxys fuscipennis* Smith

1854. *Coelioxys fuscipennis* Smith, F. *Cat.Hym.B.M.Ins.*, 2: 266. ♀.

1896. *Coelioxys fuscipennis*: Dalla Torre, C.G.de. *Cat. Hym.*, 10: 487.

1897. *Coelioxys fuscipennis*: Bingham, C.T., *Faun.Brit.India (Hym.)*, 1: 511. ♀.

(a) *Material examined*.—5 ♀♀, Gudha, coll. T. G. Vazirani, 25-27.iii.1958.

(b) *Measurements*.—♀. Total body length 12-13 mm. ; wing expanse 21-23 mm.

(c) *Distribution*.—Rajasthan : Gudha. Elsewhere : India and Burma.

Genus (16) *Anthophora* Latreille

24. *Anthophora confusa* Smith

1854. *Anthophora confusa* Smith, F., *Cat.Hym.B.M.*, 2: 337. ♀.

1897. *Anthophora confusa*: Bingham, C. T., *Faun.Brit.India (Hym.)*, 1: 528. ♀, ♂

(a) *Material examined*.—8 examples, coll T G. Vazirani, 6.iv.1958-14.v.1958, as follows :—Gudha (3 ♂♂, 2 ♀♀) ; Sambhar Lake (1 ♂) and Korsina (1 ♂, 1 ♀)

(b) *Measurements*.—Total body length (♀ 13-15 mm. ; ♂ 11-12 mm.) ; wing expanse (♀ 23-26 mm. and ♂ 21-23 mm.).

(c) *Distribution*.—Rajasthan : Gudha ; Korsina ; Sambhar Lake. Elsewhere : India : Barrackpore ; Bombay ; Ladak. Also Sikkim and Burma.

25. *Anthophora niveocincta* Smith

1854. *Anthophora niveo-cincta* Smith, F., *Cat.Hym.B.M.*, 2: 337. ♀,

1897. *Anthophora niveo-cincta*: Bingham, C. T., *Faun.Brit.India (Hym.)*, 1: 527-528. ♀.

(a) *Material examined*.—9 ♀♀, coll. T. G. Vazirani, 27.ii-17.v.1958, as follows:—Gudha (2 ♀♀); Nawa (1 ♀); Bangadh (2 ♀♀); Lihorana (1 ♀); Phulera (1 ♀) and Korsina (2 ♀♀)

(b) *Measurements*.—♀. Total body length 12-14 mm.; wing expanse 22-25 mm.

(c) *Distribution*.—Rajasthan: Bangadh; Gudha; Lihorana; Nawa; Phulera. Elsewhere: Smith (1854) gave the distribution "India" only, since then no definite distribution of the species has been given by any worker.

Genus (17) *Xylocopa* Latreille

Subgenus *Ctenoxylocopa* Michener

26. *Xylocopa (Ctenoxylocopa) fenestrata* (Fabricius)

1798. *Apis fenestrata* Fabricius, J.C., *Ent. Syst., Suppl.* 3: 273. ♂

1896. *Xylocopa fenestrata*: Dalla Torre, C.G.de., *Cat.Hym.*, 10: 210.

1897. *Xylocopa fenestrata*: Bingham, C.T., *Faun.Brit.India (Hym.)*, 1: 535, 536, 539. ♀, ♂

1963. *Xylocopa (Ctenoxylocopa) fenestrata*: Hurd, P. D. and Moure, J. S. *Univ.Calif.Publ.(Ent.)*, 29: 175. ♀, ♂

(a) *Material examined*.—33 examples as follows:—coll. T. G. Vazirani, 19.iii. to 13.v.1958, Gudha (15 ♀♀); Phulera (1 ♀); Korsina (1 ♂, 2 ♀♀); Nawa (1 ♀); Sambhar Lake (9 ♀♀, 1 ♂). coll. Motilal, 9.viii.1962, Doli Village (1 ♀)

(b) *Measurements*.—Total body length (♀ 22-24 mm.; ♂ 21-22 mm.); wing expanse (♀ 46-50 mm.; ♂ 44 mm.).

(c) *Distribution*.—Rajasthan: Doli village; Gudha; Korsina; Lihorana; Nawa; Phulera; Sambhar Lake. Elsewhere: This species is very common all over India and is also known from Nepal, Pakistan, Burma, Ceylon, Celebes (?), Mesopotamia, Mauritius, Madagascar, Iran and Indo-China (?) It is also recorded from Brazil (Hurd & Moure, 1961).

Subgenus *Koptortosoma* Gribodo

27 *Xylocopa (Koptortosoma) aestuans* (Linnaeus)

1758. *Apis aestuans* Linnaeus, C., *Sys.Nat.*, 1 ed. X: 579. ♀.

1896. *Xylocopa aestuans*: Dalla Torre, C.G.de., *Cat.Hym.*, 10: 202.

1897. *Xylocopa aestuans*: Bingham, C.T., *Faun.Brit.India (Hym.)*, **1**: 540. ♀, ♂

1963. *Xylocopa (Koptortosoma) aestuans*: Hurd, P. D. and Moure, J. S. *Univ.Calif.Publ.Ent.*, **29**: 273. ♀, ♂.

(a) *Material examined*.—11 examples, coll. T. G. Vazirani, 1-31.v.1958, as follows:—Sambhar Lake (2 ♀♀); Gudha (4 ♀♀, 4 ♂♂); Korsina (1♀).

(b) *Measurements*.—Total body length (♀ 21-23 mm.; ♂ 20-22 mm.); wing expanse (♀ 46-48 mm.; ♂ 42-46 mm.).

(c) *Distribution*.—Rajasthan: Gudha; Korsina; Sambhar Lake. Elsewhere: Throughout India, Nepal, Pakistan, Ceylon, Burma and extends to the Malayan region in the East. It is also known from Egypt, Arabia, Sokotra and Senegal.

