

[December 1880]

XVI. *Synopsis of the British Heterogyna and Fossorial Hymenoptera.* By EDWARD SAUNDERS, F.L.S.

[Read November 3rd, 1880.]

(Plates VII. and VIII.)

It is now about twenty-two years since the late Mr. F. Smith published his descriptive Catalogue of the British Fossorial Hymenoptera, &c., and since that time so many new species have been discovered, and so many alterations have been made in the synonymy of the species then known, that I thought the short treatise, which I now offer to the Society, giving the more modern views of the subject, might not be unacceptable.

In it I have endeavoured to give brief and concise descriptions of each genus and species, accompanied by synoptical tables showing their differential characters in a few sentences.

It is, however, often very difficult to find words which will express the distinctive characters tersely enough for the purposes of such tables, and I hope that, in any cases where the tabulated characters may appear insufficient, the actual descriptions will be consulted, where the differences are pointed out more fully.

The book which has been of more assistance to me than any other in preparing this Synopsis is Thomson's '*Hymenoptera Scandinaviæ*;' the aptitude of its author for discovering small structural characters, most of which are really important, although often difficult to find, is truly wonderful, and I have to thank him for many of the characters here employed.

I have omitted a good many species given by F. Smith, which appear to me to have little or no claim to a place in our fauna. Some of these he has himself left out in his Catalogue, published by this Society in 1871.

Altogether I have described 30 species of Heterogyna and 121 species of Fossores. F. Smith, in his last Catalogue, gives 35 species of Heterogyna and 119 of Fossores; but then he places *Mutilla*, *Myrmosa*, and *Methoca* in the Heterogyna, which I have placed in the Fossores. His reason for doing this I have never been able to understand, as the Mutillidæ appear to me to have neither the structure nor the habits of the

Heterogyna, and certainly, as far as we know, do not possess two forms of the female, as the name Heterogyna implies; except in this case I have altered but very little the general arrangement of the families.

I cannot conclude this without acknowledging how much I owe to the kindness and friendship of the late Mr. Smith; he was always willing to give all the information that he possibly could, and never seemed to mind how often one troubled him. I must also thank Messrs. Bridgman, Cameron, Dale, V. Perkins, Billups, Service, and others for the kind manner in which they have lent me specimens, and helped me with observations, &c.

I hope shortly to publish a similar Synopsis of our British Wasps and Bees.

HYMENOPTERA.

ACULEATA.

- Hairs simple, or in some cases twisted, but not branched
or plumose *Section 1.*
- Hairs more or less branched or plumose, at least those on
the thorax *Section 2.*

I have been obliged to adopt the character of the hairs for my primary division, as I can find no other satisfactory structural character.

SECTION I.

- (2) 1. Petiole of the abdomen with one or more scales or
nodes; sexes consisting of ♂, ♀, and ♀ .. *Heterogyna.*
- (1) 2. Petiole of the abdomen simple; sexes consisting of
♂ and ♀ only.
- (4) 3. Wings not folded longitudinally *Fossoræ.*
- (3) 4. Wings (at rest) folded longitudinally *Diploptera.*

HETEROGYNA.

The form of the abdomen in the Heterogyna, or Ants, easily distinguishes them from any other family of the Hymenoptera. The 1st segment in the Formicidæ and Poneridæ and the 1st and 2nd in the Myrmicidæ are narrowed so as to form a distinct petiole, the single joint in the Formicidæ, &c., bearing a transverse upright scale, each of the two joints in the Myrmicidæ forming a distinct elevated node. All the sexes in the Formicidæ are stingless, whereas the ♀ and ♀ of

the Poneridæ and Myrmicidæ are aculeate. The pupæ of *Formica* and *Ponera* are generally contained in silken cocoons; those of the Myrmicidæ are always naked. All the species possess three sexes, ♂, ♀, and ♀. The ♂ and ♀ have wings; the ♀ is always apterous; the wings of the ♀ are pulled off by the ♀ or cast, after impregnation.

- (4) 1. Petiole with a single transverse scale or node.
- (3) 2. Abdomen not constricted between the 1st and 2nd segments; ♀ and ♀ without a sting .. *Formicidæ*.
- (2) 3. Abdomen constricted between the 1st and 2nd segments; ♀ and ♀ with a sting *Poneridæ*.
- (1) 4. Petiole with two nodes *Myrmicidæ*.

FORMICIDÆ.

- (4) 1. Petiole with an erect scale.
- (3) 2. ♂ 1st joint of flagellum not thicker than the rest; ♀ and ♀ with the 1st joint of the flagellum as long as or longer than the apical.. .. *Formica*.
- (2) 3. ♂ 1st joint of flagellum much thicker than the rest; ♀ and ♀ with the 1st joint of the flagellum shorter than the apical *Lasius*.
- (1) 4. Petiole without an erect scale *Tapinoma*.

FORMICA, Linn. (Pl. VII. figs. 1 and 2).

Syst. Nat. ed. x. vol. i. p. 579.

♂ and ♀ about equal in size; ♀ very variable in this respect, the ♀ major, as it has been called, being often more than half as large again as the ♀ minor. Pupæ enclosed in silken cocoons; ♀ and ♀ without stings. Maxillary palpi with six joints, labial with four. Antennæ 13-jointed in the ♂, 12-jointed in the ♀ and ♀. Mandibles generally somewhat slender in the ♀, wide and triangular in the ♀ and ♀, much narrowed at the base. Upper wings with one marginal, two submarginal, and one discoidal cells, the apical margin of the 2nd submarginal being the actual edge of the wing. Petiole with an erect, flattened scale, generally more or less triangular, widest above.

The species of this genus are rather naturally divided into two sections by their habits, the first four making their nests above ground, the last three underground.

Messrs. Emery and Forel consider the last three to be all races of one species.

- (2) 1. Head more or less emarginate posteriorly .. *exsecta*.
 (1) 2. Head not emarginate posteriorly.
 (4) 3. Clypeus emarginate *sanguinea*.
 (3) 4. Clypeus not emarginate.
 (8) 5. Frontal area polished..
 (7) 6. Eyes not hairy in ♀ and ♂, sparsely so in ♂, which has the body with only a few scattered hairs *rufa*.
 (6) 7. Eyes hairy in ♀ and ♂, densely so in ♂, which has the body covered with upright hairs .. *congerens*.
 (5) 8. Frontal area dull.
 (10) 9. Abdomen shining, without a silky pubescence .. *gagates*.
 (9) 10. Abdomen with a silky pubescence.
 (12) 11. ♂ body without metallic tinge; ♀ body closely punctured; ♂ thorax more or less red .. *cunicularia*.
 (11) 12. ♂ body with a metallic tinge; ♀ body with scattered punctures; ♂ thorax not reddish at all *fusca*.

