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INCLUDING

CEYLON AND BURMA

HYMENOPTERA—VOL. 2

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INCLUDING

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PREFACE.

THIS volume is the second by Col. Bingham containing descriptions of Hymenopterous Insects, and includes the Ants, or Formicidæ, and the Chrysididæ. These families complete the Aculeate division of the Order Hymenoptera. The first volume, comprising the Bees and Wasps, was issued in 1897, and the author has devoted much of his time in the intervening years to the collection and study of Ants and other Insects in Burma and India.

A single coloured plate, to illustrate the Chrysididæ, is added. The Ants, which are dull-coloured and generally black or brown, are sufficiently represented by figures in the text.

The Ants of India, Ceylon, and Burma are numerous, and they have received in recent years much attention from naturalists. The Chrysididæ are less well known than the Ants, and it is probable that further additions may be made to the list of species recorded as occurring in British India.

It is not proposed for the present to proceed with the remaining families of Hymenoptera in the 'Fauna of British India.' As, however, a large number of species belonging to the Ichneumonidæ and other families are known, and as all are of considerable interest and importance, it may be hoped that an account of them will be published at some

future time. The knowledge of the Indian members of these groups is more imperfect than is that of the Aculeata. At present Col. Bingham's knowledge of Indian animal life, accumulated during a long period of service in India and Burma, can be employed upon a group of insects that is better known, and of which a complete general account has for many years been urgently required. The Editor has much satisfaction in being able to announce that H.M.'s Secretary of State for India has approved of the inclusion of the Indian Butterflies in the present series, and that Col. Bingham has undertaken the description of them.

Other volumes of the fauna which are nearly ready for the press, and which may be expected before long, are Mr. Gahan's on Longicorn Coleoptera, and a second volume of Rhynchota by Mr. Distant. Land and Fresh-water Mollusca and the Butterflies will, it is hoped, appear in due course.

For the first time in many years, less than a twelvemonth has elapsed between the publication of the last part of the Fauna, Vol. I. of the Rhynchota, and its successor, the work now issued.

W. T. BLANFORD.

March 1st, 1903.

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INTRODUCTION.

THE tribe *Heterogyna*, suborder ACULEATA of the Hymenoptera, consists of but one family, the *Formicidæ* or Ants.

Morphologically ants are at once distinguished from other aculeate Hymenoptera by a remarkable modification of the one or two segments of the abdomen immediately following the median segment or propodeum. This modification of the anterior portion of the abdomen consists in the almost complete detachment of one or two segments from the rest of the abdomen to form a highly flexible pedicel composed of one or two nodes. In the majority of the genera of the *Formicidæ*, the attachment of the pedicel to the median segment in front and to the rest of the abdomen behind is extremely constricted and narrow, giving great freedom of movement to both thorax and abdomen properly so called. When the pedicel is formed of two segments a similar constriction lies between the two. In certain low forms (*Myopopone*, *Amblyopone*, &c.) the node of the pedicel is attached by the whole of its posterior face to the succeeding segment of the abdomen, showing an approximation to the stiffer and more ponderous form of abdomen possessed by the fossorial wasps of the family *Scoliidæ*.

Ants, like the honey-bees and one section of the wasps, are social insects with, in any well-established nest or community, three distinct forms—the perfect and fertile female (♀), the male (♂), and the so-called neuter or worker (☿), which is merely an undeveloped female. Very often there is more than one form of worker, and in some cases the largest form or forms differ considerably from the smaller in structure; these are known as soldiers (☿).

Unlike the neuters among the bees and wasps, the neuter ants are invariably wingless, and generally have the thorax more or less modified and different from the thorax in the female or male. Exceptional cases, however, occur in certain genera, where the fertile females, or males, or both, are ergatoid, assuming the form of thorax peculiar to the worker.

The parts of the head, thorax and abdomen in an ant are homologous with those in other hymenopterous insects, but are generally modified. The subjoined figures give illustrations of some

of the various forms assumed by these, with details of the parts of which they are composed. The lettering in all the figures is alike and refers to the same parts.

