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XIII.—*Observations on the Genus Typhlopone, with descriptions of several exotic species of Ants.* By J. O. WESTWOOD, F.L.S.

[With a Plate.]

HAVING in my 'Introduction to the Modern Classification of Insects' figured an insect from the collection of C. C. Babington, Esq., under the name of *Typhlopone fulva*, and which, without hesitation, I considered to be a *neuter Ant**, it becomes necessary,—now that Mr. Shuckard has, in a previous page of these Annals, stated his conviction that it is the *female* of a genus belonging to another family, in which neuters do not exist,—that I should give my reasons for the opinion I have advanced, that it belongs to the family of the Ants, and is a neuter insect, and which I still retain.

Ignorant although we are of the males of this genus, it is not only upon a comparison of known individuals of *Typhlopone* with the females and neuters of the Ants, and with the females of the *Mutillidæ*, that I found my opinion; we are now acquainted with four facts relative to the habits of these insects. 1st, One of Mr. Shuckard's specimens is stated by him still to retain within its jaws the wing of a *Termes*. 2ndly, Another, of which the head alone remained, had attacked and pertinaciously retained hold of the leg of an ant, which had evidently pulled off the body of the *Typhlopone*, in order to rid itself of its incumbrance. 3rdly, Mr. Raddon has obtained many specimens of *Typhlopone*, found alive in casks of sugar from the West Indies. And 4thly, Mr. Babington's three specimens were also found in sugar. Now these are circumstances

* I have in this paper continued to employ the term 'neuter' for the abortive sex of the *Heterogyna* and other social *Hymenoptera*, although it is certainly improper, such individuals being, in fact, females, with partially developed female organs. The term 'worker', which has also been applied to them, is not exclusively their own, because the real productive females, amongst the humble-bees and wasps, work as much as the so-called 'neuters'. It would perhaps be better to term them 'pseudo-females.'

which are well known to be the habits of neuter Ants. Of the extraordinary pertinacity with which some of the latter retain hold of these and larger insects, I have collected various notices in my 'Introduction' (v. 2, p. 230.), whilst the partiality of Ants for sugar is very great, and well known. One species is indeed named *Formica Saccharivora* by Linnæus.

I proceed, therefore, to structural peculiarities.

The large and flattened head is not exclusively characteristic of the *Formicidæ*, but the want of eyes and ocelli occurs only in *Typhlopone*, and in various blind ants, mentioned in my 'Introduction' (v. 2, p. 218.). The antennæ are equally similar in structure in *Typhlopone* and several ants. In my drawings of *T. fulva*, made immediately after the meeting of the British Association at Cambridge, the antennæ of *T. fulva* are represented as having only eleven joints; that is, one joint less than the typical number in female and neuter aculeate *Hymenoptera*. A specimen recently given to me by Mr. Raddon, exhibits also eleven decided joints in the antennæ. Mr. Shuckard describes them as "consisting apparently of only ten joints," and blames me for not having described these organs, as well as for having omitted a generic and specific description of *T. fulva* in my 'Introduction,' where they would have been out of place. Mr. Shuckard does not endeavour to show in what way the loss of the two joints, which he states to be wanting, occurs, but he assumes that the circumstance of *Myrmecodes* and other apterous *Mutillidæ* having only eleven joints in the antennæ, proves that *Typhlopone* is allied to those genera. Now Latreille, with true philosophic spirit, has shown how this loss occurs in the *Myrmecodes* and *Myzine* ('Règne Animal,' 5. 316, 318.), namely, by the second joint being lodged within the extremity of the first joint, by which it is hidden. Such is also the case in the *Thynni*, which are the males of *Myrmecodes*; but it is not so in *Typhlopone*, and the loss must be accounted for in some other manner. Mr. Shuckard, indeed, describes the *T. Thwaitesii* as having eleven jointed antennæ, and *T. Spinolæ* as having apparently twelve joints, arising from the large terminal joint being divided in its middle by a slender dark ring, thus proving that it is by the soldering together of the terminal joints, and not by the immersion of the second joint within the apex of the long basal joint, that this is effected. Hence we perceive an identity of structure between *Typhlopone* and the Ants, and a dissimilarity between them and the *Mutillidæ*. The former is still further confirmed by the fact, that I have detected in some species of Ants, which I shall describe at the end of this paper, only ten joints in the antennæ, and that

Odontomachus armatus, Latr. (neuter = *Daceton armigerum*, Perty), *Cryptocerus atratus* (female and neuter), *Atta cephalotes* (female and neuter), and others, have only eleven jointed antennæ, the second joint being exposed. No previous author has noticed this curious circumstance, and Mr. Shuckard stating that "this curtailment is never found in the apterous social *Heterogyna**", thereon founds an unwarranted relationship with the *Mutillidæ*.