1. *rufa*, Linn. Syst. Nat. ed. x. 1, p. 580, No. 2. Fig. Smith Cat. Brit. Foss. Hym. pl. i. fig. 1, 2, 3, &c.

♂ black-brown; legs and genital segments testaceous; base of femora, tibiae, and tarsi sometimes darker; head, prothorax and mesothorax, and sides of metathorax, dull; the rest more or less shining. Head and thorax covered with fine semi-erect hairs. Mandibles not toothed; eyes with scattered hairs. Abdomen widest at the base, somewhat egg-shaped, surface very indistinctly and somewhat rugosely punctured, with a few hairs on the basal and apical segments. Wings clouded with brown at the base; nerves brown. Length 10—12 mill.

♀ brown; head, with the exception of the vertex and a central stripe, prothorax, metathorax, and sometimes sides of mesothorax, petiole, and extreme base of abdomen and legs testaceous-red. Head and thorax dull; wings slightly clouded at the base; scutellum and abdomen polished and shining. Eyes not hairy. Apical segment of the abdomen and the under side with somewhat long hairs. Length 10 mill.

♂ entirely dull, except the frontal area and parts of the mouth; head widest behind the eyes; not excavated or constricted posteriorly; red, with a brownish spot covering the vertex, and extending widely between the eyes to the insertion of the antennæ; clypeus not emarginate, with a dark central line; antennæ brown; thorax with only a few scattered bristly hairs, red, more or less clouded on the pro- and mesothorax. Abdomen

brown-black, covered with a very short, fine, cinereous pubescence, and scattered over with occasional upright silvery hairs, especially on the basal segment; scale of the petiole red, more or less rounded above, and sometimes slightly emarginate; legs reddish. Length 6—10 mill.

Hab.—Common in fir woods, &c., generally forming its dome-like nest on the ground, but occasionally in the trunk of an old tree; the ♂ and ♀ appear about midsummer. In the nest of this ant is found occasionally, another of our rarer species the *Stenammas Westwoodii*; on the Continent, *Diplocephus fugax*, is also found with it.

2. *congerens*, Nyl. Act. Soc. Fenn. (1846), 2, p. 906.

♂ differs from *rufa* in having the eyes more densely and regularly hairy, the wings with pale yellowish nerves at the base, and less clouded; the abdomen dull, and all the segments above with black bristly hairs.

♀ differs in having the eyes with very short, scattered, fine hairs, and the abdomen covered with a very fine short sericeous adpressed grey pubescence. Scutellum dull.

♂ differs in having the thorax comparatively densely covered with hairs, and the eyes hairy.

Hab.—Loch Rannoch and Bournemouth, and probably elsewhere, but overlooked.

Forel and Emery consider this as only a race of *rufa*.

3. *sanguinea*, Ltr. Essai Fourmis France, p. 37.

Resembling *rufa*, but ♂ and ♀ much brighter in colouring.

♂ differs in having the mandibles with three to five teeth, and the clypeus emarginate; the thorax also has only a few isolated bristly hairs. Length 9 mill.

♀ differs in the brightness and extent of the red colour, the thorax sometimes being entirely red, and in having the clypeus emarginate, and the frontal area dull. Length 9—10 mill.

♂ differs much in the same respects as the female; the thorax is generally unspotted, and the legs bright clear testaceous-red; the clypeus emarginate, and the frontal area dull. Some of the pale varieties of *cuni-*

cularia resemble it closely in colour, and in the dull frontal area, but the simple clypeus will distinguish them at once. Length 5—9 mill.

Hab.—Weybridge, Chobham, Hawley Hants, New Forest, &c. Makes its nest generally in banks, and makes slaves of *F. fusca* and *cunicularia*. The ♂ and ♀ appear about July.

4. *exsecta*, Nyl. Act. Soc. Fenn. 1846, 2, p. 909, Fig. Entom. Ann. 1865, frontisp. fig. 2.

Similar in colour to *rufa* (see No. 1), but very distinct in form; the wide emargination of the head at the back, the smaller eyes placed farther from the posterior margin, and the sides of the head behind the eyes converging to the posterior margin, easily distinguish it in all the sexes, besides the narrow, almost straight-sided and deeply-notched scale of the petiole, and the smaller size of the ♂ and ♀. Length 7—8 mill.

Hab.—Bournemouth.

The ♂ and ♀ appear in July. This species forms a nest, heaped up after the style of that of *rufa* and *congerens*, but much smaller in diameter, and frequently on the open heath.

5. *cunicularia*, Ltr. Hist. Nat. Fourm. p. 151.

Very like *rufa* in colouring; ♂ differs in being smaller, with clearer wings, in having the thorax without semi-erect hairs, and the frontal area dull; the legs clear testaceous. Length $3\frac{1}{2}$ lines.

♀ differs in having the metathorax generally brown, the abdomen dull, the legs clear testaceous, and the frontal area dull. Length 9 mill.

♀ like a small elongate *rufa*, and sometimes even brighter in colour, but generally more obscure. It may always be distinguished from that species by the dull frontal area, and from *sanguinea* by the entire clypeus. Length 7—8 mill.

Hab.—Generally distributed and common in many localities. Makes its nest in the ground; ♂ and ♀ appear about August.

6. *fusca*, Linn. Syst. Nat. ed. x. 1, p. 580. Fig. Latr. Hist. Nat. Fourm. pl. vi. fig. 32.

♂ dark black-brown, shining, with a somewhat bronzy tint. Scape of the antennæ of the same colour as the head; frontal area dull, legs and genital segments testaceous-red. Length 8 mill.

♀ dark brown, polished, with a bronzy tint, only the legs and scape of the antennæ dull brownish red; head and thorax with a few erect hairs. Abdomen remotely and very shallowly punctured, bearing a few scattered bristly hairs. Length 8 mill.

