

## INSECTA : HYMENOPTERA : FORMICIDAE

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### INTRODUCTION

Ants (family Formicidae), the most successful social insects, are found everywhere. They can survive in almost all kinds of ecological niches, living in colony. The colony consists of different castes—male, female, worker and soldier—which have specific and specialised duty to perform for the survival of the colony. This synchronised group activities and the great degree of adaptability are the key factors for their survival since Mesozoic period.

Ants have both the deleterious and beneficial effects. Some ants are considered as pests (house hold as well as garden); some give protection (even nurture in their colony) to the other plant pests, like plant-lice, mealy bugs, tree hoppers, etc.; some are notorious for their stinging and biting habits. On the other hand some ants have also been utilised as an agent of biological control; formic acid of ants has the value in pharmacology; some tribal people consume ants (*Oecophylla* sp.) as a source of high protein; and even efforts are there to establish ants as index organism of environmental pollution.

Considering the immense importance of these tiny creatures, exploration of ants is very much in need. Workers like Jerdon (1851, 1854 a, b), Forel (1900 a, b), Bingham (1903), Wheeler (1928), Smith (1948), Chapman and Capco (1951), Wilson (1964), Bolton (1977), Mathew (1980), Tiwari and Jonathan (1986 a, b), Tiwari (1994), Dutta and Raychaudhuri (1983), Sheela and Narendran (1997, 1998) have made valuable contributions to the Indian fauna of ants. But except some stray reports, no effort was there to consolidate the ant fauna of Arunachal Pradesh.

This taxonomic work of Ants of Arunachal Pradesh under the *State Fauna Series* is based on the collections done by the authors (twice in the year 2001) and other survey parties of this department. Beside that, the National Zoological Collection lying in Z.S.I has also been studied and incorporated. The entire materials have been deposited in the collection of Z.S.I., Kolkata and its Field Station of Arunachal Pradesh.

### TOPOGRAPHY

Arunachal Pradesh, lying on the lap of eastern Himalaya, is situated in between 91° 31' to 97° 30' E longitude and 26° 28' to 29° 30' N latitude. This north-eastern state of India, covering an area of 83,743 sq. km, consists of 13 districts with the capital as Itanagar. It has long international boundary with China in the north and north-east, Bhutan in the west and Myanmar in the east. It is a land of thick forests, deep river valleys, beautiful plateaus and ice-capped mountains. Some peaks of Greater Himalayas are with permanent ice cover and some are seasonal. The snow of these peaks along with heavy rain fall are the source of countless rivers and rivulets criss-crossed through valleys of this area.

The state has nearly 61.5% forest area which is gradually coming down by human interference. The forest area is mainly dominated by tropical rain forest. Other types—tropical moist deciduous forest, temperate forest and alpine forest—are also seen here.

This rich floral wealth makes this state an abode of large number of species of all the groups.

## MATERIALS AND METHODS

Ants were collected from the field mostly by hand picking with the help of brush soaked in alcohol (70%) and forceps of different sizes. Some were collected by sweeping also. Sometimes baits like sugar, jaggery and other eatables were used to attract the ants. The collected specimens were kept in 70% alcohol, as well as the specimens of bigger sizes were kept in insect packet with dry preservatives after killing those with ethyle acetate/benzene vapour. The collected specimens were brought to the laboratory and were set, pinned and labeled for study.

## SYSTEMATIC ACCOUNT

The ants are classified as a single family Formicidae under order Hymenoptera and are widely distributed throughout the world. Nearly 9538 species of ants under 296 genera and 16 subfamilies have been in record presently from world over. Of these 771 species under 101 genera are from Oriental region (Bolton, 1995a). From Indian subregion nearly 550 species are so far recorded.

Report, specifically from Arunachal Pradesh, is very rare and scanty. Tiwary and Maiti (1976) and Tewary *et al.* (1977) recorded 12 species from Arunachal Pradesh. Earlier the other eminent naturalists might have explored this region. But locality was not mentioned as 'Arunachal Pradesh' by them as this has been designated as a new state of India in 1987. Present work deals with 63 species of ants under 30 genera and 7 subfamilies. Keys of the subfamilies, genera and species have also been incorporated here. A few undetermined species are recorded here which are not included in the keys. Species represented singly of a genus is with its brief diagnostic characters.

**Abbreviation :** The abbreviations used in the text are M = Male, F = Female, W = Worker and S = soldier.

**Distinguishing features :** Ants are distinguished at a glance from other aculeate hymenoptera by the presence of petiole and post

petiole which is/are the modification of one or two segments of abdomen immediately following the propodeum. Presence of elbowed antennae is also unique.

### LIST OF TAXA

#### Family FORMICIDAE

##### Subfamily DORYLINAE Forel

##### Genus *Dorylus* Fabricius

1. *Dorylus labiatus* Shuckard
2. *Dorylus laevigatus* Smith

##### Subfamily PONERINAE Lepeletier

##### Genus *Diacamma* Mayr

3. *Diacamma assamense* Forel
4. *Diacamma rugosum sculptum* (Jerdon)

##### Genus *Gnamptogenys* Roger

5. *Gnamptogenys bicolor* (Emery)

##### Genus *Hypoponera* Santschi

6. *Hypoponera truncata* (Smith)

##### Genus *Myopopone* Roger

7. *Myopopone castanea* (Smith)

##### Genus *Odontomachus* Latreille

8. *Odontomachus monticola* (Emery)

##### Genus *Odontoponera* Mayr

9. *Odontoponera transversa* (Smith)

##### Genus *Pachycondyla* Smith

10. *Pachycondyla astuta* Smith
11. *Pachycondyla javana* (Mayr)
12. *Pachycondyla leeuwenhoekii* (Forel)
13. *Pachycondyla luteipes* (Mayr)
14. *Pachycondyla rufipes* (Jerdon)

##### Subfamily CERAPACHYINAE Forel

##### Genus *Cerapachys* Smith

15. *Cerapachys sulcinodis* Emery

##### Subfamily FORMICINAE Lepeletier

##### Genus *Camponotus* Mayr

16. *Camponotus confucii* Forel
17. *Camponotus compressus* (Fabricius)
18. *Camponotus invidus* Forel
19. *Camponotus irritans* (Smith)

20. *Camponotus nicobarensis* Mayr21. *Camponotus* sp.Genus *Cataglyphis* Foerster22. *Cataglyphis setipes* (Forel)Genus *Oecophylla* Smith23. *Oecophylla smaragdina* (Fabricius)Genus *Paratrechina* Motschoulsky24. *Paratrechina bourbonica* (Forel)25. *Paratrechina indica* Forel26. *Paratrechina* sp.Genus *Polyrhachis* Smith27. *Polyrhachis armata* (Le Guillou)28. *Polyrhachis bicolor* Smith29. *Polyrhachis convexa* Roger30. *Polyrhachis dives* Smith31. *Polyrhachis hippomanes ceylonensis* Emery32. *Polyrhachis illaudata* Walker33. *Polyrhachis laevisissima* Smith34. *Polyrhachis tibialis* SmithGenus *Pseudolasius*35. *Pseudolasius familiaris* (Smith)

Subfamily DOLICHODERINAE Forel

Genus *Dolichoderus* Lund36. *Dolichoderus* sp.Genus *Tapinoma* Foerster37. *Tapinoma melanocephalum* (Fabricius)Genus *Liometopum* Mayr38. *Liometopum lindgreeni* ForelGenus *Technomyrmex* Mayr39. *Technomyrmex albipes* (Smith)

Subfamily PSEUDOMYRMECINAE Emery

Genus *Tetraponera* Smith40. *Tetraponera rufonigra* (Jerdon)

Subfamily MYRMICINAE Lepeletier

Genus *Aphaenogaster* Mayr41. *Aphaenogaster smythiesii* ForelGenus *Cardiocondyla* Emery42. *Cardiocondyla nuda* (Mayr)43. *Cardiocondyla shuckardi* Forel44. *Cardiocondyla* sp.Genus *Crematogaster* Lund45. *Crematogaster aberrans* Forel46. *Crematogaster biroi* Mayr47. *Crematogaster politula* Forel48. *Crematogaster walshi* Forel49. *Crematogaster* sp.Genus *Meranoplus* Smith50. *Meranoplus bicolor* (Guer.)51. *Meranoplus rothneyi* ForelGenus *Monomorium* Mayr52. *Monomorium aberrans* ForelGenus *Myrmica* Latreille53. *Myrmica rugosa* MayrGenus *Solenopsis* Westwood54. *Solenopsis geminata* (Fabricius)Genus *Tetramorium* Mayr55. *Tetramorium lanuginosum* Mayr56. *Tetramorium* sp.Genus *Pheidologeton* Mayr57. *Pheidologeton affinis* (Jerdon)58. *Pheidologeton diversus* (Jerdon)59. *Pheidologeton namus* Roger60. *Pheidologeton* sp.Genus *Pheidole* Westwood61. *Pheidole parva* Mayr62. *Pheidole watsoni* Forel63. *Pheidole* sp.**Key to the subfamilies of FORMICIDAE**

1. Pedicel of abdomen with one node ..... 2
- Pedicel of abdomen with two nodes ..... 6
2. A more or less marked constriction between basal two segments of abdomen ..... 3
- No constriction between basal two segments of abdomen ..... 4
3. Elongate, slender; scape usually short and stout, antennal fossa more or less encircled by a

lateral carina on the cheek (rarely obsolete); posterior surface of head usually with distinct carina running ventrally from each dorso-lateral corner; dorsal surface of thorax with sutures indistinct or absent; pygidium margined laterally and posteriorly with a row of large or small (always distinct) spines .....

..... CERAPACHYINAE

– Without these combinations of characters .....

..... PONERINAE

4. Opening at posterior end of gaster (acidopore) terminal, circular and usually surrounded by a fringe of hairs .....

FORMICINAE

– Opening at posterior end of gaster (acidopore) transverse, slit-like .....

5

5. Eyes never present, blind .....

DORYLINAE

– Eyes always present ..

DOLICHODERINAE

6. Elongate, often very slender; eyes very large and elongate; clypeus with a rounded upper margin, not prolonged between frontal carinae; frontal carinae usually narrow and not expanded laterally to cover the antennal insertions; antennae short .....

PSEUDOMYRMECINAE

– Without these combinations of characters; frontal carinae usually large, nearly always covering the antennal insertions .....

..... MYRMICINAE

#### Subfamily DORYLINAE Forel

##### Genus *Dorylus* Fabricius

1793. *Dorylus* Fabricius, *Ent. Syst.*, 2 : 365, M.

Type species : *Vespa helvola* Linnaeus, 1764

#### Key to the species

1. Mandibles without teeth on the masticatory margin, apex acutely pointed .....
- laevigatus*
- Mandibles with 2 teeth on the masticatory margin, apex broader .....
- labiatus*

#### 1. *Dorylus labiatus* Shuckard

1840. *Dorylus labiatus* Shuckard, *Ann. Mag. Nat. Hist.*, 5 : 319, M.

2000. *Dorylus (Typhlopone) labiatus*, Tiwari *et al.*, *Zool. Surv. India, State Fauna Series 3: Fauna of West Bengal*, 8 : 232.

*Material examined* : India : Arunachal Pradesh : 1 M, Kameng Division, Elephant Flat, Bhalukpong (700 m), 23, xii 1965, coll. S.K. Bhattacharya and A.N.T. Joseph; 26 M, Lohit Division, Kangu, Roing (300m), 7.iii. 1969, coll. S.K. Tandon and party; 7 M, Lohit Division, Sadiya Road (300m), 8.iii 1969, coll. S.K. Tandon and party; 12W, Chowkhan Road, Namsni (100m), 16.iii.1969, S.K. Tandon and party; 25 W, Papumpare, Naharlagun, 19.iv.2001, coll. Sheela and party.

*Distribution* : India : Arunachal Pradesh, Sikkim and whole continent of India, particularly from West Bengal, Uttar Pradesh, Manipur, Orissa, Himachal Pradesh, Maharashtra, Gujarat and Delhi.

#### 2. *Dorylus laevigatus* Smith

1857. *Typhlopone laevigatus* Smith, *J. Proc. Linn. Soc. London Zool.*, 2 : 70.

1951. *Dorylus (Dichthadia) laevigatus*, Chapman and Capco, *Monogr. Inst. Sci. Tech. Manila (Check List Ants Asia)*, 1 : 9.

*Material examined* : India : Arunachal Pradesh : 2 F, Lohit Dist., Namsai, Papagan River, 31.i.1994, coll. G. Tirumalai and party.

*Distribution* : India : Arunachal Pradesh.

*Elsewhere* : Borneo, Myanmar, Java, Sumatra.

