

BRITISH FOSSIL INSECTS.

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INTRODUCTION.

The Lacoë collection of fossil insects, in the United States National Museum, includes a considerable series of English specimens, partly from the Lias and partly the Oligocene of the Isle of Wight, all collected many years ago by the Rev. Peter Bellinger Brodie. A study of this material has revealed many new and interesting forms, which are described herewith. There are in addition many others, some too imperfect for description; others, especially Coleoptera and minute parasitic Hymenoptera from the Oligocene, belonging to groups which I can not properly describe without larger collections of recent forms.

SUMMARY OF OCCURRENCES.

It seems useful to present a brief summary of our knowledge of British fossil insects up to the date of writing. In this I have included only the species which have been definitely named and described, as experience shows that references to species by the generic name or family name only, which are scattered through the literature, are too unreliable to be used as evidence.

CARBONIFEROUS (27 species).

Palaeodictyoptera.—Thirteen species. The family called Pteronidiæ by Bolton should be written Pteronidiidae. *Pteronidia* Bolton 1912 is antedated by *Pteronidea* Rohwer 1911, but the difference of a letter should save it.

Blattoidea.—Thirteen species, seven of them described in recent years by Mr. H. Bolton.

Protodonata.—*Meganeura radstockensis* Bolton, 1914, from the upper coal measures at Radstock, Somerset.

LIAS (82 species).

Orthoptera.—Nineteen species, of which three are first described below. Six are Blattoids, six Mantoids, and seven Locustoids.

Coleoptera.—Thirty-three species, of which six are first described below.

Odonata.—Eight species.

Neuroptera.—Prohemerobiidae, two species. Sialidae, one species, described below.

Panorpatae.—Four species of *Orthophlebia*.

Trichoptera.—Two species of *Necrotaulius*.

Palaeohemiptera.—Two species, one first described below.

Homoptera.—Four Fulgorid species.

Seven other species of insects have received names, but are too imperfect to place definitely in the system.

OOLITE (209 species).

Orthoptera.—Fifty-five species, of which 43 are Blattoids, 3 Phasmoids, 2 Grylloids, and 7 Locustoids.

Coleoptera.—Eighty-seven species.

Hymenoptera.—Two species of Pseudosiricidae, formerly supposed, quite erroneously, to be ants.

Odonata.—Eight species.

Neuroptera.—Four species.

Panorpatae.—Two species.

Trichoptera.—Three species of *Necrotauliidae*.

Lepidoptera.—Three species.

Diptera.—Eighteen species, including forms referred to Mycetophilidae, Bibionidae, Psychodidae, and Tipulidae.

Heteroptera.—Five species.

Homoptera.—Ten species, including five Fulgoridae, and a single Aphid.

Twelve other species are considered by Handlirsch to be too imperfect to be accurately classified.

The British Mesozoic insects, especially those from the Lias, are largely known from A History of the Fossil Insects in the Secondary Rocks of England, by the Rev. P. B. Brodie, published in 1845. This work contained a general account of the subject, with a number of plates drawn by Westwood, who added some critical notes, in which he included the new generic name *Orthophlebia*. There were no formal descriptions of genera or species. Brodie himself gave specific names to 32 of the insects he figured; in 1856 Giebel named 67 others; and finally Handlirsch, in his great work on fossil insects, gave specific names to 22 of those which had remained nameless, and proposed a large number of genera. Five of the species figured by Brodie received names from as many authors, namely, Westwood, Hagen, Strickland, Buckland, and Buckman. More than 30 figures still remain without names, but almost without exception they fail to show characters from which the species could be recognized.

Thus, of the 291 British Mesozoic insects, no less than 126 are figured in Brodie's work, and with a small number of exceptions are

not otherwise known. Since the figures are small and not very detailed, and the specimens themselves were never very critically studied, it is clear that our knowledge of the subject is much less than the long array of generic and specific names would suggest. Of the 49 Mesozoic Blattoids, 27 were described and named by Scudder in 1886.

TERTIARY (42 species).

Coleoptera.—Two from Corfe (? Middle Eocene), named by Giebel in 1856; one from Bovey Tracey (Upper Eocene), named by Heer in 1862; one from Mundesley (Upper Pliocene), named by Curtis in 1840.

Isoptera.—Three species of *Mastotermes* described by v. Rosen, two from Gurnet Bay (Oligocene), and one from Bournemouth (Eocene).

Lepidoptera.—*Lithopsyche antiqua* Butler, from Gurnet Bay.

Odonata.—One from Gurnet Bay, described below.

Diptera.—Nineteen from Gurnet Bay, described below.

Hymenoptera.—Ten from Gurnet Bay, described below.

Homoptera.—Four from Gurnet Bay; three described below, and one by Woodward in 1879.

POST TERTIARY (8 species).

Eight species of *Coleoptera*, all living species, have been recorded. The total number of British fossil insects to date is accordingly 368 species, of which 44 are first described in this paper. Undoubtedly many others have been collected and await description. Brodie, in *Geological Magazine*, December, 1893, pages 538–540, and 1894, pages 167–169, refers to large undescribed collections from Gurnet Bay. These are now in the British Museum, and I hope to have an opportunity to describe them during the coming year.

DESCRIPTIONS OF GENERA AND SPECIES.

LIAS INSECTS.

The insect-fauna of the British Lias (lowest division of the Jurassic), as far as we know it, consists of medium sized or small species, the *Coleoptera* and *Orthoptera* being most abundant. *Diptera*, *Lepidoptera*, and *Hymenoptera* were apparently absent. The *Coleoptera* have the most modern facies, and although they doubtless all belong to extinct genera, several of the modern families were apparently already in existence. Still more remarkable is the appearance in several species of elytral stripes, representing the same fundamental pattern as we see in living beetles. The Blattoid forms, which are so conspicuous in the Paleozoic, seem to be relatively scarce and insignificant in the Lias; but later, in the Oolite, they abound. The *Odonata* are well established. The Lias insects come from several

different localities, so their peculiarities are not likely to be due to any particular ecological conditions. It is probable that the material collected is fairly representative of the fauna, but it is very desirable to obtain a larger series of species. Should species of any of the missing orders be detected in new collections, they would be of extreme interest and value.

ORTHOPTERA.

EOSPILOPTERONIDAE, new family.

EOSPILOPTERON, new genus.

Anterior wing broad; costa straight, not elevated; apex rounded and obtuse; subcosta not far from margin, with very oblique crossveins in the costal cell; radius giving off the sector at about the end of the basal third of the wing, and shortly after that branched, and the lower division again branched, the radius thus ending as three nearly parallel veins, which enter the margin well before the apex; radial sector emitting five very oblique simple branches below; media forked a short distance before the level of the origin of radial sector, with the upper division again forked at level of origin of sector or slightly beyond; cubitus apparently simple; anal region not clearly made out. The longitudinal veins are everywhere connected by delicate vertical crossveins.

There is a general resemblance to *Zalmonites*, *Zalmona*, and *Pseudohumbertiella*, but the radius is quite distinctive. A new family seems to be indicated.

Genotype.—*Eospilopteron ornatum*, new species.

EOSPILOPTERON ORNATUM, new species.

Plate 60, fig. 2.

Anterior wing about 35 mm. long and 9.5 broad; upper apical field (in region of radius and sector) with a large round brown spot, about 3.5 mm. diameter; apical field beyond, above, and below the large spot with scattered small spots, forming a rather obscure mottling.

Lias (Brodie). Lacoë Coll. 3488. The precise locality is unfortunately unknown.

Holotype.—Cat. No. 61388, U.S.N.M.

ELCANA LIASINA (Giebel).

Plate 60, fig. 1.

English Lias, "Insect Beds" (Brodie). Lacoë Coll. 3490, 3491, 3493, 3494, 3495, the last also marked "Osborn's Pit, July, 1856." I give a figure of part of the wing of the best preserved one (3490), showing several details not before made known. This wing is about 11.75 mm. long; 3495 is a little over 13 mm. I am unable to recog-

nize more than one species, and this is doubtless *E. liasina*, although the original figure published by Brodie shows the wing too narrow apically, and omits the middle branch of the media. The radial sector seems to have six branches, as in Brodie's figure, but close scrutiny shows a seventh branch (with branchlets) near the apex of the wing, as Handlirsch figures for *E. britannica*. According to the figure of *E. britannica*, that also lacks the middle branch of the media. *E. brodiei* Handlirsch is based on the apical half of a wing, and is probably identical with *E. liasina*. It seems probable that the three species of *Elcana* named from the English Lias can all be reduced to one.

Plesiotype.—Cat. No. 61389, U.S.N.M.

LOCUSTOPSIS LACOEI, new species.

Plate 60, fig. 4.

Anterior wing 11.25 mm. long, not quite 2 mm. broad in middle, but in apical region about 2.25 mm. broad; obscurely mottled; costal nerve reaching margin 7 mm. from apex of wing, and emitting about seven oblique branches or cross-nervures above; subcosta with a strong oblique branch just beyond end of costal nerve, but soon after closely approximated to costal margin, ending about 2.75 mm. from apex of wing; radial sector little divergent from radius, originating near middle of wing, and giving off three oblique branches; media also with three branches, which are simple; cubitus forked, but not joining media, although a rather prominent crossvein beyond the fork gives an illusory appearance of this; three anals.

Lias at Binton (Brodie). Lacoë Coll. 3460. This is smaller than the previously described species; it comes close to *L. dobbertinensis* Handlirsch, from Mecklenburg, but is smaller and differs in the details of the venation. It does not appear altogether impossible that it is identical with *dobbertinensis*, but it is probably distinct, and Handlirsch's species does not show some of the characteristic parts on which precise identification must depend. Furthermore, our insect is from the *Lower Lias*, the German one from the *Upper Lias*, and this alone would be almost conclusive against specific identity.

Holotype.—Cat. No. 61390, U.S.N.M.

LOCUSTOPSIS BUCKLANDI (Brodie).

Lias at Binton (Brodie). Lacoë Coll. 3461. Wing 18 mm. long, very like *L. lacoëi*, but very much larger. The radial sector and media and each three-branched, as in *L. lacoëi*. The character of the cubitus can not be made out. The costa, subcosta, and radius are essentially as in *L. lacoëi*. The insect is a true *Locustopsis*. Handlirsch does not indicate the type of *Locustopsis*; *L. elegans* Handlirsch is herewith designated as such.

HAGLOPSIS BRODIEI, new species.

Plate 60, fig. 7.

Anterior wing 25 mm. long, lacking a very little of the extreme base; width in middle 7.5 mm.; apex moderately obtuse; costa straight (not convex as in *Sialidæ*), lower margin very slightly and evenly convex; longitudinal veins throughout joined by delicate cross nervures, which are straight or slightly curved, vertical or more or less oblique. Subcosta very delicate, its very fine terminal branch ending about 10 mm. from apex of wing, where it is closely approximated to the first of the numerous oblique nervures which leave the end of the radius to join the costa; radial sector arising (leaving radius) a little more than 13.5 mm. from end of wing, and emitting four branches from its lower side; media branching about 19.5 mm. from apex of wing, the upper branch simple, the lower once branched, the fork of the lower branch at same level as separation of radial sector; between the media and the lower margin are four simple longitudinal veins, without any closed cell, the second anal curves upward basally (the anal angle of the wing being rounded) and sends a few very oblique nervures to the margin.

Lias at Binton (Brodie). Lacoe Coll. 3453.

