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Publication Committee for Volume 1.

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J. B. SMITH.

Dr. W. H. FOX.

L. O. HOWARD.

B. P. MANN.



Mr. Howard called the attention of the Society to some enlarged figures of the mouth-parts of *Periplaneta orientalis* in Miall and Denny's work on the Cockroach, in which no indication is given of a *digitus* proceeding from near the tip of the *lacinia* corresponding to the one described by Mr. Howard at a recent meeting of this Society.*

Mr. Howard then briefly reviewed Miss Ormerod's recent book on South African Insects, and pointed out the striking similarity or correspondence in genus, if not in species, of the pests of the farm and garden of South Africa to those of this country. Among the insects especially noted were a Cetoniid enemy to figs and peaches (*Rhabdotis semipunctata*); *Papilio demoleus*, represented here by the Orange Dog, *P. cresphontes*; the little cabbage moth (*Plutella cruciferarum*), widely distributed over the world; an Orange fly (*Ceratitis citriperda*), having a habit similar to our *Trypeta ludens*, *Icerya purchasi*, etc.

Mr. Howard also read Mr. H. Edward's paper on "Noises made by Lepidoptera," prepared for "Insect Life."†

This very interesting paper called forth a considerable discussion by various members relative to the noises produced by Lepidoptera and other insects.

Mr. Schwarz read the following paper :

MYRMECOPHILOUS COLEOPTERA FOUND IN TEMPERATE NORTH AMERICA.

By E. A. SCHWARZ.

Toward the close of the last century it was already known to the entomologists of that early date that certain insects could be found in the nests of ants, but no further attention was paid to the subject until, in 1813, the Rev. P. W. J. Müller published, in Germar's *Magazin der Entomologie*, a remarkable paper on the Coleopterous genus *Claviger*, in which he proved that the species of this genus occur exclusively among certain species of ants; that the beetles were for their living entirely dependent on the ants, which feed and take care of the beetles in order to enjoy the licking of a secretion which exudes on the tufts of hair on the first abdominal segment of the beetle. Müller succeeded also in finding the pupa skin of *Claviger* in the ants' nest, thus proving that its larva also lives among ants. His paper attracted a great deal of attention; but, although we know now many species of *Claviger* and many allied genera, our

* See p. 217.

† Published in the July, 1889, number of that Journal, v. ii, pp. 11-15.

knowledge of the biology of this genus has not advanced a single step beyond the results obtained by Müller. In fact, no one has hitherto been able to rediscover the pupa skin.

For nearly thirty years afterwards only the captures of various insects amongst ants were recorded by various authors, but in 1841 and 1844 Mr. Fred. Mærkel, of Saxony, published (Germar's *Zeitschr. f. Ent.*, vols. iii and v) the first comprehensive work on myrmecophilous insects. He raised the number of these insects to 284, distributed as follows among the different orders: Coleoptera, 274; Orthoptera, 1; Heteroptera, 3; Hymenoptera, 2; Diptera, 4 (among them a then unknown larva, which afterwards proved to be that of *Merodon*). In the same year (1844) Schiøedte added quite a number of species belonging to various orders, and numerous additions in Coleoptera were made in 1846 by Prof. Mæklin. In the latest catalogue of myrmecophilous insects, Mr. E. André (*Revue et Mag. Zool.*, 1874) enumerates no less than 584 species, among them 542 Coleoptera, but of these more than 250 must be considered as more or less accidental visitors of ants' nests.

Mærkel proposed to arrange myrmecophilous insects in three groups: 1st, species which live among ants only in the larva and pupa stages, but which, as imagos, leave the company of ants (*e. g.*, *Euryomia*, *Coscinoptera*, etc.); 2d, species which in the imago state are often met with among ants, but often also at other places not in company of ants (the numerous accidental visitors); 3d, species which in the imago state (and presumably also as larva) are exclusively found in the nests of ants, and the existence of which appears to depend upon the ants (the true myrmecophilous insects).

He excludes certain *Membracidae* and *Aphididae* which, properly speaking, do not live among ants of their free will, but are carried into the nests by the ants and held in captivity. These would constitute a fourth class, and later discoveries added thereto certain species of *Formicidae*, which are kept as slaves by other species of ants. A fifth class would be formed by the true parasites of ants, viz., certain Diptera (probably *Conopidae*), Hymenoptera (*Chalcididae* and *Proctotrupidae*), and Coleoptera (*Stylopidæ*).