#### Subfamily PONERINAE Lepeletier

#### Key to the genera

1. Pedicel not free; a strong constriction, but no flexible joint between pedicel and abdomen ..
- ..... *Myopopone*
- Pedicel free, with a flexible joint between pedicel and abdomen .....
- 2
2. Mandibles articulated close together in middle of front margin of head .....
- Odontomachus*
- Mandibles articulated wide apart at lateral angles of front margin of head .....
- 3

3. Pronotum with teeth or spines .....  
 ..... ***Odontoponera***  
 – Pronotum without teeth or spines ..... 4
4. Node of pedicel bispinous posteriorly .....  
 ..... ***Diacamma***  
 – Node of pedicel not bispinous, sometimes  
 denticulate posteriorly ..... 5
5. Posterior coxae armed with a spine .....  
 ..... ***Gnamptogenys***  
 – Posterior coxae unarmed ..... 6
6. Ventral apex of hind tibia, when viewed from  
 in front with femur at right angle to the body,  
 with a single large pectinate spur; without a  
 second simple spur in front of the pectinate  
 main spur in the direction of observer .....  
 ..... ***Hypoconera***  
 – Ventral apex of hind tibia, when viewed from  
 in front with femur at right angle to the body,  
 with two spurs—a large pectinate spur and a  
 second simple spur, which is in front of the  
 pectinate main spur in the direction of observer  
 ..... ***Pachycondyla***

## 2. Genus *Diacamma* Mayr

1862. *Diacamma* Mayr, *Verh. Zool.-Bot. Ges. Wien*, **12** :  
 718, W.

Type species : *Ponera rugosa* Le Guillou, 1842.

### Key to the species

1. Pronotum longitudinally striate ..... *assamense*  
 – Pronotum with transversely arched striae, which  
 are more or less concentric anteriorly .....  
 ..... *rugosum sculptum*.

## 3. *Diacamma assamense* Forel

1897 *Diacamma tritschleri* Forel, race *assamensis* Forel, in  
*Emery, Rend. Accad. Sci. Bologna (N.S.)*, **1** : 151.

1900b *Diacamma assamense* Forel, *J. Bombay nat. Hist.*  
*Soc.*, **13** : 318, 319.

1995. *Diacamma assamense*, Bolton, *New Genl. Cat. Ants*  
*World* : 169.

*Material examined* : India : Arunachal Pradesh  
 : Kameng : 3W, Tini (213m), 3.v.1966, coll. A.N.T.  
 Joseph & Party; 2W, Pinjuli (244 m), 4.v.1966,  
 coll. A.N.T. Joseph & party; 1W, Boindila (2621 m),  
 22.iv.1966, coll. A.N.T. Joseph & Party.

*Distribution* : India : Arunachal Pradesh,  
 Sikkim and Assam.

*Elsewhere* : Myanmar.

## 4. *Diacamma rugosum sculptum* (Jerdon)

1851. *Ponera sculpta* Jerdon, *Madras J. Lit. Sci.*, **17** : 117, W.

1863. *Diacamma sculptum*, Mayr, *Verh. Zool.- Bot. Ges.*  
*Wien*, **13** : 407.

2003. *Diacamma rugosum sculptum*, Tiwari *et al.*, *Zool.*  
*Surv. India, Fauna of Sikkim, State Fauna Series 9*  
 (Part-4) : 576.

*Material examined* : India : Arunachal  
 Pradesh: 2W, Papumpare, Itanagar, Ganga Lake,  
 15.v.1991, coll. D. B. Bastawade & party; 22W,  
 Papumpare, Lobi, 25.vii.1991, coll. T.K. Pal &  
 party.

*Distribution* : India : Arunachal Pradesh,  
 Karnataka, Kerala, Maharashtra, Tamil Nadu,  
 Sikkim, West Bengal, Andaman & Nicobar  
 Islands.

*Elsewhere* : Borneo, Philippines, Singapore, Sri  
 Lanka, Taiwan.

## 3. Genus *Gnamptogenys* Roger

1864. *Gnamptogenys* Roger, *Berl. Ent. Zeitschr.*, **7** : 174.

Type species : *Ponera tornata* Emery, 1911.

## 5. *Gnamptogenys bicolor* (Emery)

1889. *Ectatomma (Stictoponera) bicolor* Emery, *Ann. Mus.*  
*Civ. Stor. Nat. Gen.*, **27** : 493. W.

1958. *Gnamptogenys bicolor*, Brown, *Bull. Mus. Comp.*  
*Zool. Harvard*, **118** : 227.

1995b. *Gnamptogenys bicolor*, Bolton, *New Genl. Cat. Ants*  
*World* : 208.

*Diagnostic characters* : W. TL 6-6.5 mm.

Dark ferruginous brown; head, thorax, pedicel and base and sides of the first abdominal segment coarsely punctured, cribrate. Head oval; mandibles triangular, not dentate; clypeus obtuse. Prothorax angular anteriorly, forming distinct tooth on either side; metanotum with two distinct teeth situated mid-apical position. Laminated angular projection beneath the pedicel. Second abdominal segment shining and smooth.

*Material examined* : India : Arunachal Pradesh : 13 W, Lower Subansiri, Yazli, 15.iv.2001, coll. Sheela and party.

*Distribution* : India : Arunachal Pradesh, Assam.

*Elsewhere* : Myanmar, Malay Peninsula.

#### 4. Genus *Hypoconera* Santschi

1938. *Ponera* (*Hypoconera*) Santschi, *Bull. Soc. Ent. Franc.*, **43** : 79.

1967. *Hypoconera*, Taylor, *Pacific Ins. Monogr.*, **13** : 9.

Type species : *Ponera abeillei* Andre, 1881.

#### 6. *Hypoconera truncata* (Smith)

1860a. *Ponera truncata* Smith, *J. Proc. Linn. Soc. London Zool.* **5** : 72. W.

1995b. *Hypoconera truncata*, Bolton, *New Genl. Cat. Ants World* : 216.

*Diagnostic characters* : W. TL 3-3.5 mm. Castaneous brown; mandibles, antennae, legs paler, punctate and pubescent. Head without mandibles broadly oval; mandibles with extremely broad masticatory margin; clypeus carinate. Thorax above distinctly flat and depressed. Node of pedicel flat, much broader than long, distinctly thick and rounded above. Constriction between basal two segments of abdomen well marked, sting exerted.

*Material examined* : India : Arunachal Pradesh : 1W, Tawang (320m), 27.iv.1966, col. A.N.T. Joseph and party; 35W, Lower Subansiri, Ziro 13.v.1966, coll. A.N.T. Joseph and party; several W, Dibang Valley, Riong, Salley Lake, 7.iv.1993, coll. P.T. Bhutia and party.

*Distribution* : India : Arunachal Pradesh, Sikkim, Tamil Nadu, West Bengal.

*Elsewhere* : Myanmar, Celebes, Java, Borneo, Sulawesi, Taiwan.

#### 5. Genus *Myopopone* Roger

1861. *Myopopone* Roger, *Berl. Ent. Zeitschr.*, **5** : 49. W.

Type species : *Myopopone maculata* Roger, 1861.

#### 7. *Myopopone castanea* (Smith)

1860b. *Amblyopone castaneus* Smith, *J. Proc. Linn. Soc. London Zool.*, **5** : 105. W.

1903. *Myopopone castanea*, Bingham, *Fauna Brit. India, Hym.*, **2** : 33.

1995b. *Myopopone castanea*, Bolton, *New Genl. Cat. Ants World* : 270

*Diagnostic characters* : W. TL 16 mm. Jet Black, shining; legs and apical segment of abdomen light yellowish brown; pilosity long and fairly dense, more towards apex of abdomen. Head, without mandibles, square; mandibles as broad at apex as at base, the apex and inner margin strongly dentate, puncture run into longitudinal striae; antennae 12-segmented, short thick; eyes minute. Thorax almost flat above, compressed laterally; pronotum broader than long, transverse posteriorly; mesonotum transverse, highly polished and smooth. Pedicel almost square, anteriorly truncate, posteriorly attached to abdomen by its whole posterior face; abdomen tapering gradually to apex, constriction between basal two segments well marked; sting long exerted.

*Material examined* : India : Arunachal Pradesh : 1W, Santipur (100m), 2.iii.1969, coll. S.K. Tandon and party; 2W, Digaru Road (150m), 11.iii.1969, coll. S.K. Tandon and party; 1W, Dibang Valley, Riong, 8.ix.1991, coll. T.K. Pal and party; 8W, Kameng, Ankaling (2800m), 10.iii.1961, coll. K.C. Jayrama Krishna and party; 1W, Subansiri, Kimin (180 m), 9.v.1966, coll. A.N.T. Joseph and party.

*Distribution* : India : Arunachal Pradesh, Sikkim, Andaman and Nicobar Islands.

*Elsewhere* : Myanmar, Indonesia, Malayan Sub-region.

### 6. Genus *Odontomachus* Latreille

1804. *Odontomachus* Latreille, *Hist. Nat. Crust. Ins.*, **13** : 257.

Type species : *Formica haematoda* Linnaeus, 1758.

### 8. *Odontomachus monticola* Emery

1892. *Odontomachus monticola* Emery, *Ann. Soc., Ent. Fr.*, **60** : 560, W.

1900b. *Odontomachus monticola*, race *punctulatus* Forel, *J. Bombay nat. Hist. Soc.* **13** : 58, W.

1995b. *Odontomachus monticola*, Bolton, *New Genl. Cat. Ants World* : 296.

*Diagnostic characters* : W. TL 11–13 mm. Dark castaneous; mandibles, antennae, legs reddish yellow. Pilosity almost wanting, pubescence sparse and short. Head broader in front; the side hollows deep and well marked; mandibles robust with 8 small but distinct teeth; apical one large, innermost one as broad as long; striae on the front coarse, divergent, spread out in fan-shape; emarginate occiput smooth. Thorax with concentric striae on pronotum; meso- and metanotum transversely striate. Node of pedicel smooth, very convex in front, the spine at apex above thick at base; abdomen large.

*Material examined* : India : Arunachal Pradesh : 2W, Lower Subansiri, 12 km. North of Ziro, 29.iii.1992, coll. D.B. Bastawade and party.

*Distribution* : India : Arunachal Pradesh, Assam, Andaman and Nicobar Islands, Meghalaya, Sikkim, West Bengal.

*Elsewhere* : China, Myanmar, Indonesia.

### 7. Genus *Odontoponera* Mayr

1862. *Odontoponera* Mayr, *Verh. Zool.-Bot. Ges. Wien*, **12** : 717, W.

Types species : *Ponera transversa* Smith, 1857.

### 9. *Odontoponera transversa* (Smith)

1857. *Ponera transversa* Smith, *J. Proc. Linn. Soc. London Zool.*, **2** : 68, W.

1903. *Odontoponera transversa*, Bingham, *Fauna Brit. India, Hym.*, **2** : 73, W F.

1995b. *Odontoponera transversa*, Bolton, *New Genl. Cat. Ants World* : 298

*Diagnostic characters* : W. TL 9–12 mm. Black; mandibles, antennae, legs castaneous; head almost square, striate, striae outwardly divergent from medial longitudinal lines; mandible subtriangular, strongly dentate; clypeus narrow, anteriorly transverse; mandible and clypeus finely longitudinally striate, antennae 12-segmented. Thorax massive, transversely striate; pronotum convex, anterior lateral angles dentate; suture distinct; apical portion of metanotum flat with a denticulate ridge on each side, basal portion with gradual slope. Pedicel cuneiform, transversely striate. Abdomen comparatively short, smooth.

*Material examined* : India : Arunachal Pradesh : 2 W, Subansiri Division, Pamir (564 m) / Tamen (457 m), 18.v.1966, coll. A. N. T. Joseph and party; 1 W, Siang Division, Likhoboli (140 m), 6.x.1966, coll. S. K. Tandon and G. S. Arora; 2 W, Tirap, Changlong (500 m), 30.x–1.xi.1971, coll. G. S. Arora and party.

*Distribution* : India : Arunachal Pradesh, Sikkim, Meghalaya, Andaman and Nicobar Islands and almost throughout India.

*Elsewhere* : Myanmar, China, Java, Borneo, Sumatra, Malayan region, Philippines, Singapore.

### 8. Genus *Pachycondyla* Smith

1858. *Pachycondyla* Smith, *Cat. Hym. Brit. Mus.*, **6** : 105.

Type species : *Formica crassinoda* Latreille, 1802.