Genus (18) *Apis* Linnaeus

The genus *Apis* Linn. was divided up into genera *Megapis* with *Apis dorsata* Fabr. as the type and *Micrapis* with *Apis florea* Fabr. as the type by Ashmead (1904, pp. 120, 122). More recently Muesbeck, Krombein and Townes (1951, p. 1255) have again put *Megapis* and *Micrapis* under *Apis* Linn. and here we have followed the latter authors.

28. *Apis dorsata* Fabricius

1793. *Apis dorsata* Fabricius, J.C., *Ent.Syst.*, **2**: 328.

1896. *Apis dorsata*: Dalla Torre, C.G.de., *Cat.Hym.*, **10**: 589.

1897. *Apis dorsata*: Bingham, C. T., *Faun.Brit.India (Hym.)*, **1**: 557. ♀, ♂ & ♀.

1904. *Megapis dorsata*: Ashmead, A., *Proc.Ent.Soc.Wash.*, **6**: 120.

(a) *Material examined*.—20 examples as follows:—coll. T. G. Vazirani, 10.iv.1958, Phulera (10 ♀♀, 5 ♂♂, 4 ♀♀); coll. A. K. Datta, 6.iii.1962, Sardar Samad (1 ♀).

(b) *Measurements*.—Total body length (♀ 18-21 mm.; ♂ 16-17 mm.; ♀ 16-18 mm.); wing expanse (♀ 36-37 mm.; ♂ 32-33 mm.; ♀ 30-35 mm.).

(c) *Distribution*.—Rajasthan: Phulera; Sardar Samand. Elsewhere: Throughout India, Burma and Ceylon. Distribution extends to the Malayan region to Java and China.

29. *Apis florea* Fabricius

1787. *Apis florea* Fabricius, J. C., *Mant.Ins.*, **1**: 305.

1896. *Apis florea*: Dalla Torre, C.G.de., *Cat.Hym.*, **10**: 591.

1897. *Apis florea*: Bingham, C. T., *Faun.Brit.India (Hym.)*, 1: 559.

1904. *Micrapis florea*: Ashmead, A., *Proc.ent.Soc. Wash.*, 6: 120.

(a) *Material examined*.—17 examples, coll. T G. Vazirani, 6.i.1957 to 19.v.1958 as follows:—Bikaner (1 ♂); Kuchaman Road (2 ♀♀); Gudha (3 ♂♂, 3 ♀♀); Jhapag (1 ♀); Sambhar Lake (2 ♀♀); Phulera (2 ♀♀); Korsina (1 ♂, 2 ♀♀)

(b) *Measurements*.—Total body length (♀ 13 mm.; ♂ 12 mm.; ♀ 8 mm.); wing expanse (♀ 24 mm.; ♂ 24 mm.; ♀ 16 mm.).

(c) *Distribution*.—Rajasthan: Bikaner; Gudha; Jhapag; Korsina; Kuchamon Road; Phulera; Sambhar Lake. Elsewhere: It is the common small honey-bee and is distributed throughout the Indian sub-continent. It is also known from Ceylon, Malaya and Java.

Family (IX) FORMICIDAE

Genus (19) *Dorylus* Fabricius

Subgenus *Typhlopone* Westwood

30. *Dorylus (Typhlopone) labiatus* Shuckard

1840. *Dorylus labiatus* Shuckard, W. E., *Ann.Mag.nat.Hist.Soc.*, 5: 319. ♂.

1903. *Dorylus labiatus*: Bingham, C. T., *Faun.Brit.India (Hym.)*, 2: 2. ♂, ♀

1910. *Dorylus (Typhlopone) labiatus*: Emery, C., *Gen.Ins.*, Fasc., 102: 13.

(a) *Material examined*.—10 examples as follows:—coll. Z. S. I. Party, 16.vii.1966, Sriganganagar (3 ♀♀); coll. A. K. Mukherjee, 24.xii.1957, Sambhar Lake (2 ♂♂); coll. K. K. Tiwari & S. Biswas, 14.i.1958, Mohangarh (1 ♂); coll. T G. Vazirani, 9.iv.1958 to 23.v.1958, Jhapag (1 ♂), Lihorana (1 ♂), Mani Lake (2 ♂♂).

(b) *Measurements*.—Total body length (♂ 30-33 mm.; ♀ 2.5-6.8 mm.); wing expanse (♂ 36.5-42 mm.)

(c) *Distribution*.—Rajasthan: Jhapag; Lihorana; Mani Lake; Mohangarh; Sambhar Lake; Sriganganagar. Elsewhere: This species is known from whole of the Indian subcontinent.

Subgenus *Alaopone* Emery

31 *Dorylus (Alaopone) orientalis* Westwood

1835. *Dorylus orientalis* Westwood, J. O., *P.Z.S.*, 5: 72. ♂,

1903. *Dorylus orientalis*: Bingham, C. T., *Faun.Brit.India. (Hym.)*, 2: 4. ♂, ♀.

1910. *Dorylus (Alaopone) orientalis*: Emery, C., *Gen.Ins., Fasc.*, 102: 15.

(a) *Material examined*.—9 examples as follows:—coll. K. K. Tiwari & S. Biswas, Phalodi, 17.xi.1957 (1 ♂), ? Condoneer, 12.iii.1958 (5 ♂♂); coll. T. G. Vazirani, 31.v.1958, Sambhar Lake (1 ♂); coll. J. S. Bhatti, 9.xi.1960, Rampura (2 ♀♀)

(b) *Measurements*.—Total body length (♂ 17-23 mm.; ♀ 2.5-6 mm.); wing expanse (♂ 33-35 mm.).

(c) *Distribution*.—Rajasthan: ? Condoneer; Phalodi; Sambhar Lake; Rampura. Elsewhere: This species is known from throughout India, Burma and Ceylon, also extends into Malaya, Borneo, Sumatra and Java in the East.