In more recent times important contributions have been made to our knowledge of the biology of myrmecophilous insects and their relations to the ants mainly by the investigations of von Hagens, Lespès, Sir John Lubbock, A. Forel, E. André, and E. Wasmann. These investigations are, of course, connected with great difficulties. If we uncover from beneath a stone or a log a colony of ants, or if we dig into a large ant-hill, the inhabitants are at once put into the greatest uproar, and no observations can be made. To closely observe the domestic life of the ants and their inclines it is necessary to construct artificial formicaries in suitable glass jars, as described by Sir John Lubbock. Among the authors just mentioned, Mr. Wasmann has, since the year 1886, reviewed the previous records and augmented the same by a long series of the most interesting

original observations (published in the *Tijdschrift v. Entom.*, 1887; *Deutsche Ent. Zeit.*, 1886 and 1887; *Wiener Ent. Zeit.*, 1889). He not only discovered the earlier stages of some myrmecophilous Coleoptera, but to him we owe also a great deal of information regarding the life-habits of myrmecophilous insects and their relations to the ants.

As a result of his observations, Mr. Wasmann has been able to subdivide the genuine myrmecophilous insects (Mærkel's group 3) as follows:

1st. Species which are fed by the ants and from which these derive a benefit in licking up a certain secretion. To this group belong, of the Coleoptera, the genus *Claviger*, and, no doubt, all allied genera and, further, the species of *Lomechusa*.

2d. Species which are treated with indifference by the ants and which live off the bodies of dead ants and other animal and vegetable débris to be found in the colonies of ants. The ants evidently derive some benefit from this class of inquilines, and their behavior toward them is certainly not hostile. To this class belong most of the *Staphylinidæ* (excepting *Lomechusa* and *Myrmedonia*), most of the other Clavicorn beetles (excepting, perhaps, the genus *Hetærius* and other *Histeridæ*), and most species of the other Orders; in short, by far the largest majority of the insects recognized as myrmecophilous.

3d. Species found only among ants, but which are by no means "myrmecophilous" in the usual sense of the word; they like the ants as the wolf does the sheep, *i. e.*, they kill and devour the ants and steal their eggs, larvæ, or pupæ, wherever they have a chance of doing so. To this class belong the numerous species of *Myrmedonia*, *Quedius brevis*, and in all probability the genus *Hetærius* and other *Histeridæ*. The ants are decidedly hostile to this class of inquilines, and attack and kill them whenever they are able to take hold of them; but these robbers are well protected, partly by their much greater agility and partly by their hard covering. The *Myrmedonias* and *Quedius brevis*, which are soft-bodied insects, carefully avoid mingling with the ants in their galleries, but hide like highway robbers near the entrance of the nest, or within the walls of the galleries, and watch their chances of attacking a solitary ant unawares. The *Hetærius*, on the other hand, freely mingle with the ants; their covering is extremely hard and very smooth, and moreover their antennæ and legs are retractile, so that the ants cannot do anything with them. As Mr. Lewis says, the ants evidently regard these *Hetærius* as an unavoidable evil, against which they are unable to defend themselves, and they get along with the beetles as best they can.

These groups just mentioned are by no means strictly separated, and many myrmecophilous insects cannot be classified at present.

In North America myrmecophilous insects have been discovered since more than 40 years, and recorded as such by various authors in describing these species or otherwise; but until quite recently these records were scattered all through the North American entomological literature. As far as the Coleoptera are concerned, Dr. John Hamilton has, with his ac-

customed carefulness, collated these records and augmented the same with original observations in his paper entitled "Catalogue of the Myrmecophilous Coleoptera, with bibliography and notes," published in the *Canad. Entom.*, v. 20, 1888, pp. 161-166. Some additions were published by him in the same periodical, v. 21, 1889, pp. 105-108. In the other Orders the records of North American myrmecophilous species are extremely meagre. Among the Lepidoptera, *Helia americalis*; of Orthoptera, two species of *Myrmecophila*; of the Diptera, one or several species of *Merodon* and an unknown dipterous parasite. There are apparently no North American records of myrmecophilous Hymenoptera, although in Europe numerous species are known as such (genera *Neomyrmex*, *Formicoxenus*, *Xenomyrmex*, *Tomognathus*, *Ceraphron*, *Diapria*, etc.), and no such records of Heteroptera, although several species are recorded in Europe, *e. g.*, the genus *Microphysa*. In the Homoptera there are a few short references to certain *Aphididæ* (by Walsh), but none to *Membracidæ*, although at least one species is commonly met with among ants. In Thysanoptera, Arachnida, and Myriapoda myrmecophilous species or genera are known in Europe, but I have not come across any American records, although every one who has done any collecting among ants knows that a species of the Thysanopterous genus *Beckia* is extremely abundant in almost every ants' nest, and that at least two species of Acarids swarm in the larger colonies of *Formica integra* and other species. The Neuroptera seem to be the only Order of which no myrmecophilous species are known.