### Key to the species

1. Episternum of mesothorax separated from sternum by a suture..... 2
- Episternum of mesothorax not separated from sternum ..... 4
2. Node of pedicel convex in front, upper portion of the posterior face bevelled off towards front ..... 3
- Node of pedicel not bevelled, flat and truncate anteriorly and posteriorly ..... *leeuwenhoekii*

3. Abdomen finely and closely punctured, opaque, not shining ..... *astuta*  
 – Abdomen smooth, highly polished and shining ..... *javana*  
 4. Meso-metanotal suture obsolete ..... *rufipes*  
 – Meso-metanotal suture well-marked ..... *luteipes*

#### 10. *Pachycondyla astuta* Smith

1858. *Pachycondyla astuta* Smith, *Cat. Hym. Brit. Mus.*, 6 : 107. W.  
 1903. *Ectomomyrmex astutus*, Bingham, *Fauna Brit. India, Hym.*, 2 : 86.  
 1995b. *Pachycondyla astuta*, Bolton, *New Genl. Cat. Ants World* : 303.

*Material examined* : India : Arunachal Pradesh: 1W, Papumpare, Itanagar, Ganga Lake, 15.v.1991, coll. D.B. Bastawade and party; 9W, Debang Valley, 3 km. From Roing, 8.ix.1991, coll. T.K. Pal and party.

*Distribution* : India : Arunachal Pradesh, Assam, Meghalaya, Sikkim.

*Elsewhere* : Myanmar, China, Malaya, Java, Sumatra.

#### 11. *Pachycondyla javana* (Mayr)

1867. *Ectomomyrmex javanus* Mayr, *Tijds. V. Ent.*, 10 : 84.  
 1903. *Ectomomyrmex javanus*, Bingham, *Fauna Brit. India, Hym.*, 2 : 86.  
 1995b. *Pachycondyla javana*, Bolton, *New Genl. Cat. Ants World* : 306.

*Material examined* : India : Arunachal Pradesh : 1W, Tirap, Pangsam Pass (1265 m.), 28.x.1971, coll. G.S. Arora and party.

*Distribution* : India : Arunachal Pradesh, Assam, Sikkim, West Bengal.

*Elsewhere* : Myanmar, China, Indonesia. (Java, Sumatra).

#### 12. *Pachycondyla leeuwenhoekii* (Forel)

1886. *Ponera leeuwenhoekii* Forel, *J. Asiat. Soc. Bengal*, 55 : 244. W.

- 1900b. *Ectomomyrmex leeuwenhoekii*, Forel, *J. Bombay Nat. Hist. Soc.*, 13 : 321. W.  
 1995b. *Pachycondyla leeuwenhoekii*, Bolton, *New Genl. Cat. Ants World* : 306.

*Material examined* : India : Arunachal Pradesh : 9W, Upper Subansiri, Ziro, 29.iii.1992, coll. D.B. Bastawade and party; 2W, East Siang, Pasighat, Ranaghat, 29.iii.1996, P.T. Bhutia and party; 1W, Papumpare, Itanagar, Ganga lake, 10.iv.2001, Sheela and party.

*Distribution* : India : Arunachal Pradesh, Assam, Kerala, Meghalaya, Sikkim.

*Elsewhere* : Myanmar, Singapore.

#### 13. *Pachycondyla luteipes* (Mayr)

1862. *Ponera luteipes* Mayr, *Verh. Zool.-Bot. Ges. Wien*, 12 : 722. W.  
 1903. *Brachyponera luteipes*, Bingham, *Fauna Brit. India, Hym.*, 2 : 101. W M.

*Material examined* : India : Arunachal Pradesh : 6W, Dirang (800 m), 11–12. iii.1969, coll. S.K. Tandon and party; 3W, Bomdila (2480m), 6.iii.1973, coll. S.K. Tandon and party; 4W, Sapper (1800m), 13.iii.1973, coll. S.K. Tandon and party.

*Distribution* : India : Arunachal Pradesh, Kerala, West Bengal and mostly throughout India.

*Elsewhere* : Myanmar, Sri Lanka, Indonesia (Java, Sumatra), Philippines, Malay Peninsula.

#### 14. *Pachycondyla rufipes* (Jerdon)

1851. *Ponera rufipes* Jerdon, *Madras J. Lit. Sci.*, 17 : 119. W.  
 1903. *Bothroponera rufipes*, Bingham, *Fauna Brit. India, Hym.*, 2 : 96. W.  
 1995. *Pachycondyla rufipes*, Bolton, *New Genl. Cat. Ants World* : 309.  
 1999. *Bothroponera rufipes*, Tiwari, *Memoirs Zool. Surv. India*, 18(4) : 28, syns.

*Material examined* : India : Arunachal Pradesh : 1W, Kameng Division, Dirang, 24.vii.1961, coll. S. Biswas and party; 1W, Siang Division, Saitan Bridge (1524 m), 23.iv.1966, coll. A.N.T. Joseph and party; 2W, Kameng Division,



Pinjuli (244m), 21.v.1966, coll. A.N.T. Joseph and party; 1W, Siang Division, Dali Vill. (200m), 10.x.1966, S.K. Tandon and G.S. Arora; 1W, Siang Division, Kambang (200m), 14.x.1966, S.K. Tandon and G.S. Arora; 1W, Daphabum Expedition, Chowkham (250m), 24.ii.1969, coll. J.M. Julka and party; 1W, Tirap, Changlong (600m), 6.x.1966, coll. A.N.T. Joseph and party; 1W, Lower Subansiri, Yazli, Pitapol, 19.ix.1983, coll. T.K. Pal and party, 1W West Siang, Kabu (600m), 2.iv.1966, coll. Bhutia and party.

*Distribution* : India : Arunachal Pradesh, Meghalaya, Karnataka, Kerala, Orissa, Sikkim, West Bengal, Andaman & Nicobar Islands, Himalayas from Siwalik to Assam.

*Elsewhere* : Sri Lanka.

### III. Subfamily CERAPACHYINAE Forel

#### 9. Genus *Cerapachys* Smith

1857. *Cerapachys* Smith, *J. Proc. Linn. Soc. London. Zool.*, 2 : 74, W.

Type species : *C. antennatus* Smith, 1857.

#### 15. *Cerapachys sulcinodis* Emery

1889. *Cerapachys sulcinodis* Emery, *Ann. Mus. Civ. Stor. Nat. Genova.* 27 : 493, W.

1951. *Cerapachys (Cerapachys) sulcinodis*, Chapman and Capco, *Monogr. Inst. Sci. Tech.*, Manila (Check List Ants Asia), 1 : 20.

1995b. *Cerapachys sulcinodis*, Bolton, *New Genl. Cat. Ants World* : 145.

*Diagnostic characters* : W. TL 5.5-6.5 mm. Black; mandibles, antennae and legs brownish yellow; abundant fine erect yellowish hairs along the whole body. Head convex in front, posterior lateral angles acute; mandibles triangular, obsolete dentate; antennae 12-segmented, apical joint of flagellum distinctly much longer than preceding three joints, basal joint very short. Thorax strongly rounded and convex above, posterior face of metanotum flat; legs cylindrical, densely pubescent. Node of pedicel longer than broad, convex above, densely punctured and longitudinally coarsely furrowed or wrinkled;

abdomen elongate, constriction between basal two segments broad and well marked, apex acute.

*Material examined* : India : Arunachal Pradesh, 5W, Lower Subansiri, Yazli, Lichi, 19.ix.1988, coll. T.K. Pal and party.

*Distribution* : India : Arunachal Pradesh, Meghalaya, Sikkim.

*Elsewhere* : China, Hong Kong, Myanmar, Malaya Peninsula.

### IV. Subfamily FORMICINAE Lapeletier

#### Key to the genera

1. Antennal sockets situated close to the posterior clypeal margin, and metapleuron with a distinct metapleural gland orifice, the orifice situated above the hind coxa and below the level of propodeal spiracle ..... 2
  - Either antennal sockets situated far behind the posterior clypeal margin, or the metapleuron lacking a metapleural gland orifice in the location described above ..... 4
2. Maxillary palp with 2-4 segments ..... *Pseudolasius*
  - Maxillary palp with 6 segments ..... 3
3. With alitrunk in absolute profile, the propodeal spiracle well in front of the point where the propodeal side rounds into the declivity ..... *Cataglyphis*
  - With alitrunk in absolute profile, the propodeal spiracle bordering or actually on the curvature where the propodeal side rounds in the declivity ..... *Paratrechina*
4. Mandibles with 10 or more teeth or denticles in total. Apical tooth disproportionately large. Petiole reduced to an elongate low node, which allows gaster to be bent forward over alitrunk. Maxillary palpi 5-jointed ..... *Oecophylla*
  - Mandibles usually with 5-7 teeth. Apical tooth not as above. Petiole an erect node or scale, gaster not capable of being bent forward. Maxillary palpi 6-jointed ..... 5
5. Targite of first gastral segment large.

accounting for at least half the length of gaster in dorsal view in profile. Spines or teeth present on pronotum, propodeum, or on both .....

..... *Polyrhachis*

- Targite of first gastral segment shorter, accounting for distinctly less than half the length of gaster in dorsal view in profile. Spines or teeth usually absent from pronotum, propodeum and petiole .....

..... *Camponotus*

#### 10. Genus *Camponotus* Mayr

1861. *Camponotus* Mayr, *Europ. Formicid* : 35.

Type species : *Formica ligniperda* Latreille, 1802.

#### Key to the species

1. Thorax viewed from side forming a regular arch .....
- ..... 2

  - Regular arch of the thorax interrupted by the metanotum being raised, rounded above and gibbous .....
  - ..... *confucii*

2. Head, thorax and abdomen either entirely black or pale yellow .....
- ..... 3

  - Head, thorax and abdomen never all black or all yellow .....
  - ..... 4

3. Head, thorax and abdomen black .....
- ..... *compressus*

  - Head, thorax and abdomen pale yellow .....
  - ..... *invidus*

4. Head and abdomen black or dark castaneous red, thorax yellow; tibiae spined beneath .....
- ..... *irritans*

  - Head, thorax and base of abdomen reddish yellow, apex of abdomen darker; tibiae without spines beneath .....
  - ..... *nicobarensis*

#### 16. *Camponotus confucii* Forel

1894. *Camponotus confucii* Forel, *J. Bombay Nat. Hist. Soc.*, **8** : 396, W.

1999. *Camponotus confucii*, Tiwari, *Memoirs zool. Surv. India*, **18**(1) : 73.

*Material examined* : India : Arunachal Pradesh

: 26W, Tirap, Deomali Forest (250 m), 9.xi.1971, coll. G.S. Arora and party.

*Distribution* : India : Arunachal Pradesh, Karnataka, Western India.

*Elsewhere* : Upper Myanmar.

#### 17. *Camponotus compressus* (Fabricius)

1787. *Formica compressa* Fabricius, *Mant. Insect.*, **1** : 307. W.

1999. *Camponotus compressus*, Tiwari, *Memoris zool. Surv. India*, **18**(1) : 69.

*Material examined* : India : Arunachal Pradesh : 1W, Debang Valley, Roing, Abango Vill., 5.iv.1993, coll. P.T. Bhutia and party; 5W, Papumpare, Nirjuli, 20.iv.2001, coll. Sheela and party.

*Distribution* : India : Arunachal Pradesh, Assam, Tamil Nadu, West Bengal and almost throughout India.

*Elsewhere* : Arabia, Africa, Borneo, Myanmar, Nepal, Philippines, Russia, Sri Lanka.

#### 18. *Camponotus invidus* Forel

1892a. *Camponotus invidus* Forel, *J. Bombay Nat. Hist. Soc.*, **7** : 225 and 234, W.

1995b. *Camponotus (Tanaemyrmex) invidus*, Bolton, *New Genl. Cat. Ants World* : 105.

*Material examined* : India : Arunachal Pradesh, 15W, Papumpare, Itanagar, Ganga Lake, 15.v.1991, coll. D.B. Bastawade and party; 7W, Changlong, Tengmo, 17 km from Nampong, ix.1991, coll. T.K. Pal and party.

*Distribution* : India : Arunachal Pradesh, Orissa, Sikkim, West Bengal, Andaman and Nicobar Islands.

#### 19. *Camponotus irritans* (Smith)

1857. *Formica irritans* Smith, *J. Proc. Linn. Soc. London Zool.*, **2** : 55.

1995b. *Camponotus (Tanaemyrmex) irritans*, Bolton, *New Genl. Cat. Ants World* : 105.

*Material examined* : India : Arunachal Pradesh, 3W, Lohit, Khupa, Nara, 26.ii.1990, coll. T.K. Pal and party.

*Distribution* : India : Arunachal Pradesh, West Bengal.

*Elsewhere* : Indonesia, Indo-China, Sri Lanka.

## 20. *Camponotus nicobarensis* Mayr

1865. *Camponotus nicobarensis* Mayr, *Reise der Nov. Zoologischer Wien* : 31, W.

1995b. *Camponotus (Tanaemyrmex) nicobarensis*, Bolton, *New Genl. Cat. Ants World* : 113.

*Material examined* : India : Arunachal Pradesh : 1W, West Kameng, Rupa Camp, 20.xii.1965, coll. S.K. Bhattacharyya and A.N.T. Joseph.