Distinguished from *H. parallela* (Giebel) by the smaller size and the simple upper branch of media. The apex is also more pointed than in Brodie's figure of *H. parallela*.

Holotype.—Cat. No. 61392, U.S.N.M.

HAGLOPSIS PARALLELA (Giebel).

Plate 60, fig. 3.

Lias (Brodie); Lacoe Coll. 3489. A characteristic specimen, differing from the original figure in having the upper branch of the lower division of the media forked near the end. The fork of the upper division of the media is slightly over 7.5 mm. basad of the fork of the lower division. The cubitus is simple, and there are three simple anals. The radial sector shows four branches, instead of five as in the figure, but the apex of the wing is lost.

No. 3430, showing only the upper half of the wing, is referred to the same species. In it the fork of the upper division of the media is about 6.5 mm. basad of the origin of the radial sector, and the third branch of the radial sector is less than half as far from the second as the second is from the first. In 3489 the upper division of the media forks nearly 8.5 mm. basad of the origin of the radial sector, and the third branch of the sector is fully as remote from the second as the second is from the first. However, judging by analogy with living insects, these differences may well be due to individual variation. For convenience of reference, 3489 may be known as variety *a* and 3430 as variety *b*.

3431, a fragment of the middle of a wing, is also referred to *H. parallela*.

Plesiotypes.—Cat. No. 61393, U.S.N.M.

CALOBLATTINA LIASINA (Giebel).

Giebel's species was evidently based on the same figure¹ as Handlirsch's *Actinoblattula brodiei*. The latter consequently falls as a synonym.

PANORPATAE.

ORTHOPHLEBIA COMMUNIS Westwood.

Plate 60, fig. 8.

This, the type of the genus, is represented by Nos. 3455, 3456, 3457, 3458, Laccoe Collection, from the Lias, the last three from Binton. The two primary branches of the radial sector fork at nearly the same level, but the upper fork is a little more basad, varying to considerably more. The anal field was not very clearly figured by Westwood, so I give a new figure (from No. 3458) showing the details. There is a rather close general resemblance to *Panorpa*. The media gives rise to four branches, of which the first is again branched; *Panorpa* has three branches, of which the first is again branched. The radial sector always has four branches leaving its upper division. In two species which Handlirsch describes from Mecklenburg there are only three such branches; this is also true of the English *O. intermedia* and *O. lata*, which appear to be identical. *O. similis* is doubtfully separable from *O. communis*. It is not impossible that all the Lias species of *Orthophletia* can be reduced to two, *O. communis* and *O. intermedia*, but it is not desirable to attempt such a reduction in the present state of our knowledge.

Plesiotype.—Cat. No. 61394, U.S.N.M.

NEUROPTERA.

NEMATOPHLEBIA, new genus (Sialidae).

Posterior wing (apparently) long and narrow, with straight costa and rounded apex; both specimens before me are longitudinally folded in the middle, and doubtless folded thus in life, after the manner of modern Sialids. Subcosta running parallel with and close to costal margin, with which it is connected by vertical (not or little oblique) cross nervures, ending a considerable distance before the apex of the wing; stigmal region clouded, as in *Corydalid*; radius straight, ending above wingtip, quite a distance from the apex, emitting the media not very far from base, and at a very acute angle, but this angle is greater than that made by the radial sector, which leaves the

¹ Brodie, Fossil Insects, pl. 8, fig. 12.

radius well before the middle of the wing; radial sector with three long simple branches, the third appearing as the main stem; at the end the sector branches again, sending a branchlet obliquely downward toward the end of the third branch, this emitting four delicate V-like pairs of nervures to the margin; media straight, probably branched below, but this can not be clearly made out; anal region obscured, owing to the folding. There are crossveins at intervals, in the manner of *Corydalis*.

There appears to be a certain affinity with *Solenoptilon*, from the Lias of Mecklenburg, but no very close resemblance. I naturally asked myself whether the specimens could represent the hind wings of *Orthophlebia*. They are, however, evidently not Panorpoid at all, but belong to the Sialoids, and presumably to the Sialidae. The characteristic features are the folding of the wing and the unbranched first branch of the radial sector. The narrow costal cell as well as the folding appear to indicate hind wings. It seems very likely that the problematical *Orthophlebia longissima* Giebel belongs to *Nematophlebia*.

Genotype.—*Nematophlebia plicata*, new species.

NEMATOPHLEBIA PLICATA, new species.

Plate 60, figs. 5-6.

Wing about 10 mm. long; stigmal region clouded and apical field suffusedly dusky, but no maculation; veins fuscous, delicate crossveins pallid; apical part of radius minutely speckled.

Lias; Gloucestershire or Warwickshire (Brodie). Lacoe Coll. 3478 (= type) and 3479.

Holotype.—Cat. No. 61395, U.S.N.M.

PALAEOHEMIPTERA.

MESHEMIPTERON, new genus.

Anterior wing with the apical field apparently more or less membranaceous, with delicate veins; subcosta separating from radius near or about (probably rather before) middle of wing, forming a long triangular cell with the basal angle very acute, the upper apical acute, and the lower apical obtuse; media branching about level with middle of cell in radio-subcostal fork, its upper branch widely separated from radius; cubitus simple until it reaches the apical field.

Genotype.—*Meshemipteron incertum*, new species.

MESHEMIPTERON INCERTUM, new species.

Plate 60, fig. 9.

Anterior wing as preserved 6.5 mm. long; if complete, it would perhaps be 8.5; no markings visible.

The specimen is unnumbered, but was collected by Brodie in the Lower Lias, and comes from the Lacoe collection. It is presumably

related to *Dysmorphoptila*, but quite distinct. There is a marked similarity in essential structure with the Permian *Prosbole*. According to Handlirsch, the subcosta of *Prosbole* is fused with the radius, and a slight elevation running close to the upper margin is not a vein. In this insect there is a similar slight elevation or fold, which is very probably not a vein. The little cell in the fork of the subcosta and radius of *Prosbole* is represented by a large elongate cell in our insect. Upon comparison with the modern Heteroptera similar homologies can be made out. Thus *Alydus conspersus* has essentially the same type of venation, but the cell in the fork of the radius and subcosta is very large, and coalesces with the cell in the fork of the media. Hence, our insect can be regarded as intermediate in venation between *Alydus* and *Prosbole*. In our insect, as in the Palaeohemiptera and Homoptera, the veins are continuous from the basal to the apical fields, the membrane not being abruptly differentiated; nevertheless, the region of the membrane seems to have been modified, and its veins are more delicate than those on the middle and basal parts of the wing.

I was at first inclined to refer *Meshemipteron incertum* to Handlirsch's genus *Homopterites*, assuming that the figure of that insect was partly erroneous. It is not impossible that this would be correct, but we are hardly at liberty to make such an assumption, especially as Handlirsch definitely places *Homopterites* in the Fulgoridae, and seems quite clear about its characters.

Holotype.—Cat. No. 61396, U.S.N.M.

COLEOPTERA.

PROTOCUNEUS, new genus. (Rhynchophora?)

Elytron elongated, narrow at base, pointed at apex, the outer margin presenting an obtuse but salient angle far above the middle; texture dense, black as preserved, with very numerous large punctures, which are arranged in regular rows on the inner half of the elytron, but on the outer half are irregular; outer margin thickened.

Genotype.—*Protocuneus punctatus*, new species.

PROTOCUNEUS PUNCTATUS, new species.

Plate 61, fig. 6.

Elytron nearly 4.5 mm. long, 1 mm. broad at the broadest point (level with the outer angle); outer margin from angle to apex about 3.25 mm.

Lias at Wilncote (Brodie); Lacoë Coll. 3426. This is marked "Elytron of beetle, Buprestidae or Elateridae;" but I think it belongs rather to the Rhynchophora, as indicated by the large punctures and the general form. Some Curculionidæ (e. g., species of *Acalles*)

have the prominent outer angle above the middle. There is also a slight suggestion of certain members of the curious Hawaiian Proterhinidae, particularly *Proterhinus kaalae* Perkins.

Holotype.—Cat. No. 61397, U.S.N.M.

ANHYDROPHILUS BRODIEI Handlirsch.

Lias (Brodie). Lacoë Coll. 3499 (Cracombe, Worcestershire), 3443, 3444, 3445, 3446, 3470 (Wainlode Cliff, Gloucestershire). Elytra about 4.75 mm. long, elongate-oval, convex, apex rather obtuse; sculpture almost lacking, but there were apparently very faint widely spaced striae. So far as anything shows, the insect could be closely allied to *Agabus*.

ELATEROPHANES SOCIUS (Giebel).

Plate 61, fig. 2.

Lias (Brodie). Lacoë Coll. 3441, 3434, 3439; all from Wainlode Cliff, Lower Lias. Brodie figured a specimen showing the thorax; those before me are elytra. They agree well with the modern Elateridae, e. g., *Monocrepidius*. There are eight longitudinal striae. The length of an elytron is 6.2 mm.

Westwood's figure, published by Brodie, actually shows the antennal grooves on the under side of the thorax, and leaves no doubt that the Elateridae were fully differentiated as early as the Lias.

Plesiotype.—Cat. No. 61400, U.S.N.M.

ELATEROPHANES ACUTUS, new species.

Plate 61, fig. 1.

Elytron 5 mm. long, about 1.5 broad in middle, as preserved dark coffee brown; striae as in *E. socius*, but faint. Compared with *E. socius*, the elytron is broader in proportion to its length and the apex is more acute. The specimen shows the inner surface.

Wainlode Cliff, Gloucestershire, Lower Lias (Brodie). Lacoë Coll. 3438.

Holotype.—Cat. No. 61401, U.S.N.M.

PSEUDOTELEPHORUS HAUERI (Giebel).

Lias (Brodie). Lacoë Coll. 3480. From the Lower Lias. In the list accompanying the specimens it is marked "Telephoridae." In addition to the very numerous fine punctures (appearing as brown dots), there are about 10 very delicate striae. The insect is evidently not closely related to *Telephorus*. (Cat. No. 61402, U.S.N.M.)

The two following species, also marked "Telephoridae" in the list, appear to belong to the same genus. The striae are delicate and not sharp, and the minute punctiform brown markings seem to be the bases of hairs, not true punctures. They may have been pigmented spots, such as occur in the Erotylidae.

PSEUDOTELEPHORUS PUNCTULATUS, new species.

Plate 61, fig. 4.

Lias (Brodie). Lacoë Coll. 3496. Preserved portion of elytron 7.5 mm. long (actual length probably a little over 9 mm.); width in middle 3 mm.; striae delicate, about 10; apex moderately acute. Larger and broader than *P. haueri*, with the outer margin more convex.

Holotype.—Cat. No. 61403, U.S.N.M.

PSEUDOTELEPHORUS GRANDIS, new species.

Plate 61, fig. 3.

Lias (Brodie). Lacoë Coll. 3497. Visible part about 11 mm. long, the total length would be about 12; striae obscure. A narrow (width in middle not quite 4 mm.) parallel-sided elytron, with a shallow sulcus next to outer margin. The base is distinctly narrower than the middle.

Holotype.—Cat. No. 61404, U.S.N.M.

PHANEROGRAMMA, new genus (Tenebrionidae?).

Elytron moderately elongate, convex, rather obscurely rugose, with five raised keellike lines; the first straight and delicate, parallel with and close to the sutural margin; the second delicate and faint, about equally remote from the first and the third, failing below; the third and fourth beginning very close together near the humeral angle, gradually diverging, curved, bending mesad; the fifth faint and incomplete.