My principal reason for presenting herewith a list of our myrmecophilous Coleoptera so shortly after that published by Dr. Hamilton is that I am able to add, in a number of instances, the names of the ants among which the beetles have been found. Mr. Fred. Blanchard, of Lowell, Mass., has been kind enough to send me specimens of the ants among which he had discovered Coleoptera; some other species of ants in connection with their Coleopterous inquilines were furnished by Messrs. Ulke and Pergande, while the remaining species were observed by Mr. H. G. Hubbard or by myself.

Regarding the names of the ants mentioned in previous records and in Dr. Hamilton's list it may be said that "*Formica pennsylvanica*" is = *Camponotus pennsylvanicus*; "*Formica herculanea*" also = *C. pennsylvanicus*;^{*} "*Lasius integerrimus*?" is apparently a wrong determination, and perhaps = *L. claviger*; "*Formica rufa*," probably also incorrectly determined, is either = *F. integra* or *exsectoides*, or an allied species. For these determinations, as well as for those of the other *Formicidæ* mentioned in the following lists, I am indebted to Mr. Theodor Pergande, who is the best authority in this country on this difficult group of Hymenoptera, and without whose help I would have been unable to prepare the appended list.

It appeared to me advisable to exclude from the list of myrmecophilous

* Mr. Pergande considers this as a race distinct from the European *C. herculaneus*.

Coleoptera those species which, in my opinion, are to be considered as accidental or occasional visitors or intruders in ants' nests. Many of these species recorded by former observers were already considered as doubtfully myrmecophilous by Dr. Hamilton. This list of accidental visitors could be still greatly extended from unpublished material, but I mention here only the following:

Panagæus crucigerus, found hibernating in ants' nests (Hamilton), with *Lasius claviger* (Pergande); *Casnonia pennsylvanica*, with *Prenolepis nitens* (Pergande); *Bembidium 4-maculatum*; *Tachys incurvus*, found abundantly with *Formica exsectoides* (Blanchard); *Colon* (no species has been found among ants by American observers); *Scydmanus capillosulus*; *S. brevicornis*; *Eumicrus grossus*, found with ants by Mr. Ulke;* *E. Motschulskii*, with *Lasius alienus* (Schwarz); *Decarthron formisceti*; *Quedius molochinus*, with *Lasius claviger* (Pergande); *Leptacinus longicollis*; *Diochus Schaumii*; *Edaphus nitidus*, found with *Formica exsectoides* and *Aphænogaster fulva* (Schwarz); *Stictocranius puncticeps*; *Lathrobium dimidiatum*, found with *Prenolepis parvula* and *Cremastogaster lineolata* (Pergande, Schwarz); *Lithocharis* sp., with *Solenopsis debilis* (Pergande); *Tachyporus brunneus*; *T. scitulus*; *Conosoma pubescens*; *Apocellus sphaericollis*, found often with *Ponera contracta* (Pergande); *Arpedium Schwarzii* with *Prenolepis parvula* (Pergande); *Eleusis pallidus*; *Ptenidium evanescens*; *Hister Harrisii*, found with *Camponotus pennsylvanicus*? (Hamilton), and possibly to be included among the myrmecophilous species; *Hister americanus*, with *Ponera contracta* (Pergande); *Meligethes brassicæ*; *Cyphon padi*; *Pleurophorus cæsus*, with *Prenolepis fulva* (Pergande); *Atænius cognatus*, with *Formica fusca* and *Aphænogaster fulva* (Pergande, Schwarz); *Serica vespertina*, with *Formica Schaufussi* and *Lasius interjectus* (Pergande); *Diædus punctatus*, with *Aphænogaster fulva* (Schwarz).

REVISED LIST OF NORTH AMERICAN MYRMECOPHILOUS COLEOPTERA.