*Distribution* : India : Arunachal Pradesh, Andaman and Nicobar Islands.

*Elsewhere* : China, Java, Nias Islands.

## *Camponotus* sp.

*Material examined* : India : Arunachal Pradesh : 4W, Upper Subansiri, Ziro, 29.iii.1992, coll. D.B. Bastawade and party; 2W, E. Siang, Pasighat, Regin, 5.ix.1992, coll. P.T. Bhutia and party; 8W, Debang Valley, Roing, Salley Lake, 7.iv.1993, coll. P.T. Bhutia and party; 6W, West Kameng, Tippi, 12.x.1993, coll. P.T. Bhutia and party.

## 11. Genus *Cataglyphis* Foerster

1850. *Cataglyphis* Foerster, *Verh. Nat. Ver. Pre. Rhein. West.* 7 : 493.

Type species : *Formica bicolor* Fabricius 1793 (= *Cataglyphis fairmairei* Foerster 1850).

## 22. *Cataglyphis setipes* (Forel)

1894. *Myrmecosystus viaticus* race, *setipes* Forel, *J. Bombay Nat. Hist. Soc.*, 8 : 401. W.

1922. *Cataglyphis setipes*, Wheeler, *Bull. Amer. Mus. Nat. Hist.*, 45 : 945.

1995b. *Cataglyphis setipes*, Bolton, *New Genl. Cat. Ants World* : 137.

*Diagnostic characters* : W. TL 10 mm. Head, thorax, pedicel dark red, abdomen black, legs almost black; densely setose and spinose.

Head without mandibles quadrangular, sides straight; mandibles large, strongly dentate, apical tooth remarkably long, curved and acute; clypeus convex; frontal area triangular; antennae 12-segmented, filiform; eyes placed well above the middle line of head; ocelli present. Thorax viewed from side constricted, saddle-shaped, sutures well marked; pronotum convex; mesonotum long, narrow, rounded above; metanotum short, gibbous. Node of pedicel rounded; abdomen comparatively short, oval.

*Material examined* : India : Arunachal Pradesh : 1W, Subansiri, Pamir (564m), 17.v.1966, coll. A.N.T. Joseph and party; 1W, Siang, Tappi (600m), 23.x.1966, coll. S.K. Tandon and G.S. Arora.

*Distribution* : India : Arunachal Pradesh, Meghalaya, Punjab, Sikkim, Tamil Nadu, West Bengal, Central India.

*Elsewhere* : Persia.

## 12. Genus *Oecophylla* Smith

1857. *Oecophylla* Smith., *J. Proc. Linn. Soc. London Zool.*, 5 : 101, W F.

Type species : *Formica smaragdina* Fabricius, 1775 (= *Formica virescens* Fabricius, 1775).

## 23. *Oecophylla smaragdina* (Fabricius)

1775. *Formica smaragdina* Fabricius, *Syst. Ent.* : 828, W, pl., figs.

1999. *Oecophylla smaragdina*, Tiwari, *Memoris Zool. Surv. India*, 18 (4) : 66.

*Diagnostic characters* : W. TL 8-10 mm. Yellowish red. Head quadrangular without mandibles, posteriorly transverse; mandibles long, dentate, apical tooth acute and curved; clypeus strongly convex; antennae 12-segmented, filiform; eyes large. Thorax elongate; pronotum convex, anteriorly narrowed into a collar; mesonotum saddle-shaped; metanotum rounded above, sutures distinct. Pedicel elongate, scarcely nodiform; abdomen short, oval.

*Material examined* : India : Arunachal Pradesh : 2W, Siang, Siji Vill. (200m), 8.x.1966, coll. S.K. Tandon and G.S. Arora; 32W, Papumpare, Itanagar, Ganga Lake, 10.iv.2001, coll. Sheela and party.

*Distribution* : India : Arunachal Pradesh, Manipur, Meghalaya, Karnataka, Kerala, Orissa, Sikkim, Tamil Nadu, West Bengal, Andaman and Nicobar Islands, and mostly the whole India except desert and treeless areas.

*Elsewhere* : Australia, China, Java, Myanmar, New Guinea, Sri Lanka.

### 13. Genus *Paratrechina* Motschoulsky

1863. *Paratrechina* Motschoulsky, *Bull. Soc. Nat. Moscou.*, 36 : 13.

Type species : *Formica longicornis* Latreille, 1802 (= *P. currens* Motschoulsky, 1863).

#### Key to the species

1. Head highly polished, smooth and shining, not pilose; only a few scattered hairs on clypeus and mandibles ..... *bourbonica*
- Head not polished, only slightly shining, pilose or pubescent ..... *indica*

### 24. *Paratrechina bourbonica* (Forel)

1886. *Prenolepis nodifera bourbonica* Forel, *Ann. Soc. Ent. Belg.*, 30 : 210, W F M.

1999. *Paratrechina bourbonica*, Tiwari, *Memoirs Zool. Surv. India*, 18 (4) : 80.

*Material examined* : India : Arunachal Pradesh : 8W, Lower Subansiri, Yazli, 16.v.1989, coll. P.T. Bhutia and party.

*Distribution* : India : Arunachal Pradesh, Tamil Nadu, West Bengal.

*Elsewhere* : Myanmar, Seychelles, Pemba Islands, Oceania.

### 25. *Paratrechina indica* Forel

1894. *Prenolepis indica* Forel, *J. Bombay Nat. Hist. Soc.*, 8 : 409, W F M.

1995b. *Paratrechina indica*, Bolton, *New Genl. Cat. Ants World* : 314.

*Material examined* : India : Arunachal Pradesh : 6W, Lower Subansiri, Hapoli, 16.iv.2001, coll.

Sheela and party; 3W, Upper Subansiri, Daporizo, 18.iv.2001, coll. Sheela and party.

*Distribution* : India : Arunachal Pradesh, Maharashtra, West Bengal.

### 26. *Paratrechina* sp.

*Material examined* : India : Arunachal Pradesh, 2 W, Lower Subansiri, Hapoli, 16.iv.2001, coll. Sheela and party.

### 14. Genus *Polyrhachis* Smith

1857. *Polyrhachis* Smith, *J. Proc. Linn. Soc. London Zool.*, 2 : 58.

Type species : *Formica bihamata* Drury, 1773.

#### Key to the species

1. Thorax more or less rounded above, the sides not margined along their whole length ..... 2
- Thorax more or less flat above, the sides margined along their whole length ..... 7
2. Metanotum unarmed ..... *laevissima*
- Metanotum with a spine on each side ..... 3
3. Pronotum with a short spine .....  
..... *hippomanes ceylonensis*
- Pronotum with a spine on each side ..... 4
4. Pubescence sparse, almost entirely wanting .  
..... *armata*
- Pubescence dense, silky and recumbent ..... 5
5. Abdomen red ..... *bicolor*
- Abdomen black ..... 6
6. Pubescence bronzy yellow or golden ... *dives*
- Pubescence silvery ..... *tibialis*
7. Node of pedicel with 2 long spines on upper angles and 2 short teeth on sides ... *illaudata*
- Node of pedicel armed with 4 short sub equal spines ..... *convexa*

**27. *Polyrhachis armata* (Le Guillou)**

1842 *Formica armata* Le Guillou, *Ann. Soc. Ent. France*, 10 : 313, F.

1863a. *Polyrhachis armata*, Roger, *Berl. Ent. Zeitsch.*, 7 : 9.

1995b. *Polyrhachis (Myrmhopla) armata*, Bolton, *New Genl. Cat. Ants World* : 343.

*Material examined* : India : Arunachal Pradesh : 1W, Lohit, Kariranga (100m), 25.ii.1969, coll. S.K. Tandon and party.

*Distribution* : India : Arunachal Pradesh, Assam.

*Elsewhere* : Indonesia (Java), Myanmar, Philippines.

**28. *Polyrhachis bicolor* Smith**

1858. *Polyrhachis bicolor* Smith, *Cat. Hym. Brit. Mus.*, 6 : 65, F.

1995b. *Polyrhachis (Myrmhopla) bicolor*, Bolton, *New Genl. Cat. Ants World* : 344.

*Material examined* : India : Arunachal Pradesh : 2W, Lower Subansiri, Yazli, 16.v.1989, coll. P.T. Bhutia and party.

*Distribution* : India : Arunachal Pradesh, West Bengal.

*Elsewhere* : Myanmar, Philippines.

**29. *Polyrhachis convexa* Roger**

1863a. *Polyrhachis convexa* Roger, *Berl. Ent. Zeitsch.*, 7 : 153, W.

1995b. *Polyrhachis (Myrma) convexa*, Bolton, *New Genl. Cat. Ants World* : 346.

*Material examined* : India : Arunachal Pradesh, 1W, Kameng, Loo Dohung (1524m.), 23.iv.1966, coll. A.N.T. Joseph and party.

*Distribution* : India : Arunachal Pradesh.

*Elsewhere* : Sri Lanka.

**30. *Polyrhachis dives* Smith**

1857. *Polyrhachis dives* Smith, *J. Proc. Linn. Soc. Lon. Lon. Zool.*, 2 : 64, W.

1999. *Polyrhachis dives*, Inwari, *Memoirs Zool. Surv. India* 18(4) : 75.

*Material examined* : India : Arunachal Pradesh : 33W, Kameng, Rupa Camp, 20.xii.1965, coll. S.K. Bhattacharyya and A.N.T. Joseph; 16W, Siang, Kambang (200m) and Old Jining (500m.), 16.x.-20.x.1966, coll. S.K. Tandon and G.S. Arora; 14W, Tawang, Lumla, 9.iv.1991, coll. P.T. Bhutia and party; 40W, Lohit, Namsai, 31.i.1994, coll. G. Thirumalai and party; 27W, Debang Valley, Roing, Abango vill., 5.iv.1993, coll. P.T. Bhutia and party; 4W, Papumpare, Naharlagun, 19.iv.2001, coll. Sheela and party; 7W, West Kameng, Bhalukpong, Sessa, 22.iv.2001, coll. Sheela and party.

*Distribution* : India : Arunachal Pradesh, Sikkim, Tamil Nadu, Eastern Himalayas.

*Elsewhere* : China, Indonesia, Myanmar, Philippines, Singapore, Sri Lanka, Thailand.

**31. *Polyrhachis hippomanes ceylonensis***

Emery

1893. *Polyrhachis hippomanes ceylonensis* Emery, *Ann. Soc. Ent. France*, 62 : 254.

1995b. *Polyrhachis hippomanes ceylonensis*, Bolton, *New Genl. Cat. Ants World* : 345.

*Material examined* : India : Arunachal Pradesh : 21W, Kameng, Rupa Camp, 20.xii.1965, coll. S.K. Bhattacharyya and A.N.T. Joseph.

*Distribution* : India : Arunachal Pradesh.

*Elsewhere* : Singapore, Sri Lanka.

**32. *Polyrhachis illaudata* Walker**

1859. *Polyrhachis illaudata* Walker, *Ann. Mag. Nat. Hist.*, (3) 4 : 373, W.

1995b. *Polyrhachis (Myrma) illaudata*, Bolton, *New Genl. Cat. Ants World* : 350.

*Material examined* : India : Arunachal Pradesh : 1W, Kameng, Rupa Camp, 20.xii.1965, coll. S.K. Bhattacharyya and A.N.T. Joseph; 2W, Kameng, Dunn Bridge (1524m) and Shaitan Bridge (1524m), 21-23.iv.1966, coll. A.N.T. Joseph and party; 3W, Subansiri, Kimin (198m) and Pamir (564m), 17.v.1966, coll. A.N.T. Joseph

and party; 2W, Tirap, Changlong (600m.), 30.x.1971, coll. G.S. Arora and party.

*Distribution* : India : Arunachal Pradesh, Assam, Andaman & Nicobar Islands, Karnataka, Kerala, Meghalaya, Sikkim, Tamil Nadu, West Bengal.

*Elsewhere* : China, Indonesia, Myanmar, Philippines, Sri Lanka.

### 33. *Polyrhachis laevis* Smith

1858. *Polyrhachis laevis* Smith, *Cat. Hym. Brit. Mus.*, 6 : 64, W.

1995b. *Polyrhachis (Cyrtomyrma) laevis*, Bolton, *New Genl. Cat. Ants World* : 351

*Material examined* : India : Arunachal Pradesh : 2W, Lower Subansiri, Yazli, 16.v.1989, coll. P.T. Bhutia and party.

*Distribution* : India : Arunachal Pradesh, West Bengal.

*Elsewhere* : Indonesia, Myanmar, Singapore.

### 34. *Polyrhachis tibialis* Smith

1858. *Polyrhachis tibialis* Smith, *Cat. Hym. Brit. Mus.*, 6 : 63, W.