♀ dark brown, with a bronzy tint, covered with an exceedingly fine sericeous pubescence, which gives it a sheeny appearance; legs and antennæ slightly paler. Abdomen with a few short, pale, bristly hairs near the apex of each segment. Length 5—8 mill.

Hab.—Very common; makes its nest in the ground.

Very closely allied to *cunicularia*, and I have little doubt that Emery and Forel are right in considering them as merely races of the same species; there seems to be no structural character to distinguish one from the other, and their habits are very similar; still they generally differ considerably in colour, but occasionally a ♀ is found which it would be almost impossible to refer to one or the other with any certainty.

7. *gagates*, Ltr. Essai Fourm. France, p. 36.

I have a single ♀ which belongs to this form. Its bright shining, glabrous body, scattered over with brownish bristly hairs, separates it from *fusca*.

Length 7 mill.

Hab.—Bournemouth.

Smith gives this as a new species to England in Ent. Annual for 1866, but has omitted it from his Catalogue. Emery and Forel consider it as another race of *fusca*.

LASIUS, *Fab.*

Syst. Piez. p. 415.

Formica pars, Smith.

Differs from *Formica* in having the ♂ much smaller than the ♀, and in the shape of the antennæ (see table of genera, *antea*).

- (2) 1. Deep black; ♀ and ♂ very shining *fuliginosa*.
 (1) 2. Brownish; ♀ and ♂ not very shining.
 (6) 3. Tibiæ with erect prominent hairs.
 (5) 4. ♂ with the mandibles with one tooth, wings clear;
 ♀ head not so wide as thorax, wings clear; ♂
 dark brown *niger*.
 (4) 5. ♂ with the mandibles 5-toothed, wings dusky at
 the base; ♀ head wider than the thorax,
 wings dusky at the base; ♂ pale yellow .. *umbratus*.
 (3) 6. Tibiæ without prominent hairs.
 (8) 7. ♂ and ♀ with the wings more or less clouded; ♂
 forehead not channelled; ♂ pale yellow .. *flavus*.
 (7) 8. ♂ and ♀ wings quite clear; ♂ forehead chan-
 nelled; ♂ brown *alienus*.

1. *fuliginosus*, Ltr. Ess. Fourm. France, p. 36. Fig.
 Hist. Nat. Fourm. pl. v. fig. 27.

Jet-black, shining; head widely excavated behind.

♂ about the same size as the ♀; thorax and abdomen with a few scattered hairs; flagellum of antennæ and the tarsi testaceous; wings dusky at the base. Length 4—5 mill.

♀ and ♂ like the ♂, but rather more shining; the segments of the abdomen above with an apical fringe of fine short hairs, set at some distance from each other; extreme apex of the body, tarsi, and sometimes tibiæ, more or less testaceous. Length, ♀ 6 mill., ♂ 3—5 mill.

Hab.—Generally distributed; in old trees, &c. Very distinct from any other species. ♂ and ♀ are found in June and July.

2. *niger*, Linn. Syst. Nat. ed. x. 1, p. 580.

♂ fuscous, legs and flagellum of antennæ rather paler, entire insect covered with a fine, adpressed, grey pubescence, and with scattered, fine, erect hairs; head slightly narrower than the thorax, deeply sulcate in front; mesothorax, looked at sideways, much raised and rounded in front, flat on the disk; wings hyaline; scutellum large, somewhat raised, and nearly square; scale of the petiole somewhat truncate above, and largely, but very slightly, emarginate; abdomen somewhat egg-shaped; scape of the antennæ and tibiæ with fine erect hairs. Length 3—5 mill.

♂ much larger than the ♀, similar in colour, but with the mandibles, legs, and scape of antennæ pale testaceous-brown; head much narrower than the thorax;

wings large and hyaline, their nervures pale; abdomen very large and oval, densely covered with a fine silky pubescence, and with short, semi-erect, brownish hairs; scape of the antennæ and tibiæ with fine erect hairs. Length 8—10 mill.

♀ generally rather smaller than the ♂, and like like the ♀ in colour and pubescence, but the head larger and much wider than the thorax; abdomen only slightly larger than the head; scape of the antennæ and tibiæ with fine erect hairs; extreme apex of the antennæ pale in all the sexes. Length 2—5 mill.

Hab.—Very abundant everywhere.

3. *alienus*, Först. Hym. Stud. i. Heft p. 36.

Differing only from the preceding in having the scape of the antennæ and tibiæ without the erect hairs, and being generally rather paler and smaller; ♀ with the costal area infusate.

Hab.—Not nearly so common as *niger*, but widely distributed. I have taken it at Chobham, Hayling Island, &c.

4. *umbratus*, Nyl. Add. Adn. Form. Bor. Eur. p. 1048.
= *brunnea*, Sm. Cat. Brit. Hym. p. 2.

The ♂ of this species is easily distinguished from either of the above by the much wider head, which is wider than the thorax, by the mandibles being armed with five teeth, and by the dark smoky base to the wings. The flagellum of the antennæ and the tibiæ and tarsi are also paler. Length 3—5 mill.

The ♀ differs from the allied species in its brighter brown, almost mahogany, colour, the large head, which is wider than the thorax, the much smaller abdomen, and the light clear brown antennæ and legs. Length 7 mill.

The ♀ is of a pale yellow colour, and therefore can only be confounded with *L. flavus*, from which the erect hairs of the tibiæ and the denser hairiness of the body generally distinguish it. Length 2—5 mill.

Hab.—Generally distributed, and not uncommon. It occurs in the London district, and I have taken it at Chobham, Hayling Island, &c.

5. *flavus*, DeGeer. Ins. ii. 1089, 5, pl. xlii. f. 24—28.

♂ differs from the preceding by the narrow head and the untoothed mandibles, and the tibiæ without erect hairs; from *niger* and *alienus* it differs in having no distinct frontal channel, and the wings generally slightly clouded at the base.

♀ differs from *umbratus* in the smaller head, paler colour, and smaller size, and the want of erect hairs on the tibiæ; from *niger* and *alienus* in the dusky base to the wings, the brown colour extending to nearly their middle.

§ pale yellow, like *umbratus*, but generally smaller, and distinguished by the want of the erect hairs on the tibiæ and scape of the antennæ.

Hab.—Common everywhere.

TAPINOMA, *Foerst.* (Pl. VII. fig. 3).

Hym. Stud. 1 Heft, p. 43.