The situation of the antennæ close to the mouth, and the elongated basal joint with the following joint affixed so as to form an elbow, are also characters which *Typhlopone* possesses in common with the Ants.

The mouth is remarkable for the extraordinary minuteness of the palpi. The curtailed structure of the trophi (that is, of the maxillæ, labium and palpi) is stated by Mr. Shuckard peculiarly to distinguish the *Dorylidæ* from both the *Formicidæ* and the *Mutillidæ*. But this is not the case, as I have instanced a considerable number of species of ants in which both the maxillary and labial palpi possess much fewer joints than the typical number (Intro. 2, p. 219.).

The structure of the thorax is very interesting in *Typhlopone*. Mr. Shuckard has, however, completely mistaken its formation, considering the prothoracic collar as the mesothorax, and overlooking the true mesothorax. This has evidently resulted from the want of a careful examination of the corresponding parts in the allied groups, and the absence of generalization in the views taken of the thoracic organization; hence, therefore, the erroneous nature of the observations which Mr. Shuckard has published relative to the supposed peculiar distinction between *Typhlopone* and the other apterous *Heterogyna* of both groups, and of the relation between *Typhlopone* and the *Dorylidæ* in this respect†.

The principle upon which the variation in the development of the thoracic segments is regulated, depends entirely upon

* Mr. Shuckard has made some observations relative to the adoption of the term *Heterogyna* of Latreille, contending that the term ought to be retained for the *Mutillidæ*, instead of being applied to the Ants, as it is by Saint Fargeau and Haliday. It appears to me, however, that the term was intended to apply either to the distinction which existed between the winged females of *Formica* and the wingless females of *Mutilla*, or to the difference between the winged females and the wingless pseudo-females of *Formica*. In this latter sense the name is the most appropriate that could be applied to the *Formicidæ* as distinct from every other group of insects.

† Amongst other things, Mr. Shuckard states that when the meso- and metathorax are of unequal size in the winged males of *Heterogyna*, it is the latter which is most developed,—a statement neither confirmed by nature nor by the principle that the segments of the thorax are always in proportion to the size of the locomotive organs which they respectively bear.

the locomotive organs and their action. In wingless insects motion is of course performed by the legs alone, and for this end the thoracic segments are nearly equally developed, especially when the legs are nearly of equal size. This is especially to be seen in the typical *Myrmeciæ* of New Holland, in which, from the elongated form of the body, each segment is necessarily drawn out to its full length of development. Here we find the collar of the prothorax large, oval, longitudinally or obliquely striated, emarginate behind, receiving the front of the mesothorax in the emargination, and which, as well as the metathorax, is transversely striated. The examination of a very few species of neuter Ants will show the more or less gradual coalescence of the meso- and metathorax; the prothorax, however, remaining always most distinct and large, and such is exactly its structure in *Typhlopone*. In the apterous females of the typical *Mutillidæ*, on the other hand, all the segments are consolidated into a single mass.

Of the legs, I shall merely observe, that the employment of the character to be derived from the calcaria is fallacious, because although many Ants possess but one spur to each tibia, there are certainly many which possess two to each of the four hind tibiæ. Such is especially the case in the typical *Myrmeciæ*, in which one of the two spurs of each of the four hind legs exhibits a very beautiful structure. At the same time, there are others, such as *Cryptocerus atratus*, *Pheidole providens*, &c., which are entirely destitute of calcariae in the four hind legs. And it is moreover to be observed, that both in respect to the spurs and the tarsal unguis, the formation is identical in all the three kinds of individuals of *Myrmecia*, as well as in both sexes of *Thynnus*, and even in both sexes of *Mutilla**. In *Typhlopone* the unguis are perfectly simple: so also may we reasonably expect them to be in their males.

Another circumstance also deserves to be noticed, namely, the entire want of cilia or bristles on the fore legs of *Typhlopone*, a character found in the apterous female *Mutillidæ*, and dependent upon their habits of burrowing in sand. The absence of these appendages consequently either proves that *Typhlopone* is an ant or a parasitic Mutillideous insect; none such, however, have as yet been observed amongst the *Mutillidæ*; indeed it is not only contrary to analogy to suppose that the female of a parasitic aculeate Hymenopterous insect should want wings, (its œconomy rendering the possession of them absolutely necessary for its existence,) but the habits noticed above are sufficient to disprove the supposition.