1995b. *Polyrhachis (Myrmhopla) tibialis*, Bolton, *New Genl. Cat. Ants World* : 358

1999. *Polyrhachis tibialis*, Tiwari, *Memoirs Zool. Surv. India*, 18(4) : 78.

*Material examined* : India : Arunachal Pradesh : 6W, Lower Subansiri, Yazli, 16.v.1989, coll. P.T. Bhutia and party.

*Distribution* : India : Arunachal Pradesh, Karnataka, Kerala, West Bengal.

*Elsewhere* : Indonesia, Myanmar.

### 15. Genus *Pseudolasius* Emery

1887. *Pseudolasius* Emery, *Ann. Mus. Civ. Stor. Nat. Genova*, 4(24) : 244.

Type spaces : *Formica familiaris* Smith, 1860.

### 35. *Pseudolasius familiaris* (Smith)

1860a. *Formica familiaris* Smith, *J. Proc. Linn. Soc. London Zool.* 5(suppl. to 4) : 68, W.

1903. *Pseudolasius familiaris*, Bingham, *Fauna Brit. India, Hym.*, 2 : 338.

1995b. *Pseudolasius familiaris*, Bolton, *New Genl. Cat. Ants World* : 370

*Diagnostic characters* : W. TL(maj.) 6-7 mm.,(min.) 3.5 mm. Reddish yellow to creamy buff, abdomen almost reddish brown; very minutely but closely reticulate-punctate; hairs fairly long, erect; pubescence fine, short and silky, dense on abdomen. Head nearly square without mandibles, broader posteriorly; powerful mandibles with four teeth, innermost broad, others acute; clypeus convex in the middle; depressed at the sides; 12-segmented antennae somewhat short, scape stout; eyes small. Thorax short, narrower than head; pronotum rounded, convex; viewed from above mesonotum circular; basal portion of metanotum much shorter than oblique apical portion; sutures distinct. Node of petiole quadrangular, posteriorly fitted into a hollow in abdomen; abdomen short, broad and convex.

*Material examined* : India : Arunachal Pradesh : 3W, Lower Subansiri, Bismile, 14.iv.2001, coll. Sheela and party.

*Distribution* : India : Arunachal Pradesh, Meghalaya, Sikkim.

*Elsewhere* : Celebes, Java, Myanmar.

### V. Subfamily DOLICHODERINAE Forel

#### Key to the genera

1. Petiole in profile usually a simple transversely flattened strip, sometimes slightly swollen anterodorsally but never equipped with a standing scale. Petiole overhung by first gastral segment and usually not visible in dorsal view when alitrunk and gaster are in same plane ..... 2
- Petiole in profile surmounted by a node or scale, which somewhat inclined, forward, but node always present and conspicuous. Petiole not overhung by first gastral segment, usually visible in dorsal view when alitrunk and gaster are in same plane ..... 3
2. In dorsal view 5 gastral tergites visible, the

fifth one small but continuing the line of gaster and not bent forward, anal orifice situated apically ..... *Technomyrmex*

- In dorsal view only 4 gastral tergites visible; the fifth one bent forward and the anal orifice situated ventrally ..... *Tapinoma*

3. Clypeus with oval side-processes overlapping the base of the mandibles on each side .....

..... *Liometopum*

- Clypeus without such side-processes .....

..... *Dolichoderus*

### 16. Genus *Dolichoderus* Lund

1831. *Dolichoderus* Lund, *Ann. Sci. Nat.*, **23** : 130.

Type species : *Formica attelaboides* Fabricius, 1775.

### 36. *Dolichoderus* sp.

*Material examined* : India : Arunachal Pradesh, 2W, Lohit, Yalong, 25.ii.1990, coll. T.K. Pal and party.

### 17. Genus *Tapinoma* Foerster

1850. *Tapinoma* Foerster, *Hym., Stud.*, **1** : 43, W F.

Type species : *Tapinoma collina* Foerster, 1850 (= *Tapinoma erraticum* Latreille, 1798)

### 37. *Tapinoma melanocephalum* (Fabricius)

1793. *Formica melanocephala* Fabricius, *Ent. Syst.*, **2** : 353, W.

1999. *Tapinoma melanocephalum*, Tiwari, *Memoirs zool. Surv. India*, **18**(4) : 83.

*Diagnostic characters* : W. TL 1.5-2 mm. Head, sometimes thorax also dark brown; thorax and abdomen or abdomen alone yellowish white. Head longer than broad, oval, rounded posteriorly; mandibles triangular, broad, masticatory margin armed with numerous minute teeth; antennae long, scape extending beyond the top of the head; eyes comparatively large. Thorax viewed from side not emarginate; pro-meso and meso-metanotal sutures distinct; basal portion of metanotum very short, passing into much longer obliquely slopping portion by an obtuse angle. Pedicel very short; abdomen elongate, oval.

*Material examined* : India : Arunachal Pradesh, 35W, Lower Subansiri, Bismile, 11.iv.2001, coll. Sheela and party; 4W, Upper Subansiri, Daporizo, 18.iv.2001, coll. Sheela and party.

*Distribution* : India : Arunachal Pradesh, Karnataka, Tamil Nadu, West Bengal and almost throughout the country.

*Elsewhere* : Oceania, South America and spreaded through the tropics of both hemispheres.

### 18. Genus *Liometopum* Mayr

1861. *Liometopum* Mayr, *Europ. Formicid.* : 38.

Type species : *Formica microcephala* Panz., 1798.

### 38. *Liometopum lindgreeni* Forel

1902a. *Liometopum lindgreeni* Forel, *Ann. Soc. Ent. Belg.*, **46** : 293.

1995b. *Liometopum lindgreeni*, Bolton, *New Genl. Cat. Ants World* : 247.

*Diagnostic characters* : W. TL 4.5-5 mm. Head, thorax, legs, nodes of pedicel and base of abdomen reddish brown; rest of abdomen dark brown. Pubescence pale, very dense and decumbent, giving with the fine, close, minute reticulate punctate sculpture. Head with the mandibles triangular, broader posteriorly than in front; broad mandibles with 8-10 teeth; clypeus triangular, rounded posteriorly with oval side-processes overlapping the base of mandibles on each side; 12-segmented antennae stout, planted immediately behind the posterior margin of clypeus. Pro-meso, and meso-metanotal sutures well-marked; thorax in-total forming a slight curve to the apex of metanotum, which is oblique but not truncate. Node of pedicel oval, not inclined, erect; abdomen broadly oval, not gibbous.

*Material examined* : India : Arunachal Pradesh, 36W, Papumpare, Itanagar, Ganga lake, 10.iv.2001, coll. Sheela and party.

*Distribution* : India : Arunachal Pradesh, Assam.

*Elsewhere* : Myanmar.

19. Genus *Technomyrmex* Mayr

1872. *Technomyrmex* Mayr. *Ann. Mus. Civ. Stor. Nat. Genova*, 2 : 147, W F.

Type species : *Technomyrmex strenua* Mayr. 1872.

39. *Technomyrmex albipes* (Smith)

1861. *Tapinoma albipes* Smith. *J. Proc. Linn. Soc. London. Zool.*, 6 : 38, W.

1895. *Technomyrmex albipes*. Forel, *J. Bombay Nat. Hist. Soc.*, 9 : 466.

2003. *Technomyrmex albipes*, Tiwari *et al.*, *Zool. Surv. India, Fauna of Sikkim, State Fauna Series 9* (Part-4) : 494.

*Diagnostic characters* : W. TL 2.5-3 mm. Black, mandibles reddish brown, tarsi white; head, thorax and abdomen very finely and closely reticulate-punctate, covered with thin short silky-white pubescence. Head longer than broad, widely emarginate posteriorly; broad, triangular mandibles armed with numerous small teeth on its masticatory margin; clypeus with a deep crescentic emargination medially on anterior margin; scape of antennae scarcely extending beyond top of head. Thorax somewhat broad, viewed in profile widely emarginate at meso-metanotal suture; mesonotum convex, slightly raised above pronotum; apical portion of metanotum much longer with backward slope. Pedicel without a proper elevated node, simply with an oval flat thickening in the middle; gibbous abdomen produced at base, overhanging the pedicel, posteriorly conical.

*Material examined* : India : Arunachal Pradesh: 26W, West Kameng, Tippi, 28.iv.2001, coll. Sheela and party.

*Distribution* : India : Arunachal Pradesh and almost all other states.

*Elsewhere* : Java, New Guinea, Oceania.

VI. Subfamily PSEUDOMYRMECINAE  
Emery20. Genus *Tetraponera* Smith

1852. *Tetraponera* Smith, *Ann. Mag. Nat. Hist.*, (2) 9 : 44.

Type species : *Eciton nigrum* Jerdon. 1851 (= *Tetraponera arata* Smith, 1852).

40. *Tetraponera rufonigra* (Jerdon)

1851. *Eciton rufonigrum* Jerdon, *Madras J. Lit. Sci.*, 17 : 111.W.

1999. *Tetraponera (Tetraponera) rufonigra*. Tiwari, *Memoirs zool. Surv. India*, 18(4) : 35.

*Diagnostic characters* : W. TL 10-13 mm. Head, second joint of pedicel and abdomen black; mandibles, antennae, thorax and first joint of pedicel light to deep brick-red; pilosity and pubescence sparse. Shining, minutely and closely punctured. Head little longer than broad; occiput transverse; cheeks straight; broadly linear mandibles with 5 to 6 teeth on masticatory margin; ocelli present. Thorax elongate; broad pronotum with dentate anterior lateral angles; pro-mesonotal suture arched to the front; meso-metanotal suture deeply emarginate; metanotum longer than pro- and mesonotum together. Pedicel elongate; abdomen oval, acute at apex; sting exerted.

*Material examined* : India : Arunachal Pradesh : 17W, Lower Subansiri, Yazli, 16.v.1989, coll. P.T. Bhutia; 21W, Papumpare Itanagar, Ganga lake, 10.iv.2001, coll. Sheela and party.

*Distribution* : India : Arunachal Pradesh, Karnataka, Kerala, West Bengal and mostly widely distributed species in India.

*Elsewhere* : China, Indonesia, Myanmar, Singapore, Sri Lanka.

## VII. Subfamily MYRMICINAE Lepelletier

## Key to the genera

1. Postpetiole articulated on dorsal surface of first gastral segment; the gaster in dorsal view roughly heart-shaped and capable of being bent forward over the alitrunk. Petiole dorsoventrally flattened and without a node ..... *Crematogaster*
- Postpetiole articulated on anterior surface of first gastral segment; gaster in dorsal view not heart-shaped and not capable of being bent forward. Petiole not dorsoventrally flattened,



- possessing a node of some form ..... 2
2. Apical and preapical antennal segments much larger than preceding funicular segments and forming a conspicuous 2-segmented club .... 3
- Apical plus 2 preapical funicular segments of antennae enlarged and forming a conspicuous 3-segmented club ..... 4
3. Antenna with 10-segments; anterior clypeal margin with a single long, anteriorly projecting, unpaired median seta at the midpoint of the margin ..... *Solenopsis*
- Antenna with 11-segments; anterior clypeal margin lacking a single median unpaired seta, instead usually with a pair of setae that straddle the midpoint ..... *Pheidologeton*
4. Antenna with 9-segments ..... *Meranoplus*
- Antenna with 11-12 segments ..... 5
5. Antenna with 11-segments; sting with a lamellate appendage, which projects dorsally, close to the sting apex but at an angle to the shaft ..... *Tetramorium*
- Antenna with 12-segments; sting without a lamellate appendage ..... 6
6. Palp formula 6, 4. Spurs on posterior tibiae usually pectinate ..... *Myrmica*
7. Palp formula less than 6,4. Spurs on posterior tibiae usually simple or absent ..... 8
8. Masticatory margin of mandibles with 3-6 teeth which are decreasing in size from the apical to the basal most. Club of flagellum distinct ..... 9
- Masticatory margin of mandibles with 7 or more teeth or denticles. Club of flagellum not distinct ..... *Aphaenogaster*
9. Midpoint of anterior clypeal margin without a long unpaired median seta. Median portion of clypeus not longitudinally bicarinate and lateral portion not flattened and prominent ..... *Pheidole*
- Midpoint of anterior clypeal margin with a long unpaired median seta, which projects forward over the mandibles. Median portion of clypeus longitudinally bicarinate, or lateral portions of clypeus flattened and strongly prominent ..... 10
10. Propodeum unarmed and rounded. Clypeus bicarinate medially ..... *Monomorium*
- Propodeum armed with a pair of spines. Clypeus not bicarinate medially; but lateral portions of clypeus dorsoventrally flattened and thin, strongly prominent over the mandibles .. ..... *Cardiocondyla*
21. Genus *Aphaenogaster* Mayr
1853. *Aphaenogaster* Mayr, *Verh. Zool.-Bot. Ver. Wien*, 3 : 107.
- Type species : *Aphaenogaster sardous* Mayr, 1853.
41. *Aphaenogaster smythiesii* Forel
- 1902b. *Stenamma (Aphaenogaster) smythiesii* Forel, *Rev. Suisse Zool.*, 10 : 222, W, F, M.
2003. *Aphaenogaster smythiesii*, Tiwari *et al.*, *Zool. Surv. India, Fauna of Sikkim, State Fauna Series 9 (Part-4)* : 482.
- Diagnostic characters* : W. TL, 4.5-5.5 mm. Dark castaneous brown; smooth, polished and shining; pilosity white and obtuse, most plentiful on abdomen. Head without mandibles rectangular, posterior lateral angles rounded; triangular mandibles striate at base. Thorax narrow; pronotum convex, pro-mesonotal suture distinct; mesonotum obliquely sloping back; meso-metanotal suture emarginate, deeply marked; metanotum rounded from side to side; short and acute metanotal spines broad at base. First node of pedicel obliquely sloped posteriorly, rounded above; second node longer than broad; abdomen a little broader posteriorly than at base, rounded in front at apex.
- Material examined* : India : Arunachal Pradesh, 6W, Lower Subansiri, Bismile, 14.iv.2001, coll. Sheela and party.
- Distribution* : India : Arunachal Pradesh, Meghalaya, Sikkim, West Bengal, North-West Himalayas.

