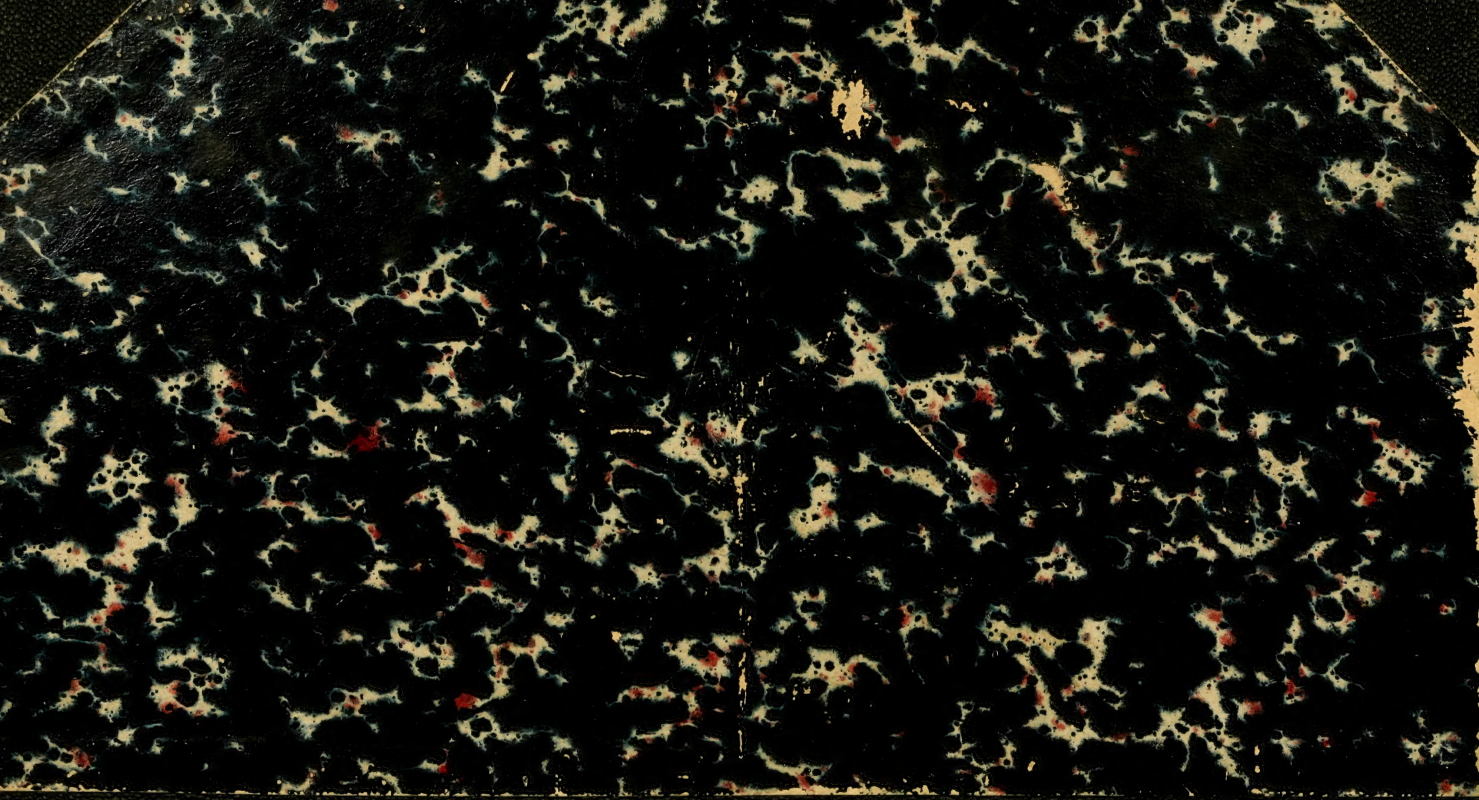

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A Regular Meeting of the Club is held in the Council Room of the Boston Society of Natural History (entrance on Newbury St.) on the third Tuesday of each month except July and August. Meetings begin at 7.45 p. m. Entomologists visiting Boston are cordially invited to be present.

EXCHANGES.

[Exchange notices (not over five lines) inserted free for subscribers. Notices will be inserted in the order in which they are received, and those at the top of the column will be removed only when it is necessary to make room for new ones at the bottom.]

AMARA. Being engaged in the study of this genus, I will determine specimens for collectors. These should be sent numbered. I am also anxious to obtain species in other genera of Carabidae not in my collection, from all parts of the world, and will purchase or exchange for same. Roland Hayward, Readville, Mass.

WANTED.—Eggs, larvae or pupae of grasshoppers, dragon-flies, beetles, bugs, etc. Will give tropical butterflies in exchange. Denton Bros., Wellesley, Mass.