* In both sexes of *Mutilla Klugii*, for example, each of the unguis of which is furnished with a remarkable seta, as long as the unguis itself.

Lastly, of the abdomen, it may be stated that the pedunculated base is especially characteristic of the ants, and that the trispinose apex is only found, as Mr. Shuckard notices, in an American Ant.

One of the most important characters employed by Mr. Shuckard in his descriptions of the *Dorylidæ*, is that derived from the structure of the male genital organs,—a character which has already been employed by Audouin in the *Bombi*, and by Vander Linden and others in the *Libellulidæ*, and proved to be of very great value in determining the species of these insects. Mr. Shuckard, indeed, says, that in respect to its large size in the *Dorylidæ*, “it exclusively resembles several of the solitary *Heterogynæ*,” and hence he considers the analogy as strongly in favour of the connexion of these genera with the *Mutillidæ*. He, however, overlooks the fact that the males of all those groups which swarm in the air at certain periods of the year are furnished with very large organs of generation, and for a very evident purpose. This is extraordinarily the case in the wasps, as well as in the hive-bee, the *Ephemeræ*, *Chironomi*, and the *Ants*. As regards the first and last of these groups, reference may be made to the plates of DeGeer’s 2nd volume, or the figures 85.5, 88.6, in the 2nd volume of my ‘Introduction.’ In these groups, however, the males are much smaller than their partners, and therefore the analogy thence assumed in respect to the *Dorylidæ* does not necessarily exist.

Such are the considerations which induce me (although in the absence of an opportunity of ascertaining by internal dissection the state of the sexual characters of the individuals of *Typhlopone* yet observed) to consider these insects as being unquestionably neuter *Ants*. And as they are equally strong when applied to the African genus *Anomma*, I have no more hesitation in deeming that genus equally Formicidæous, as it differs only in trivial characters from *Typhlopone*.

I had proposed to myself to have extended these remarks to an examination of the opinions entertained by Mr. Shuckard relative to the sexual relationship between *Typhlopone* and *Labidus*, the parasitic nature of the *Dorylidæ*, the relationship between the latter and the *Mutillidæ*, and the observations on *Scleroderma*; all of which I consider untenable. I must, however, defer these subjects till another opportunity. Before laying down my pen, however, I must express the pleasure I have received from the careful manner in which Mr. Shuckard has executed the *descriptive* portion of his memoir, and the ingenious manner in which he has treated the *conjectural* part.

By way of supplement, I submit the following descriptions of several Ants, which, especially in the structure of their antennæ and oral organs, serve to illustrate the preceding observations, and to confirm the relationship of *Typhlopone* with the Ants:—

CAREBARA, Westw.

(καρηβαρῶ, *capite doleo*, ob capitis exiguitatem.) Characteres e fœminâ desumpti.

Caput minimum oculis ocellisque munitum.

Antennæ minimæ vix capite longiores, graciles, ad apicem paullo crassiores, supra os insertæ 10-articulatæ, articulo 1^{mo} longo; 2^{do} obconico; 3^{tio} præcedenti multo minori, reliquis magnitudine et longitudine sensim increscentibus; ultimo ovali.

Mandibulæ mediocres corneæ curvatæ, apice oblique truncato et irregulariter denticulato.

Maxillæ minutæ, apice in lobum tenuem ovalem terminato. Palpi maxillares minuti 3-articulati articulo 1^{mo} brevi crasso, duobus ultimis gracilibus subæqualibus.

Mentum corneum obovale versus basin attenuato, labium subductum. Palpi labiales minuti graciles biarticulati.

Thorax ovalis, suprâ mesothorace maximo fere omnino occupatus.

Abdomen maximum ovale subdepressum segmentis subæqualibus, basi binodosum.

Alæ maximæ; venis ut in fig. 6. dispositis.

Pedes breves tibiis 4 posticis ecalcaratis.

Species unica. *Carebara lignata*, Westw.

Tota luteo-fulva, nitida tenuissimè punctata; facie linea longitudinali sub ocellum medium impressa et versus os furcata; antennis in foveolis inter se et oculos æque distantibus insertis; mesothoracis scuto utrinque linea impresso, parapsides fere efficientibus, scutelloque utrinque parapteris bene determinatis; alis infuscat, cellula prima submarginali in una alarum anticarum in duas partes vena fere secta.

Long. corp. lin. $10\frac{1}{2}$; expans. alar. lin. 20.

Syn. *Myrmica lignata* De Haan MSS.

Habitat in Java. In Mus. Hope.

SOLENOPSIS, Westw.