Genus (20) *Sima* Roger

Subgenus *Sima* Roger

32. *Sima (Sima) rufonigra* (Jerdon)

1851. *Eciton rufonigra* Jerdon, T. C., *Madr.J.Lit.Soc.*, 15: 111.

1903. *Sima rufonigra*: Bingham, C. T., *Faun.Brit.India (Hym.)*, 2: 108. ♀, ♀.

1921. *Sima (Sima) rufonigra*: Emery, C., *Gen.Insect., Fasc.*, 174A: 23.

(a) *Material examined*.—4 examples:—coll. B. Biswas, 21.xii.1956, Bhagat Ki Kothi (2 ♀♀); and Z. S. I. Party, 8.xi.1960, Kasli (2 ♀♀).

(b) *Measurements*.—♀ Total body length 9-10 mm.

(c) *Distribution*.—Rajasthan: Bhagat Ki Kothi; Kasli. Elsewhere: This species is known from throughout the main Indian land.

Genus (21) *Crematogaster* Lund

Subgenus *Acrocoelia* Mayr

33. *Crematogaster (Acrocoelia) brunnea* sub.sp. *contemta* Mayr

1878. *Crematogaster contemta* Mayr, G., *Verh.Zool.bot.Ges.Wein.*, 28: 681, 685. ♀

1903. *Cremastogaster contemta*: Bingham, C. T., *Faun.Brit.India (Hym.)*, 2: 130. ♀.

1922. *Crematogaster (Acrocoelia) brunnea* sub.sp. *contemta*; Emery, C., *Gen.Insect.*, Fasc. 174B: 150.

(a) *Material examined*.—8 ♀♀ as follows:—coll. B. Biswas, Jhunjhunu (2 ♀♀), 2.xi.1960; coll. Z. S. I Party, Netro village (2 ♀♀), 22.ii.1961; coll. A. K. Datta, Mandor Garden (2 ♀♀), 19.ii.1961; coll. R. C. Sharma, Basri village, (2 ♀♀), 9.viii.1962.

(b) *Measurements*.—♀ Total body length (3.5-4.0 mm.)

(c) *Distribution*.—Rajasthan: Basri village; Jhunjhunu; Mandor Garden; Netro village. Elsewhere: This species is recorded from Bengal, Western India and Ceylon.

Genus (22) *Meranoplus* Smith

34. *Meranoplus bicolor* (Guerin)

1838. *Cryptocerus bicolor* Guerin—Meanville, F. E., *Cuv.Iconogr.Regn. Anim.Ins.*, 7: 425.

1903. *Meranoplus bicolor*: Bingham, C. T., *Faun.Brit.India (Hym.)*, 2: 168. ♀, ♂, ♀.

1923. *Meranoplus bicolor*: Emery, C., *Gen.Insect.*, Fasc. 174B: 228.

(a) *Material examined*.—7 ♀♀, Pokran, coll. K. K. Tiwari & S. Biswas, 22.xi.1957

(b) *Measurements*.—♀ Total body length 3.5-4 mm.

(c) *Distribution*.—Rajasthan: Pokran. Elsewhere: This species is known from throughout the Indian subcontinent and extends to the Malayan subregion in the East.

(d) *Remarks*.—Bingham (1903) mentions that this species avoids the hot and dry plains in N W Provinces, Panjab and Central India. The present record from Pokran (District Jaisalmer), which is one of the driest places in India, is of ecological importance.

Genus (23) *Monomorium* Mayr

Subgenus *Xeromyrmex* Emery

35. *Monomorium (Xeromyrmex) salomonis indica* Forel

1902. *Monomorium salomonis* race *indicum* Forel, *A. Rev.Suisse Zool.*, 10: 213. ♀, ♀, ♂.

1903. *Monomorium indicum*: Bingham, C. T., *Faun.Brit.India (Hym.)*, 2: 205. ♀, ♂; ♀.

1922. *Monomorium (Xeromyrmex) salomonis* sub.sp. *indica*; Emery, C., *Gen.Insect. Fasc. 174B*: 178.

(a) *Material examined*.—13 ♀♀ as follows:—coll. T. G. Vazirani, 31.v.1958, Korsina (1 ♀); coll. B. Biswas, 21.viii-10.ix.1960, Nokh (7 ♀♀); coll. R. K. Bhatnagar, 28.xii.1960, Kolayat (2 ♀♀); coll. A. K. Datta, 20.xii.1961, Kotra (3 ♀♀).

(b) *Measurements*.—♀ Total body length 3-4 mm.

(c) *Distribution*.—Rajasthan: Kolayat; Korsina; Kotra; Nokh. Elsewhere: This species is very common throughout India and Burma.

Genus (24) *Pheidole* Westwood

Subgenus *Pheidale* Westwood

36. *Pheidole (Pheidole) sulcaticeps* Roger

1863. *Pheidole sulcaticeps* Roger, *J. Berl.ent.Zeit.*, 7: 193. ♂, ♀, ♂, ♀.

1903. *Phidole sulcaticeps*: Bingham, C. T., *Faun.Brit.India (Hym.)*, 2: 251. ♂, ♀

1921. *Pheidole (Pheidole) subcaticeps*: Emery, C., *Gen. Insect.*, Fasc. 174A: 94.

(a) *Material examined*.—10 ♂♂, Jaisalmer, coll. K. K. Tiwari and S. Biswas, 25.xii.1957

(b) *Measurements*.—♂ Total body length 4.5-5 mm.

(c) *Distribution*.—Rajasthan: Jaisalmer. Elsewhere: This species is known from Bengal, and western India.

Genus (25) *Messor* Forel

37 *Messor barbarus himalayana* Forel

1902. *Stenamma (Messor) barbarum* race *himalayanum* Forel, A., *Rev.Suisse Zool.*, 10: 220. ♀, ♂, ♀.

