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## NOTES ON SOME GENERA OF BEES.

BY T. D. A. COCKERELL.

A few years ago Mr. J. Vachal sent me a lot of critical comments on Mr. Ashmead's "Classification of the Bees" (TRANS. AM. ENT. SOC., xxvi). At the time, I suggested that he should publish them; but I believe he has not done so, and as many of them are important, I present them here. I add various remarks of my own, but in every instance Mr. Vachal's observations are carefully credited to him. The paper is intended to be supplementary to that of Mr. Ashmead, contributing facts which will have to be considered when a revised classification is prepared.

**NOMIOIDES** Schenck.

According to Mr. Vachal there is no rima or furrow on the fifth dorsal segment of the female, as in other Halictinæ. However, in a female of *N. variegatus* from Triest, June 8, 1897 (Ducke, com. Friese), it is distinctly present, though lacking the fringe of hairs seen in *Halictus*. In *N. pulchellus* I find the maxillary palpi twice the length of the galea, six jointed, the joints about equal, except the first, which is shorter. The labial palpi have four joints of equal length, or approximately so. The mouth-parts are essentially as in *Halictus*. Mr. Vachal says *Nomioides* is not *Lucasius*, a genus "founded on two aberrant male *Halictus*, of which the females are true *Halictus*." I have *Lucasius*, and it is not at all like *Nomioides*.

**DIDONIA** Gribodo.

This cannot go in Sphecodinæ. Mr. Vachal writes: "*Didonia*, after the description of Gribodo, is not destitute of pollen-collecting apparatus: 'Pedibus posticis autem ut in *Andrenis*, flocculo pollinifero trochanterorum magno;' Gribodo put it in *Andrenidæ*, Latr. = *Panurgidæ*, Ashm."

**CAUPOLICANA** Spinola.

Mr. Vachal states that the second and third cubital cells are not equal, the second is much shorter, the first recurrent nervure almost or wholly interstitial with the first transverse cubital nervure. As a matter of fact, *Caupolicana* is quite identical with *Megacilissa*.

More or less green or purple forms, confused with *Megacilissa*, belong to *Ptiloglossa* Smith, which in Ashmead's tables is placed with Andreninæ.

#### **MYDROSOMA** Smith.

Ashmead has it *Madrosoma*; Mr. Vachal pointed out the error. This has an obtuse emarginate tongue, and seems to be a genuine Colletid, differing from *Colletes* by its metallic tints. In *Caupolicana* (*C. yarrowi* Cresson) the tongue is short, but deeply divided into two long narrow segments, which are thickly covered with long bristles. The labial palpi are short and thick, the first joint very stout and as long as the next two together, the second and third short and cordate, the fourth swollen-cylindrical, and decidedly longer than the second or third, which are equal to one another. The short six-jointed maxillary palpi have the first joint much the longest, as long as the next three together, 2 to 5 suboval and about equal, 6 long-cylindrical, nearly as long as 4 and 5 together. The galea, though short, is longer than the palpus, and bears long bristles at its end. The teeth of the maxillary comb are extremely long. The form of the maxillary comb, with the lower teeth longer and curved, is quite as in *Colletes*. While *Caupolicana* is not so like *Colletes* as *Mydrosoma* must be, I think there is no question that Ashmead is right in including it with the Colletidæ. The form of the palpi is quite suggestive of *Scolia*.

#### **PROTOXÆA** Ckll. and Porter.

This is not related closely to the Colletidæ. Compared with a *Scolia* (? *hematodes*) from Las Vegas, N. M., the mouth parts show the greatest possible similarity, so that I must regard *Protoxæa* as derived from the Scoliidæ, or rather both from a common ancestor having a similar mouth. The long first joint of the labial palpi of *Protoxæa* appears to be produced by the chitinisation of the area between the first joint (very short) in *Scolia* and the mentum, that is, of the palpiger. Thus, the labial palpus represents palpiger and the first joint of palpus fused. *Scolia* has a marginal comb on the galea, which is lacking in *Protoxæa*, which has not even the ordinary maxillary comb.

The differences between *Protoxæa* and the Scoliidæ, aside from the mouth-parts, at first sight seem very great, but there are resemblances which should not be overlooked. In particular I find a cer-

tain similarity in the wings, which, though not extending to details, appears to be significant. The coarse punctures on a shining ground, and to some extent the form of the thorax of *Scolia* are indicated in the bee genus *Temnosoma*, though not in *Protoxæa*. The eyes of *Protoxæa* are not emarginate, but they are so in many Halictine bees, while the Myzinid wasps have them so in the male, but not in the female.\*

The mouth of *Temnosoma* could be derived from that of the *Scolia-Protoxæa* type by the shortening of the tongue, paraglossæ and first joint of labial palpus; the tongue, as in *Halictus* and *Cilissa*, preserves the peculiar tapering form of *Prctoxæa*. The galea in *Protoxæa* shows no sign of the apical division seen in *Scolia*, but in *Nomia* and *Halictus* it is plainly indicated, and *Nomia* (which Mr. Vachal considers nearer to *Halictus* than to *Andrena*) has also the tapering tongue, broad basally and filiform apically. A very interesting genus is *Meroglossa* Smith, which assuredly does not belong to the Prosopidæ. The arrangement of its tongue and paraglossæ is quite suggestive of *Protoxæa*, but the maxillary palpus is very much longer than in that genus. The venation is quite different.