(σωλήν *canalis* et ὄψις *facies*, ob faciem canaliculatam.)

Characteres e pseudo-fœmina desumpti.

Caput maximum subquadratum horizontale posticè emarginatum, suprâ linea media longitudinali in duas partes divisum anticè in medio bituberculatum. Oculi parvi laterales ante medium marginis locati.

Antennæ breves graciles prope os in foveolis duabus insertæ; 10-articulatæ, articulis duobus apicalibus majoribus.

Labrum parvum inter mandibulas et supra os deflexum bilobum.

Mandibulæ magnæ valde curvatæ crassæ apice obliquo, edentulæ.

Maxillæ et mentum minima fere membranacea, labium subduc-

tum. Palpi maxillares et labiales biarticulati ; gracillimi brevissimi, apice seta instructi.

Thorax valde angustus, prothorace mediocri ; mesothorace majori. Abdomen magnum fere circulare subdepressum segmentis basalibus duobus nodos duos formantibus, segmento proximo maximo. Pedes graciles tibiis 4 posticis ecalcaratis, unguibus tarsorum simplicibus.

Species unica. *Solenopsis mandibularis*, Westw.

Tota castaneo-fulva nitida tenuissime punctata, hirta ; oculis, margine antico capitis acuto, mandibulisque nigris ; abdominis apice fusco, mesothorace utrinque in tuberculum conicum elevato ; nodo 1^{mo} pedunculi abdominalis elongato, apice elevato-conico, 2^{ndo} brevi subrotundato.

Long. corp. lin. 3.

Habitat in America Æquinoctiali. D. L. Guilding.

In Mus. D. Hope.

This insect is so closely allied to the *Pheidole providens*, W. (*Atta providens* of Col. Sykes, figured in the Transactions of the Entomological Society, vol. i. pl. 13. fig. 5.), that it can only be regarded as a geographical subgenus, distinguished chiefly therefrom by the peculiarity of its antennæ and the smooth and glossy body. As the former has not hitherto been characterized generically, I take this opportunity of doing so.

PHEIDOLE, Westw.

Sub-genus Asiaticum *Solenopsidi* proximum.

Caput maximum posticè emarginatum anticè haud bituberculatum, striolatum obscurum, anticè linea utrinque obliqua impressa versus oculos ducta in quibus insident antennæ 12-articulatæ, graciles breves, articulo 2^{ndo} sequenti majori, tribus ultimis magnis clavam formantibus. Mandibulæ crassæ intùs concavæ extùs curvatæ apice truncato (in fig. supr. cit. erroneè dente medio depictæ).

Labrum, maxillæ, labium, mentum, palpi, pedes, pedunculus et abdomen ut in *Solenopside*.

Species unica, *Pheidole providens*, W.

Atta providens, Sykes, loc. cit. supr.

Habitat in India Orientali. D. Sykes.

The following are descriptions of the individuals of *Typhlopone* which have fallen under my notice, and which are distinct from those described by Mr. Shuckard :—

Species typica, *Typhlopone fulva*.

Luteo-fulva nitida tenuissime punctata, capite posticè nonnihil angustiori, margine postico parum emarginato, margine antico nigricanti, tuberculis duobus mediis in lineas elevatas posticè productis desinentibus et inter has carinas canali impresso posticè ad tertiam partem capitis ducto et gradatim terminato ; antennis in fossulis duabus mediocriter impressis, insertis : castaneis 11-articulatis articulo 1^{mo} fulvo ; ultimo articulis tribus

antecedentibus vix majori; mandibulis castaneis apice nigro; metathorax æqualis haud impressus; pedunculus abdominis anticè subtruncatus, postice latior angulis lateralibus posticis rotundatis; subtùs ad basin angulariter productus. Mandibulæ ad apicem subacutæ angulo prominente versus medium lateris interni denteque parvo paullo sub apicem, spatio inter angulum et dentem subapicalem subserrulato.

Long. corp. lin. $4\frac{1}{2}$.

In Mus. D. C. C. Babington. In saccharo detecta.

Individuum alterum etiam in saccharo detectum differt statura minori, lineas $3\frac{1}{2}$ longitudinis tantum habens, colore obscuriori sc. testaceo-fulvo; dente mandibularum subapicali magis prominenti angulo medio tamen fere obsoleto, canali faciei nisi inter carinas frontales oblitterata.

Typhlopone Shuckardi.