1903. *Messor himalayanus*: Bingham, C. T., *Faun.Brit.India (Hym.)*, 2: 279. ♀, ♂, ♀.

1921. *Messor barbarus himalayana*: Emery, C., *Gen.Insect.*, Fasc. 174A: 70.

(a) *Material examined*.—41 examples as follows:—coll. B. Biswas, 10.xi.1956, 26.xi.1956, Devdyani Kyars (6 ♀♀);

Bundi Nadi (6 ♀ ♀) ; coll. *Z.S.I. Party*, 18.xii.1956, 23.xi.1956, 11.i.1957, Jodhpur (12 ♀ ♀) ; Kishangarh (5 ♀ ♀) ; Bikaner (4 ♀ ♀) ; A. K. Mukherjee coll., 16.xi.1957, Gudha (8 ♀ ♀).

(b) *Measurements*.— ♀ Total body length 7.5-8.5 mm.

(c) *Distribution*.—Rajasthan : Bundi Nadi ; Bikaner ; Devdyani Kyars ; Gudha ; Jodhpur ; Kishangarh. Elsewhere : This species is recorded from Dharamsala (H.P.) and the Tons valley (U.P.) in India and Quetta in Pakistan.

Genus (26) *Acantholepis* Mayr

38. *Acantholepis frauenfeldi* (Mayr)

1855. *Hypoclinea frauenfeldi* Mayr, G., *Verh.zool.-bot.Ver.Wien*, 1855 : 378. ♀ .

1903. *Acantholepis frauenfeldi* : Bingham, C. T., *Faun.Brit.India*—(*Hym.*), 2 : 315, 316. ♀, ♂ .

1925. *Acantholepis frauenfeldi* : Emery, C., *Gen.Insect.*, Fasc. 183 : 23, 25.

(a) *Material examined*.—10 examples as follows :—coll. *J S. Bhatti*, 9.xi.1960, Bishalpur (5 ♀ ♀) ; coll. *N Majumder* and *R. N Bhargava*, 9.vi.1962, Palidung (5 ♀ ♀).

(b) *Measurements*.— ♀ Total body length 3-3.5 mm.

(c) *Distribution*.—Rajasthan : Bishalpur ; Palidung. Elsewhere : India : Barrackpore (West Bengal) but is chiefly confined to hilly regions. It is also known from southern Europe and northern Africa.

(d) *Remarks*.—According to Bingham (1903), this species is chiefly confined to hilly areas of the Indian subcontinent. Its record from Barrackpore (W Bengal) and the present distribution in comparatively dry areas of Rajasthan shows its adjustment to different ecological conditions.

Genus (27) *Camponotus* Mayr

Subgenus *Tanaemyrmex* Ashmead

39. *Camponotus (Tanaemyrmex) compressus* (Fabricius)

1787. *Formica compressus* Fabricius, J. C., *Mant.Ins.*, 1 : 307. ♀ .

1903. *Camponotus compressus* : Bingham, C. T., *Faun.Brit.India*—(*Hym.*), 2 : 351. ♀, ♂, ♀ .

1925. *Camponotus (Tanaemyrmex) compressus*: Emery, C., *Gen.Insect.*, Fasc. 183: 98.

(a) *Material examined*.—40 examples as follows:—coll. *Z.S.I.Party*, 25.iv.1957, Devdyani Kyars (3 ♀ ♀); coll. *K. K. Tiwari* and *S. Biswas*, 4.i.1958, Biprasarh (4 ♀ ♀); coll. *T. G. Vazirani*, 9.iv.1958, 13.vi.1958, Jhapog (4 ♀ ♀), Gudha (3 ♀ ♀); coll. *A. K. Mukherjee*, 6.vii.1958, Gudha (8 ♀♀); coll. *J. S. Purobit*, 17.iii.1961, Kuni (4 ♀♀, 4 ♀ ♀); coll. *K. C. Kansal*, 27.vi.1961, Patodi House (4 ♂ ♂); coll. *Motilal*, 9.viii.1962, Phulera (3 ♂ ♂, 3 ♀ ♀).

(b) *Measurements*.—Total body length (♀ 10-13 mm.; ♂ 14-18 mm.; ♀ major 10-16 mm.; ♀ minor 6-10 mm.); wing expanse (♀ 8.5-12.5 mm.; ♂ 7.5-10.5 mm.).

(c) *Distribution*.—Rajasthan: Biprasar; Devdyani Kyars; Gudha; Jhapog; Kuni; Patodi House and Phulera. Elsewhere: This species is very common in India, Burma and Ceylon. It is also known to occur in Russia, Arabia and Africa. In the East its distribution extends to the Malayan subregion.

Genus (28) *Cataglyphis* Forster

40. *Cataglyphis bicolor setipes* (Forel)

(Text-fig. 4)

1894. *Myrmecocystus viaticus* race *setipes* Forel, A., *J.Bombay nat. Hist.Soc.*, 8: 401. ♀.

1903. *Myrmecocystus setipes*: Bingham, C. T., *Faun.Brit.India (Hym.)*, 2: 312. ♀

1925. *Cataglyphis bicolor setipes*: Emery, C., *Genera Insect.*, Fasc. 183: 266.

(a) *Material examined*.—(i) One ♂ and 7 ♀ ♀ in spirit, in a vial, coll. *B. Biswas*, 21.i.1957, Sardarshahr, Churu District, Rajasthan. (ii) 10 ♀ ♀ coll. *B. Biswas*, 25.x.1956, Sanodia; 3 ♀ ♀ coll. *K. K. Tiwari* and *S. Biswas*, 14.xii.1957, Jhapog; 6 ♀ ♀ coll. *T. G. Vazirani*, 16.v.1958, Phulera; 5 ♀ ♀ coll. *A. K. Datta*, 31.i.1961, Bikaner; 2 ♀ ♀ coll. *K. K. Mahajan*, 24.ix.1964, Nawa.