The following list enumerates the true myrmecophilous species—*i. e.*, those which live in ants' nests during all stages of development; further, those which are myrmecophilous only in the larva state, those which are myrmecophilous only in the imago state, and those which are more frequently found among ants than elsewhere. But it includes also quite a number of still doubtful species, for which it must be left to future observation whether they are to be retained here or referred to the list of accidental visitors. For the bibliographical references of previous records the reader is referred to Dr. Hamilton's list.

* The specimens found with ants at Washington, D. C., constitute, according to Mr. Ulke, a species distinct from the true *E. grossus* from Alabama and Florida. If this be correct, it has to be transferred, as *Eumicrus* n. sp., to the list of myrmecophilous species.

Ptomaphagus parasitus.—Found among *Camponotus pennsylvanicus*? (Hamilton), *Formica fusca* (Hubbard), *F. exsectoides* (Blanchard, Pergande), *F. Schaufussi* (Schwarz).

Ptomaphagus n. sp.—Formerly confounded with the preceding, it was first distinguished by Mr. Blanchard. Occurs with *Camponotus pictus* (Blanchard), *Formica integra* (Schwarz).

Ptomaphagus brachyderus.—*Camponotus pictus* (Blanchard).

Scydmaenus rasmus.—*Lasius alienus* (Hubbard and Schwarz).

Adranes cæcus.—*Lasius alienus* (Schwarz).

Adranes LeContei.—*Lasius umbratus*? (Hubbard).

Fustiger Fuchsi.—Unquestionably strictly myrmecophilous, but I could never obtain specimens of the ant with which it occurs.

Atinus monilicornis.—*Prenolepis parvula* (Ulke).

Biotus formicarius.—"In the nests of a small brown ant" (Casey).

Ceophyllus monilis.—*Lasius aphidicola* (Hubbard).

Cedius Ziegleri.—*Formica exsectoides* (Blanchard, Pergande), *F. integra* (Schwarz); "*F. rufa*," mentioned by Dr. LeConte is probably = *F. exsectoides*.

Cedius spinosus.—This is doubtfully referred here; sometimes found among ants (no specimens preserved), under bark, but often also not with ants.

Tmesiphorus costalis.—Found by Dr. LeConte with "*Formica rufa*."

Tmesiphorus carinatus.—Doubtfully myrmecophilous, but it has been found with ants (no specimens preserved) under bark of old trees.

Ctenistes pulvereus.—Referred here on the authority of Dr. LeConte. None of the eastern species can be called myrmecophilous.

Tyrus humeralis.—*Aphænogaster tennesseensis* (Schwarz), but occasionally found without the company of ants.

Cercocerus batrisoides.—In all probability to be included here, but no specimens of the ants have been preserved.

Tychus puberulus.—Included on the authority of Dr. LeConte. The eastern species, so far as observed by myself, are not myrmecophilous.

Decarthron stignosum.—*Aphænogaster fulva* (Blanchard), *A. Treati* (Hubbard and Schwarz). This is, in my experience, the only strictly myrmecophilous species of the genus.

Verticinotus cornutus.—Referred here on the authority of Dr. Brendel. A second, still undescribed, species of this genus was found by myself in northern and central Florida under moss and not in the company of ants.

Batrisus.—My experience with this genus is that the species of the first group (hind tibiæ without spur) are strictly myrmecophilous, while many species of the second group (hind tibiæ with long terminal spur) appear to live quite independently from the company of ants. *B. globicollis* is certainly not myrmecophilous, and the same may be said of *B. spretus* and allied eastern species which have been separated therefrom by Captain Casey. The determinations of some of the following species of this genus are possibly incorrect.

Batrisus ionæ.—*Lasius alienus* (Schwarz). The ant mentioned by Dr. LeConte as the host is probably the same species.

Batrisus juvenicus.—*Aphænogaster tennesseensis* (Schwarz).

Batrisus ferox.—*Lasius claviger* (Schwarz), *L. interjectus* (Pergande).

Batrisus cristatus.—The "large rufous ant with a brownish head" mentioned by Dr. LeConte, appears to be a species of *Aphænogaster*.

Batrisus riparius.—*Camponotus pennsylvanicus* ? (LeConte); found by Mr. Hubbard at Crescent City, Fla., in an old Cynipid gall inhabited by a colony of ants (no specimens preserved); Dr. LeConte found it in Georgia under pine bark apparently not in company of ants.