Genotype.—*Phanerogramma heeri*, new species.

PHANEROGRAMMA HEERI (Giebel).

Plate 60, fig. 10.

Akicera heeri GIEBEL, Ins. Vorw., 1856, p. 310.

Akicera frauenfeldi GIEBEL, Ins. Vorw., 1856, p. 310.

Giebel's names were based on Brodie's figures.¹ They evidently refer to the same species, and Brodie's figure 15, on the same plate, shows the elytra in place. Giebel thought they were Orthoptera (genus *Akicera* Serville), and Handlirsch suggests that they may be femora of some Locustoid. Neither of these authors had specimens, and actual examination of one (Lias, Binton, collected by Brodie, Lacoë Coll. 3452) indicates that it is a Coleopterous elytron. It is about 5 mm. long, and the delicate rugosity is most pronounced in the middle line between the longitudinal keels. There appears to be no reason why the genus should not belong to the Tenebrionidae.

Plesiotype.—Cat. No. 61405, U.S.N.M.

¹ Hist. Foss. Ins., pl. 8, figs. 17, 18.

HOLCOPTERA SCHLOTHEIMI (Giebel).

Plate 61, fig. 7.

Lias (Brodie). Lacoë Coll. 3484. A characteristic elytron, about 6 mm. long, differing from the type only in having the inner discal stripe reaching the base. There is a distinct sutural stripe. Neither striae nor punctures can be seen.

Plesiotype.—Cat. No. 61406, U.S.N.M.

HOLCOPTERA GIEBELI (Handlirsch).

Holcoelytrum giebeli Handlirsch certainly does not require a separate generic name. It is very close to *H. schlotheimi*, but larger, with four longitudinal color-bands on the elytron instead of three.

HOLCOPTERA CONFLUENS, new species.

Plate 61, fig. 8.

Elytron 5 mm. long and about 1.3 wide; similar to *H. schlotheimi*, but smaller and more slender, with the two principal discal bands confluent except at base, or sometimes slightly separated subapically. There is sometimes a faint and slender fourth band next to the outer margin.

Lias (Brodie). Lacoë Coll. 3482 (= type), 3483, 3498. Exact locality not given, but the first two, at least, are from the Lower Lias, as is *H. schlotheimi* (3484). Westwood considered *Holcoptera* to be probably related to the Carabidae, remarking that he knew an Indian species with similar markings. One is also reminded of certain species of *Lebia*, as *L. furcata*. The pattern is also suggestive of species of *Bidessus*.

Holotype.—Cat. No. 61407, U.S.N.M.

GLAPHYROPTULA ANGLICA, new species.

Plate 61, fig. 5.

Length 4.5 mm., elytra 3.5; width of elytron in middle 1 mm. or a very little more; outer margin of elytra obtusely subangulate (in *Chrysobothris* fashion) 2 mm. from base; no sculpture visible; humeral angle prominent, extending far beyond thorax.

Lower Lias, Gloucestershire or Warwickshire (Brodie). Lacoë Coll. 3475. This seems to be clearly a small Buprestid. The genus was based by Handlirsch on a similar but considerably larger species described by Heer from the Lower Lias of Switzerland.

Holotype.—Cat. No. 61408, U.S.N.M.

GLAPHYROPTULA LIASINA (Giebel).

The *Ancylocheira liasina* of Giebel, based on a figure (pl. 10, fig. 1) in Brodie's work, is to be referred to the same genus. It is consider-

ably larger than *G. anglica*, and has the angle on outer margin of elytra nearer the apex.

OLIGOCENE INSECTS.

All the Oligocene material before me comes from a single locality, Gurnet Bay in the Isle of Wight. According to the labels on the specimens, this locality belongs to the Bembridge series, but J. W. Taylor¹ refers it to the Osborne series. J. Starkie Gardner² spells the name Gurnett Bay, but on page 36 of the same work he writes Gurnet Bay, recording *Sequoia couttsiae* Heer from the locality. Handlirsch³ places the Gurnet Bay deposit in the Lower Oligocene, along with that of Aix in Provence and the Baltic Amber. I have not been able to determine any species as identical with those of Aix or Baltic Amber. Compared with the amber fauna, that of Gurnet Bay seems more decidedly temperate, with less suggestion of an oriental or Australian facies. There is, however, the genus *Mastotermes*, now known only from Australia. Kurt von Rosen,⁴ when recording these termites, speaks of the Gurnet Bay limestone as Middle Oligocene, having apparently received this information from the British Museum. It is necessary to learn more about the Gurnet Bay fauna before expressing any positive opinion, but it seems possible that it is later than the amber.

The preservation of the specimens is most remarkable, as Brodie long ago pointed out. There was absolutely no compression, and when the rock is fractured so as to bisect an insect longitudinally, a cast of its internal organs is presented, as shown in plate 65, fig. 7, A. Many minute insects were preserved without losing their more delicate parts, as is shown by a mosquito wing still carrying the scales. The preservation was indeed similar to that of the amber insects, with the important practical difference that the medium is entirely opaque. There was perhaps a mud spring, with heated waters, into which the insects fell, possibly overcome by gaseous emanations. The waters were not themselves poisonous, as they were full of mollusks, and many of the insect-bearing fragments of rock carry also multitudes of a species of Phyllopod Crustacean, which is, I believe, the *Branchiopodites* described by Woodward.⁵ It would be difficult to exaggerate the importance of this extraordinary deposit for an understanding of the Oligocene life of England, and it is very much to be hoped that more will shortly be learned about it, and more of the materials collected will be described.

¹ Monograph Land and Freshwater Mollusca British Islands, pt. 7, 1900, p. 411.

² Monog. British Eocene Flora, vol. 2, pt. 1, 1883, p. 4.

³ Die Fossilien Insekten, p. 677.

⁴ Trans. Second Entomological Congress, p. 321.

⁵ Quart. Journ. Geol. Soc., Lond., vol. 35, 1879, p. 346.

HYMENOPTERA.

PHILOPONITES, new genus (Philanthidae).

Allied to *Philoponus* Kohl, but differing by the less produced, more broadly truncate marginal cell, the second submarginal extremely broad below, the first recurrent nervure curved and bent backward above, and the oblique transverso-median. The first recurrent nervure reaches the second submarginal cell before the end of the first third; the second recurrent reaches the third submarginal no great distance before the middle. The second submarginal is greatly narrowed above, and the third transversocubital has a double curve. There is a rather close resemblance to the American Miocene genus *Prophilanthus* Cockerell, but there are important differences in detail, e. g., in *Prophilanthus* the marginal cell is nearly as in *Philoponus*, and the third submarginal receives the second recurrent nervure near the base.

Genotype.—*Philoponites clarus*, new species.

PHILOPONITES CLARUS, new species.

Plate 64, fig. 2.

Anterior wing about 6.3 mm. long, hyaline, with brown nervures, and large dark brown stigma. The following measurements are in μ : Breadth (depth) of stigma, about 240; greatest breadth (depth) of marginal cell, 480; marginal on second submarginal, 320; marginal on third submarginal, 720; lower side of marginal beyond third submarginal, 320; second submarginal on first discoidal, 320; second submarginal on third discoidal, 800; third submarginal on third discoidal, 448; lower side of third submarginal beyond third discoidal, 592; second discoidal cell on median, 80.

Oligocene at Gurnet Bay (Brodie). Lacoe Coll. 7620.

The names *Philoponus* and *Acolpus* applied (Kohl, 1889; Vachal, 1893) to the modern genus are both preoccupied (*Philoponus* Thorell, 1887; *Acolpus* Jayne, 1883). Kohl suggests that perhaps the name *Pseudoscobia* Radoszkowski may be available.

Holotype.—Cat. No. 61409, U.S.N.M.

ANEURHYNCHUS CONSERVATUS, new species (Diapriidae).

Plate 64, fig. 1.

Male.—Length about 2.5 mm.; anterior wings about 2.5 mm. long, broad and ample, with the stigma about equally distant from base and apex; hind wings relatively short, narrow, 1120 μ long and about 192 broad, the margin ciliate; antennae long, the three joints which can be seen (a considerable distance from base) much longer than wide; head rather small, in lateral profile very broad oval; hind coxae very stout, about 225 μ long and 160 broad; periole of abdo-

men 416 μ long, slender; second dorsal segment 672 μ long; portion of abdomen beyond second dorsal 432 μ long. There is no basal cell in front or hind wings, the basal nervure being absent; the stigmatic vein is quite long (96 μ), with a distinct knob; the very faint venation of the apical half of the wing is like that of *Cinetus*,¹ but the insect is not closely allied to *Cinetus*, being certainly a Diapriid of the subfamily Spilomicrinae. The reference to *Aneurhynchus* is necessarily more or less provisional, but there are no evident grounds for proposing a new generic name.

Oligocene at Gurnet Bay (Brodie). Lacoë Coll. 7642. It is interesting to find such a minute and delicate insect well preserved.

Holotype.—Cat. No. 61410, U.S.N.M.

The following eight species are all ants.

PONERA HYPOLITHA, new species.

Plate 64, figs. 3-4.

Represented by the middle of the wing, showing thick dark veins, the venation as in modern *Ponera*. The following measurements are in μ : Length of first submargined cell, 1,600; length of first section of marginal nervure, which runs vertically down from middle of stigma, 400; length of upper side of first discoidal cell, 800; length of second submarginal cell, 1,040; median cell on second discoidal, 640. The second submarginal cell comes to a point above.

Oligocene at Gurnet Bay (Brodie). Lacoë Coll. 7671 (type). On same piece of rock as *Necropsylla anglica*. In *Euponera succinea* Mayr from Baltic Amber the lower basal corner of the first discoidal cell is much more produced, and comes much nearer to the base of the second discoidal. A hind wing (7527), 5 mm. long, is referred to *P. hypolitha*, as it has the *Ponera* venation, and the appearance of the nervures is similar.

Holotype and paratype.—Cat. Nos. 61411, 61412, U.S.N.M.

DOLICHODERUS BRITANNICUS, new species.

Plate 65, figs. 6-7.

Female.—Anterior wing about 6 mm. long, as preserved faintly reddish, with pale ferruginous venation, except the subcosta, which is dark; stigma long and narrow; base of marginal cell vertical, and level with end of second submarginal, the latter narrowed to a point basally, where it meets the upper apical corner of first discoidal; first discoidal quadrate, longer than high, not narrowed above, not nearly reaching the transverse median. The following measurements are in μ : Transverse median nervure to basal corner of first discoidal cell, 448; length of discoidal cell, 560; length of second submarginal cell, 880; length of marginal cell, 1,760.

¹ Ashmead, Bull. 45, U. S. Nat. Mus., pl. 14, fig 6.

Venation of hind wings ordinary for the group. Epinotum rounded; petiole formed as in modern *Dolichoderus*, as also the gaster.

Oligocene at Gurnet Bay (Brodie). Lacoë Coll. 7578, and its reverse 7641 (type). I also refer here 7584, although the first discoidal cell is longer. This specimen is preserved as a lateral section, showing the body cavities. The petiole, here seen in lateral profile, agrees with *Dolichoderus*. A very similar species is *Dolichoderus obliteratus* (*Hypoclinea obliterata* Scudder) from the Tertiary at Quesnel, British Columbia.

Holotype and paratype.—Cat. Nos. 61413, 61414, U.S.N.M.

DOLICHODERUS ANGLICUS, new species.

Plate 65, fig. 8.