22. Genus *Cardiocondyla* Emery

1869. *Cardiocondyla* Emery, *Ann. Acc. Asp. Nat. Naples*,  
Era 2, 2 : 20.

Type species : *Cardiocondyla elegans* Emery, 1869.

## Key to the species

1. Anterior angles of propodeum rounded .....  
..... *nuda*  
– Anterior angles of propodeum bidenticulate ..  
..... *shuckardi*

42. *Cardiocondyla nuda* (Mayr)

1866. *Leptothorax nuda* Mayr, *Sitz. Akad. Wiss. Wien.*, 53  
: 508, W.

2003. *Cardiocondyla nuda*, Tiwari et al., *Zool. Surv. India*,  
*Fauna of Sikkim, State Fauna Series 9 (Part-4)* :  
492.

*Material examined* : Arunachal Pradesh : 1W,  
Debang Valley, Roing, Abango vill., 5.iv.1993, coll.  
P.T. Bhutia and party.

*Distribution* : India : Arunachal Pradesh,  
Andaman and Nicobar Islands, Meghalaya, Sikkim,  
West Bengal.

*Elsewhere* : Malaysia, Sri Lanka, Oceania.

43. *Cardiocondyla shuckardi* Forel

1891. *Cardiocondyla shuckardi* Forel, *Hist. Phy. Nat. Pol.*  
*Madagascar*, 20 : 161.

1995. *Cardiocondyla shuckardi*, Bolton, *New Genl. Cat.*  
*Ants World* : 133.

*Material examined* : India : Arunachal  
Pradesh : 1W, West Kameng : Bhalukpong,  
22.iv.2001, coll. Sheela and party.

*Distribution* : India : Arunachal Pradesh.

44. *Cardiocondyla* sp.

*Material examined* : India : Arunachal  
Pradesh. 15 W, Papumpare, Nirjuli, 20.iv.2001,  
coll. Sheela and party.

23. Genus *Crematogaster* Lund

1831. *Crematogaster* Lund, *Ann. Sci. Nat.*, 23 : 132.

Type species : *Formica scutellaris* Oliv., 1792.

## Key to the species

1. Club of flagellum of antennae 3-jointed ..... 2  
– Club of flagellum of antennae 2-jointed .....  
..... *biroi*  
2. Pronotum sculptured ..... *Crematogaster* sp.  
– Pronotum not sculptured, smooth ..... 3  
3. Basal level portion of metanotum sculptured  
..... *walshi*  
– Basal level portion of metanotum not  
sculptured, smooth ..... 4  
4. Head, viewed from the front, anteriorly  
truncate, raised into a high convex cone above  
..... *aberrans*  
– Head, viewed from the front, anteriorly not  
truncate, not cone-shaped above ..... *politula*

45. *Crematogaster aberrans* Forel

1892b. *Crematogaster aberrans* Forel, *Ann. Soc. Ent. Belg.*,  
36 : 531, W.

1995. *Crematogaster aberrans*, Bolton, *New Genl. Cat. Ants*  
*World* : 146.

*Material examined* : India : Arunachal Pradesh  
: 33 W, Lohit, Teju ( 150 m.), 10.iii.1969, coll. S.  
K. Tandon and party.

*Distribution* : India : Arunachal Pradesh,  
Karnataka, Maharashtra.

46. *Crematogaster biroi* Mayr

1897. *Crematogaster biroi* Mayr, *Term. Fuzetek*, 20 : 428,  
W.

2003. *Crematogaster biroi*, Tiwari et al., *Zool. Surv. India*,  
*Fauna of Sikkim, State Fauna Series 9 (Part-4)* :  
487.

*Material examined* : India : Arunachal  
Pradesh : 2 W, Lower Subansiri, Bismile,  
14.iv.2001, coll. Sheela and party.

*Distribution* : India : Arunachal Pradesh,  
Meghalaya, Karnataka, Sikkim, Uttar Pradesh.

*Elsewhere* : Sri Lanka.

#### 47. *Crematogaster politula* Forel

1902b. *Crematogaster subnuda* Mayr. race *politula* Forel, *Rev. Suisse Zool.*, 10 : 207, W.

2003. *Crematogaster politula*, Tiwari *et al.*, *Zool. Surv. India, Fauna of Sikkim, State Fauna Series 9* (Part - 4) : 488.

*Material examined* : India : Arunachal Pradesh : 6W, Lohit, Teju (150m.), 10.iii.1965, coll. S.K. Tandon and party.

*Distribution* : India : Arunachal Pradesh : Assam, Meghalaya, Sikkim.

#### 48. *Crematogaster walshi* Forel

1902b. *Crematogaster walshi* Forel, *Rev. Suisse Zool.*, 10 : 205, W.

2003. *Crematogaster walshi*, Tiwari *et al.* *Zool. Surv. India, Fauna of Sikkim, State Fauna Series 9* (Part-4) : 488.

*Material examined* : India : Arunachal Pradesh : 26W, East Kameng, Golosa, 4.iv.1998, coll. P.T. Bhutia and party.

*Distribution* : India : Arunachal Pradesh, Meghalaya, Orissa, Sikkim, West Bengal.

#### 49. *Crematogaster* sp.

*Material examined* : India : Arunachal Pradesh : 13W, Lohit, Teju, Lohitpur Road (500m), 13.iii.1969, coll. S.K. Tandon and party.

#### 24. Genus *Meranoplus* Smith

1854. *Meranoplus* Smith, *Trans. Ent. Soc. London* (2), 2 : 224.

Type species : *Cryptocerus bicolor* Guer., 1844.

#### Key to the species

1. Mesonotum armed posteriorly with two long acute spines; pronotum dentate ..... *bicolor*
- Mesonotum armed posteriorly with only comparatively short teeth; pronotum subdentate ..... *rothneyi*

#### 50. *Meranoplus bicolor* (Guer.)

1844. *Cryptocerus bicolor* Guer., *Cuv. Iconogr. Regn. Anim.*, *Ins.* 3 : 425.

1903. *Meranoplus bicolor*, Bingham, *Fauna Brit. India*, *Hym.*, 2 : 168.

1995. *Meranoplus bicolor*, Bolton, *New Genl. Cat. Ants World* : 250.

*Material examined* : India : Arunachal Pradesh : 32W, Papumpare, Itanagar, Ganga Lake, 10.iv.2001, coll. Sheela and party.

*Distribution* : India : Arunachal Pradesh and nearly throughout the country excepting hot, dry places.

*Elsewhere* : Myanmar to Malayan sub-region.

#### 51. *Meranoplus rothneyi* Forel

1902b. *Meranoplus rothneyi* Forel, *Rev. Suisse Zool.*, 10 : 241, W.

1995. *Meranoplus rothneyi*, Bolton, *New Genl. Cat. Ants World* : 251.

*Material examined* : India : Arunachal Pradesh : 22W, Papumpare, Itanagar, Ganga Lake, 10.iv.2001, coll. Sheela and party; 5W, Papumpare, Itanagar, Gohpur, 11.iv.2001, coll. Sheela and party.

*Distribution* : India : Arunachal Pradesh, Kerala.

#### 25. Genus *Monomorium* Mayr

1855. *Monomorium* Mayr, *Verh. Zool-Bot. Ges. Wien*, 5 : 452.

Type species : *Monomorium minutum* Mayr, 1855.

#### 52. *Monomorium aberrans* Forel

1902b. *Monomorium aberrans* Forel, *Rev. Suisse Zool.*, 10 : 209.

1995. *Monomorium aberrans*, Bolton, *New Genl. Cat. Ants World* : 258.

*Diagnostic characters* : W. TL 3.5 mm. Reddish yellow, abdomen dark brown with bluish reflections; head, thorax and abdomen smooth and shining, metanotum above transversely striate.

Head quadrate, as broad as long, posteriorly emarginate; clypeus short; scape of antennae reaching beyond the top of head; eyes lateral, closer to the anterior than to posterior margin of head. Thorax anteriorly very rounded and convex; pro-mesonotal suture obsolete; meso-metanotal suture deep, wide and in profile emarginate. Anteriorly petiolate first node of pedicel high, rounded and obtuse above; second node lower, longer than broad, rounded above; abdomen somewhat elongate, oval.

*Material examined* : India : Arunachal Pradesh : 1W, Kameng, Tenga, 19.xii.1965, coll. S.K. Bhattacharya and A.N.T. Joseph.

*Distribution* : India : Arunachal Pradesh, Madhya Pradesh.

## 26. Genus *Myrmica* Latreille

1804. *Myrmica* Latreille, *Nouv. Dict. d'Hist. Nat.*, 24 : 179

Type species : *Formica rubra* Linnaeus, 1758.

## 53. *Myrmica rugosa* Mayr

1865. *Myrmica rugosa* Mayr, *Novara Reise. Zool. Formicid* : 19, W.

2003. *Myrmica rugosa*, Tiwari *et al.*, *Zool. Surv. India, Fauna of Sikkim, State Fauna Series 9 (Part-4)* : 485.

*Diagnostic characters* : W. TL. 5.5–6 mm. Black, mandibles, antennae and legs dark castaneous; head, thorax and pedicel striate, rugose; abdomen highly polished, smooth and shining; plenty of pale, long pilosity on head, thorax and abdomen. Head convex with distinct posterior margin; finely longitudinally striate mandibles with denticulate masticatory margin and very acute apical teeth; medial portion of clypeus produced anteriorly, apex obtuse, rounded posterior margin produced between bases of antennae; antennae without distinct club. Thorax elongate, impressed at meso-metanotal suture; metanotal spines as long as the basal face of metanotum which is rectangular above. First node of pedicel longer than broad with a short petiole anteriorly, second node as broad as long, convex above; abdomen oval.

*Material examined* : India : Arunachal Pradesh

: 11W, West Kameng, Bomdila, 24.iv.2001, coll. Sheela and party; 16W, West Kameng, Tenga, 24.iv.2001, coll. Sheela and party; 33W, Tawang, 26.iv.2001, coll. Sheela and party.

*Distribution* : India : Arunachal Pradesh, Sikkim and along Himalayan ranges and above 4000 ft.

## 27. Genus *Solenopsis* Westwood

1840. *Solenopsis* Westwood, *Ann. Mag. Nat. Hist.*, 6 : 86.

Type species : *Atta geminata* Fabricius, 1804 (= *Solenopsis mandibularis* Westwood, 1841.)

## 54. *Solenopsis geminata* (Fabricius)

1804. *Atta geminata* Fabricius, *Syst. Piez.* : 423.

1863. *Solenopsis geminata*, Mayr, *Verh. Zool.-Bot. Ges. Wien*, 12 : 453.

2003. *Solenopsis geminata*, Tiwari *et al.*, *Zool. Surv. India, Fauna of Sikkim, State Fauna Series 9 (Part-4)* : 491.

*Diagnostic characters* : W. TL. 3-4.5 mm. Pale yellow to reddish yellow; smooth, shining and polished. Head more or less square; mandibles short, stout, 4-dentate; clypeus in the middle produced back between antennal carinae, apices of each side projected as small teeth beyond the anterior margin; antennae 10-segmented. Thorax narrow, pronotum rounded anteriorly; pro-mesonotal suture obsolete; mesonotum convex. First node of pedicel squamiform; petiolate anteriorly; second node oval, broader; abdomen oval.