Batrisus globosus.—*Camponotus pennsylvanicus* (Schwarz); *Lasius alienus*, *Cremastogaster lineolata* (Hubbard and Schwarz). It is, however, frequently to be found under decaying leaves, etc., not in company of ants.

Batrisus bistriatus.—"With a large rufous ant" (LeConte); "with a medium-sized, honey-yellow ant" (Hamilton). This last-mentioned ant appears to be a *Lasius*.

Batrisus lineaticollis.—"With a large rufous ant" (LeConte).

Batrisus simplex.—The two typical specimens were collected by Hubbard and Schwarz under bark of old stumps in company of ants (specimens not preserved).

Trimium puncticolle.—Included on the authority of Dr. Horn.

Homalota.—Several species have been found among ants, but since no comparison of specimens has been made, the number of species remains uncertain.

Homalota sp.—With "*Formica rufa*" at Bedford, Pa. (LeConte).

Homalota sp.—Very abundant with *Formica exsectoides* (Blanchard).

Homalota sp.—An insignificant looking species with *Formica Schaufussi* (Hubbard and Schwarz).

Homalota ? sp.—With *Lasius alienus* (Hubbard and Schwarz).

Homalota ? sp.—Remarkable from the broadly impressed thorax in the male; occurs in the hills of *Formica obscuripes* in Colorado and Nebraska (Schwarz).

Unknown Aleocharid.—Resembling in general appearance the genus *Ecitopora*; occurs with *Tapinoma sessile* at Washington, D. C. (Schwarz).

Lomechusa cava.—*Camponotus pennsylvanicus* (LeConte); "*Formica rufa*" (LeConte); *Camponotus pennsylvanicus*, *C. pictus* (Pergande, Hubbard, and Schwarz).

Myrmedonia.—Of the six North American species which are known to me, and which appear to be referable to this genus, only two have been found among ants. *M. rudis*, found many years ago by Mr. Ulke resting on fences at sunset, has the appearance of being a myrmecophilous species, but has not been found again in recent years; *M. Sallei* Sharp, occurs commonly in southern California and throughout the southern States, but does not appear to live among ants.

Myrmedonia n. sp.—*Cremastogaster lineolata* (Pergande, Schwarz).

Myrmedonia n. sp.—*Tapinoma sessile* (Blanchard); *Lasius alienus* (Hubbard and Schwarz).

Pelioptera ? *gigantula*.—This is entirely unknown to me.

Homœusa expansa.—*Lasius claviger* (Ulke).

Oxyptoda sp.—“*Formica rufa*” (LeConte). Unknown to me.

Myrmecochara pictipennis.—*Solenopsis geminata* (Schwarz).

Myrmecochara ? n. sp.—*Solenopsis debilis* (Schwarz).

Myrmecochara ? n. sp.—A species undoubtedly congeneric with the preceding, and collected by the late Mr. H. K. Morrison at Lake Tahoe, Cal. No specimens of the ant were received.

Euryusa obtusa.—*Formica integra* (Schwarz); *F. exsectoides* (Pergrande).

Euryusa n. sp.—*Lasius bicornis* (Patton). A single specimen, collected at Waterbury, Conn., was given me by Mr. W. H. Patton. The label bears the following inscription: “The beetle on the ground, not near nest; the ant was playing with it; the beetle turned up its abdomen, and the ant opened its mandibles.”

Megastilicus formicarius.—*Formica exsectoides* (Blanchard).

Platymedon laticollis.—*Formica obscuripes* (Schwarz); occurs in Arizona, Colorado, and Nebraska.

Oxytelus n. sp.—*Formica obscuripes* (Schwarz); occurs in Colorado and Nebraska.

Oxytelus placusinus.—*Formica fusca*, *Lasius alienus* (Schwarz); occasionally met with under decaying leaves, and not in company of ants.

Limulodes paradoxus.—*Lasius aphidicola* (Schwarz).

Brachyacantha ursina.—The larva is abundant near Washington, D. C., in the colonies of *Lasius claviger*, preying upon the Pemphigus domesticated by the ants (see J. B. Smith: “Ants’ nests and their inhabitants,” *Amer. Nat.*, v. 20, 1886, p. 680). Whether or not this is the normal habit of the larva must be left to future observations.

Emphyllus americanus.—A specimen of the ant among which I found this in Colorado is in the LeConte collection at Cambridge, and, judging from memory, it belongs to *Lasius*.