Female(?).—Anterior wing 5 mm. long to base of stigma, total length probably about 8 mm.; venation differing from that of *D. britannicus* as follows: Second submarginal cell petiolate above, not reaching marginal, and also failing to reach first discoidal. The following measurements are in μ : Transversomedial to basal corner of first discoidal cell, 640; length of first discoidal, 1,120; length of second submarginal, 1,440.

Oligocene at Gurnet Bay (Brodie). Lacoë Coll. 7610. This is considerably larger than the last and differs in the venation, so it probably represents a distinct species.

Holotype.—Cat. No. 61415, U.S.N.M.

DOLICHODERUS OVIGERUS, new species.

Plate 65, fig. 9.

Female.—Length about 6.75 mm.; anterior wing about 5.25 mm., hyaline, with ferruginous nervures. Structure, including petiole, essentially as in *D. britannicus*, from which it may not be distinct, but the second submarginal cell goes beyond the base of the marginal, and fails to reach the first discoidal. The following measurements are in μ : Transversomedial to basal corner of first discoidal cell, 480; basal nervure on first discoidal, 464; basal nervure on first submarginal, 208; first submarginal on first discoidal, 640; base of second submarginal to apical corner of discoidal, 144; length of second submarginal, 928; width of second submarginal at apex, 320. Anterior femur about 1,200 μ long; hind femur long and slender, 1,920 μ long and 272 broad. The abdomen contains an eggshell, 432 μ long, so perfectly preserved that I wondered whether it could have come from some modern insect; but it appears to be part of the fossil, along with numerous indications of the internal tissues.

Oligocene at Gurnet Bay (Brodie). Lacoë Coll. 7630.

Wheeler records nine species of *Dolichoderus* from Baltic Amber.

Holotype.—Cat. No. 61416, U.S.N.M.

LEPTOTHORAX GURNETENSIS, new species.

Plate 65, figs. 4-5.

Anterior wing about 2.6 mm. long; venation nearly as in modern *Leptothorax canadensis*, but transversomedial nervure much more remote from lower end of basal nervure; first discoidal cell very small. measurements in μ : Upper end of transversomedial to lower end of basal nervure, 400; lower side of first discoidal, about 145; length of submarginal cell, 672.

Variety *a*: First discoidal cell larger, its lower side 200 μ . Probably an individual variation.

Oligocene at Gurnet Bay (Brodie). Lacoë Coll. 7546; var. *a*, 7604 (Cat. No. 61418, U.S.N.M.). This seems to be a *Leptothorax*, but I have only the wings to judge from.

Wheeler records five species of *Leptothorax* from Baltic Amber. The variety *a*, with larger discoidal, and submarginal cell narrowly truncate at end, may possibly be a distinct species.

Holotype.—Cat. No. 61417, U.S.N.M.

OECOPHYLLA ATAVINA, new species.

Plate 64, fig. 7.

Female.—Length 5.5 mm.; the long petiole and short broad abdomen as in *Oecophylla*; anterior wing slightly over 7 mm. long; stigma long and slender, marginal cell very narrow; submarginal cell, which is 1,890 μ long, narrowly truncate at end; greatest depth of submarginal cell 800 μ ; basal nervure considerably longer (450 μ) on submarginal than beyond, its lower section only 320 μ (reversing the condition in *O. perditata*); lower end of basal nervure 720 μ from transvasomedial.

Oligocene at Gurnet Bay (Brodie). Lacoë Coll. 7560, and the reverse 7569.

Holotype.—Cat. No. 61419, U.S.N.M.

OECOPHYLLA PERDITA, new species.

Plate 64, figs. 5-6.

Female.—Anterior wing 12.75 mm. long; venation essentially as in *O. atavina*, except that the basal nervure has its lower section longest and the submarginal cell is pointed at tip. The following measurements are in microns: Upper section of basal nervure (on the submarginal), 640; lower section of basal nervure, 880; lower end of basal nervure from transversomedial, 1,760; greatest depth of submarginal, 1,520.

Female.—Variety *a* (probably an individual variation). Wing about 11 mm. long; base of stigma to base of wing nearly 7.5 mm., submarginal cell narrowly truncate at end. (The difference in the end of the submarginal, between this and the type, is not likely to

be specific, as I have found a similar difference, though less marked, between the opposite sides of an example of *Camponotus noveboracensis* Fitch.) Measurements in microns: Upper section of basal nervure, 560; lower section of basal nervure, 640; lower end of basal nervure to transversomedial, about 1,600; greatest depth of submarginal, 1,360; terminal truncation of submarginal cell, 160; depth of marginal cell just above end of submarginal, 512.

Male.—Anterior wing 7 mm. long; venation as in the female, submarginal cell pointed at end. The small head with very large eyes indicates *Oecophylla* and not *Camponotus*. The male is referred to this species because it is of the size to be expected, and agrees in the wing-structure.

Oligocene at Gurnet Bay (Brodie). Lacoë Coll. 7526 (type); var. *a* 7550 (on same piece of rock as the type of *Protoberis*); male, 7529.

Holotype and paratypes.—Cat. Nos. 61420–61422, U.S.N.M.

OECOPHYLLA MEGARCHE, new species.

Plate 65, figs. 1–3.

Female.—Anterior wing 20.5 mm. long; venation as in the other species; upper section of basal nervure longest (upper about 1,360 μ , lower about 910); submarginal cell 6.4 mm. long, pointed at end; marginal cell 6.1 mm. long, and 670 μ deep at level of end of submarginal; lower end of basal nervure 2.5 mm. from transversomedial. The two sections of the basal nervure being essentially in a straight line in this and the other species, these can be readily distinguished from *Dryomyrmex*; the direction of the transversomedial distinguishes them from *Mycetosoritis*, etc.

Lower wing (on another piece of rock) slightly over 16 mm. long; the venation is shown in the figure. Another specimen shows the head and anterior part of body; the mandibles are long and massive, only feebly denticulate. The head is about 3 mm. wide.

Oligocene at Gurnet Bay (Brodie). Lacoë Coll. 7525 (type), 7568, and 7623. At first sight this seems to be a *Camponotus*, but the venation of the hind wing is different, and everything appears to indicate that *megarche*, *perdita*, and *atavina* all belong to *Oecophylla*, which has two species in Baltic Amber.

Holotype and paratype.—Cat. Nos. 61423–61425, U.S.N.M.

Heer in 1850 described a *Formica obesa*, which consisted of two types, *F. obesa radobojana* from Radoboj and *F. obesa oeningensis* from Oeningen. The Radoboj insect was shown by Mayr in 1867 to belong to *Oecophylla* and is to be known as *Oecophylla obesa*. The Oeningen ant, of which three examples from the University of Zürich (Heer's collection) are before me, is evidently not an *Oecophylla*, but from the general build and appearance should be called *Camponotus oeningensis*. It has priority of place over *C. heracleus* (Heer), which is possibly its male.

HOMOPTERA.

NECROPSYLLA ANGLICA, new species (Psyllidae).

Plate 63, fig. 5.

Lower half of wing (all that is visible) hyaline, with the media, cubitus, and wing-margin very dark brown; anal nervure evanescent, not colored. Cell in fork of media $448\ \mu$ long on upper side, stem of media from separation of cubitus to fork $560\ \mu$; cubitus from separation of media to fork $240\ \mu$, length of cell in fork of cubitus $560\ \mu$. What can be seen of the venation exactly agrees with the American Miocene genus *Necropsylla* Scudder; it is also similar to the living genus *Paurocephala* Crawford.

Oligocene at Gurnet Bay (Brodie). Lacoë Coll. 7671.

Holotype.—Cat. No. 61426, U.S.N.M.

PSYLLA (sens. lat.) EXHUMATA, new species (Psyllidae).

Plate 63, fig. 6.

Female.—Anterior wings about 1.5 mm. long; broad and obtuse, dark brown; *Rs* turned upward at end; upper branch of media nearly in a straight line with stem; cell in forks of media $320\ \mu$ long on upper side; cell in forks of cubitus elongated, about $528\ \mu$ long, the lower branch vertical; stem of cubitus (from media to fork) $208\ \mu$; a vertical line through middle of wing at about level of middle of cell in forks of cubitus measures $176\ \mu$ from cubitus to media, $128\ \mu$ from media to radial sector, $160\ \mu$ from radial sector to costal margin. Caudal segment of abdomen greatly elongated, $528\ \mu$ long, and 50 wide near apex.

Oligocene at Gurnet Bay (Brodie). Lacoë Coll. 7619. The caudal end is like that of the living *Psylla floccosa* Patch. The cell in the forks of cubitus is like that of species of *Aphalara*, and the dark wings also indicate that the species is not a *Psylla* in the restricted sense. What can be seen of the structure of the head, with convex front and large prominent eyes, accords well with *Aphalara*, though not with all species of that genus. On the whole, a definite reference to a restricted modern genus seems unwarranted, although there is nothing tangible on which to establish a new generic name.

The Psyllidae of the Florissant Miocene (three genera and four species) have all had to be referred to apparently extinct genera.

Holotype.—Cat. No. 61427, U.S.N.M.

SCHIZONEURITES, new genus (Aphididae).

A minute form related to *Schizoneura* or *Eriosoma*; beak very short, four-jointed; media leaving radius at a point very remote from cubitus (I follow A. C. Baker's nomenclature of the venation), its stem very strong and distinct, the upper branch strongly divergent

from the stem, which is in a straight line with the lower branch; upper branch of media simple; cell between media and cubitus strongly contracted apically (toward wing margin); anal present; costal cell large. The apical part of the wing is obliterated in the type. Among Scudder's Florissant genera this falls closest to *Schizoneuroides*, but is easily distinguished by the great distances between the bases of media and cubitus.

Genotype.—*Schizoneurites brevirostris*, new species.

SCHIZONEURITES BREVIROSTRIS, new species.

Plate 63, fig. 7.

Length about 1.2 mm., anterior wing about 1.4 mm.; beak stout 200 μ long, the comparatively slender terminal joint 53 μ long; wings clear, with dark veins; distance from base of cubitus to base (origin from radius) of media about 384 μ ; origin of media to origin of radial sector about 160 μ ; origin of media to fork 112 μ .

Oligocene at Gurnet Bay (Brodie). Lacoë Coll. 7542.

Holotype.—Cat. No. 61428, U.S.N.M.

DIPTERA.

CULEX PROTOLEPIS, new species (Culicidae).

Plate 62, fig. 1.

Represented by the apical half of a wing, with portions of the abdomen and the thorax. The specimen is remarkable in that it preserves the linear wing-scales, which appear light ferruginous and exactly like those of modern *Culex*. The venation, made out from the rows of scales, is as in modern species. The fork of the second vein (base of second marginal cell) is 672 μ from apex of wing and 480 μ from base of submarginal cell, at which point the second vein is distinctly bent. The width of the wing at level of base of submarginal cell is about 830 μ . The species is readily known from *C. petrifactellus* by its larger size.

Oligocene at Gurnet Bay (Brodie). Lacoë Coll. 7551. It thus appears that in the structure of the wings, at least, *Culex* was fully developed as far back as the Lower Oligocene, and has not progressed since that time. Another specimen, representing a larger species, is placed on record because it shows the proboscis, antennae, etc., although the wings are not preserved.

Holotype.—Cat. No. 61429, U.S.N.M.

CULEX PROTORHINUS, new species.

Plate 62, fig. 2.