Differs from either of the preceding genera in wanting the upright scale to the petiole, which is represented by a flattened, somewhat oblong, node.

- (2) 1. Black or brown-black *erratica*.
 (1) 2. Rufo-testaceous; § only known *polita*.

1. *erratica*, Latr. Essai Fourm. France, p. 24.

At first sight like a very dark *Lasius niger*, but at once distinguishable by the want of the upright scale to the petiole.

♂ dark black-brown; eyes situated about midway between the base of the head and the apex of the mandibles, vertex square, clypeus deeply emarginate; antennæ very long, three-quarters as long as the body, joints of the flagellum subequal; thorax rounded in front, disk flat; wings hyaline, nervures pale; abdomen with a few scattered bristly hairs above, all the segments with a fringe of hairs beneath; genitalia very large, of the same colour as the rest of the body; tibiæ and tarsi pale, the former clouded in the middle. Length 5—6 mill.

♀ brown-black, with similar pubescence to that of the §; abdomen wider than in the male. Length 5—6 mill.

§ jet-black, covered with very fine adpressed grey hairs; the extreme base of the tibiæ and tarsi

paler. Very like *L. niger* in shape, but eyes much farther from the base of the head; clypeus deeply emarginate; mandibles with long hairs on their surface; no upright scale to the petiole; surface of the body above without upright hairs; abdomen beneath with long fine hairs on each segment. Length, 3—5 mill.

Hab.—Common only in certain localities, and it seems to confine itself to sandy and dry heathy country. It has occurred at Bournemouth, Chobham, Weybridge, Guildford, Coombe Wood; also near Croydon, and in Scotland.

2. *nitens*, Mayr. Verh. Zool. Bot. Wien. ii. p. 143.
= *polita*, Smith, *vide* Emery and Forel.

“♀ rufo-testaceous, smooth and shining; head elongate, with a few scattered long hairs, and slightly emarginate behind; the scape as long as the head; the flagellum about the same length, the two apical joints slightly thickened; thorax narrowed behind, and slightly strangled between the meso- and metathorax, the latter emarginate behind, with the lateral angles rounded; scale decumbent, rounded above; abdomen ovate, sprinkled with a few long hairs.”

Length 4 mill. ♀ only known.

I have never seen Smith's *polita*, so copy the description from his book.

Hab.—Wales; one specimen. J. C. Dale, Esq.

PONERIDÆ.

PONERA, Latr. (Pl. VII. fig. 4).

Hist. Nat. Crust. et Ins.

This genus is easily recognised by its elongate parallel-sided shape, and the thick large scale of the petiole, as well as by its short clavate antennæ, which hardly reach to the apex of the metathorax in the ♀, and the constricted 1st segment of the abdomen; maxillary palpi 1- or 2-jointed, labial palpi 2-jointed; wings with one radial cell, two submarginals, and one discoidal.

(2) 1. Paler, puncturation distinct, especially on the head; maxillary palpi 2-jointed, the 2nd terminating in a hair *contracta*.

(1) 2. Darker, puncturation so fine as to be hardly distinguishable even under a somewhat strong lens; maxillary palpi with only a single joint *punctatissima*.

1. *contracta*, Latr. Hist. Nat. Fourm. p. 195, pl. vii. fig. 40.

♂ brown, somewhat shining; head dull, strongly punctured; mandibles testaceous-red; thorax shining, rather remotely punctured; abdomen covered with somewhat decumbent pale hairs; apex of the abdomen paler, with a strong reflexed spine; legs testaceous.

♀ and ♂ of a paler colour, but with the same strong punctuation; the maxillary palpi of two joints, the second ending in a hair; abdomen covered with pale hairs; eyes obsolete in the ♂; wings of the ♀ as in the ♂.

Length 3—4 mill.

Hab.—Rare. Brighton; Merton, Dr. Power; Weybridge, Mr. Billups. I have never taken it myself.

2. *punctatissima*, Rog. Berl. Zeitsch. 1859, p. 246, pl. vii. fig. 7 (palpi). = *tarda*, Sm.

Very like the above, but darker; the punctuation of the head is much finer, so fine indeed as to be hardly discernible, and the pubescence of the abdomen adpressed, not mixed with semi-prominent hairs, as in *contracta*; maxillary palpi 1-jointed.

Length 3—4 mill.

Hab.—Occasionally in houses; native?

MYRMICIDÆ.

- (12) 1. Wings not very dark, or if dark not longly ciliated at the edges in ♂; 1st node of petiole much widened behind ♀ and ♂.
- (11) 2. Metathorax spined in ♀ and ♂; mesothorax with two impressed lines converging behind in the ♂
- (4) 3. Last 3 joints of flagellum not nearly so long as its remainder in ♀ and ♂; apical nerve of submarginal cell in ♂ and ♀ divided in two by a transverse nervure *Myrmica*.
- (3) 4. Last 3 joints of flagellum as long or nearly as long as its remainder in ♀ and ♂; apical nerve of submarginal cell in ♂ not divided by a transverse nervure.
- (6) 5. 2nd node of petiole in ♀ and ♂ spined beneath; ♂ with clypeus keeled *Stenamma*.
- (5) 6. 2nd node in ♀ and ♂ simple; clypeus of ♂ not keeled.
- (10) 7. Hairs of thorax simple in ♀ and ♂; antennæ 10- or 13-jointed in ♂; if 13-jointed, then with 1st joint of petiole very long.
- (9) 8. Eyes very small, and head reticulated behind in ♀ and ♂; ♂ antennæ 13-jointed *Asemorhoptrum*.
- (8) 9. Eyes not very small, and head longitudinally striate behind; ♂ antennæ 10-jointed *Tetramorium*.

- (7) 10. Hairs of thorax clubbed in ♀ and ♂; antennæ 12- or 13-jointed in ♂; 1st joint of petiole not elongate *Leptothorax*.
 (2) 11. Metathorax not spined in ♀ and ♂; mesothorax in ♂ without converging lines *Solenopsis*.
 (1) 12. Wings very dark and ciliated in ♂; 1st node of petiole square in ♂ and ♀ *Myrmecina*.

MYRMICA. (Pl. VII. figs. 5 and 6).

Latreille, Gen. Crust. et Ins. iv. p. 131.