The present conclusion is, that the whole series of Halictine bees, at any rate, came from an ancestor not far removed from the Scoliidæ. *Protoxæa* is of course not an Halictine, but it is from the same general stock, and apparently nearer to the Scoliids than is *Halictus*. We seem to have divergent rather than successive types, but further study will no doubt make the true relationships much clearer. It may be added that *Myzine* and the Tiphids have the tongue short and rounded, not in the least as in *Scolia*. The mouth of *Scolia* is in most respects far more like that of *Protoxæa* than it is like that of the Myzinids or Tiphids, though the latter have the divided galea † of *Scolia*.

I do not think the Colletidæ have any bee-ancestry in common with the Halictines. So far as the mouth-parts go, *Colletes* shows the closest possible resemblance to *Tachytes*, the resemblance extend-

\* Allied to the Scoliidæ are the Thynnidæ and *Corymura* Spinola, as Mr. Vachal remarks, was based on a ♀ Thynnid and a ♂ Halictid; a fact indicative of close resemblance.

† Kellogg (Am. Nat., Sept., 1902) calls the part here designated the galea, the maxillary lobe, and says it consists of the galea and lacina fused. So I suppose that the apical part in the Scoliids, etc., is the true galea, and the rest the lacina.

ing to the peculiar form of the tongue, and the comb along the middle of the maxillary blade. The prothorax in *Tachytes* is of course much more bee-like than that of *Scolia*, and one has to remark that the eyes in *Tachytes* are extraordinarily similar to those of *Protoxæa*, converging just the same above. The pygidial plate of *Tachytes* is also suggestive of the bees. In *Gorytes* the tongue is very broad and truncate, but not emarginate, and the paraglossæ are broad; the comb of the galea is well developed. *Gorytes* does not stand so near to the bees as *Tachytes*.

The tongue, paraglossæ and labial palpi of the Australian genus *Hyleoides* Smith, as figured by Smith, are almost precisely those of *Odynerus*, even to the spots on the tongue and paraglossæ. I do not know how to explain this; one cannot well believe a bee genus to have been derived from the Eumenidæ, although the colors of *Hyleoides* do rather resemble those of that group. Whether *Prosopis* could be derived from such a type as *Hyleoides*, I do not know, but it seems to me to closely resemble *Colletes* in its mouth, and if *Colletes* is derived from a wasp with a *Tachytes* like mouth, there is no room in the series for such a type as *Hyleoides*. The maxillary blade of *Prosopis* is quite like that of *Colletes*, except that, as in the higher bees, the comb (of about six teeth) is wholly below the palpi; the maxillary palpi are much longer than in *Colletes*. The labial palpi and tongue in the two genera are not essentially different.

It is to be observed that the bifid tongue is doubtless the older type. The Sphecoidea, Eumenidæ and Vespidae are in this respect more primitive than the Scoliidae and the majority of the bees. A Braconid examined has a long divided tongue, which would do very well for a Eumenid, but it has not the Eumenid paraglossæ.

#### **PASIPHAË** Spinola.

Mr. Vachal remarks that this has a distinct tibial pollen-brush, and cannot go with the Prosopidae. It appears to be a Colletid with only two submarginal cells.

#### **BIAREOLINA** Dufour.

This of course is an *Andrena* with two submarginal cells. Mr. Vachal states that the sixth ventral segment of the ♂ has lateral projecting points as in *Parandrena*. I possess the ♀ only; the abdomen is very strongly and excessively closely punctured; the metathorax suggests *Trachandrena*.



**SCRAPTER** Lepeletier.

Dalla Torre gives this as a synonym of *Macropis*. Mr. Vachal "*Scrapter* St. F. and Serv. 1825, is not *Scrapter* Lep., 1841, and Ashm.; the latter = *Panurginus* Nyl." He also adds that *Scrapteroides* Gribodo is *Panurginus*. *Scrapter andrenoides* Smith is no doubt an Andrenid with two submarginal cells.

**DASYPODA** Latreille.

Mr. Vachal remarks that the tip of the marginal cell is acute and contiguous with the margin of the wing. In *D. argentata* var. *braccata* (Rads.) from Deliblat (*Friese*) I find the tip of the marginal cell practically as in *Macropis labiata*. In *D. hirtipes* the same. It diverges from the costa to a minute degree, and is briefly appendiculate.

**PSÆNYTHIA** Gerstaecker.

Mr. Vachal states that this is nearer to *Camptopæum* and *Calliopsis* than to *Andrena*. That is to say, it is a Panurgine with three submarginal cells. I think *Protandrena* is also related to the Panurgids, but it is really a connecting link between these and the Andrenids, as shown by the short tongue.