Male.—Shows the thorax, head, and abdomen in lateral view; the end of the abdomen and most of the head destroyed. Parts of the plumose antennae show that these organs were fully developed in the

males, as they are to-day. The thorax is fully 2 mm. long (that of *C. protolepis* is scarcely 1.40 mm. long). The proboscis, formed as in the modern species, is about 1,920 μ long; the dorsal aspect of the thorax before the scutellum (i. e., the prescutum and scutum) is 1,470 μ long; the very prominent scutellum is 400 μ high. The depth of the abdomen is 720 μ , and the first two long segments are each about 960 μ long.

Oligocene at Gurnet Bay (Brodie). Lacoë Coll., no number.

Holotype.—Cat. No. 61430, U.S.N.M.

Another *Culex* from Gurnet Bay (No. 7549) shows a wing about 4 mm. long, with reddish scales on the costa as in *C. protolepis*, but the rest of the wing denuded. The venation is obscure, but the marginal cell is at least 640 μ long, probably more, and the base of the submarginal cell seems to be about 640 μ basad of base of marginal. It may be a distinct species, but it is probably *C. protolepis*. It appears to be too small for *C. protorhinus*. The width of the wing about middle is 880 μ (Cat. No. 61431, U.S.N.M.).

CULEX PETRIFACTELLUS, new species.

Plate 61, fig. 12.

Wing as preserved about 2.5 mm. long, but the base is lacking; when complete it would probably be 2.8 mm. The venation is not very clear, but enough can be seen to place the insect in *Culex* (s. latiss.), where it is remarkable for the narrow wings and very small size. The following measurements are in μ : Width (depth) of wing, 640; base of fourth posterior cell basad of level of second marginal, 1,120; length of second marginal, 560; length of fourth posterior to end of upper side, 1,010; to end of lower side, 640. The only striking feature discernible in the venation is the great distance between the bases of the second marginal and fourth posterior cells, a distance greater than the width of the wings; a condition like that found in *Anopheles punctipennis*.

Oligocene at Gurnet Bay (Brodie). Lacoë Coll. 7620. On a small piece of rock, about 44 mm. long, with *Philoponites*, etc.

Holotype.—Cat. No. 61432, U.S.N.M.

PALTOSTOMOPSIS, new genus (Blepharoceridae).

Small flies with venation resembling in general that of *Paltostoma*, but differing as follows: Basal cell not visible in the specimen, which shows the wing to a short distance beyond the base, it must therefore be reduced in the manner of *Hammatorhina*; cubitus single, and no anal vein. The costa is neither thickened nor bristly; the lower margin has fine equal bristles with black bases; in *Bibiocephala grandis* I find exactly the same bristles with black bases, except that they are much closer together and unequal in size. I can detect

what seem to be indications of the characteristic Blepharocerid folds, but it is not certain that these are genuine.

Genotype.—*Paltostomopsis ciliatus*, new species.

PALTOSTOMOPSIS CILIATUS, new species.

Plate 62, fig. 4.

Wing as seen (without extreme apex and base) 4 mm. long, if complete it would be about 5 mm.; hyaline, with brown veins. *Rs* slightly, but not much, bent where it gives off the upper branch, the latter straight, not so long as lower branch; if upper branch of *Rs* were produced downward to the lower margin of wing it would meet the end of the *media*; distance between end of *media* and end of cubitus 1,520 μ ; end of cubitus to the rounded anal angle of wing 1,840 μ .

Oligocene at Gurnet Bay (Brodie). Lacoë Coll. 7522. A portion of the abdomen can be seen and appears normal for the family.

In spite of its antiquity this is a highly specialized genus.

Holotype.—Cat. No. 61433, U.S.N.M.

MYCETOPHILA VECTENSIS, new species (Mycetophilidae).

Wing 3 mm. long; veins all dark brown, very distinct; a brown shading along the veins, and apex of costal cell and region of radius infuscated, but no definite large dark spots. No subcostal nervure visible, merely a slight brown shade at base of costal cell, the condition essentially as in the living *M. anomala* Johannsen, which the fossil also resembles in the spotless wings, and the cubital fork being far proximad of the fork of the *media* and also proximad of the base of the *R-m* crossvein. Costal cell very narrow, its width about level with the cubital fork being 80 μ ; *Rs* curved downward apically. The following measurements are in μ : Level of fork of *media*, which is same level as origin of *Rs* from *R* (apparent crossvein), to end of *R*, about 1,280; *media* from crossvein to fork, 176; level of fork of cubitus basad of level of fork of *media*, 252. Two delicate anal veins visible.

Oligocene at Gurnet Bay (Brodie). Lacoë Coll. 7620. On small piece of rock with *Philoponites*, etc. Certainly close to the living *M. anomala*.

Holotype.—Cat. No. 61434, U.S.N.M.

SCIARA GURNETENSIS, new species (Mycetophilidae).

Wing about 3.4 mm.; characters perfectly normal for the genus. Cell in fork of *media* formed about as in the living *S. neglecta* Johannsen, its length (to the upper apical corner) somewhat greater than the stem of the *media*. The following measurements are in μ : Length of apparent crossvein (considered to be base of *Rs*) from *R* to *Rs*, 50;

distance from apparent crossvein to end of R , 1,150; distance from apparent crossvein to base of wing, about 1,280; distance (vertical) between upper side of cell in fork of media and R_s , 304; stem of media before fork, about 1,440; fork of media to end of M_{1+2} , 1,600; fork of media to end of M_3 , 1,090; wing margin between ends of Cu_1 and Cu_2 , 720.

Oligocene at Gurnet Bay (Brodie). Lacoë Coll. 7,620. On small piece of rock with *Philoponites*, etc. This may possibly be identical with one of the species described by Meunier from amber; but, if so, this can not be demonstrated. The amber species are separated mainly on antennal characters. In *S. gurnetensis* the radius ends distad (though not much) of the fork of the media, throwing the species in the group of *S. splendida*, *errans*, and *villosa*. The wings of these three species have not been precisely described.

Holotype.—Cat. No. 61435, U.S.N.M.

SCIARA LACOEI, new species.

Plate 62, fig. 6.

Eyes large and prominent, about $96\ \mu$ across, the diameter of face between the eyes about $80\ \mu$; wings ample, about 1.5 mm. (more precisely, $1,600\ \mu$) long and $640\ \mu$ wide (deep), pale reddish, with the veins very pale yellowish; fork of media invisible, only the ends of the branches seen, the whole vein being extremely faint, as in various living species; radius (first vein) and Cu_1 ending at same vertical level, halfway between base and apex of wing; R_s ending $160\ \mu$ from level of apex of wing, its course, as also the rather long and narrow anal field, as in the living *S. prolifica* Felt; apparent crossvein between R and R_s (really base of R_s) $480\ \mu$ from base of wing and $320\ \mu$ from end of R .

Oligocene at Gurnet Bay (Brodie). Lacoë Coll. 7651. Easily known from *S. gurnetensis* by the much smaller size. 7583 (Gurnet Bay) is another example of *S. lacoëi*.

Holotype.—Cat. No. 61436; U.S.N.M.

SCIARA PROTOBERIDIS, new species.

Plate 62, fig. 7.

Length about 2.2 mm.; wings 2 mm. long, faintly dusky; venation normal for the genus, except that the cell in the forks of the media is greatly contracted apically (a tendency to be contracted may be seen in certain living species, as *S. impatiens* Johannsen); stem of media before fork obsolete, or so faint that it can not be detected in the fossil; apparent basal continuation of radial sector perfectly straight. The following measurements are in μ : Base of wing to end of R , 1,200; apparent crossvein (base of R_s) from R to R_s , about 28 long and 352 from end of R ; end of Cu_2 about 1,280 from base of

wing, and 430 from end of Cu_1 ; width of cell in forks of M at widest part 160, near apex only 104; distance from lower side of cell in forks of M to nearest part of Cu_1 , about 160.

Oligocene at Gurnet Bay (Brodie). Lacoë Coll. 7550. Just above the wing of the type of *Protoberis obliteratus*.

Holotype.—Cat. No. 61437, U.S.N.M.

TIPULA LIMIFORMIS, new species (Tipulidae).

Plate 61, fig. 11.

Represented by the middle of a wing; close to *T. limi* Scudder, from Florissant (Miocene). The wing must have been 21 or 22 mm. long, resembling *T. limi* in the dusky suffusion along the cubitus and slight dusky spot at origin of R_s , also in the nearly parallel upper and lower sides of basal end of discal cell, the veins of discal and fifth posterior cells forming a cross, and the fifth posterior somewhat contracted apically. The base of first marginal cell is 3 mm. basad of apex of second basal. The following measurements are in μ : Second basal on discal, 480; second basal on fifth posterior, 1,680; fifth posterior on wing margin, 1,360.

Oligocene at Gurnet Bay (Brodie). Lacoë Coll. 7523.

Holotype.—Cat. No. 61438, U.S.N.M.

ATARBA VECTENSIS, new species (Tipulidae).

Plate 61, fig. 10.

Wing a little over 5 mm. long, hyaline, with a large dark cloud (as in *A. pleuralis* Williston) in the marginal cell, and radius basad of marginal cell darkened for some distance. Stem of R_s straight, except for a slight curve at its origin; R_s two-branched; anterior crossvein well developed; four posterior cells; end of second basal cell level with basal corner of discal cell (as in *A. picticornis* Osten Sacken). The following measurements are in μ : Humeral crossvein to origin of R_s , 2,128; origin of R_s basad of vertical level of basal corner of discal cell, 240; R_s from origin to first branch, 672; first basal cell on submarginal, 112; first basal on first posterior, 96; discal on first posterior, 336; discal on second (morphologically second and third) posterior, 96; discal cell on third (morphologically fourth) posterior, 176; discal cell on fourth (morphologically fifth) posterior 672; truncate end of second basal, 288. The subcosta runs extremely close to the radius, and ends in the costa at a very acute angle; the crossvein to radius can not be made out.

Oligocene at Gurnet Bay (Brodie). Lacoë Coll. 7513. This appears to agree well with *Atarba*, but it might nearly as well go in *Rhamphidia*. The divergence of the branches of R_s suggests *Rhamphidia flavipes* Macquart, but in *Atarba pleuralis* this is even more extreme. It is probably not a generic character, though

Needham makes use of it in his key in Report of New York State Entomologist for 1907, page 247. In Scudder's fossil species of *Rhamphidia* from Florissant the branches of *Rs* run parallel, as in *Atarba picticornis*.

Holotype.—Cat. No. 61439, U.S.N.M.

BIBIODITES, new genus (Bibionidae).

Small flies with nearly the venation of *Bibiodes*,¹ but the third vein is confluent with the fourth for only a short distance. Legs long and slender, but the anterior femora much thickened; thorax long, rather flattened, scutellum small but prominent. The fourth vein branches at the level of the stigma, as in *Bibiodes halteralis* Coquillett.

Genotype.—*Bibiodites confluens*, new species.

BIBIODITES CONFLUENS, new species.

Plate 62, fig. 3.

Length 5 mm. or a little over; wings clear, with large dark stigmatic spot, which is about 3 mm. from base of wing; costa with minute bristles; the strong veins, under a microscope, are seen to be transversely barred, exactly as in modern *Bibio*; confluence of third and fourth veins 160 μ , from point of separation to fork of fourth 1,040 μ ; middle tibia about 1,200 μ long; measurements of hind leg in μ , tibia 1,840, first joint of tarsus 800, second joint 400, third 320, fourth 240 fifth 320. The apical part of the wing is missing, and the end of the anterior tibia can not be seen. The venation below the fourth vein is too obscure to make out.