WANTED.—Material for the study of the hybrid or polymorphic butterflies of the genus *Basilarchia*, including larvae or pupae of *arthemis* or *astyanax*, imagos of *proserpina* or *arthechippus*, or any specimens showing unusual characters. Liberal exchange. Specimens retained will be deposited in Museum of Comparative Zoölogy. W. L. W. Field, Milton, Mass.

LEPIDOPTERA—For exchange, fertile eggs of *Hemileuca maia*. Alfred C. Sampson, Sharon, Mass.

I have a few specimens of *C. calleta* and *cinctus* to exchange for rare *Sphingidae* or Pupae of same. W. T. Buxton, 17 Walter St., Somerville, Mass.

WANTED.—Ova, larvae or pupae of *Limenitis ursula* and *arthemis*. Will give cash or exchange. H. H. Newcomb, 35 Court St., Boston, Mass.

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PSYCHE.

PROBLEMS IN THE GENUS BASILARCHIA. Plates I–III.

BY W. L. W. FIELD, MILTON, MASS.

I. Introduction.

Among the representatives of the genus *Basilarchia* occurring in the north-eastern United States are certain remarkable forms which seem in a measure to bridge the gaps between the three types to which specific rank has been generally accorded. Some of these intermediate forms have been figured and described as probable hybrids, others as aberrant or dimorphic forms; several others are known to which no distinct names have been given. This paper is the result of an effort to summarize the existing knowledge of these forms, in order to prepare the way for methodical investigation.

II. The Three Generally Recognized Species.

No attempt will be made here to present detailed descriptions of these familiar butterflies, which are treated in all the leading works on North American lepidoptera. It will suffice to point out certain pertinent facts.

1. *B. arthemis* Drury (Plate I., fig. 5, ♂; Plate II., fig. 4, ♂), the common white-banded species of the mountain districts, ranges very widely through Canada, and in the United States frequents northern New England, the Adirondack and Catskill regions, and a belt of country extending westward to Minnesota. About Boston it is very rare, but has been taken by Harris, Clapp, Miss Guild, Morse, F. H. Sprague, P. S. Sprague, Zerrahn and others. Reported instances of its capture south of the latitude of Boston are so scarce as to emphasize its almost complete restriction to the hilly country of the north. The species is reported from most stations either as single-brooded or as having a partial second brood. The larvae feed upon poplar and willow.

2. *B. astyanax* Fab. (Plate I., fig. 1, ♂; fig. 2, ♀), the blue-black species without white band, is absent from Canada with the exception of southern Ontario, and even in the United States encroaches very little upon the territory of *arthemis*. In general it may be said that *astyanax* seldom appears north of latitude 43°, but that south of latitude 42° it replaces *arthemis*. It is found as far west as the

Mississippi. About Boston it is much more common than *arthemis*. The larvae feed upon apple, willow, poplar, and wild cherry.

Astyanax is generally double-brooded, though at some points near its northern limit the second brood is only a partial one. This species is extremely variable both in size and markings. Very large examples, rivalling *Semnopsyche diana* in size, occur from New York city southward: and mingling with these are found specimens scarcely larger than the average *arthemis*. Both sexes attain to both extremes of size, though the larger specimens are usually females.

3. *B. archippus* Cramer, "the Viceroy" (Plate II., fig. 1, ♂; Plate I, fig. 6. ♀), is the most famous example of mimicry among North American butterflies. The mimicked species is *Anosia plexippus*, the Monarch or Milkweed butterfly. *Archippus* has, instead of the deep brown or blue-black ground color characteristic of the *Basilarchias*, the orange coloring of *Anosia*. Unlike its allies, but like *Anosia*, it frequents sunny open fields, and in such situations may be found throughout the eastern United States. It is triple-brooded throughout almost its entire range. The larvae feed upon several species of willow, and sometimes on poplar.

Archippus is extremely variable in size, like *astyanax*. The depth of the ground color also varies somewhat, and the mesial black line of the secondaries is often (more frequently in females) indistinct or incomplete. The incomplete condition is to be seen in the female here figured.[1]

III. The Problematic Forms.

1. *Basilarchia proserpina* Edwards, the first of the problematic forms to attract attention, was described in 1865 from two males taken in the Catskill mountains, and redescribed later (Edwards '67, '69) when the same region yielded more material. The following is quoted from the notes accompanying the second ('67) description:

> On the same days I took about fifty *Arthemis*, all except two or three being males, and just from chrysalis. I have never known *Arthemis* so abundant in that locality. The variation among so many was remarkable, particularly in the width of the white band and the size of the russet spots above and below; in half the specimens these spots were wanting above, in others there were two or three and from that up to a complete series of large rounded spots; the color of under side ran through all shades, from blackish to brown, cinnamon and russet.