(b) *Description of unknown Adult Male*.—The male and the female of this species were so far unknown. We have got a male associated with several workers in a collection from Sardarshahr *vide* "Material (i)" above and is described below.

♂ Head and thorax black; antennae, mandibles, pedicel

and legs dark brown ; stigma, some veins of forewing and abdomen dark brown but somewhat paler. Head-capsule with long, thin, recumbent pilosity ; mandibles and clypeus with thick, bristle-like hairs, the clypeus with a row of bristles along anterior margin and a few on body ; thorax, pedicel, coxae of legs and abdominal sternites with thin and long hairs, as on head ; tergites apilose dorsally but with a few short hairs on lateral sides. Thoracical pleurites, median segment and coxae with thin, suppressed pilosity also ; femora with short brist-like hairs ; tibiae and tarsi with several short spines. Head and thorax with fine and minute punctation ; abdomen with still finer punctation, so as to look smooth.

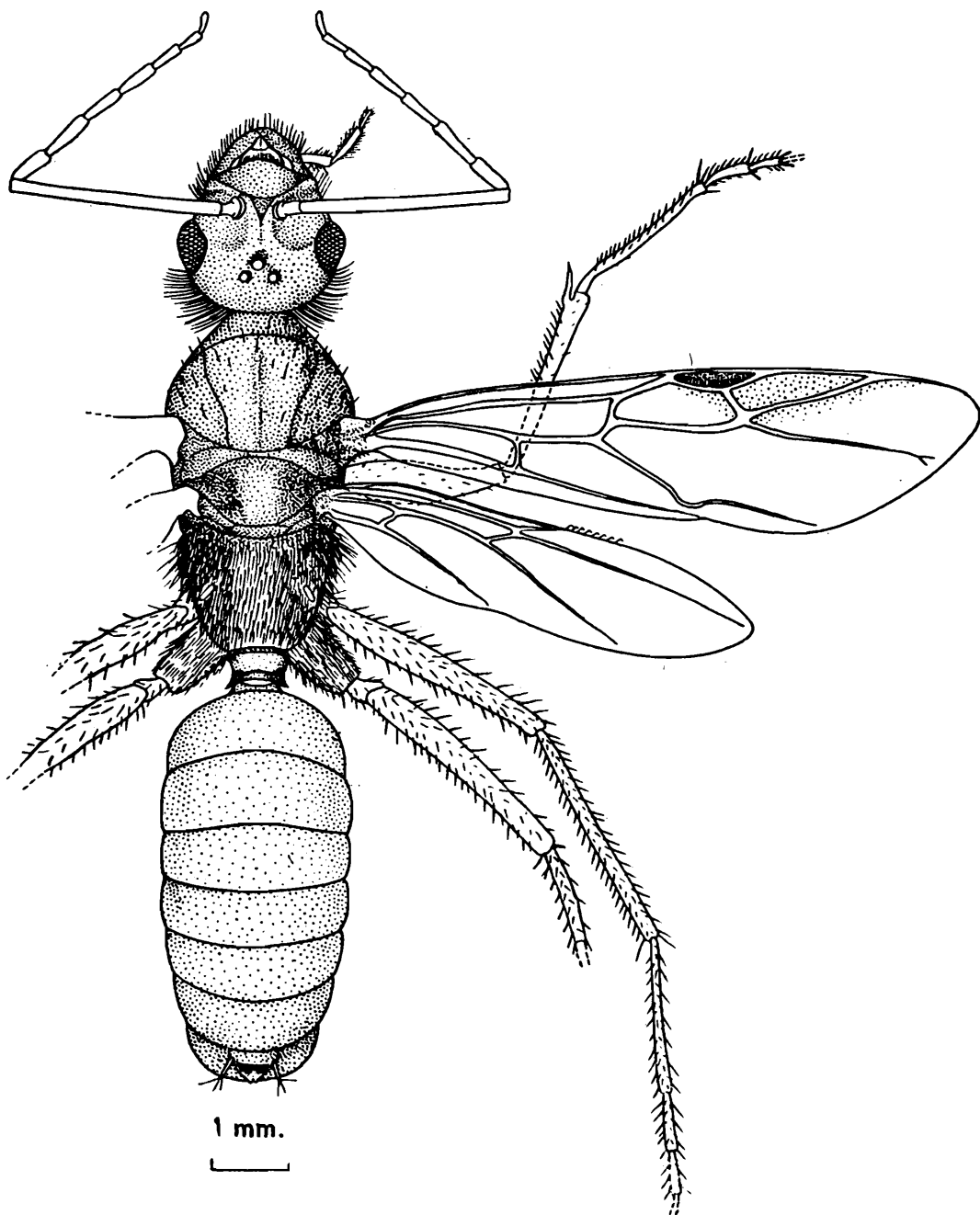
Head.—Head-capsule broadly oval ; widest in the region of eyes ; sides narrowing in front and weakly incurved ; sunken in the region of antennae, and in front of median ocellus ; with a thin groove running from median ocellus to the base of clypeus, widening gradually from a little before the insertion of antennae. Eyes long and oval ; diverging outwardly in front, when viewed from above. Median ocellus a little larger than the lateral ones. Clypeus transversely oval ; widest in the middle and appreciably narrowed laterally. Mandibles somewhat sickle-shaped, sharply pointed at apex ; dentition not clear. Antennae broken in the single specimen available ; only 8 basal segments of right antenna present ; scape thin and long, equal to first six segments of flagellum ; segments of flagellum long and narrow. Maxillary palpi 6-jointed ; segments 3 and 4 subequal and longest. Labial palpi 4 jointed.