Oligocene at Gurnet Bay (Brodie). Lacoë Coll. 7624. This might be treated as a subgenus of *Bibiodes*, but it is less specialized than the modern flies, and may be better regarded as the type of an extinct genus. The structure and appearance indicate that it belongs to the Bibioninae, not to the Scatopsinae. At the same time, it is impossible to demonstrate a second basal cell, the delicate veins of this part of the wing being wholly obliterated.

Holotype.—Cat. No. 61440, U.S.N.M.

PSYCHODA PRIMAËVA, new species (Psychodidae).

Plate 62, fig. 5.

Wing about 3 mm. long and 1 mm. broad, obtusely pointed, faintly yellowish, without markings, veins pale; thorax dark brown. R_1 strongly curved upward before the middle of the wing, and then nearly straight; R_{2+3} with a stem 512 μ long between the upward curve of R_1 and the fork; R_3 from its separation from R_2 to margin 1,440 μ ; fork of media about 1,200 μ from base of wing; M_3 , from fork to wing margin, 1,440 μ . The end of R_3 is 320 μ basad of level

¹ Melander, Bull. Amer. Mus. Nat. Hist., vol. 31, p. 339.

of tip of wing, end of R_5 40 μ basad of same level, end of M_2 480 μ basad of same level.

Oligocene at Gurnet Bay (Brodie). Lacoë Coll. 7576. The rather pointed wingtip and general appearance indicate the reference to *Psychoda*, though R_5 does end distinctly below the wingtip. The species is much larger than the *Psychoda* and *Pericoma* described by Meunier from Baltic amber.

No. 7517 (Gurnet Bay) is also *P. primaeva*.

Holotype.—Cat. No. 61441, U.S.N.M

PROTOBERIS, new genus (Stratiomyidae).

Abdomen elongated, parallel-sized, exactly as in *Beris*, with seven very distinct segments showing. The rock is broken in such a manner as to leave only the abdomen and a wing, but the basal segment of abdomen shows no sign of overlapping spines, and the insect was probably without them, as is the living *Allognosta*. Wings long, extending about 1.5 mm. beyond abdomen; costoapical region dark, much as in *Acanthina*; only part of the venation can be made out, but evidently the discal cell was long, probably as long as in *Xylomyia*; the rather long praefurca certainly does not emit the second vein (as it does in *Beris*), this must have arisen further on, as in *Allognosta* and *Chorisops*; the anterior crossvein, instead of being vertical as in *Beris*, is strongly oblique, seeming to be a branch of the fourth vein; the third vein is arched at end, reaching the margin at a very acute angle near the end of the wing, and emitting some distance before an only moderately oblique upper branch.

Genotype.—*Protoberis obliteratus*, new species.

PROTOBERIS OBLITERATUS, new species.

Plate 63, fig. 1.

Abdomen black, 5.2 mm. long and 1.8 wide. Wing about 8 mm. long, dusky, costoapical region dark fuliginous. The following measurements are in μ : Length of praefurca, 560; length of anterior crossvein, 160; length of anterior branch of third vein, 320; anterior branch of third vein to end of lower branch, about 1,120; fork of third vein to upper branch of fourth (vertically), 720; upper branch of fourth to lower branch, at same level, 640.

Oligocene at Gurnet Bay (Brodie). Lacoë Coll. 7550.

Holotype.—Cat. No. 61442, U.S.N.M.

STRATIOMYS BRODIEI, new species (Stratiomyidae).

Plate 62, fig. 8.

A species of the type of *S. chamaeleon* Linnaeus, with large triangular lateral markings on abdominal segments, the pale triangles on the first segment about twice as broad laterally as on the second; abdomen about 5 mm. long and 4 broad, shaped as usual in the

genus. Wings clear, with brown veins, which are (so far as visible) as usual in the genus. The discal crossvein is oblique, its upper end more basad, rather in the fashion of *Chrysochlora*; its length is about 160 μ . The discal cell is hexagonal, with three veins entering it and three leaving it; the following measurements are in μ : Length of discal cell, 670; width (depth) of cell, 432; face on third posterior cell, 304; face on fourth posterior, 320. (In the living *S. potamida* and *S. furcata* the face or side bordering third posterior is distinctly longer than that on fourth.) Length of wing about 8 mm., but the exact length is uncertain, the apex being invisible.

Oligocene at Gurnet Bay (Brodie). Lacoë Coll. 7507. Other specimens, with the same history, and labeled 7510, 7520, 7586, 7505. This is the oldest known *Stratiomys*; it shows that the color pattern has come down practically unchanged from the Lower Oligocene.

Holotype.—Cat. No. 61443, U.S.N.M.

EPHYDRA OLIGOCENA, new species (Ephydridae).

Wing about 3 mm. long; costa and second vein dark brown and thick, the other veins pallid; costa with minute black bristles, not larger above the costal cell than elsewhere; costa slightly interrupted at end of costal cell; costal cell narrow, its depth only 96 μ , the first vein curved, not at all bent; second vein with a slight upward curve, but perfectly straight at end; second basal cell confluent with discal; anterior crossvein 432 μ from base and 624 from upper apical corner of discal (plus second basal) cell; end of discal cell oblique, 192 μ from corner to corner; a short distance beyond the end of discal cell a vertical line run upward across the wing will find the first posterior cell 288 μ deep, the submarginal 240, and the marginal 144; the sides of the first posterior are here almost exactly parallel, but those of the second posterior rapidly diverge.

Oligocene at Gurnet Bay (Brodie). Lacoë Coll. 7509. Larger than *E. sepulta*, with end of discal cell conspicuously oblique, the lower corner more apicad. Aldrich¹ has figured the venation of several species of *Ephydra* from photographs. In *E. hians* Say the end of discal cell is very oblique, with the lower corner more basad, exactly reversing the condition in *E. oligocena*. In *E. millbrae* Jones it is less oblique; but in *E. gracilis* Packard it is somewhat oblique, with the lower corner more apicad, approaching the condition of *E. oligocena*.

Holotype.—Cat. No. 61444, U.S.N.M.

EPHYDRA (scus. lat.) SEPULTA, new species (Ephydridae).

Plate 63, fig. 2.

Wing about 2.5 mm. long, hyaline, with pale brown veins, costa with numerous short intensely black bristles or spinules; anal margin

¹ Journ. New York Ent. Soc., vol. 20, 1912, pls. 7, 9.

of wing straight, not convex, so that the anal field is not nearly twice as broad (deep) as the discal cell; costa continued to apex of wing, which is obtuse; antennae small, normal for the group; thorax moderately convex above. In the following description of the wing the measurements are all in μ : Costal cell very acutely pointed at apex, where there is apparently no enlarged bristle; lower side of marginal cell at apex straight, the cell extending to near the end of the wing as in modern *Ephydra*; sides of submarginal cell essentially parallel, the cell 160 deep at level of end of discal cell, and 208 deep at level of end of its upper side; first posterior cell slightly contracted apically, its depth at level of end of discal cell 208, but near apex 176; anterior crossvein 96 long, placed 576 from end of discal cell, and only about 272 from its base on upper side, though about 400 from its base on lower side, which, however, includes the confluent second cell; discal cell 144 broad at apex and 112 broad (deep) at level of crossvein; lower side of discal cell perfectly straight, except the basal 160, which bulges downward, marking the perfectly confluent second basal cell.

Oligocene at Gurnet Bay (Brodie). Lacoë Coll. 7512. This differs from typical *Ephydra* by the smaller anal field, and the crossvein nearer the base of the discal cell, more as in *Parydra*, *Hydrellia*, etc.

On the same piece of rock is a *Mycetophila*, too imperfect for description.

Holotype.—Cat. No. 61445, U.S.N.M.

HIPPELATES BRODIEI, new species (Chloropidae).

Wing about 1.8 mm. long, broad, hyaline, costa almost straight, apex very obtuse, anal area broad; the costa shows fine bristles. Anterior crossvein considerably beyond middle of discal cell; second basal cell wholly confluent with discal. The following measurements are in μ : End of marginal cell on costa about 1,090 from base of wing, and 592 beyond end of costal cell; at end of marginal cell is a minute brown spot; end of marginal cell 560 basal of level of tip of wing; width of first posterior cell at apex about 240; submarginal on first basal, 240; length of first basal cell about 480; anterior crossvein to base of marginal cell, 416; first posterior on discal cell, 224; length of discal cell, including confluent second basal, about 640; second posterior on axillary, 400.

Oligocene at Gurnet Bay (Brodie). Lacoë Coll. 7643. So far as anything shows, this is a perfectly ordinary *Hippelates*; considering its minute size, its preservation is remarkable. Of course the characters of the legs, used to define the genera of this family, can not be made out; nor is it possible to see the antennae.

Holotype.—Cat. No. 61446, U.S.N.M.

SPHAEROCERA SEPULTULA, new species (Borboridae).

Plate 63, fig. 3.

Wing about 1.8 mm. long, broad, grayish, with dark veins, except the second, which is perfectly colorless; thorax convex in lateral profile. This is referred to *Sphaerocera* on account of its general appearance; the form of the costal cell; the long second vein with a gentle curve, the convexity wholly upward; the discal cell narrow apically; the anterior crossvein before middle of discal cell; the second posterior cell (only base visible) rapidly broadening from the base; and the large anal or axillary field without evident veins. In addition, although the head is very obscure, two large bare black bristles project in front, and are apparently the aristae, which are large and conspicuous in *Sphaerocera*. The costa has fine short black bristles; the costal region above the costal cell is well preserved, but whatever armature there may be is concealed. The following wing-measurements are in μ : Tip of costal cell basal of vertical level of end of third vein, 1,216; apex of discal cell basal of vertical level of end of third vein, 832; width of discal cell at apex, 80; anterior crossvein to end of discal cell, 480; to base of discal cell about 208.

Oligocene at Gurnet Bay (Brodie). Lcoe Coll. 7539.

Holotype.—Cat. No. 61447, U.S.N.M.

STENOMYITES, new genus (Ortalididae.)

Minute flies, referable to the subfamily Richardiinae, or perhaps to the Ulidiinae; wings of ordinary shape (not narrow and elongated as in *Eumetopia*); auxiliary vein widely separated (160μ at level of basal corner of marginal cell) from first, running a straight course to costa, with which it imperceptibly merges, as in *Macrostenomyia*; second basal and anal cells certainly very small, not visible in the specimen, which does not show extreme base of wing; marginal cell a little broader beyond middle than at end, the end a little narrower than that of first posterior (all this essentially as in *Eumetopia*); first basal cell shorter than in many genera, but seeming shorter than it really is, owing to the loss of extreme base of wing; discal cell long.

Genotype.—*Stenomyites fuscipennis*, new species.

STENOMYITES FUSCIPENNIS, new species.

Plate 63, fig. 4.

Wing with a large apical dark fuscous cloud, much as in *Eumetopia*, and with a broad rather oblique cloud before the middle; other parts of the wing are more or less marked with brown, but this is indistinct. The following measurements are in μ : Marginal cell on first basal, 400; greatest width (depth) of marginal cell, 256, and its width at

apex 240; width of first posterior cell at apex, 288; discal cell on first posterior, 800; end of discal cell, 240.

Oligocene at Gurnet Bay (Brodie). Lacoë Coll. 7620. On small piece of rock with *Philoponites*, etc.

Holotype.—Cat. No. 61448, U.S.N.M.

ODONATA.

MEGALESTES(?) ANGLICUS, new species.

Plate 61, fig. 9.