Notwithstanding his observations upon these intergrading forms, all of which he referred to *arthemis*, Edwards for some time believed *proserpina* to be a distinct

[1] Streecker ('78) has described a variety, *pseudodorippus*, which altogether lacks the mesial line.

species. Scudder ('72) treated it as a variety of *astyanax*, and in criticising this view Edwards ('73) suggested that it might be a dimorphic form of *arthemis*. The discovery of "other varieties of *proserpina*" led Scudder ('75) to adopt this view tentatively, though he suggested that *proserpina* might prove to be a hybrid between *arthemis* and *astyanax*. Two years later Edwards ('77) announced the rearing of larvae from eggs laid by a captured *proserpina*;[1] four came to maturity, giving three typical *arthemis* (or form *lamina*, as he then designated it) and one *proserpina* closely resembling *astyanax*.[2] After another space of two years, Edwards ('79) published a full account of his studies of *proserpina*, including an exhaustive list of localities in which it had been taken, and a history of the breeding experiments. On the plate accompanying this was figured a "variety" of *proserpina*, the oft-quoted specimen from Mr. Mead's collection.[3] This will be referred to later.

One of the most noteworthy features of *proserpina* is its distribution, which is almost wholly confined to the narrow zone in which the ranges of *arthemis* and *astyanax* overlap.

2. *B. arthechippus* Scudder, (Plate II., figs. 2, 3), generally regarded as a hybrid between *arthemis* and *archippus*, was described from a specimen taken at Chateauguay Basin, Quebec, in 1879, by Mr. J. G. Jack.[4]

The specimens here figured were taken in Alstead, N. H., by the Field brothers, in 1895 and 1896; still another was seen on the wing in the same locality in 1902, but not captured. The three above mentioned are now in the Museum of Comparative Zoology.

Arthechippus exhibits a very thorough mingling of the characters of its supposed parents, and the three specimens preserved are almost exactly alike in appearance. All three are males; whether females ever occur remains to be seen.

3. An unnamed *Basilarchia*, apparently a hybrid between *astyanax* and *archippus*, is represented by fig. 4 on Plate I. This specimen was obtained by Mr. A. P. Morse from Sherborn, Mass., and is a male. The ground color is mahogany brown; the spots of the inner row are deep orange, those of the outer row somewhat paler. There are no blue markings.

Mr. Jacob Doll has a similar specimen which was taken on Long Island, and one or two others have been reported.

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[1] The male which had impregnated this female was of course unknown.

[2] *Basilarchia astyanax* = *ursula* Fab. Edwards employs the latter name.

[3] This "variety" has also been figured by Scudder ('89) and Holland ('99), the latter failing to mention the fact that it is not a typical *proserpina*. The specimen reproduced herewith as fig. 6 on Plate III. resembles it closely, but lacks some of the red markings.

[4] Scudder ('89) refers to a second specimen, described by Edwards. This is an error; both Edwards and Scudder had seen the same specimen.

IV. The "Varieties" of Proserpina.

Proserpina is the only one of the problematic *Basilarchias* here listed which by its variability is susceptible of subdivision. That *proserpina* as heretofore treated comprises several well-marked forms I believe to be clearly apparent from the data already accumulated. Yet *arthemis* is credited in all our catalogues with being dimorphic only, and *proserpina* is given as the alternate form. To attempt a complete list of the proper subdivisions at this time would be premature: but it seems desirable to point out four of them, as follows:

(a) The typical *proserpina*, described by Edwards in 1865. The size is that of an average *arthemis*; ground color black or very dark brown; the mesial white band shows faintly as a broken row of dots on the primaries above, and somewhat more distinctly below. On the secondaries there is no mesial band, and the blue spots are very small. The female of this form was described by Edwards in 1868 as "similar" to the male. Figures 1 and 2 on Plate III. show two males of this form taken in Alstead, N. H.; the second specimen was reversed to show the under surface. Fig. 3 on Plate I. shows an example from Andes, N. Y.

(b) A larger form, with mesial band developed on primaries to about one-third of its area in typical *arthemis*, and broadest at the costa. Ground color dark as in the preceding, and blue spots restricted. On Plate III., fig. 3 shows a female from Sullivan County, N. Y., and fig. 4 a male from Alstead, N. H.

(c) A large form, with distinctly brown ground color; the mesial band appears on both pairs of wings, but is narrow and irregular as compared with the band on typical *arthemis*. Red spots appear on upper surface of secondaries as in most specimens of *arthemis*. Figured (Plate III., fig. 5) from a male taken in Temple, N. H.