Thorax.—Pronotum flat ; extending laterally upto about base of the wings. Mesonotum gibbous ; with two lateral and a median narrow, longitudinal, grooves ; scutellum swollen and raised. Metanotum short. Median segment quadrate and large.

Legs.—Long and strong ; femora long, cylindrical, narrowing in front ; tibia long, cylindrical, with several spines on inner side ; tarsi broken, 3 basal joints present, with several spines ; claws simple, thin, long and about the length of 4th tarsal joint ; the latter shortest of the 3 joints.

Wings.—Wings transparent ; veins strong and prominent. Forewing : Stigma dark brown ; veins in apical half dark brown, paler in basal half. Stigma elongate. Costal cell long and narrow ; radial elongately triangular ; cubital subtrapezoidal ; 1st discoidal absent ; 2nd discoidal large ; medial elongately triangular ; submedial complete, oval, long and narrow ; apical

elongate. Costa (c) fairly prominent, running along anterior margin upto the stigma. Radial + subcosta (R + Sc) fused, thick and running close to and parallel with costa upto the stigma. R + Sc giving off Radial Sector 1st free abscissa a little before the stigma to meet mediocubital arising from anterior cubitus (CuA). Median and cubitus fused proximally; median first and second free abscissae absent, 3rd abscissa forming the posterior side of the cubital cell and 4th running upto the distal margin. CuA running obliquely towards posterior margin. Anal close to the posterior margin, forming a long anal cell.



Text-fig. 4. *Cataglyphis bicolor setipes* (Forel). Adult male in dorsal view.

Hind wing.—Smaller than forewing ; venation thick, paler than in forewing ; anterior costal margin with a row of small hooks (hamuli), 17 in number. Costa (C) along the anterior margin ; R + Sc (?) thick running parallel with costa upto about half of wing membrane and enclosing a long and narrow costal cell. Median + Anterior cubitus fused, separating a little before the middle, the upper branch (called here the median) connecting up with R + Sc by a small stub and then running close to the anterior margin upto the distal end. Anterior cubitus running obliquely to posterior margin. Anal ending at about the proximal third of wing-membrane.

Abdomen.—Pedicel subquadrate ; spiracle or pedicel raised. Abdomen broadly oval. Genitalia very large.

(c) *Measurements* (in mm.).—

(i) Male :

1. Total length c	...	...	...	12.5
2. Wing expanse c	...	...	...	20.0
3. Length of head (i.e., length upto base of mandibles)	...	...	...	1.67
4. Width of head across the eyes	...	...	...	2.23
5. Width of head at base of mandibles	...	...	...	1.6
6. Long diameter of eye	...	...	...	0.73
7. Short diameter of eye	...	...	...	0.57
8. Diameter of median ocellus	...	...	...	0.17
9. Diameter of lateral ocellus	...	...	...	0.13
10. Length of mandibles	...	...	...	0.93
11. Length of forewing	...	...	...	8.6
12. Length of hindwing	...	...	...	6.0

(ii) Worker :

Total body-length 10-12 mm.

(d) *Distribution*.—Rajasthan : Bikaner ; Jhapog ; Nawa ; Phulera ; Sardarsharh and Sanodia. Elsewhere : India : United Provinces ; Punjab and Central India. Also extending to Iran to the West.

Family (X) CHRYSIDIDAE

Genus (29) *Stilbum* Spinola

41 *Stilbum cyanurum amethystinum* (Fabr.)

1775. *Chrysis amethystina* Fabricius, J. C., *Syst.Ent.*: 359.

1903. *Stilbum cyanurum*: Bingham, C. T., *Faun.Brit.India* (Hym.), 2: 433-434. ♀, ♂.

1951. *Stilbum cynurum amethystinum*: Muesbeck C.F.W., Krombein, K. V. and Townes H. K., *U.S.Dept.Agric.Monogr.*, No. 2: 725.

(a) *Material examined*.—4 examples as follows:—coll. T. G. Vazirani, 18.iv.1958, Patodi House (2 ♀♀); coll. A. K. Datta, 9.viii.1961, Basri Village (1 ♂); coll. R. N. Bhargava, 2.ix.1961, Paota (1 ♀).

(b) *Measurements*.—Total body length (♀ 10.5-16 mm.; ♂ 9.5-12 mm.); wing expanse (♀ 16-20 mm.; ♂ 19-27 mm.).

(c) *Distribution*.—Rajasthan: Basri Village; Paota; Patodi House. Elsewhere: This species is known from throughout the world.

Family (XI) ICHNEUMONIDAE

Genus (30) *Xanthopimpla* Saussure

42. *Xanthopimpla apicipennis* (Cameron)

1899. *Pimpla apicipennis* Cameron, P., *Mem. & Proc.Manch.Lit. Phil.Soc.*, 43 (3): 161. ♀.

1913. *Xanthopimpla trifasciata*: Morley, C., *Fauna Brit.India (Hym.)*, 3: 119. (In "Part").

1961. *Xanthopimpla apicipennis*: Townes, H., Townes, M. and Gupta, V. K., *Mem.Amer.ent.Inst.*, No. 1: 50.

(a) *Material examined*.—1 example, Gudha, coll. T. G. Vazirani, 19.iii.1958.

(b) *Measurements*.—Total body length 9.5 mm.; wing expanse 15 mm.

(c) *Distribution*.—Rajasthan: Gudha. Elsewhere: India: Assam (Khasi Hills) and Nicobar Islands. Also Sikkim; Nepal (Thamaspur), Ceylon (Kandy and Wattamulla); Burma (Mandalay), Singapore and New Guinea.