**ANCYLA** Lepeletier.

Mr. Vachal remarks that this is not an Andrenid; he adds: "Dalla Torre was wrong in putting it as a synonym of *Andrena*; but he corrected his mistake at p. 614; at p. 250 he has put *Plistotrichia* Mor. (nec *Pristotrichia* Radoszk, which is the same genus, between *Eucera* and *Meliturga*, where is its true place." Smith placed the genus between *Andrena* and *Nomia*, which no doubt resulted in confusion.

With regard to *Eucera*, I believe it is the European representative of our *Synhalonia*. The resemblance in the ornamentation of the abdomen between the females of *Eucera longicornis* and *Synhalonia frater* is quite remarkable. E. Saunders says the maxillary palpi of *Eucera* are 5-jointed; in *E. (macrocera) ruficollis* Br. from Algeria (*Vachal*), I find them 6-jointed, counting the thick basal joint, which is easily overlooked. In *Meliturga clavicornis* they are also 6-jointed. *Meliturga* is a peculiar genus, the ♂ with large eyes converging above, quite as in *Protoxæa*. The labial palpi have the first two joints flattened (the first very much the longest), but still not excessively differentiated from the last two, which still remain

nearly in a straight line with them. The tongue is quite as in the long-tongued bees, but only moderately long. The apex of the ♂ abdomen is bispinose, recalling *Oxæa*. The ♂ antennæ are strongly clavate, but those of the ♀ would do very well for an *Andrena*. The marginal cell is obliquely truncate; the first recurrent nervure meets the second transverso-cubital as in *Protoxæa*. The female abdomen looks like that of an *Andrena*. All of this beautifully connects the Anthophorid bees with the Andrenoid and other primitive types, which we concluded to be derived from ancestors allied to the Scoliidæ.

**STEGANOMUS** Ritsema and **CTENOPECTRA** Smith.

These do not belong to the Megachilidæ according to their authors, Mr. Vachal remarks. Smith thought *Ctenoplectra* near to *Macropis*, remarking: "The posterior legs have a dense clothing or pollen brush as in that genus." *Steganomus* was separated by Ritsema on a ♂, "he said that his genus was closely allied to *Nomia*, that is, a *Nomia* with two cubital cells" (Vachal). Smith put *Cyathocera* (= *Steganomus*) in the Andrenidæ near *Nomia*, and said of the ♀ that the posterior legs have the tibiæ and basal joint of the tarsi furnished with a dense scopa. Mr. Vachal thinks Mr. Ashmead was misled by what appears to be a typographical error in the table in Bingham's work on the Hymenoptera of India, whereby these genera appear to go with those having an abdominal scopa. Mr. Vachal adds that the species of *Ctenoplectra* from Africa (*C. antinorii* Gribodo) which he has before him has the three last segments of the abdomen fringed.

**EUASPIS** Gerstaecker.

Mr. Vachal has the ♀ of the two species of this genus, and says both are without scopa, ventral or tibial, so the genus should go in the Stelidinae.

**ALLODAPE** Lepeletier.

Mr. Vachal states that this has a tibial scopa in the ♀; he thinks it belongs next to *Ceratina*.

**MACROPIS** Panzer

This is not a Panurgid, according to Mr. Vachal; he says it is an isolated genus of uncertain affinities. It appears to me to be a modified Andrenid, but it wholly lacks the lateral facial depressions



of *Andrena*. The mouth-parts do not appear to be essentially different from those of the Andrenids, and many characters of the abdomen, wings, etc., are strongly suggestive of *Andrena*. These remarks are based on the European *M. labiata*; the American *M. ciliata* has an abdomen strongly recalling *Exomalopsis solani*. The American *M. steironematis* Rob., with its densely punctured abdomen, looks very different from *labiata* or *ciliata*, but it has the *Macropis* mouth.

**ANTHOCOPA** Lepeletier and **CHALICODOMA** Lepeletier.

Mr. Vachal observes that Lepeletier cared more for the habits than the form of bees, for founding generic groups; thus *Anthocopa* (wrongly credited by Ashmead to Latreille) was based on *Osmia papaveris* Latr., which is a petal-cutting bee, thus resembling the leaf-cutting *megachile*; while *Chalicodoma*, a Megachiline, makes mud-mortar cells.

**FIorentinia** Dalla Torre.

As Mr. Vachal says, this was merely a new name for *Epeicharis* Rad., and so cannot differ from it. Ashmead has a separate genus called *Florentina* D. T., apparently intending *Fiorentinia*. The characters given by Ashmead for "*Florentina*" appear to belong to *Fiorentinia*; those given by him for *Epeicharis* Rad. do not belong to that genus, the maxillary palpi being said to be two-jointed. Is there not some confusion with *Epicharis* Klug.?

**EPICLOPUS** Spinola.

This genus ("*Epicolpus*" in Ashmead) is said by Mr. Vachal not to be an Anthophorid, but to be hardly separable from *Melecta*. Its blue color is peculiar. In this connection one may remark on the beautiful and extraordinary patches of bright blue appressed pubescence on the head, thorax, legs and especially abdomen in *Crocisa splendidula* Lep. from Africa, a specimen of which I owe the kindness of Mr. Vachal. Something of the same sort is seen in Ashmead's Xylocopid genus *Cyanosderes*.