Fig. i.

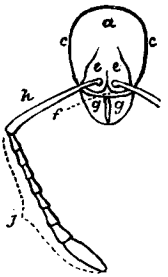


Fig. ii.

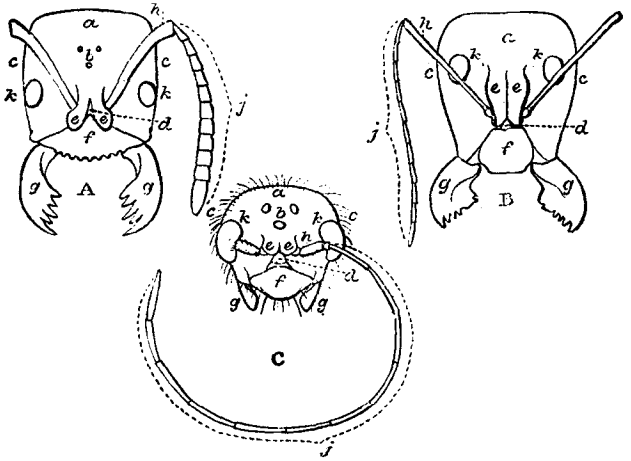
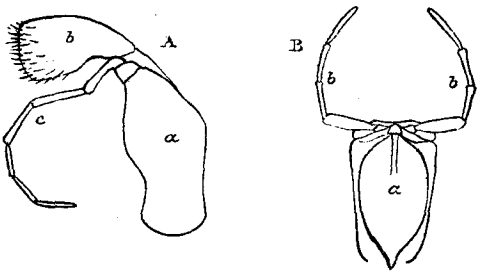


Fig. i.—Head in outline of ☿ of *Ænictus*, one of the *Dorylinæ*.
Fig. ii.—Heads in outline of A ♀ and C ♂ of one of the *Ponerinæ*, B ☿ of one of the *Camponotinæ*.

a, vertex; *b*, ocelli, generally present in the ♀ and ♂, in some cases also in the ☿, but more often absent in the last; *c*, *c*, sides of head, which may be straight or convex; *d*, frontal area, always small, sometimes well-defined, often obsolete or indistinct; *e*, *e*, frontal or antennal carinæ, rarely nearly obsolete or ill-defined, often very prominent: in many of the *Ponerinæ* anteriorly flattened and broad, covering the bases of the antennæ; *f*, clypeus; *g*, *g*, mandibles, both of which organs vary greatly, not only among the different subfamilies and genera but among the different species of the same genus: generally also they are very dissimilar

in the ♂ from what they are in the ♀ or ☿ ; *h*, scape, *j*, flagellum, the two united forming the antenna: the scape or basal joint, except in the ♂ of certain species, is always longer than any of the other joints, these latter are often greatly modified in relative size and thickness, but in the great majority the apical joint of the flagellum is the longest and broadest; *k*, *k*, compound eyes, which may be present or absent, and composed of few (one to five) or many facets. The softer mouth-parts of ants are similar to those of typical Hymenopterous insects fully described at p. iv of the Introduction to Vol. I. of the Hymenoptera in this series. Owing probably to the small, often minute size of the vast majority of ants, the mouth-parts have not been much used in determining the classification. Fig. iii repre-

Fig. iii.



Mouth-parts of *Camponotus* ☿.

sents the maxilla (A) and labium (B) of one of the *Camponotinæ*. In A: *a*, stipes; *b*, galea; *c*, palpus. In B: *a*, ligula; *b*, *b*, palpi.