(d) *Remarks*.—The species *X. apicipennis* Cameron was described from Khasi Hills, Assam, India. Morley (1913) treated it as a synonym of *X. trifasciata* Smith, but more recently Townes, H., Townes, M. and Gupta, U.K. (1961), in their catalogue of the Indo-Australian Ichneumonidae, have again reinstated the species. They are, however, doubtful about the distribution of the two species. The single example before us from Rajasthan compares very well with the original description of Cameron (1899)

43. *Xanthopimpla emaculata* Szepligeti

1908. *Xanthopimpla emaculata* Szepligeti, G., *Notes Leyden Mus.*, **29**: 256. ♀.
1913. *Xanthopimpla immaculata*: Morley, C., *Faun. Brit. India, (Hym.)*, **3**: 115.
1961. *Xanthopimpla emaculata*: Townes, H., Townes, M. and Gupta, V. K., *Mem. American ent. Inst.*, No. 1: 54.
- (a) *Material examined*.—1 example, Monaklao, coll. A. K. Datta, 28.vi.1961.
- (b) *Measurements*.—Total body length 10.5 mm.; wing expanse 14 mm.
- (c) *Distribution*.—Rajasthan: Monaklao. Elsewhere: It is widely distributed in the Indian subcontinent and is also known from Formosa, Java, Micronesia, Philippines and Sumatra.

44. *Xanthopimpla punctata* (Fabricius)

1781. *Ichneumon punctatus* Fabricius, J. C., *Sp. Ins.*, **1**: 437.
1913. *Xanthopimpla punctata*: Morley, C., *Faun. Brit. India (Hym.)*, **3**: 124.
1961. *Xanthopimpla punctata*: Townes, H., Townes, M. and Gupta, V. K., *Mem. Amer. ent. Inst.*, No. 1: 62.
- (a) *Material examined*.—1 example, Basri Village, coll. B. Biswas, 1.xi.1960.
- (b) *Measurements*.—Total body length 14.5 mm.; wing expanse 18 mm.
- (c) *Distribution*.—Rajasthan: Basri Village. Elsewhere: This species is widely distributed in the orient and the Japanese archipelago.

45. *Xanthopimpla regina* Morley

1913. *Xanthopimpla regina* Morley, C., *Faun. Brit. India (Hym.)*, **3**: 118. ♂, ♀.
1961. *Xanthopimpla regina*: Townes, H., Townes, M. and Gupta, V. K., *Mem. Amer. ent. Inst.*, No. 1: 66.
- (a) *Material examined*.—1 example, Rajsamand, coll. A. K. Datta, 24.xii.1961.
- (b) *Measurements*.—Total body length 9 mm.; wing expanse 15 mm.
- (c) *Distribution*.—Rajasthan: Rajsamand. Elsewhere: India: Bihar (Chapra) Also Sikkim; Bangla Desh (Sylhet); Nepal; and Burma (Mandalay).

Family (XII) CHALCIDIDAE

Genus (31) *Brachymeria* Westwood46. *Brachymeria bengalensis* Cameron

1897. *Brachymeria bengalensis* Cameron, P., *Mem. & Proc. Manch. Lit. Phil. Soc.*, 41 (4): 40-41.

1938. *Brachymeria bengalensis*: Mani, M. S., *Cat. Indian Ins.*, Pt. 23, *Chalcidoidea* :

(a) *Material examined*.—2 examples, coll. T. G. Vazirani, 10.v.1958, and coll. A. K. Datta, 28.vi.1961, respectively from Nawa and Monaklao.

(b) *Measurements*.—Total body length 4-6 mm.; wing expanse 6.5-7 mm.

(c) *Distribution*.—Rajasthan: Nawa; Monaklao. Elsewhere: India, Malaya, Indonesia, N. Guinea, Vietnam, Laos, Thailand, Ryuke Islands, Formosa and Philippines.

*We are thankful to Dr. K. J. Joseph, Department of Zoology, University of Calicut, Calicut, for identification of these specimens.

VI. SUMMARY

The State of Rajasthan is divided by the Aravalli Hills into two unequal halves which are very different climatically and so in vegetation. The North-western portion forms a part of the Great Indian Desert, thus being ecologically different from the rest of the country. The south-eastern part forms the hilly and wetter area.

The hymenopterous fauna of the South-eastern portion, was to some extent, known while the drier part of the state remained almost unexplored. As many as 45 species, belonging to 11 families, were so far known, out of which 41 were reported from the wetter and 4 from the drier parts of the state.

The Zoological Survey of India conducted general faunistic survey of the state in a systematic and detailed manner and several hundred examples of Hymenoptera from 47 different localities in the state were collected and made available to us for the present study. The collections mostly came from the drier portion of the state.

Fortysix species belonging to 31 genera distributed in 12

families are reported in this paper. Out of these only two were already recorded, one is new to science and the remaining ones are new records from the state. In all 89 species are thus now known from the whole of Rajasthan state. It is noticed that the species occurring in higher altitudes and wetter portion of the state are not found in the drier plains, showing thereby the ecological adjustment of different species to different climatic and topographic conditions.

All the 46 species available in the collection are dealt with briefly. A species new to science belonging to the genus *Iswara* and the hitherto unknown male of *Cataglyphis bicolor setipes* (Forel) are described in detail and figured adequately.