The five forms that I have described of this genus bear a very close general resemblance to one another, and the latest authorities, Messrs. Emery and Forel, consider them as mere races of one species. I have no doubt they are right; but as a rule they are pretty easily distinguishable, and I have therefore thought better to keep them distinct.

The short apical joints to the flagellum, the last three of which are not nearly so long as its remaining joints in the ♀ and ♂, and the transverse nervure which divides the submarginal cell in the ♂ and ♀, distinguish this genus from its allies. Labial palpi 4-jointed; maxillary palpi 6-jointed.

- (6) 1. ♂ with the basal joint of the antennæ half as long as the flagellum, and also gradually curved near the base; ♀ and ♂ with the basal joint not somewhat angularly and sharply bent near the base.
 (3) 2. Frontal area longitudinally striated in all the sexes *sulcinodis*.
 (2) 3. Frontal area smooth and shining in all the sexes.
 (5) 4. ♂ with long erect hairs on the tibiæ; ♀ with the metathoracic spines not longer than they are wide at the base; ♂ with the spines scarcely longer than in the ♀ and the space between them smooth and shining *lævinodis*.
 (4) 5. ♂ with short, somewhat adpressed hairs on the tibiæ; ♀ with metathoracic spines much longer than their basal width; ♂ with long spines like the ♀ and with the space between them rugose *ruginodis*.
 (1) 6. ♂ with the basal joint of the antennæ not $\frac{1}{2}$ so long as the flagellum, or, if half as long as the flagellum, then with it sharply bent near the base; ♀ and ♂ with the basal joint sharply and angularly bent near the base.
 (8) 7. ♂ basal joint of antennæ very short, not longer than the first two or three joints of the flagellum; ♀ and ♂ with the basal joint not spinose at its bend *scabrinodis*.
 (7) 8. ♂ basal joint of antennæ half as long as the flagellum; sharply bent at the base; ♀ and ♂ with the angle of the basal joint spinosely lobate .. *lobicornis*.

1. *ruginodis*, Nyl. Adn. Mon. Form. Bor. Eur. p. 929, 2.

♂ dark brown, shining, surface with scattered, short, semi-erect hairs; mesothorax in front, metathorax, and abdomen polished and shining; wings dusky at the base, the dusky colour extending as far as the radial cell; head, across the eyes, wider than the thorax, eyes very prominent, situated about midway between the base of the head and the apex of the mandibles, frontal area not sulcate, vertex somewhat longitudinally rugose; antennæ with the scape curved towards the base, and thickened towards the apex, as long as the first six joints of the flagellum; mesothorax in front of the converging lines very shining and polished, behind them slightly uneven, with indications of longitudinal rugosities; metathorax with two very blunt spines, both nodes of the petiole smooth and shining; abdomen about the same width as the thorax, egg-shaped; legs with fine short semi-adpressed hairs. Length 6 mill.

♀ testaceous, covered with long pale hairs; head, with the exception of the mandibles, abdomen except at the apex, and a curved line running from the insertion of the wings, round the scutellum, generally darker; wings more or less testaceous towards the base, nerves pale; head and thorax deeply and longitudinally rugose, the latter rather smoother on the disk; head wider than the thorax, frontal area smooth and shining, scape of the antennæ slightly and regularly curved at the base; mesothorax rounded in front, moderately convex on the disk, as wide behind as in front; metathorax with two strong, slightly curved spines, which are longer than they are wide at the base, space between them transversely rugose; nodes of the petiole rugose; abdomen shortly oval, with a darker cloud towards the base; legs covered with short, somewhat adpressed hairs. Length 6—7 mill.

♂ differs from the ♀ in the shape of the thorax, which is wider in front than behind, and constricted near the middle; it is also generally much more rugose, with the rugosities deep and longitudinal. The metathorax is as high as the mesothorax, and the spines project above its level. Length 5—6 mill.

A common species in most localities.

2. *lævinodis*, Nyl. Adn. Mon. Form. Bor. Eur. p. 927.

Extremely like the above, but differs in the male by being smaller, with the antennæ much shorter, and the scape slightly shorter in comparison with the flagellum, and the legs covered with long erect hairs.

In the ♀ by the metathoracic spines being much shorter and wider, each spine being wider at the base than it is long, and quite straight, the space between the spines being smooth and shining, not transversely rugose as in the preceding; the nodes of the petiole also are rather smoother. In the ♂ much as in the ♀, but having, besides, the thorax less deeply rugose, and the rugosities not longitudinal.

Also a common species, but less generally distributed than the preceding.

3. *sulcinodis*, Nyl. Adn. Mon. Form. Bor. Eur. p. 931.

♂ differs from either of the preceding in being darker (nearly black); head not shining, with the frontal area longitudinally sulcate; mesothorax in front dull, more or less transversely wrinkled, rather deeply and longitudinally rugose behind the converging lines; scutellum and base of the metathorax also rugose; first node of the petiole dull and more or less rugose, second polished and shining; abdomen and legs much as in the preceding. Length 6 mill.

♀ and ♂ may be known by their darker, redder brown colour, the head more deeply rugose, and reticulated behind the eyes at the sides, the scape of the antennæ curved suddenly near the base, the frontal area sulcate, the thorax and nodes of the petiole deeply, longitudinally, and rugosely sulcate. Length 6—7 mill.

Hab.—Rare. Wales, Hampshire, Chobham.

4. *scabrinodis*, Nyl. Adn. Mon. Form. Bor. Eur. p. 930.

♂ at once known from any of the preceding by the short scape of the antennæ, which is not longer than the first two or three joints of the flagellum, and by having the legs very densely covered with long erect hairs.

♀ and ♂ very like *sulcinodis*, but with the scape of the antennæ thicker and rather shorter, distinctly geniculated near the base; it also appears to be flattened at the turn: this appearance is given by a sort

of angular dilatation on its upper side. The thorax and the nodes of the petiole are less rugose. The colour of the insect is testaceous, as in *ruginodis* and *lævinodis*, from which the geniculated scape distinguish it at once. Wings in the ♀ dusky to beyond the submarginal cell.

Hab.—Very abundant almost everywhere.

5. *lobicornis*, Nyl. Adn. Mon. Form. Bor. Eur. p. 932, fig. Smith Brit. Foss. Hym. pl. i. fig. 12 (antenna).

Like the other species of the genus in general appearance.

♂ differs from *scabrinodis* in the long scape of the antennæ, which is half as long as the flagellum, and from the other species in the scape being angularly bent at the base.