Part of basal half of wing preserved, colorless, with dark veins; origin of median sector to origin of nodal sector about 7 mm.; width (depth) of wing at level of origin of nodal sector about 5 mm.; venation, so far as visible, essentially as in the Indian genus *Megalestes*,¹ differing, however, in the much greater length of the cell in fork at origin of median sector, this cell being about as long as the ones immediately apicad of it. The cells between the nodus and origin of nodal sector are more numerous than in *Ortholestes*, and agree very exactly with the condition in *Megalestes major* Selys. The zigzag lower sector of triangle is also unlike *Ortholestes*, but agrees with *Megalestes*. The condition at the base of the subnodal sector is unlike that of *Lestes* or *Ortholestes*, but agrees with *Megalestes*, except for the fact that the distance from the origin of the sector to the first crossvein is about as long as the crossvein.

Oligocene at Gurnet Bay, Isle of Wight (Brodie). Lacoë Coll. 7632.

Holotype.—Cat. No. 61449, U.S.N.M.

EXPLANATION OF PLATES.

PLATE 60.

- FIG. 1. *Elcana liasina* (Giebel).
 2. *Eospilopteron ornatum*, new species.
 3. *Hagloopsis parallela* (Giebel).
 4. *Locustopsis lacoëi*, new species.
 5. *Nematophlebia plicata*, new species. Details of venation.
 6. *Nematophlebia plicata*, new species.
 7. *Hagloopsis brodiei*, new species.
 8. *Orthophlebia communis*, Westwood.
 9. *Meshemipteron incertum*, new species.
 10. *Phanerogramma heeri* (Giebel).

PLATE 61.

- FIG. 1. *Elaterophanes acutus*, new species.
 2. *Blaterophanes socius* (Giebel).
 3. *Pseudotelephorus grandis*, new species.
 4. *Pseudotelephorus punctulatus*, new species.
 5. *Glaphyryptula anglica*, new species.
 6. *Protocuneus punctatus*, new species.
 7. *Holcoptera schlotheimi* (Giebel).

¹ Needham, Proc. U. S. Nat. Mus., vol. 26, pl. 51, fig. 7.

- FIG. 8. *Holcoptera confluens*, new species.
 9. *Megalestes ? anglicus*, new species.
 10. *Atarba vectensis*, new species.
 11. *Tipula limiformis*, new species.
 12. *Culex petrifactellus*, new species.

PLATE 62.

- FIG. 1. *Culex protolepis*, new species.
 2. *Culex protorhinus*, new species.
 3. *Bibiodites confluens*, new species. *a*, part of wing; *b*, vein, much magnified; *c*, profile of head and thorax; *d*, front leg.
 4. *Paltostomopsis ciliatus*, new species. *A*, hind margin of wing; *B*, hind margin of wing of *Blepharocera grandis*, for comparison.
 5. *Psychoda primaeva*, new species.
 6. *Sciara lacœi*, new species. *A*, wing; *B*, head.
 7. *Sciara protoberidis*, new species.
 8. *Stratiomys brodiei*, new species. Discal cell. (No. 7507.)

PLATE 63.

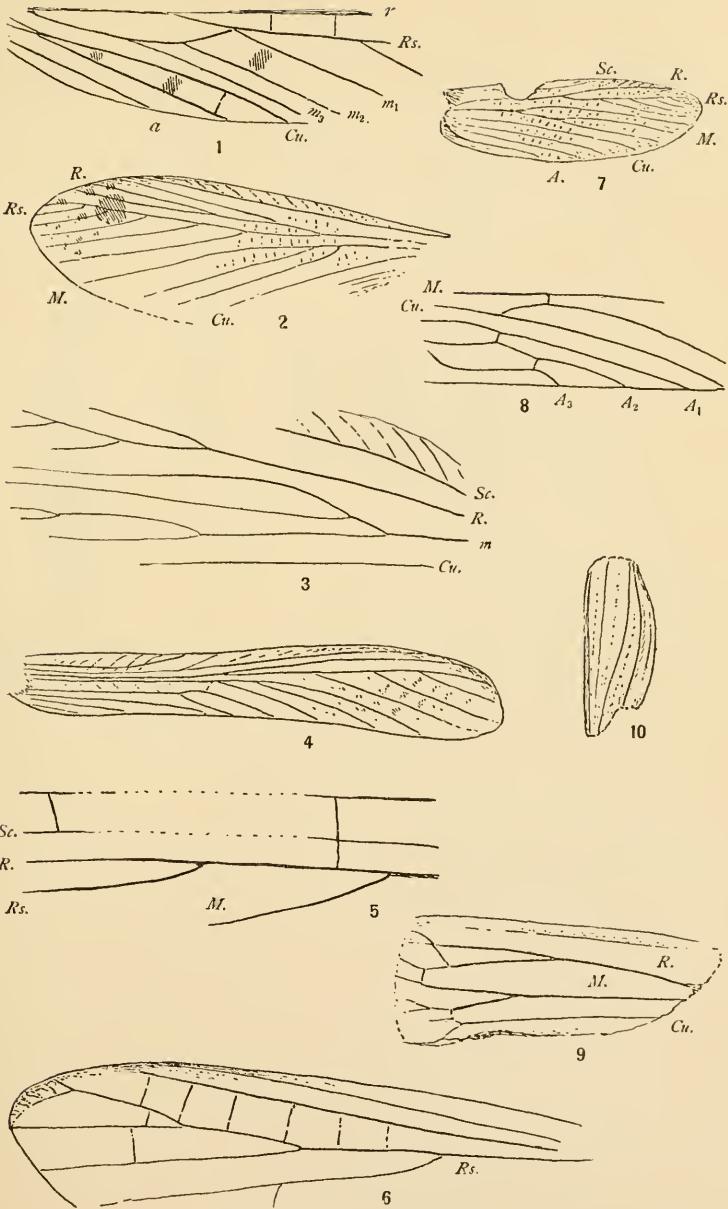
- FIG. 1. *Protoberis obliterated*, new species. *A*, end of third vein; *B*, praeurca and adjacent parts.
 2. *Ephydra sepulta*, new species. *A*, discal cell and adjacent parts; *B*, bristles of costa.
 3. *Sphaerocera sepultula*, new species.
 4. *Stenomyites fuscipennis*, new species.
 5. *Necropsylla anglica*, new species.
 6. *Psylla exhumata*, new species. *A*, anterior wing; *B*, caudal segment; *C*, front of head, with eyes.
 7. *Schizoneurites brevirostris*, new species. *A*, anterior wing; *B*, rostrum.

PLATE 64.

- FIG. 1. *Aneurhynchus conservatus*, new species. *a*, wings; *b*, abdomen; *c*, three joints of antenna.
 2. *Philoponites clarus*, new species.
 3. *Ponera hypolitha*, new species.
 4. *Ponera hypolitha*, new species. Hind wing. (No. 7527.)
 5. *Oecophylla perditia*, new species. (No. 7526.)
 6. *Oecophylla perditia*, new species. Male. (No. 7529.) *A*, head and front of thorax; *B*, part of wing.
 7. *Oecophylla atavina*, new species. (No. 7569.)

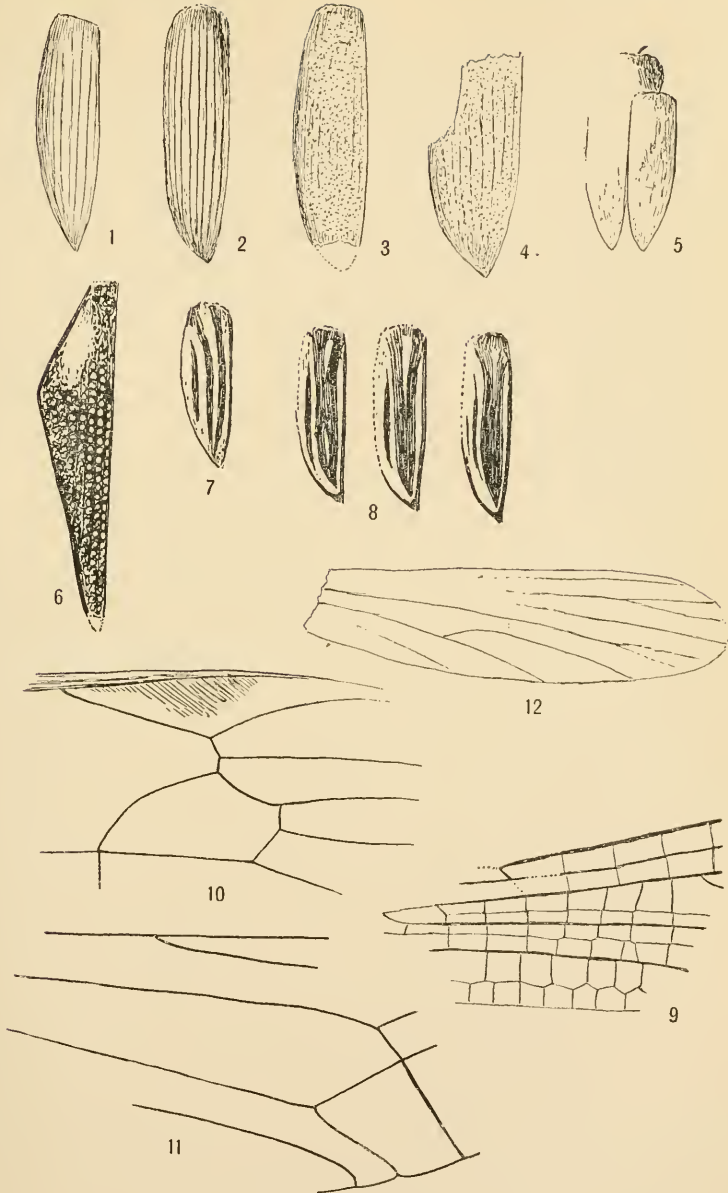
PLATE 65.

- FIG. 1. *Oecophylla megarche*, new species. (No. 7525.)
 2. *Oecophylla megarche*, new species. Hind wing. (No. 7568.)
 3. *Oecophylla megarche*, new species. Mandibles. (No. 7623.)
 4. *Leptothorax gurnetensis*, new species. (No. 7526.)
 5. *Leptothorax gurnetensis*, new species, var. *a*. (No. 7604.)
 6. *Dolichoderus britannicus*, new species. (No. 7578.)
 7. *Dolichoderus britannicus*, new species. *A*, longitudinal section of body; *B*, part of wing. (No. 7584.)
 8. *Dolichoderus anglicus*, new species. (No. 7610.)
 9. *Dolichoderus ovigerus*, new species. (No. 7630.) *A*, part of wing; *B*, egg; *C*, petiole and base of gaster.