VII. REFERENCES

- AIYAR, T. V. R. 1916a. A catalogue of new wasps and bees (Fossores, Diploptera and Anthophila) described from the Indian region since 1897.—*J. Bombay nat. Hist. Soc.*, Pt. I, **24**(3): 539-560.
- AIYAR, T. V. R. 1916b. A catalogue of new wasps and bees (Fossores, Diploptera and Anthophila) described from the Indian region since 1897.—*J. Bombay nat. Hist. Soc.*, Pt. II, **24**(4): 711-721.
- AIYAR, T. V. R. 1917. A catalogue of new wasps and bees (Fossores, Diploptera and Anthophila) described from the Indian region since 1897.—*J. Bombay nat. Hist. Soc.*, Pt. III, **25**(1): 92-103.
- AIYAR, T. V. R. 1924. A catalogue of the braconid wasps described from the Indian region.—*Rept. Proc. 5th. ent. Mtg.*: 352-362.
- ASHMEAD, A. 1904. New generic names—*Megapis* and *Micrapis* for *dorsata* and *florea*. *Proc. ent. Soc.*, Washington, **6**: 120-122.
- PETREM, J. G. 1928. Monographie der Indo-Australischen Scolüden. Mit Zoogeographischen Betrachtungen.—*Treubia*, **9** (Suppl.): 1-388.
- RINGHAM, C. T. 1897. *Fauna Brit. India (Hymenoptera)*, London, **1**: 1-564, 4 pls.
- BINGHAM, C. T. 1903. *Fauna Brit. India (Hymenoptera)*, London, **2**: 1-496, I pl.
- BÖRNER, C. 1919. Stammesgeschichte der Hautflügler.—*Biol. Zentralbl.*, **39**: 145-186.
- CAMERON, P. 1899. Hymenoptera orientalia, or contributions to a knowledge of the Hymenoptera of the oriental zoological region. Part VIII. The Hymenoptera of the Khasi Hills. First paper.—*Mem. Manchester Soc.*, **43**(3): 1-220: I Pl.
- CAMERON, P. 1905. Descriptions of new genera and species of Hymenoptera from India.—*Zeit. f. Hym. V. Dipt.*: 281.

- CAMERON, P. 1907. On the parasitic Hymenoptera collected by major C. G. Nurse in the Bombay Presidency.—*J. Bombay nat. Hist. Soc.*, **17** (2): 578-597.
- CAMERON, P. 1908a. A contribution to the Aculeate Hymenoptera of the Bombay Presidency.—*J. Bombay nat. Hist. Soc.*, **18** (2): 300-311.
- CAMERON, P. 1908b. A contribution to the Aculeate Hymenoptera of the Bombay Presidency.—*J. Bombay nat. Hist. Soc.*, **18** (3): 649-659.
- DALLA-TORRE, C. G. de. 1896. Apidae (Anthophila).—*Catalogus Hymenopterorum.*, **10**: 1-643.
- DALLA-TORRE, C. G. de. 1897. Sphegidae (Fossores).—*Catalogus Hymenopterorum*, **8**: 1-749.
- DOVER, C. 1924. The Indian species of Apterogyna (Mutillidae).—*Ent. mon. mag. Lond.*, (3) **60**: 254-256.
- FRIESE, H. 1911. Apidae 1. Megachilinae.—*Das. Tierr.*, **28**: 1-440.
- HURD, P. D. (Jr.) and MOURE, J. S. 1963. A classification of the large carpenter bees (Xylocopinae). *Univ. Calif. Publ. ent.*, **29**: 1-334.
- MANI, M. S. 1938. *Catalogue of Indian Insects*, Delhi, Part 23. Chalcidoidea: ii + 2 + 170 pp.
- MANI, M. S. 1939. *Catalogue of Indian Insects*, Delhi, Part 24. Evanidae: i + 14 + ii pp.
- MORLEY, C. 1913. *Fauna Brit. India (Hymenoptera)*, London, **3**: 1-521: 152 figs.: I pl.
- MUESEBECK, C. F. W., KROMBEIN, K. V. and TOWNES, H. K. 1951. Hymenoptera of America North of MEXICO—Synoptic Catalog—*Agri. Monogr. U.S. Dep. agri.*, No. 2: 1420 pp.
- NURSE, C. G. 1902. New species of Indian Chrysididae.—*Entomologist*, **35**: 304-308.
- NURSE, C. G. 1903a. New species of Indian Aculeate Hymenoptera.—*Ann. Mag. nat. Hist.*, **11**: 528-549.
- NURSE, C. G. 1903b. New species of Indian Hymenoptera. *J. Bombay nat. Hist. Soc.*, **15** (1 & 2): 1-18.
- NURSE, C. G. 1904. New species of Indian Hymenoptera. *J. Bombay nat. Hist. Soc.*, **15** (2): 557-585.
- NURSE, C. G. 1909. New and little known Indian Hymenoptera.—*J. Bombay nat. Hist. Soc.*, **19** (2): 510-517.
- FRUTHI, H. S. and BHATIA, D. R. 1952. Peculiarities of the insect fauna of the Rajasthan desert and the share of insects in the maintenance of the desert.—*Bull. nat. Ins. Sci. India*, No. 1, New Delhi: 241-245.
- SMITH, F. 1854. *Catalogue of Hymenopterous insects in British Museum, London.*—**2**: 1-248.
- SMITH, F. 1856. *Catalogue of Hymenopterous insects in British Museum, London.*—**4**: 1-240.

- SMITH, F. 1873. Arrangement of insects in Lardner's cabinet cyclopaedia.—*Ann. Mag. nat. Hist. Soc. London*, (4) 12: 179-256.
- TOWNES, H., TOWNES, M. and GUPTA, V. K. 1961. *A catalogue and reclassification of the Indo-Australian Ichneumonidae*.—(*Mem. American ent.Inst.*, Michigan, No. 1), 1-522.
- TURNER, R. E. 1909. *Iswara* and its allies.—*Ann.Mag.nat.Hist.*, (8) 3: 476.
- TURNER, R. E. 1910. Thynnidae.—*Gen.Ins.*, Fasc. 105: 1-62.
- TURNER, R. E. 1912. A monograph of the wasps of the genus *Cerceris* inhabiting British India with notes on other Asiatic species.—*J.Bombay nat.Hist.Soc.*, 21 (3): 476-516 & 794-819: II pls.
- WESTWOOD, J. O. 1851. Descriptions of some new exotic Hymenoptera, belonging to *Evania* and allied genera.—*Tr. ent. Soc. London* (n.s.), 1: 213-234.