♀ and ♂ are of the same dark colour as *sulcinodis*, but have the scape of the antennæ geniculated as in *scabrinodis*, but not flattened at the bend, the bend bearing a distinct spine.

Hab.—Rare. Chobham, South Shields, Whitley, Scotland, &c.

STENAMMA, *Westw.* (Pl. VII. fig. 7).

Intr. Class. Ins. vol. ii. p. 226.

This genus may be known from *Myrmica* by having only three joints to the labial palpi and four to the maxillary, and by the ♂ and ♀ only having eleven joints to the antennæ. The smooth polished surface of the head and thorax and the spine under the second node of the petiole in the ♀ and ♂, as well as the keeled clypeus of the ♂, will distinguish it from all its allies.

1. *Westwoodii*, Westw. Intr. Class. Ins. ii. p. 226, pl. lxxxvi. fig. 11.

♂ brownish black; antennæ, mandibles, sides of prothorax, and legs pale, slightly hairy; head and thorax dull, and very finely rugose; clypeus with a central keel; abdomen smooth and shining; wings milky white; anterior wings with the marginal cell incomplete, and with one submarginal and one discoidal cell. Length 5 mill.

♀ and ♂ testaceous, smooth, polished, and shining, with short scattered hairs; antennæ rather densely

clothed with short hairs, basal joint of the flagellum as long as the next three together; metathorax with two rather short, triangular spines, second node of the petiole beneath produced in front into a strong spine; abdomen more or less brown across the middle; wings of ♀ as in ♂, but clearer. Length, ♀ 5 mill., ♂ 3—4 mill.

Hab.—Nests of *Formica rufa*. Weybridge, Guildford, &c.

ASEMORHOPTRUM, Mayr.

Europ. Form. (Nachtrag.), after p. 75.

This genus is very closely allied in general appearance to the following, but the ♂ may be known at once by its 13-jointed antennæ; the ♀ and ♂ by their small eyes and 8- to 9-toothed mandibles.

1. *lippula*, Nyl. Add. Alt. Form. Bor. p. 41. Fig. Smith, Brit. Foss. Hym. pl. i. fig. 18.

♂ brown, the antennæ and legs paler, sparsely clothed with long fine pale hairs; head finely and longitudinally rugose; scape of the antennæ as long as the first three joints of the flagellum; wings ciliated, somewhat opaque, nervures very pale; metathorax nearly smooth, with a tooth on each side at the apex; abdomen smooth and shining; first joint of the petiole very long; apex of the abdomen densely covered with somewhat curled whitish hairs. Length 4 mill.

♀ and ♂ reddish brown, mandibles, antennæ, and legs rather paler; head rather elongate and narrow, finely reticulated; thorax irregularly, longitudinally rugose; metathorax with two short spines; first joint of the petiole elongate, with a rather small apical node, second node of the petiole nearly round, a little longer than wide, first segment of abdomen beyond the petiole, very long, at least three times as long as the remainder.

Length, ♀ 5—6 mill., ♂ 3 mill.

Hab.—Rare. Plymouth, London district, Chobham, Tunbridge Wells, Norwich, &c.

TETRAMORIUM, Mayr.

Form. Austr. p. 151.

Differs from *Myrmica*, &c., as shown in the table of genera.

Antennæ 10-jointed in the ♂ 12-jointed in ♀ and ♂; labial palpi 3-jointed; maxillary palpi 6-jointed; front wings with one marginal, one submarginal, and one discoidal cell; metathorax with two spines in the ♀ and ♂; merely truncate and angulated in the ♂; ♀ nearly twice the size of the ♂, and considerably larger than the ♂.

1. *cæspitum*, Linn. Syst. Ent. ed. x. vol. i. p. 581.

♂ brown-black, shining; head much narrower than thorax; antennæ and legs paler; head finely and longitudinally rugose on the vertex; thorax shining, clothed with scattered hairs; nodes of the petiole short, the second widely transverse, both more or less hairy above; abdomen polished and shining, with a few scattered pale hairs; wings milky white, nervures pale. Length 6—7 mill.

♀ larger than the ♂; head as wide as thorax, or nearly so; mesothorax irregularly punctured; apex of the metathorax emarginate and spined at each side; abdomen oval, shining and polished, with pale scattered hairs; wings as in the ♂. Length 7—8 mill.

♂ dark brown; thorax, sides of head, antennæ, mandibles, and legs somewhat paler. Head large and quadrate, decidedly wider than the thorax, longitudinally striate; thorax longitudinally striate, much widest in front; metathorax with two sharp spines. Nodes of the petiole much elevated, smooth; first, looked at sideways, almost as high as long; looked at from above, not quite so wide as long; second, looked at sideways, nearly round; looked at from above, transverse. Abdomen shining and polished. Entire insect clothed with scattered long hairs. Length 2—4 mill.

Hab.—Sandy localities; often very abundant.

LEPTOTHORAX, Mayr.

Form. Austr. p. 159.

This genus consists of three species only in England, which have the peculiarity of having their hairs clavate in the ♀ and ♂, a character easily seen with a strong lens. The ♀ is small, scarcely larger than the ♂; the ♂ is also small, with 11- or 13-jointed antennæ; the frontal area not clearly defined. Labial palpi 3-jointed; maxillary palpi 5-jointed.

- (2) 1. ♂ antennæ 12-jointed; ♀ and ♀ 11-jointed .. *acervorum*.
 (1) 2. ♂ antennæ 13-jointed; ♀ and ♀ 12-jointed.
 (4) 3. ♂ thorax in front of the converging lines very
 finely rugose: club of the antennæ in ♀ and ♀
 dark *unifasciatus*.
 (3) 4. ♂ thorax in front of the converging lines smooth
 and polished; club of the antennæ in ♀ and ♀
 pale *Nylander*i.

1. *acervorum*, Fab. Ent. Syst. ii. p. 358.

♂ black; mandibles and legs brown, joints and tarsi paler; clothed with long whitish hairs, especially on the dull, rugose head; mandibles not toothed; antennæ 12-jointed, scape very short and thick, about as long as the second joint of the flagellum, which is much longer than the first; thorax irregularly rugose posteriorly; metathorax tuberculated at the sides behind; nodes of the petiole smooth and shining; abdomen shining and smooth; wings very thin, milky white. Length 5 mill.