*Material examined* : India : Arunachal Pradesh : 3W, Siang Div., Tarak vill. (200m.), 18.x.1966, coll. S.K. Tandon and G.S. Arora; 1W, Tirap, Changlong (540m.), 30.x.1971, coll. G.S. Arora and party; 1W, Tirap, Khonsa (825m.) 4.xi.1971, coll. G.S. Arora and party.

*Distribution* : India : Arunachal Pradesh and almost all other states.

*Elsewhere* : Spread pretty nearly over the tropics of the two hemispheres (Bingham 1903.).

## 28. Genus *Tetramorium* Mayr

1855. *Tetramorium* Mayr, *Verh. Zool.-Bot. Ges. Wien*, 5 : 423.

Type species : *Formica caespitum* Linnaeus, 1758.

55. *Tetramorium lanuginosum* Mayr

1870. *Tetramorium lanuginosum* Mayr. *Verh. Zool.-Bot. Ges. Wien*, 20 : 976.

1995. *Tetramorium lanuginosum*. Bolton, *New Genl. Cat. Ants World* : 410.

*Diagnostic characters* : W. TL. 2.5-3 mm. Head, thorax and pedicel light orange-brown, abdomen bright brown; head, thorax and pedicel densely, rather coarsely punctured, rugose and opaque; abdomen polished. Head, thorax and abdomen covered with uneven long soft dense whitish pilosity. Head convex, broader posteriorly than in front; sides convex; mandibles finely, regularly, rather closely longitudinally striate; clypeus broad, somewhat rounded; antennae thick, scape not reaching the top of head; antennal carinae wide apart, long and divergent. Thorax broad, rounded in front; metanotal spines long and slender; metasternal teeth very small. Pedicel short; anteriorly shortly petiolate first node little longer than broad; smooth and shining second node smaller and lower; abdomen very broadly oval.

*Material examined* : India : Arunachal Pradesh : 5W, Lower Subansiri, Yazli, 15.iv.2001, coll. Sheela and party; 4W, Lower Subansiri, Hapoli, 16.iv.2001, coll. Sheela and party; 2W, Upper Subansiri, Daporizo, 18.iv.2001, coll. Sheela and party.

*Distribution* : India : Arunachal Pradesh, Gujarat, Sikkim.

*Elsewhere* : Myanmar, Sri Lanka.

56. *Tetramorium* sp.

*Material examined* : India : Arunachal Pradesh : 1W, Lohit, Sunpura area, 28.ix.1991, coll. T.K. Pal and party.

29. Genus *Pheidologeton* Mayr

1862. *Pheidologeton* Mayr. *Verh. Zool.-Bot. Ges. Wien*, 12 : 750.

Type species : *Oecodoma diversa* Jerdon. 1851.

## Key to the species (based on soldier caste)

1. Length 4.5–13 mm.; dark chestnut brown in colour; head posteriorly widely emarginate; pedicel short, thick in profile, upper margin of first node transverse ..... 2
- Length under 4.5 mm.; dull yellow in colour;

head posteriorly slightly emarginate; pedicel somewhat elongate, first node conical.....

..... *nanus*

2. Front of the head bearing a single ocellus in the middle ..... *diversus*
- Front without any ocellus ..... *affinis*

57. *Pheidologeton affinis* (Jerdon)

1851. *Oecodoma affinis* Jerdon. *Madras J. Lit. Sci.*, 17 : 110, S W.

1863a. *Pheidologeton affinis*. Roger. *Berl. Ent. Zeits.*, 7 : 30.

1995. *Pheidologeton affinis*. Bolton, *New Genl. Cat. Ants World* : 333.

*Material examined* : India : Arunachal Pradesh : 1W, Lohit, Kandu (300m.), 7.iii.1969, coll. S.K. Tandon and party, 32W, Tirap, Changlong (500m.), 31.x.1971, coll. G.S. Arora and party.

*Distribution* : India : Arunachal Pradesh, Assam, Maharashtra, Karnataka, West Bengal.

*Elsewhere* : Myanmar, Sri Lanka.

58. *Pheidologeton diversus* (Jerdon)

1851. *Oecodoma diversa* Jerdon. *Madras J. Lit. Sci.*, 17 : 109, S W.

1863a. *Pheidologeton diversus*. Roger. *Berl. Ent. Zeits.*, 7 : 30.

2003. *Pheidologeton diversus*. Tiwari *et al.*, *Zool. Surv. India, Fauna of Sikkim State Fauna Series 9 (Part-4)* : 486.

*Material examined* : India : Arunachal Pradesh : 3W, Siang, Kambang (200m.), 16.x.1966, coll. S.K. Tandon and G.S. Arora.

*Distribution* : India : Arunachal Pradesh, Karnataka, Kerala, Maharashtra, Sikkim, West Bengal.

*Elsewhere* : Myanmar, Malaysia.

59. *Pheidologeton nanus* Roger

1863b. *Pheidologeton nanus* Roger. *Berl. Ent. Zeits.*, 7 : 191.

1995. *Pheidologeton nanus*. Bolton, *New Genl. Cat. Ants World* : 333.

*Material examined* : India : Arunachal Pradesh

: 1W, Siang, Perying vill. (200m.), 15.x.1966, coll. S.K. Tandon and G.S. Arora.

*Distribution* : India : Arunachal Pradesh.

*Elsewhere* : Sri Lanka.

#### 60. *Pheidologeton* sp.

*Material examined* : India : Arunachal Pradesh, 10W, Upper Subansiri, Daporizo, 18.iv.2001, coll. Sheela and party.

#### 30. Genus *Pheidole* Westwood

1839. *Pheidole* Westwood. *Ann. Mag. Nat. Hist.*, 6 : 87.

Type species : *Atta providens* Sykes, 1835.

#### Key to the species (based on soldier caste)

1. Head anteriorly beneath bidentate .... *watsoni*
- Head anteriorly beneath not dentate ... *parva*

#### 61. *Pheidole parva* Mayr

1865. *Pheidole parva* Mayr, *Nov. Reise, Formicid.*, 98, W S.

1995. *Pheidole parva*, Bolton, *New Genl. Cat. Ants World* : 327.

*Material examined* : India : Arunachal Pradesh : 1S, Siang, Perying vill. (200 m.), 15.x.1966, coll. S.K. Tandon and G.S. Arora.

*Distribution* : India : Arunachal Pradesh, Western India.

*Elsewhere* : Myanmar, Sri Lanka.

#### 61. *Pheidole watsoni* Forel

1902b. *Pheidole watsoni* Forel, *Rev. Suisse Zool.*, 10 : 171 & 189, S W.

1995. *Pheidole watsoni*, Bolton, *New Genl. Cat. Ants World* : 332.

*Material examined* : India, Arunachal Pradesh : 4S, Lower Subansiri, Hapoli, 16.iv.2001, coll. Sheela and party; 35S, Papumpare, Itanagar, Nirjuli, 20.iv.2001, coll. Sheela and party.

*Distribution* : India : Arunachal Pradesh, West Bengal.

*Elsewhere* : Myanmar, Sri Lanka.

#### 62. *Pheidole* sp.

*Material examined* : India : Arunachal Pradesh : 50 S, Papumpare, Itanagar, Nirjuli, 20.iv.2001, coll. Sheela and party.

### SUMMARY

The paper deals with the ants collected from different parts of Arunachal Pradesh by the authors in 2001 and other collections made by various survey parties of Zoological Survey of India.

This is the first consolidated report of the ants of Arunachal Pradesh. Altogether 63 species of ants under 30 genera and 7 subfamilies have been incorporated here including the earlier record of 12 species of ants from this state by Tiwari and Maiti (1976) and Tiwari, Guha and Maity (1977).

Key to the subfamilies, genera and species of the recorded taxa are provided here.

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**District wise distribution of the species**

No	Name of the species	Papumpare	E. Kameng	W. Kameng	L. Subansiri	U. Subansiri	E. Siang	W. Siang	Dibang Valley	Lohit	Tirap
1	<i>Dorylus labiatus</i> Shuckard	-	✓							-	
2	<i>D. laevigatus</i> Smith									+	
3	<i>Diacamma assamense</i> Forel	+									
4	<i>D. rugosum sculptum</i> (Jerdon)	+									
5	<i>Gnamptogenys bicolor</i> (Emery)				-						
6	<i>Hypoponera truncata</i> (Smith)			+	+				+		
7	<i>M. castanea</i> (Smith)		✓			✓			+		
8	<i>Odontomachus monticola</i> (Emery)				+						
9	<i>O. transversa</i> (Smith)					✓		✓			
10	<i>Pachycondyla astuta</i> (Smith)	-							-		
11	<i>P. javana</i> (Mayr)										+
12	<i>P. leeuwenhoekii</i> (Forel)	-			-		-				
13	<i>P. luteipes</i> (Mayr)			-							
14	<i>P. rufipes</i> (Jerdon)			-	-		-				-
15	<i>Camponotus sulcinodis</i> Emery						-				
16	<i>C. confucii</i> (Forel)										-
17	<i>C. compressus</i> (Fabricius)	-							-		
18	<i>C. invidus</i> Forel)	-									-
19	<i>C. irritans</i> (Smith)	-								-	
20	<i>C. nicobarensis</i> Mayr			-							
21	<i>Camponotus</i> sp			-		-	-		-		
22	<i>Cataglyphis setipes</i> (Forel)					✓		✓			
23	<i>Oecophylla smaragdina</i> Fabricius	-						✓			
24	<i>Paratrechina boerhonia</i> (Forel)				-						
25	<i>P. indica</i> Forel				-						
26	<i>Paratrechina</i> sp				-						
27	<i>Polyrhachis armata</i> (Le Guillou)									-	
28	<i>P. bicolor</i> Smith				-						





No	Name of the species	Papumpare	E. Kameng	W. Kameng	L. Subansiri	U. Subansiri	E. Siang	W. Siang	Dibang Valley	Lohit	Tirap
58	<i>P. diversus</i> (Jerdon)							✓			
59	<i>P. nanus</i> Roger							✓			
60	<i>Pheidologeton</i> sp.					+					
61	<i>Pheidole parva</i> Mayr							✓			
62	<i>P. watsoni</i> Forel	+			+						
63	<i>Pheidole</i> sp.	+									

+ indicates the presence in the species in particular district

✓ indicates also the presence of the species, but here in 'material examined' data division of district is not clearly mentioned

## REFERENCES

- ANDRE, E. 1881. Untitled contribution in "séance du 13 avril 1881" introduced by "M. Ernest Andre, de Gray, adresse les descriptions de trois nouvelles especes de fourmis". *Bull. Soc. Ent. France*, **7** : 60-62.
- BINGHAM, C. T. 1903. *The Fauna of British India, including Ceylon and Burma* (Hymenoptera : Formicidae). **2** : 1-414.
- BOLTON, B. 1977. The Tetramorini (Hymenoptera : Formicidae). The genus *Tetramorium* Mayr in the Oriental and Indo-australian regions and Australia. *Bull. Br. Mus. Nat. Hist.(ent.)*, **36(2)** : 67-151, illustr.
- BOLTON, B. 1995a. A taxonomic and Zoogeographical census of the extant ant taxa (Hymenoptera : Formicidae). *J. Nat. Hist.*, **29** : 1037-1056.
- BOLTON, B. 1995b. A New General Catalogue of Ants of the World. Harvard Univ. Press, Cambridge. 1-504.
- BROWN, W. L. Jr. 1958. Contributions toward a reclassification of the Formicidae. II. Tribe Ectatommini. *Bull. Mus. Comp. Zool.*, Harvard, **118** : 175-362.
- CHAPMAN, J. W. and CAPCO, S. R. 1951. Check List of the Ants (Hymenoptera : Formicidae) of Asia. *Monogr. Inst. Sci. Tech. Manila*, **1** : 1-327, 1 map.
- DATTA, S. K. and RAYCHAUDHURI, D. 1983. Taxonomy of the aphidicolous Ants (Hymenoptera : Formicidae) of Sikkim and hilly areas of West Bengal (1) : Myrmicinae. *AKITU N. Ser.*, **56** : 1-14.
- DONISTHORPE, H. 1942. Ants from the Columbo Museum Expedition to Southern India, Sept.-Oct., 1938, *Ann. Mag. Nat. Hist.*, (11) **9** : 449-561.
- DRURY, D. 1773. *Illus. Nat. Hist.* Wherein are exhibited upwards of two hundred and twenty figures of exotic insects. **3** : 1-76 London.
- EMERY, C. 1869. Enumerazione dei Formicidi che rinvenngonsi nei contornidi Napoli. *Ann. Accad. Asp. Natur.*(2), **2** : 1-26.
- 1886. Alcune formiche africane. *Bull. Soc. Ent. Ital.*, **18** : 356-366.
- 1889. Viggio di Leonardo Fea in Birmania e regioni vicine. 20 formiche di Birmania e del Tenasserim raccolte da Leonardo Fea (1885-87) *Ann. Mus. Civ. Stor. Nat. Gen.* (2), **7** : 485-520.
- 1892. Voyage de M. Ch. Alluaud dans le territoire d'Assinie (Afrique occidentale) en juillet et aout 1886. Formicides. *Ann. Soc. Ent. France*, **60** : 553-574.
- 1893. Voyage de M. E. Simon a l ile de Ceylan (janvier-fevrier 1892). Formicides. *Ann. Soc. Ent. France*, **62** : 259-270.
- 1897. Revisione del genere *Diacamma* Mayr. *Rend. Accad. Sci. Bologna (N.S.)*, **1** : 147-167.
- 1911. Hymenoptera, Fam. Formicidae, Subfam. Ponerinae. *Genera insect.*, **118** : 1-125, 3 pls.
- FABRICIUS, J.C. 1775. *Systema Entomologiae*, sistens insectorum classes, ordines, genera, species, adiectics synonymis, locis, descriptionibus, observationibus : 1-832.