The *thorax* in ants varies enormously in shape and development of the component parts. The thorax of a ☿, as already stated, differs markedly from the thorax of the ♀ or ♂ of the same species, except in the case of ergatoid males and females. Figs. iv–viii illustrate partially the forms of the thorax in the five subfamilies; but as the genera vary greatly among themselves, no form can be selected as in any way typical, and reference should be made to the illustrations in the body of the text for the peculiar form of thorax assumed by any genus. Taking the *Ponerinæ* for example, fig. iv and fig. v (B & C) represent the thoraces of one of the species in the ♀, ♂ and ☿. The parts are:—*a*, the prothorax, generally forming a portion of the dorsum in the ♀ as in fig. iv, but often suppressed beneath the mesonotum in the ♂, fig. v, B, and also in the ♀, fig. vi; in the ☿, fig. v, C, and figs. vii & viii, it is level with the mesonotum; *b*, the mesothorax with its scutellum *c*, the latter often nearly or quite suppressed and rudimentary; *o*, the postscutellum or upper portion of the metathorax is often (nearly always in the ☿) completely obsolete, but *d*, properly the median segment, has, according to usual

custom, been termed the metanotum or metathorax throughout the descriptions in this book. The lateral visible parts of the

Fig. iv.

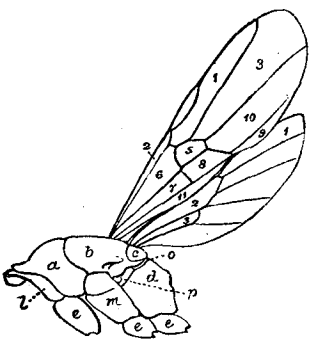


Fig. vi.

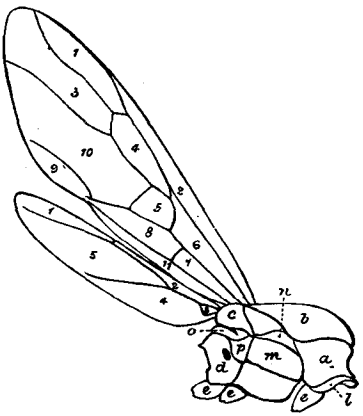


Fig. v.

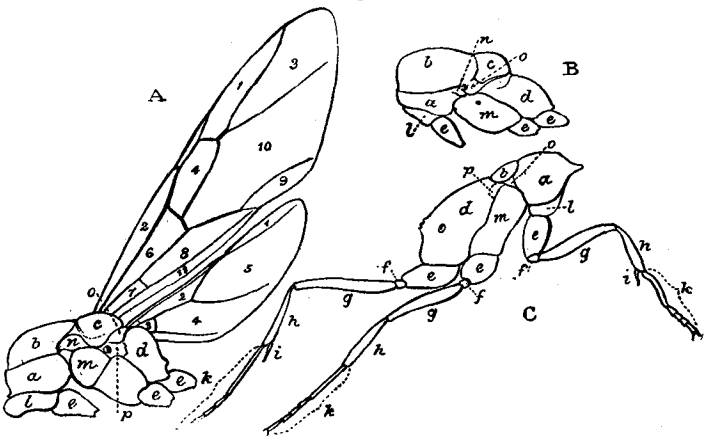
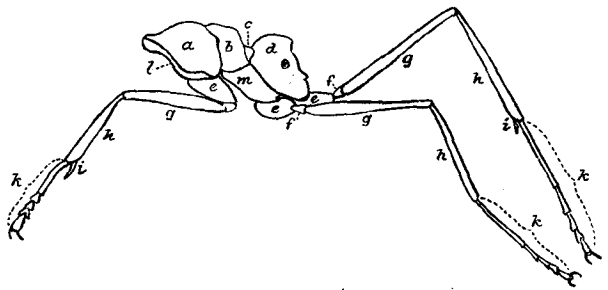


Fig. iv.—Details,—thorax and wings of ♀ of the *Ponerinæ*.
„ v.—A. Details,—thorax and wings of ♀ of the *Camponotinæ*.
B. Details,—thorax of ♂ of the *Ponerinæ*.
C. Details,—thorax of ☿ of the *Ponerinæ*.
„ vi.—Details,—thorax and wings of ♀ of the *Myrmecinæ*.

thorax are *l*, the propleuræ; *m*, the mesopleuræ, often with a more or less indistinct suture dividing or partially dividing the

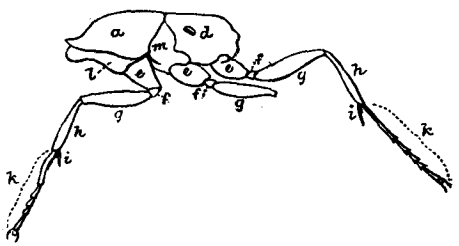
episternum from the epimeron; *p*, a portion of the almost suppressed and obsolete metapleuræ. To the mesothorax at the sides above are attached in the ♀ and ♂ (ergatoid forms excepted) the fore wings, and to the sides of the metathorax the hind wings; the neuration of the wings is less complete than in most of the

Fig. vii.