♀ brownish red; head, thorax, and abdomen above, nearly black; mandibles, scape, and legs paler; antennæ 11-jointed, head finely and longitudinally rugose; thorax and nodes of the petiole also rugose; metathorax with two stout, rather blunt spines; abdomen shining, with scattered white hairs; legs with prominent hairs. Length 4—5 mill.

♂ testaceous-red; head, apex of antennæ, and abdomen nearly black; thorax sometimes with a more or less extended dark patch on the disc. Entire insect clothed with scattered short, upright, pale hairs; head and thorax rugose; antennæ 12-jointed; metathorax with two short, rather blunt spines; first joint of the petiole nearly quadrangular looked at from above, from a side view much raised posteriorly; both joints more or less rugose; abdomen smooth and shining. Length 4 mill.

Hab.—Under bark, &c.; chiefly a northern species. I have taken it, however, near Croydon, and it occurs, I believe, in other localities near London.

2. *Nylander*i, Foerst. Hym. Stud. Form. p. 53.

♂ brown; the mandibles, antennæ, and legs pale; mandibles 4- or 5-toothed; scape of the antennæ as long as the first three or four joints of the flagellum; the first seven joints of the flagellum are of about equal

lengths, the following four are thicker and longer, and the apical joint is almost longer than the two preceding together; thorax in front of the converging lines smooth and shining, behind finely and longitudinally rugose; metathorax finely rugose, and with two small tubercles; abdomen shining, the nodes of the petiole smooth above. Length 2 mill.

♀ testaceous, club of the antennæ of the same colour; abdomen black-brown, with the base of the first segment widely, and of the following more or less narrowly, testaceous. Head and thorax longitudinally striate, clothed with scattered club-shaped hairs; thorax as wide as the head; wings slightly milky, nervures very pale; metathorax with two sharp spines, very wide at the base; abdomen shining, clothed with scattered hairs. Length 5 mill.

♂ differs from the ♀ only in having the thorax much narrower than the head and constricted in the middle, its surface rather more rugosely striate, and the spines of the metathorax rather longer, and in being smaller in size. Length 2 mill.

Hab.—Not common. I have taken it by sweeping at Chobham and at Wimbledon, but only in solitary specimens. I have compiled the description of the ♂ from Mayr's '*Formicina Austriaca*.'

3. *unifasciata*, Ltr. Ess. l'Hist. Nat. Fourm. Fr. p. 47.

Very like the preceding, of which Messrs. Forel and Emery consider it a race, putting them both together under the name *tuberum*, Nyl.

The ♂ may be known from that sex of *Nylanderi* by having the thorax in front of the converging lines rugose; the ♀ and ♂ by having the apex of the antennæ dark dark brown, and the black bands of the body narrower, often wanting, except on the basal segments.

Hab.—Rare. Sherborne, Dorset, C. W. Dale; and Ventnor, Isle of Wight, taken by myself.

SOLENOPHIS, *West*.

Ann. Mag. Nat. Hist. 1840, t. vi. p. 86.

Diplorhoptrum pars, Smith.

This genus may be easily known from any other British one of this group. The ♂ has the mesothorax without

the impressed converging lines observable in all the others, and the ♀ and ♂ have the metathorax without spines or teeth; the species are very small, the ♂ a good deal smaller than the ♀ and ♂. Labial palpi 2-jointed, maxillary palpi 2-jointed; ♂ antennæ 12-jointed, ♀ and ♂ 10-jointed, club 2-jointed; front wings with one marginal, one submarginal, and one discoidal cell.

1. *fugax*, Ltr. Ess. l'Hist. Fourm. Fr. p. 46. Fig. Smith Brit. Foss. Hym. pl. i. fig. 15, 16.

♂ black, shining; mandibles, antennæ, and legs brown; tarsi and inner margins of the mandibles testaceous. Entire insect covered with long pale hairs; mandibles with three teeth; scape of the antennæ short, about as long as the second joint of the flagellum, but thicker; the three apical joints are longer than the others. Head and thorax finely rugose; abdomen shining, nodes of the petiole finely rugose; wings hyaline, nervures pale. Length 5 mill.

♀ brown-black, shining; mandibles, antennæ, and legs paler. Entire insect hairy, like the ♂; mandibles with four teeth; scape of the antennæ reaching to the eye; the first joint of the flagellum is twice as long as wide, the seven following, shorter than wide, the ninth and tenth forming a decided club. Head and thorax punctured; abdomen shining and punctured, nodes of the petiole somewhat rugose; wings as in the ♂. Length 6 mill.

♀ pale yellow, shining, covered with long pale hairs; clypeus bidentate; mandibles with four teeth; scape of the antennæ not quite so long as the flagellum, but reaching almost to the middle of the apical joint; apical joint almost as long as all the other joints of the flagellum together, apical and penultimate joints forming the club. Head and thorax with scattered punctures; metathorax rounded, without spines; abdomen with scattered punctures; first joint of the petiole very wide behind and rounded, second slightly transverse; legs hairy. Length 2 mill.

Hab.—Southend and Deal, F. Smith.

The habits of this little species, according to Forel (Mitth. Schw. Entom. Gesellsch. vol. iii. No. 3, 1869), are most interesting. It appears often or generally to live

in the walls of the nests of other ants, so that the two species do not intermix, and, although living in such close proximity to one another, are bitter enemies, and fight ferociously if they meet. The channels cut out by *S. fugax* are so fine that they will only just admit the insect. The long account given by Forel, quoted above, is well worth reading.

MONOMORIUM PHARAONIS, *Linn. Syst. Nat. ed. x. Vol. i. p. 580.* = *Diplorhoptrum domesticum*, Sm.

This genus and species can hardly be included amongst our indigenous Hymenoptera, yet it is unfortunately so common now in many houses that I cannot leave it out.

It belongs to the same division as *Solenopsis fugax*, the ♂ having no converging lines on the mesothorax, and the ♀ and ♂ no spines on the metathorax. Its elongate form and almost naked surface at once distinguish it from *fugax*, as well as the short terminal joint to the antennæ, which is not more than half as long as the rest of the flagellum. The ♂ also has 13-jointed antennæ, and the ♀ and ♂ 12; the club composed of three joints.

Common in some houses in London, Hastings, &c.