Hypocoprus formicetorum.—*Formica obscuripes* (Schwarz).

Hister planipes.—*Camponotus pennsylvanicus* ? (Hamilton); *Formica exsectoides* (Blanchard).

Hister perpunctatus.—*Formica Schaufussi* (Blanchard).

Hister repletus.—*Lasius niger* (Blanchard). I agree with Dr. Hamilton that *H. subopacus* is probably also myrmecophilous.

Heterius brunniipennis.—*Formica fusca* (Hubbard); *F. exsectoides* (Blanchard).

Heterius Blanchardi.—*Aphenogaster fulva* (Blanchard). The western species of *Heterius* are unquestionably strictly myrmecophilous, but I have not been able to obtain specimens of the ants.

Echinodes setiger.—The various species of ants, among which this is reported from South Carolina and Georgia, cannot be determined in the absence of specimens. *E. decipiens* is no doubt also myrmecophilous, and probably also the genus *Ulkeus*.

Amphotis Ulkei.—*Cremastogaster lineolata* (Ulke, Schwarz); *Formica Schaufussi* (Pergande); *F. integra* (Schwarz). Mr. Ulke mentions as host also *F. rufa*, but this must be referred to *F. integra* or *Schaufussi*. My experience with this beetle is that in early spring it is strictly myrmecophilous, but in the fall of the year it is found in decaying fungi. The second species of this genus, *A. Schwarzii*, will no doubt also prove to be myrmecophilous, but it has hitherto been found only washed up on the beach at Fortress Monroe, Va.

Monotoma fulvipes.—Occurred in great numbers in the hills of *Formica obscuripes* in Colorado (Schwarz), but has been found in the Eastern States not in company of ants.

Euparia castanea.—*Solenopsis geminata* (Riley, Schwarz).

Euphoria inda.—A Cetoniid larva, undoubtedly referable to this species, is quite common near Washington, D. C., in midsummer in the smaller hills of *Formica integra*. The imago I never met with among ants, but Mr. L. Bruner writes that he found it in the hills of *F. obscuripes*.

Euphoria hirtipes.—Mr. L. Bruner kindly informs me that he never found the larva, but only the imago, near West Point, Neb. The beetles occur quite abundantly in the hills—in the centre as well as around the edges—of *Formica obscuripes*, as many as two dozen having been found in a single ants' nest. It was found under the same conditions by Mr. G. M. Dodge at Glencoe, Neb., and has, to my knowledge, never been observed remote from ants' nests. Mr. Bruner also states that he has occasionally found in the hills of the same ant specimens of another *Euryomia* of the size of *E. melancholica*, of which, however, no specimens have been preserved. It is, perhaps, *E. pilosicollis*, which, from its great hairiness, may be supposed to be myrmecophilous.

Cremastochilus.—There is nothing to indicate that the unity in habit is interrupted in this genus. The larvæ have not yet been discovered, but live, no doubt, at the bottom of ants' nests. That the ants derive a certain benefit from the beetles and try to prevent the escape of the latter from their nests, has already been observed by Prof. Hentz (see Scudder's "Entomol. Corresp. of T. W. Harris," p. 7). I mention here only those species of which I am able to give the name of the host.

Cremastochilus variolosus.—*Aphænogaster fulva* (Schwarz).

Cremastochilus squamulosus.—*Camponotus esuriens* (Hubbard).

Cremastochilus castaneæ.—*Formica integra* (Schwarz); *F. Schaufussi* (Pergande).

Cremastochilus canaliculatus.—*Camponotus pennsylvanicus* (Hamilton). An undetermined species occurs among *Formica obscuripes* in Nebraska (Bruner).

Coscinoptera dominicana.—Larva abundantly in a large ant hill in Wisconsin (Riley); *Camponotus melleus* (Pergande).

Coscinoptera ? sp.—Larval cases in great abundance in the hills of *Formica obscuripes* in Nebraska (Bruner). The imago has not been bred. A third larva belonging to the *Clythrini* was found in ants' nests in Arizona

by Mr. Morrison, according to Prof. Riley (Amer. Nat., 1882, p. 598). The relationship of these Chrysomelid larvæ to the ants has not yet been ascertained.