Details,—thorax and legs of ☿ of the *Dolichoderinæ*.

Fig. viii.



Details,—thorax and legs of ☿ of the *Dorylinæ*.

Aculeata. In the fore wing:—*1*, radial; *2*, costal; *6*, medial; and *7* & *8*, two submedial cells, are always complete; the others are variable and may or may not be present, complete or incomplete. Three pairs of legs are present in all the sexes, the parts of which as shown are *e*, *e*, coxæ; *f*, *f*, trochanters, single-jointed; *g*, *g*, femora; *h*, *h*, tibiæ; *i*, *i*, tibial calcaria, which may or may not be present on all the legs, are often double, and may be pectinate or simple; *h*, *h*, tarsi with 5 joints, the apical joint armed with two claws, which may be pectinate, dentate, or simple.

The *abdomen* in the ♀ and ☿ is composed of 6, in the ♂ of 7 visible segments, and is, like the rest of the parts in ants, very variable, generally more massive and comparatively longer in the ♀, smaller and more slender in the ♂ than in the ☿. Figs. ix–xiii show some of the forms obtaining in the various subfamilies; the

Fig. ix.

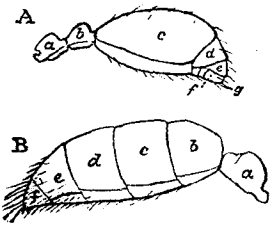


Fig. x.

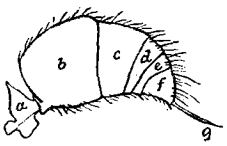


Fig. xi.

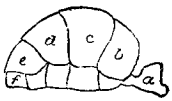


Fig. xii.

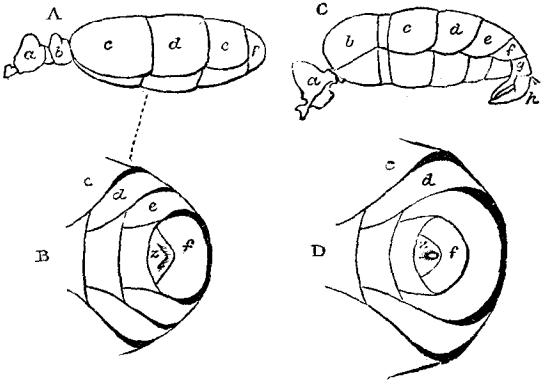


Fig. xiii.

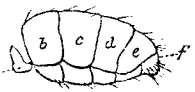


Fig. ix.—Abdomen *Ænictus* ☿.
„ x.—Abdomen of ☿ of the *Ponerinæ*.
„ xi.—Abdomen of ☿ of the *Dolichoderinæ*.
„ xii.—A, B. Abdomen of ♀ of the *Myrmecinæ*.
C. Abdomen of ♂ of the *Ponerinæ*.
D. Abdomen of ♀ of the *Camponotinæ*.
„ xiii.—Abdomen of ☿ of the *Camponotinæ*.

1st segment *a* is always modified into a highly flexible pedicel. The 2nd segment *b* is, in the majority of the genera, unmodified and forms part of the abdomen proper, but in the ☿ of one section of the *Dorylinæ* and in all the *Myrmecinæ* it is modified in a manner similar to the 1st segment, and then forms part of the pedicel. The abdomen proper is formed of the remaining segments, *b–f*, or *b–g* in the ♂; in the section of the *Dorylinæ* mentioned above and in the *Myrmecinæ*, *c–f*. The anal aperture marked *z* (fig. xii, B & D) is in the *Camponotinæ* circular and ciliated with hairs, and

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in the other subfamilies linear in the form of a slit. In the ♂ the genitalia are often exserted, fig. xii, C *h*.