"A native of tropical and subtropical countries throughout the entire world, living in houses."—Forel and Emery.

MYRMECINA, *Curt. (Pl. VII. fig. 8.)*

Brit. Ent. vol. vi. fol. 226.

♂ antennæ 13-jointed, ♀ and ♂ 12-jointed; maxillary palpi 4-jointed, labial palpi 3-jointed; mandibles small in the ♂, with three teeth; those of the ♀ and ♂ with two strong teeth, and seven indistinct small ones; wings very dark and hairy, and margins ciliated, with an appendiculated marginal cell and one submarginal; metathorax spined in all the sexes, but very shortly so in the ♂; first node of the petiole nearly square in all the sexes, second somewhat rounded in front, truncate behind.

1. *Latreillei*, *Curt. Brit. Ent. vi. fig. 265* ♂. *Smith Brit. Foss. Hym. pl. i. fig. 19*, ♀.

♂ black-brown, covered with rather long hairs; antennæ and legs somewhat paler. Head with the vertex

much rounded and elevated, the ocelli very prominent; antennæ with the scape very short, about as long as the two following joints; mesothorax irregularly punctured and somewhat rugose behind, converging lines very deep and crenate; metathorax crenate at the base, apex with two short spines; wings as in the description of the genus; abdomen shining and polished; nodes of the petiole irregularly rugose; legs finely pilose. Length 4 mill.

♀ rather larger than the ♂, black-brown, with the clypeus, mandibles, antennæ, legs, and the under side of the thorax and nodes of the petiole reddish testaceous. Head rugose, somewhat clathrately so at the sides; scape of the antennæ thick, and about as long as the nine following joints of flagellum; mesothorax smooth in front, longitudinally rugose behind; metathorax with two horizontal spines; abdomen shining, finely pilose, nodes of the petiole rugose, basal node nearly quadrangular; legs finely pilose. Length 4 mill.

♂ like the ♀ but smaller, and with thorax more rugose. Length 3 mill.

Hab.—Rare. Isle of Wight; London district; Worthing.

The following species have been admitted into our lists, but they only occur in greenhouses, or other places where there can be little or no doubt that they have been introduced from abroad:—

Tetramorium guineense, F.=*Kollari*, Sm.—Greenhouses, Exeter, &c.

T. simillimum, Sm.—Kew, &c.

Pheidole megacephala, F.=*lævigata*, Sm.—Greenhouses, &c., Exeter, and house in the Borough.

FOSSORES.

Of this tribe we have thirty-six genera in England, varying very much in structure and in the neuration of the wings. They have all short tongues, and the ♀ has no pollen-collecting apparatus; the first joint of the posterior tarsi also is not wider than the others, as it is in nearly all the Melliferæ. Still, there are cases where it is not easy, at least for a beginner, to say whether the insect before him belongs to the Fossores

EXPLANATION OF PLATE VIII., FIG. 41.

Giving nomenclature of nervures and cells.

- | | |
|--------------------------|---|
| 1. Costal cell. | <i>a.</i> Costal nervure. |
| 2. Externo-medial cell. | <i>b.</i> Post-costal nervure. |
| 3. Interno-medial cell. | <i>c.</i> Externo-medial nervure. |
| 4. Anal cell. | <i>d.</i> Anal nervure. |
| 5. Marginal cell. | <i>e.</i> Posterior margin. |
| 6. 1st submarginal cell. | <i>f.</i> Stigma. |
| 7. 2nd " | <i>g.</i> Radial nervure. |
| 8. 3rd " | <i>h.</i> Apical margin. |
| 9. 4th " | <i>i.</i> Externo-medial nervure |
| 10. 1st discoidal cell. | (extension of <i>c.</i>) |
| 11. 2nd " | <i>j.</i> Transverse medial nervure. |
| 12. 3rd " | <i>k.</i> Discoidal nervure. |
| 13. 1st apical cell. | <i>l.</i> External nerve of 1st submar- |
| 14. 2nd " | ginal cell. |
| | <i>m.</i> External nerve of 2nd submar- |
| | ginal cell. |
| | <i>n.</i> External nerve of 3rd submar- |
| | ginal cell. |
| | <i>o.</i> Cubital nervure. |
| | <i>p.</i> 1st recurrent nervure. |
| | <i>q.</i> 2nd " |
| | <i>r.</i> Subdiscoidal cell. |

XVII. *On a Collection of Hemiptera from Japan.*

By JOHN SCOTT.

[Read December 1st, 1880.]

IN my former paper published in the Ann. & Mag. of Nat. Hist., vol. xiv. (1874), I called attention, in the list given at the commencement, to certain species about whose names I was then uncertain. Since that time I have determined them, and below give the results. In addition to these I have also added a few more genera and species received by me from Mr. George Lewis, after the publication of the paper above referred to, and, having fully investigated them, I am able to add one new genus and a few new species.

HEMIPTERA—HETEROPTERA.*

Fam. PODOPIDÆ.

Scotinophora scutellata, n. sp.,, *tarsalis*, Scott.

This insect has been renamed *S. Scottii* by Dr. Horváth in a Hungarian publication, as the name *tarsalis* had been used by S. von Vollenhoven in his Faun. Ind. Néerl. i. p. 42, 3, pl. 3, f. 8 (1863), of which I was not aware until my attention was called to the fact.

Fam. ASOPIDÆ.

Asopus japonensis, n. sp.

Fam. CYDNIDÆ.

Æthus palliditarsus, n. sp.

Fam. HALYDIDÆ.

Stollia guttigera, Thunb.

Fam. PENTATOMIDÆ.

Alcimus japonensis, n. sp.

* The Homopterous portion will form a separate paper.



2. *Formica*.



3. *Tapinoma*.



1. *Formica*.



4. *Ponerz*.



5. *Myrmica*.



6. *Myrmica*.



8. *Myrmecina*.



7. *Stenaroma*.



9. *Mutilla*.



10. *Myrmosa*.



11. *Methoca*.



12. *Sapyga*.



13. *Tiphaa*.



14. *Aporus*.



15. *Evagethes*.



16. *Pompilus*.



17. *Ceropales*.



18. *Ammophila*.



19. *Tachyles*.



20. *Micropterus*.



21. *Dinetars*.



22. *Astata*.



23. *Spilomena*.



24. *Stigmus*.



25. *Diadromus*.
West. Newman & Co. sc.