Aræoschizus armatus.—This is myrmecophilous, according to a communication from Mr. H. F. Wickham, but he did not preserve specimens of the ant. I do not know whether or not this is the normal habit of this species. Of another species of this genus, *A. sulcicollis*, Dr. Horn remarks (Trans. Amer. Philos. Soc., v. 14, p. 274): "Under stones in very dry places, and very frequently, though probably merely accidentally, among ants."

Alaudes singularis.—"Specimens are very rare and found living with a small black ant under stones" (Dr. Horn, l. c., p. 362); also found among ants by Mr. H. F. Wickham. I have not the slightest doubt that this species is strictly myrmecophilous. No specimens of the ant are preserved.

Hymenorus rufipes.—Larvæ of this occur commonly in the hills of *Formica fusca* at Washington, D. C. (Pergande, Schwarz), and in the nests of *Aphenogaster Treati* (Pergande); the pupæ of *H. obscurus* were found by Mr. Pergande among *Formica fusca*. I hardly believe that these or other species of *Hymenorus* are strictly myrmecophilous in the larva state.

Anthicus n. sp. ?—A small yellow species, which I cannot refer to any described species, occurred abundantly in the hills of *Formica obscuripes* in Colorado (Schwarz). Every hill I examined contained many hundred specimens of the beetle.

If this material, so far as rendered available by the determinations of the ants, is arranged according to the hosts, we obtain the following list:

Camponotus pennsylvanicus.	Ptomaphagus parasitus, Batrisus globosus, Lomechusa cava, Hister planipes, Cremastochilus canaliculatus.
Camponotus lævigatus	Lomechusa montana.
Camponotus pictus	Ptomaphagus n. sp., P. brachyderus, Lomechusa cava.
Camponotus melleus	Coscinoptera dominicana (larva).
Camponotus esuriens	Cremastochilus squamulosus.*
Formica fusca	Ptomaphagus parasitus, Oxytelus placusinus, Hetærius brunnipennis, Hymenorus rufipes (larva), H. obscurus (larva).
Formica integra	Ptomaphagus n. sp., Cadius Ziegleri, Euryusa obtusa, Amphotis Ulkei, Euphoria inda (larva), Cremastochilus castaneæ.
Formica exsectoides	Ptomaphagus parasitus, Cadius Ziegleri, Homalota sp., Euryusa obtusa, Megastilicus formicarius, Hister planipes, Hetærius brunnipennis.

- Formica obscuripes Homalota ? n. sp., Platymedon laticollis, Oxytelus n. sp., Hypocopus formicetorum, Monotoma fulvipes, Euphoria inda, E. hirtipes, Coscinoptera sp. (larva), Anthicus n. sp. ?
- Formica Schaufussi Ptomaphagus parasitus, Homalota sp., Hister perpunctatus, Cremastochilus castaneæ.
- Lasius niger Hister repletus.
- Lasius alienus Scydmaenus rasmus, Adranes cœcus, Batrisus ionæ, B. globosus, Homalota ? sp., Myrmedonia n. sp., Oxytelus placusinus.
- Lasius umbratus ? Adranes LeContei.
- Lasius aphidicola Ceophyllus monilis, Limulodes paradoxus.
- Lasius claviger Batrisus ferox, Homœusa expansa, Brachyacantha ursina (larva).
- Lasius interjectus Batrisus ferox.
- Lasius bicornis Euryusa n. sp.
- Prenolepis parvula Atinus monilicornis.
- Tapinoma sessile Unknown Aleocharid, Myrmedonia n. sp.
- Aphænogaster tennesseensis . Tyrus humeralis, Batrisus juvenicus.
- Aphænogaster Treati Decarthron stigmatosum, Hymenorus rufipes (larva).
- Aphænogaster fulva Decarthron stigmatosum, Hetærius Blanchardi, Cremastochilus variolosus.
- Solenopsis geminata Myrmecochara pictipennis, Euparia castanea.
- Solenopsis debilis Myrmecochara ? n. sp.
- Cremastogaster lineolata . . Batrisus globosus, Myrmedonia n. sp., Amphotis Ulkei.

Dr. Marx said that the myrmecophilous spider, *Myrmekiaphila foliata*, described by Prof. Atkinson, was omitted by Mr. Schwarz. Mr. Ashmead stated that the genera of Hymenoptera mentioned by Mr. Schwarz were probably parasites of the Aphids or Dipterous larvæ to be found in ants' nests, as these genera of Hymenoptera were well known to be parasitic on Aphids and Diptera.