Many works have been compiled on the habits of ants, one of the latest and most interesting being 'Marvels of Ant Life,' by W. F. Kirby, F.L.S., F.E.S. This little book contains in a condensed form most of what was known up to three or four years ago of the conditions of life, the economy and habits of ants in general. For a popular special account, however, of Indian ants, reference should be made to a paper by Mr. R. C. Wroughton in vol. vii (1892) of the 'Journal' of the Bombay Natural History Society. Most interesting accounts also of the habits of some Indian ants are given by Mr. G. R. James Rothney in the 'Transactions' of the Entomological Society of London for 1889.

The correct classification of the genera and subfamilies of ants is still under discussion. The two great specialists in Myrmecology, Dr. Forel and Professor Emery, hold opposite views as to the relationship and arrangement of certain genera. In the present work I have followed Dr. Forel in limiting the subfamily *Dorylinæ* to two genera, *Dorylus* and *Ænictus*, and including in the *Ponerinæ* certain low forms of ants whose affinities, owing to our ignorance at present of their lives, development and habits, are doubtful. The following table gives briefly the distinguishing characters of the main divisions of the *Formicidæ*:—

Key to the Subfamilies of the Formicidæ.

☿ ☿.

A. Pedicel of the abdomen one-jointed.
  a. A more or less marked constriction between basal two segments of abdomen ..... *Ponerinæ*, p. 23.
  b. No constriction between basal two segments of abdomen.
    a'. Anal aperture in form of a transverse slit.
      a^2. Eyes never present, blind ... *Dorylinæ* *, p. 1.
      b^2. Eyes always present ..... *Dolichoderinæ*, p. 288.
    b'. Anal aperture circular ..... *Camponotinæ*, p. 308.
B. Pedicel of abdomen two-jointed ..... *Myrmecinæ*, p. 105.

In conclusion, my best thanks are due to Messrs. Smythies, Hauxwell, Thompson, Allan and Craddock, of the Forest Depart-

* The ☿ of one of the genera, *Ænictus*, has the pedicel two-jointed, as in the *Myrmecinæ*, but being without eyes and ocelli, it can only be confounded with the ☿ ☿ of the Myrmecine genera *Liomyrmex* and *Carebara*. In Indian species, however, *Liomyrmex* ☿ has 11-jointed, *Carebara* ☿ 9-jointed antennæ, whereas *Ænictus* ☿ has these organs 10-jointed. The general appearance of *Ænictus* ☿ is also so distinctive, that once known it cannot be mistaken for a species of any other genus.

ment in Burma, and to Mr. G. Rogers, late Deputy Conservator of Forests at Darjiling. All these gentlemen were good enough to procure ants for me, and my collection was thereby enriched by many species I should myself not have succeeded in capturing. To Mr. F. Möller of Tukvar, near Darjiling, I owe a very large collection of Sikhim ants; and I have to acknowledge with thanks the receipt of collections sent to me from time to time by Mr. E. E. Green and Mr. O. Wickwar from Ceylon. My most grateful acknowledgments are, however, due to Mr. R. C. Wroughton, Inspector General of Forests to the Government of India, and my friend Mr. G. A. James Rothney, who in the most generous manner placed at my disposal their rich collections of Indian ants. I have to thank Dr. Forel for the loan and gift of specimens, many of them single types, and for his unfailing kindness and courtesy in examining and identifying species for me. Dr. Forel's papers on Indian ants, published chiefly in the 'Journal' of the Bombay Natural History Society, have been of the greatest assistance to me, and I gratefully own that but for the publication of those papers, the labour of compiling the present work would have been far greater than it has been.