Testaceo-fulva nitida tenuissimè punctatissima; capite lateribus parallelis, posticè valdè emarginato fronte carinata et canaliculata ut in *T. fulva*; antennis piceo-castaneis 11-articulatis articulo ultimo duobus præcedentibus paullo majori, mandibulis piceo-castaneis apice nigricantibus, dente subapicali minuto et obtuso vix prominente; metathoracis dorso canaliculato; pedunculo abdominis subtùs versus basin in hamum brevem acutum producto, abdominis apice 5-denticulato, denticulis lateralibus majoribus.

Long. corp. lin. 5.

In Mus. nostr. Communic. D. Raddon. In saccharo detecta.

Typhlopone Dahlbomii.

Pallidè lutea, mandibulis obscurioribus; nitida tenuissimè punctatissima, capite lateribus subparallelis posticè vix emarginato impressionibus duabus frontalibus magnis rotundatis in quas insident antennæ breves clavatæ 11-articulatæ articulo ultimo maximo (præcedentibus 5 majori); impressionibus carina media tenui anticè dilatata separatis; canali omnino obsoleto, mandibulis apice acutis dentibusque duobus magnis et acutis intùs armatis; metathorace haud canaliculato pedunculoque abdominis subtùs inermi, æquali.

Long. corp. lin. $1\frac{1}{2}$.

In Mus. D. C. C. Babington. In saccharo detecta.

DESCRIPTION OF THE FIGURES.—Plate II.

Fig. 1. *Typhlopone fulva*, W. Magn. auct.

1 a. Labrum; 1 b. mandible; 1 c. maxilla; 1 d. labium; 1 e. antenna; 1 f. abdominal peduncle; 1 g. posterior tibia and tarsus.

Fig. 2. Thorax and abdominal peduncle of *T. Shuckardi*, W.; × prothoracic collar; + mesothorax; 0 metathorax.

Fig. 3 a. Front of head of *T. Dahlbomii*, W.; 3 b. antenna of the same.

Fig. 4. *Anomma Burmeisteri*, Sh. Magn. auct.

4 a. Front of its head.

Fig. 5. *Solenopsis mandibularis*, W. Magn. auct.

5 a. Underside of head; md. one of the mandibles, the other removed;

l 1. labrum; *m* × maxilla; *l* 2. labium; 5 *b.* labrum; 5 *c.* mandible; 5 *d.* maxilla; 5 *e.* labium; 5 *f.* antenna; 5 *g.* thorax and basal joints of abdomen; × prothoracic collar; + mesothorax; 0 metathorax.

Fig. 6. *Carebara lignata*, W. Mag. nat.

6 *a.* mandible; 6 *b.* maxilla; 6 *c.* labium; 6 *d.* antennæ.

Fig. 7 *a.* Thorax and basal joints of abdomen of *Pheidole providens*, W.; × prothoracic collar; + mesothorax; 0 metathorax; 7 *b.* and 7 *c.* mandibles in different position.

XIV.—*Zoological Notices*. By Dr. A. PHILIPPI*.

[With Two Plates.]

1. On *Clavagella balanorum*, Scacchi. Plate III. fig. 1—6.

Cl. vagina adnata, abbreviata, apertura simplici; valvis subtriangularibus; libera tenui, rugosa, parum convexa; spinis fistulosis irregularibus absconditis.

Habitat in cespitibus Balanorum ad costam Pausilypi prope Neapolin.

IN December of the preceding year Sig. Scacchi made the highly interesting discovery of this living species of *Clavagella*, and communicated it to the Royal Neapolitan Academy; but since years will pass away before the Memoirs of this Academy will appear in print, I believe I shall be doing a great service to zoologists in giving a detailed description of his discovery. We have examined the animal in company, but the observation on the formation of the spinoid tubes is due alone to Sig. Scacchi.

The tube is short, at the most $1\frac{1}{2}$ inch long, very thin walled, and cohering most intimately with the surrounding bodies (almost always *Balanus balanoides*); rarely does it project one or two lines. It is compressed, measures about $2\frac{1}{2}$ lines in the one, $1\frac{1}{2}$ —2 in the other dimension; its superior (upper) aperture is simple; it terminates inferiorly in general in a pear-shaped expansion, in which the *shell* is situated. This consists of a free and of an adhering shell. The *free shell* is the right one; it is of an irregular structure at the dorsal margin (Rückenrande), frequently concave, and seldom exceeding 6 lines in length and 4 in breadth. It is thin and very slightly vaulted, so that there is a wide space on the ventral side between the two shells, which is closed by the thick mantle of the animal. The *lines of growth* are very distinct, and what is very remarkable, they do not run parallel with the

* Translated from Wiegmann's 'Archiv,' Part 2, June, 1840.



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