- 1787. *Mantissa Insectorum*, 1 : 1-348 Hafniae.
- 1793. *Entomologia systematica* emendata et aucta. Secundum classes, ordines, genera, species adjectis synonymis, locis, observationibus, descriptionibus 2 : 1-519.
- 1804. *Systema Piezatorum* : 439 Brunsvigae.
- FOERSTER, A. 1850. Eine Centurie neuer Hymenopteren. Zweite Dekade. *Ver. Nat. Ver. Pre. Rhein und West.*, 7 : 485-500.
- FOREL, A. 1886, Indian ants of the Indian Museum, Calcutta. No.2. *J. Asiat. Soc. Bengal* (2), 55 : 239-249.
- 1891. In Grandidier, *Hist. Phy. Nt. Pol. Madagascar*, 20 : Histoire naturelle des Hymenopteres. 2. Les formicides : 1-231.
- 1892a. Les formicides de l'empire des Indes et de Ceylan. Part 1. *J. Bombay nat. Hist. Soc.*, 7 : 219-245.
- FOREL, A. 1892b. Nouvelles especes de formicides de Madagascar. *Ann. Soc. Ent. Belg.*, 36 : 516-535.
- 1894. Les formicides de l'Empire des Indes et de Ceylan. Part 4. Adjonction aux genres *Camponotus* Mayr, et *Polyrhachis* Shuck. *J. Bombay nat. Hist. Soc.*, 8 : 396-420.
- 1900a. Les Formicides de l'Empire des Indes et de Ceylon, part VI, *J. Bombay nat. Hist. Soc.*, 13 : 52-65.
- 1900b. Les formicides de l'Empire des Indes et de Ceylon, Part 7. *J. Bombay nat. Hist. Soc.*, 13 : 303-332.
- 1902a. Varietes myrmecologique. *Ann. Soc. Ent. Belg.*, 46 : 284-296.
- FOREL, A. 1902b. Myrmicinae nouveaux de l'Inde et de Ceylan. *Rev. Suisse Zool.*, 10 : 165-249.
- GUERIN-MENEVILLE, F. E. 1844. *Icono. Du regne animal de G. Cuvier*, ou representation d'apres nature de l'une des especes les plus remarquables et souvent non figurees de chaque genre d'animanx. *Insects* (1829-1838) : 576 Paris.
- JERDON, T. C. 1851. A catalogue of the species of ants found in Southern India, *Madras J. Lit. Sci.*, 17 : 103-127.
- JERDON, T. C. 1854a. A catalogue of the species of ants found in Southern India (Part). *Ann. Mag. Nat. Hist.*, (2) 13 : 45-46.
- JERDON, T. C. 1854b. A catalogue of the species of ants found in Southern India (Concl.). *Ann. Mag. Nat. Hist.* (2) 13 : 100-110.
- LATREILLE, P.A. 1802. *Hist. Nat. Fourmis*, et recueil de memoirs et de'observations sur les abeilles, les fanchers, et autres insectes : 1-445 Paris.
- LATREILLE, P.A. 1804. Tableau methodique des insectes. Class huitieme. Insectes, *Insecta. Nouv. Dic. Hist. Nat.*, 24 : 129-200.
- LE GUILLOU, E.J.F. 1842. Catalogue raisonne des insectes hymenopteres recueillis dan le voyage de circumnavigation des corvettes l'Astrolabe et La Zelle. *Ann. Soc. Ent. France*, 10 (1841) : 311-324.

- LINNAEUS, C. 1758. *Systema Naturae* per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis. Editio 10, 1 : 1-823 Holmiae.
- 1764. *Museum S : ae Rae Mtis Ludo. Ulri. Regi. Suec., Goth., Van. In. quo animalia rariora, exotica, imprimis. Insecta & Conchilia describuntur & determinantur. Prodrumi instar* : 1- 719 Holmiae.
- LUND, P. W. 1831. Lettre sur les habitudes de quelques fourmis du Bresil, adressee a M. Audouin. *Ann. Sci. Nat.*, 23 : 113-138.
- MATHEW, R. 1980. Description of new species of ants (Hymenoptera : Formicidae) from Khasi Hills, Meghalaya. *Oriental Ins.*, 14 (4) : 425-427.
- MAYR, G. 1853. Beitrage zur Kenntniss der Ameisen. *Ver. Zool.-Bot. Ver. Wien*, 3 : 101-114.
- 1855. Formicina austriaca. Beschreibung der bisher im Osterreichischen Kaiserstaate angefundenen Ameisen nebst Hinzufugung jener in Deutschland, in der Schweiz und in Italien vorkommenden Ameisen. *Ver. Zool.-Bot. Ver. Wien*, 5 : 273-478.
- MAYR, G. 1861. Die Europaischen Formiciden (Ameisen.) : 1-80 Wien.
- 1862. Myrmecologische Studien. *Ver. Zool.-Bot. Ges. Wien*, 12 : 649-776.
- 1863. Formicidarum index syonymicus. *Ver. Zool.-Bot. Ges. Wien*, 13 : 385-460.
- 1865. *Reise der Osterreichischen Fregatte Novara um die Erde in den Jahren 1857, 1858, 1859, unter den befehlen des Commodore B. Von Wullerstorf-Urbair*. Zoologischer Theil. Formicidae : 1-119 Wien.
- 1866. Myrmecologische Beitrage. *Sitzu. Akad. Wiss. Math.-Nat. Classe*, 53 : 484-517.
- 1872. Formicidae Borneenses collectae a J. Doria et O. Beccari in territorio Sarawak annis 1865-1867. *Ann. Mus. Civ. Stor. Nat. Genova*, 2 : 133-155.
- 1897. Formiciden ans Ceylon und Singapur. *Term. Fuzetek*, 20 : 420-436.
- MOTSCHOULSKY, V. de. 1863. Essai d'um catalogue des insectes de l'ile Ceylon. *Bull. Soc. Imp. Nat. Moscou*, 36 : 1-153.
- OLIVIER, G.A. 1792. *Encyclo. Methodique. Hist. Nat. Insects*, 6 (Part 2) : 369-704. Paris.
- PANZER, G.W.F. 1798. *Faunae Insect. Ger. Initia*; order Deutschlands Insecten gesammelt und herausgegeben von D. G. W. F. Panzer, 54 Heft : Nos. 1651-1652. Nurnberg.
- ROGER, J. 1861. Die Ponera-artigen ameisen. *Berl. Ent. Zeitschr.*, 5 : 1-54.
- 1863a. Verzeichniss der Formiciden-Gattungen und Arten. *Berl. Ent. Zeitschr.*, 7 : 1-65.
- 1863b. Die neu aufgefuehrten Gattungen und Arten meines Formiciden-Verzeichnisses, nebst eganzung einiger fruher gegeben Beschreibungen. *Berl. Ent. Zeitschr.*, 7 : 131-214.
- SANTSCHI, F. 1938. Notes sur quelques *Ponera*. *Bull. Soc. Ent. France*, 43 : 78-80.
- SHEELA, S. and NARENDRAN, T.C. 1997. A new genus and a new species of Myrmicinae (Hymenoptera : Formicidae) from India. *J. Ecobiol.* 9(2) : 87-91.
- 1998. On Five New species of *Tetramorium* (Hymenoptera : Formicidae : Myrmicinae) from India. *Entomon*, 23(1) : 37-44.

- SHUCKARD, W.E. 1840. Monograph of the Dorylidae, a family of the Hymenoptera Heterogyna. *Ann. Mag. Nat. Hist.*, **5** : 315-328.
- SMITH, F. 1852. Descriptions of some hymenopterous insects captured in India, with notes on their economy, by Ezra T. Downes, Esq., who presented them to the Honourable East India Company. *Ann. Mag. Nat. Hist.* (2), **9** : 44-50.
- 1854. Monograph of the genus *Cryptocerus*, belonging to the group Cryptoceridae—family Myrmicidae—division Hymenoptera Heterogyna. *Trans. Ent. Soc. London* (2), **2** : 213-228.
- 1857. Catalogue of the hymenopterous insects collected at Sarawak, Borneo; Mount Ophir, Malacca; and at Singapore, by A. R. Wallace. *J. Proc. Linn. Soc. London, Zool.*, **2** : 42-88.
- 1860a. Descriptions of new species of hymenopterous insects collected by Mr. A. R. Wallace at Celebes. *J. Proc. Linn. Soc. London, Zool.*, **5** (suppl to 4) : 57-93.
- 1860b. Catalogue of hymenopterous insects collected by Mr. A. R. Wallace in the Islands of Bachian, Kaisaa, Amboyna, Gilolo, and at Dory in New Guinea. *J. Proc. Linn. Soc. London, Zool.*, **5** (suppl. To 4) : 93-143.
- SMITH, M.R. 1948. A new genus and species of ant from India. *N.Y. Ent. Soc. Jour.*, **56** : 205-208.
- TAYLOR, R.W. 1967. A monographic revision of the ant genus *Ponera* Latreille. *Pacific Ins. Monogr.*, **13** : 1-112.
- TEWARI, R.N. & MAITY, P.K. 1976. Some New Records of Ants from Arunachal Pradesh (Hymenoptera : Formicidae). *News. zool. Surv. India*, **2**(2) : 49-50.
- TIWARI, R.N.; GUHA, D.K. & MAITY, P.K. 1977. New Records of Ponerine Ants from Arunachal Pradesh (Hymenoptera : Formicidae). *News. zool. Surv. India*, **3**(3) : 132-133.
- TIWARI, R.N. & JONATHAN, J.K. 1986a. A new species of *Liomyrmex* Mayr from Andaman Islands (Hymenoptera : Formicidae). *Rec. zool. Surv. India*, **83**(1 & 2) : 87-90.
- TIWARI, R.N. & JONATHAN, J.K. 1986b. A new species of *Metapone* Forel from Nicobar Islands (Hymenoptera : Formicidae). *Rec. zool. Surv. India*, **83**(1 & 2) : 149-153.
- TIWARI, R.N. 1994. Two new species of a little known genus *Myrmecina* Curtis (Insecta : Hymenoptera : Formicidae) from Kerala, India. *Rec. zool. Surv. India*, **94**(2-4) : 151-158.
- TIWARI, R.N. 1999. Taxonomic Studies of Ants of Southern India (Insecta : Hymenoptera : Formicidae). *Memoirs zool. Surv. India*, **18**(4) : 1-96.
- TIWARI, R.N.; KUNDU, B.G.; ROYCHOWDHURY, S and GHOSH, S.N. 2000. Insecta : Hymenoptera : Formicidae. *Fauna of West Bengal, State Fauna Series*, **3**(Part-8) : 209-288.
- TIWARI, R.N.; KUNDU, B.G.; ROYCHOWDHURY, S and GHOSH, S.N. 2003. Insecta : Hymenoptera : Formicidae. *Zool. Surv. India. Fauna of Sikkim, State Fauna Series*, **9**(Part-4) : 467-506.
- WALKER, F. 1859. Characters of some apparently undescribed Ceylon insects. *Ann. Mag. Nat. Hist.*, (3) **4** : 370-376.
- WESTWOOD, J.O. 1839. Observations on the genus *Typhlopone*, with descriptions of several exotic species of ants. *Ann. Mag. Nat. Hist.*, **6** : 81-89.

- WHEELER, W.M. 1922. The ants of the Belgian Congo. *Bull. Ann. Mus. Nat. Hist.*, **45** : 1-1139.
- WHEELER, W.M. 1928. *Zatapinoma*, a new genus of Ants from India. *Proc. New. Engl. Zool. Cl. Cambridge*, **10** : 19-23., 3 figs.
- WILSON, E.O. 1964. The true Army ants of the Indo-Australian area (Hymenoptera : Formicidae : Dorylinae). *Pacific Ins.*, **6(3)** : 427-483.