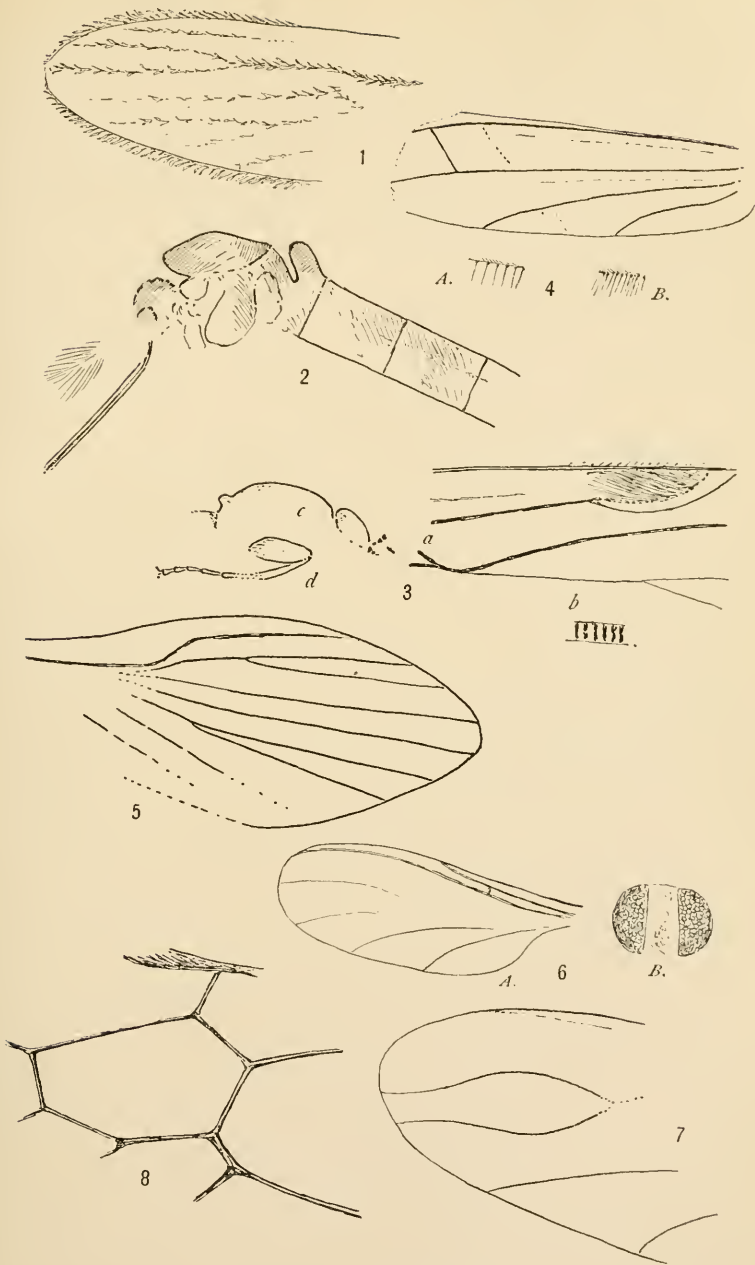
BRITISH FOSSIL INSECTS.

FOR EXPLANATION OF PLATE SEE PAGE 498.



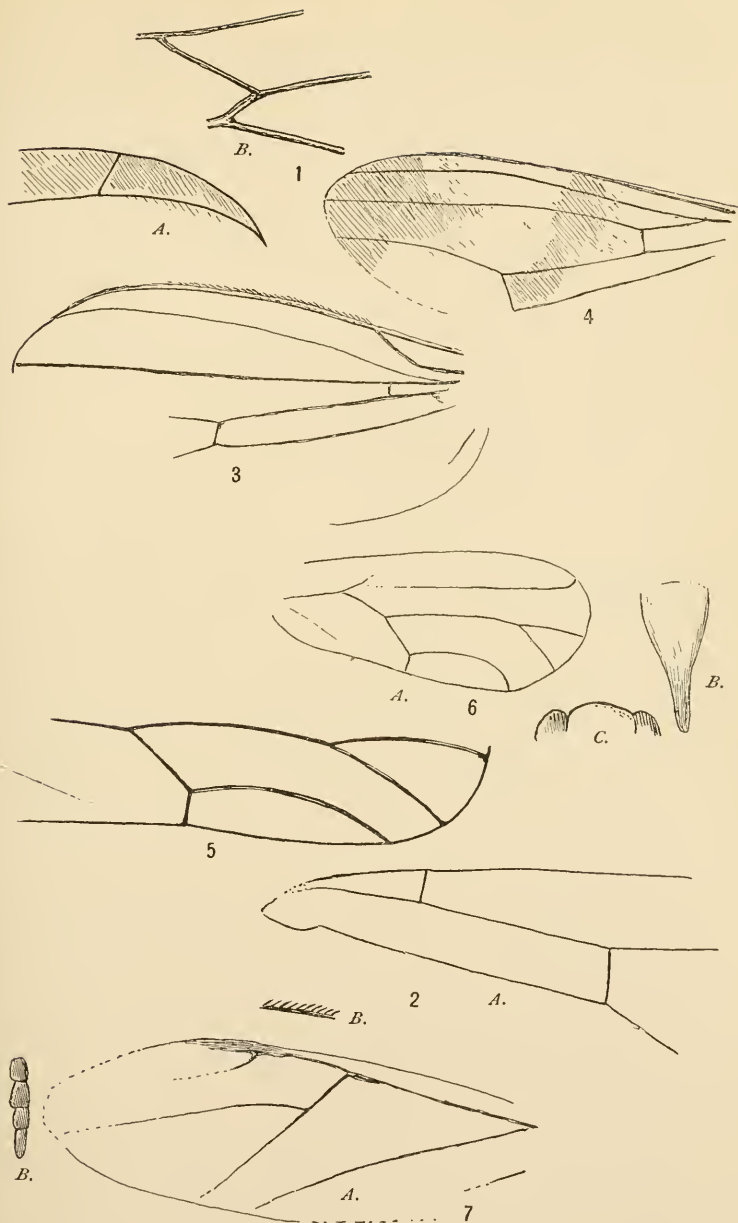
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FOR EXPLANATION OF PLATE SEE PAGES 498 AND 499.



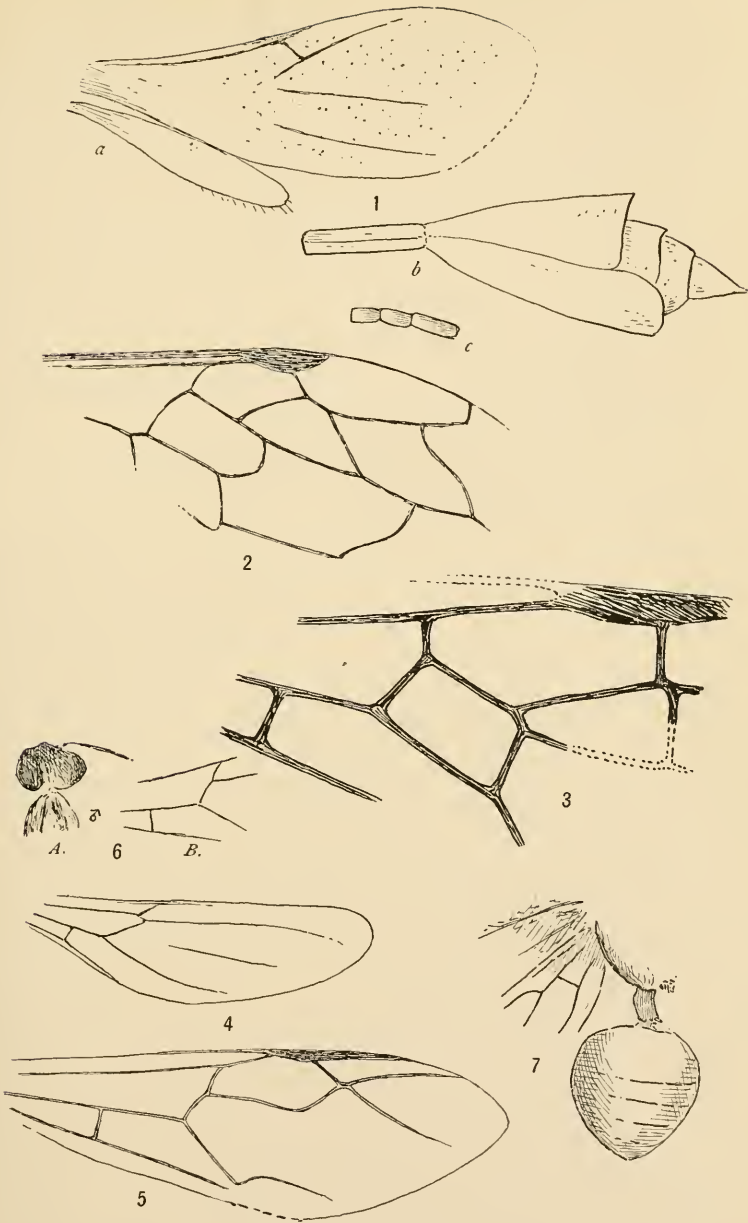
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FOR EXPLANATION OF PLATE SEE PAGE 499.



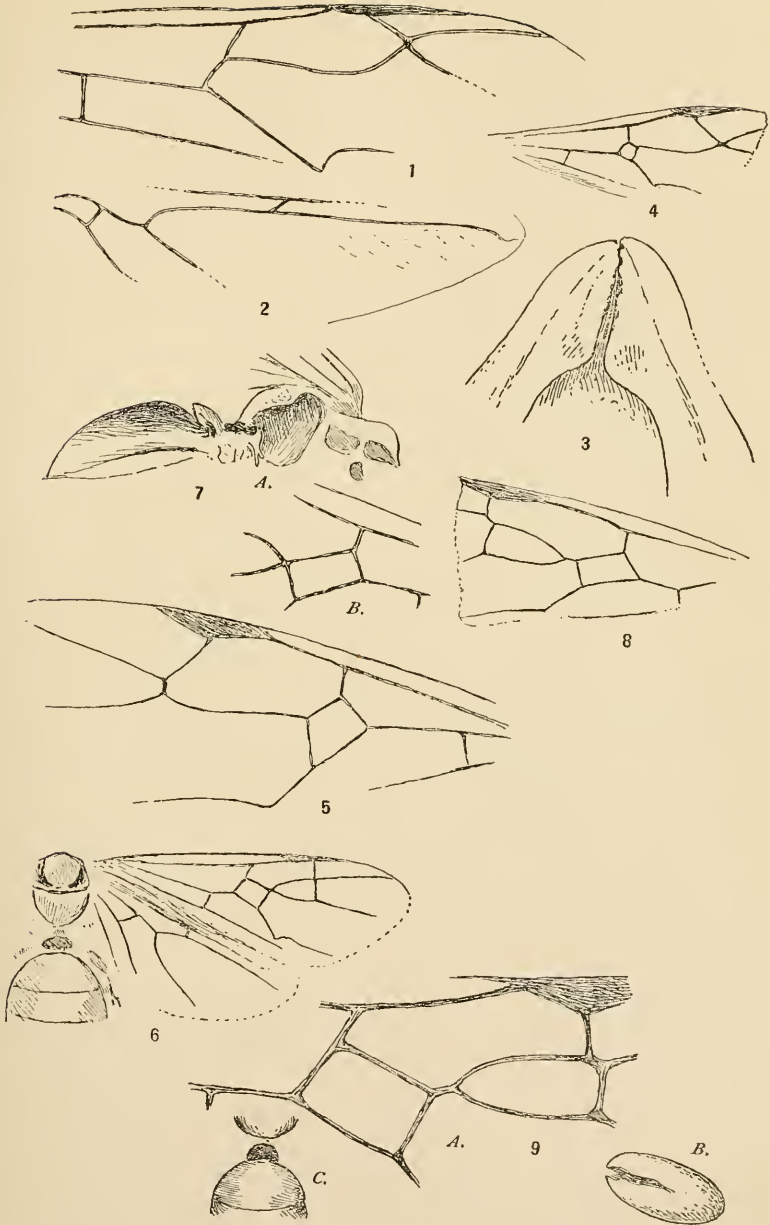
BRITISH FOSSIL INSECTS.

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