I am under great obligations for the loan or gift of specimens to Dr. R. Gestro of the Museo Civico, Genoa; to Mons. E. André of Gray, Haute-Saône, France; and to Professor Emery of Bologna. Also to the Authorities of the British Museum for free access to the collections at the Museum of Natural History, South Kensington.

The illustrations for this work have required great accuracy and care, and have been efficiently executed by the artist, Mr. H. Knight.

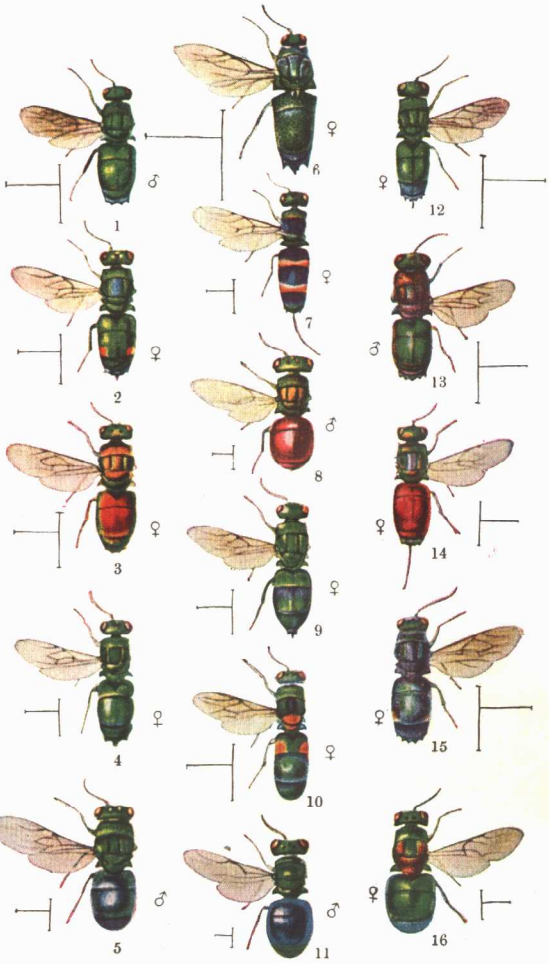
The systematic position of the *Chrysididæ* is in my opinion with the *Aculeata*, and the latter portion of this volume deals with the forms so far recorded from within our limits. I am greatly indebted to Major C. Nurse, of the Indian Army, for the kind gift and loan of many specimens.

NOTE.—Under *Tetramorium*, p. 175, the genus *Rhoptromyrmex* is wrongly ascribed to Forel. The correct reference is:—

Rhoptromyrmex, *Mayr, Ann. Hofmus. Wien*, xvi (1901), p. 18.

PLATE I.

Fig. 1. *Chrysis fuscipennis*, Brullé, ♂ ..... p. 467.
„ 2. *Chrysis lusca*, Fabr., ♀ ..... p. 484.
„ 3. *Chrysis gujaratica*, Nurse, ♀ ..... p. 456.
„ 4. *Chrysis singalensis*, Mocsáry, ♀ ..... p. 453.
„ 5. *Hedychrum flammulatum*, Smith, ♂ ..... p. 429.
„ 6. *Stilbum cyanurum*, var. *splendidum*, Fabr., ♀ .. p. 433.
„ 7. *Chrysis greeni*, Bingham, ♀ ..... p. 459.
„ 8. *Hedychridium perversum*, Nurse, ♂ ..... p. 424.
„ 9. *Chrysis elizabethæ*, Bingham, ♀ ..... p. 449.
„ 10. *Chrysis abuensis*, Nurse, ♀ ..... p. 446.
„ 11. *Ellampus timidus*, Nurse, ♂ ..... p. 420.
„ 12. *Chrysis principalis*, Smith, ♀ ..... p. 490.
„ 13. *Chrysis imperiosa*, Smith, ♂ ..... p. 479.
„ 14. *Chrysis annulata*, du Buysson, ♀ ..... p. 457.
„ 15. *Chrysis oculata*, Fabr., ♀ ..... p. 488.
„ 16. *Holopyga nursei*, Bingham, ♀ ..... p. 423.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