(d) A form resembling *astyanax* (*ursula*) in many ways, yet having the white band well developed on all the wings. The blue scales on the upper surface of secondaries are abundant and brilliant. This form is called by some collectors a "white-banded *ursula*." A small specimen of this form, reared at Sharon, Mass., from a hibernating larva by Mr. A. C. Sampson, is figured as fig. 6 on Plate III.[1] Very large specimens, taken on Long Island, are in the collections of Messrs. Jacob Doll and H. H. Newcomb. There are two specimens in the Museum of Comparative Zoology; one of these is from Deerfield, Mass., and the other bears no locality label. The specimen from the Mead collection is similar to these, but shows more red on the upper surface.

[1] This specimen is now in Mr. Newcomb's collection.

V. Proserpina Considered as a Possible Hybrid.

Scudder ('89) treats *proserpina* as a hybrid produced by the crossing of *arthemis* and *astyanax*. The principal facts upon which he bases his theory are:

1. The occurrence of apparent hybrids *arthemis-archippus* and *astyanax-archippus*.
2. *Proserpina* resembles *astyanax* even more closely than *arthemis*, to which latter species Edwards has proved it to be in some way related.
3. In structure of genitalia *proserpina* and *astyanax* are precisely alike.
4. *Proserpina* is more variable than either of the supposed parents.
5. *Proserpina* occurs only in a narrow belt where the ranges of its supposed parents overlap.
6. "*Proserpina* is known at so many points in this belt, that it presumably occurs wherever *arthemis* and *astyanax* are brought into contact."
7. No dimorphic species is known of which one of the forms appears only along one edge of the territory occupied by the species.

VI. The Facts Summarized.

The three recognized species, *Basilarchia arthemis*, *B. astyanax* and *B. archippus*, all occur together in a narrow zone running westward from the Atlantic coast to the Mississippi river; north of that zone, *arthemis* and *archippus* occur together; south of it, *astyanax* and *archippus* occur together.

With these three species we may effect three different combinations of two species each, viz.: *arthemis-archippus*, *arthemis-astyanax*, *archippus-astyanax*.

Each of these three combinations is actually represented by an intermediate form.

Two of these intermediate forms, *arthemis-archippus* and *archippus-astyanax*, are generally believed to be hybrids, but their hybrid nature is as yet undemonstrated.

The third, *arthemis-astyanax*, is really a group of several interblending forms, assembled under the name *proserpina*.

The *proserpina* forms are either the results of the intercrossing of *arthemis* and *astyanax*, or polymorphic forms of *arthemis*.[1] They are found in the narrow zone above mentioned.

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[1] Grey ('79) has suggested that the three supposed species are polymorphic forms of one species. The statement here given does not necessarily preclude the view that *astyanax* and *arthemis* may both be forms of a single polymorphic species. Mr. H. H. Newcomb has suggested this to the Cambridge Entomological Club.

VII. Conclusion.

The futility of speculation and the importance of actual experiment are well shown in the cases presented. The problems involved in the inter-relations of these butterflies are of interest to all biologists. They can only be solved by careful and long-continued investigation.

At the Alstead laboratory the effort will be made during the coming summer to breed hybrid *Basilarchias* in a large enclosure, with growing trees on which the larvae may feed. Quantitative studies of variation in this genus are now under way. It is hoped that before the close of the summer new light may be had upon the questions here discussed.

I am indebted to Messrs. A. P. Morse, H. H. Newcomb and A. C. Sampson for the loan of specimens from their collections.

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NEW ACRIDIIDAE FROM THE SOUTHEASTERN STATES.

BY ALBERT P. MORSE, WELLESLEY, MASS.

DURING a rapid trip through the southeastern states the past summer under the auspices of the Carnegie Institution of Washington, for the purpose of studying the Acridiidae of that region, the following new forms were obtained. These include two species of Eotettix, one long-winged and eleven short-winged species of Melanoplus, and a Spharagemon.

Eotettix pusillus sp. nov.

A diminutive species readily distinguished from *signatus* by its size and nearly circular tegmina. Facial costa widest between antennae, nearly equalling interspace between eyes, with parallel sides, abruptly narrowed below the median ocellus to two-thirds of its width above. Disk of pronotum tectiform, distinctly convex in longisection, the mid-carina very pronounced, the lateral carinae faintly indicated on the prozone, obsolete on metazone. Tegmina broadly obovate or subcircular, two-thirds or three-fourths as long as the pronotum. Tip of male abdomen upturned, supra-anal plate triangular, nearly or quite as broad as long, pointed at apex, with sinuous sides. Furcula well developed, consisting of two broad flattened lobes as long as or longer than the last dorsal segment. Cerci subconic, shorter than supra-anal plate, two to three times as long as the width of base; acuminate, stout at base, tapering to a slender tip.

General color pale yellowish green, dorsum and tegmina dull yellowish brown. Lateral stripes on the sides of the prozone, more or less of the bases of the abdominal segments and genicular lobes of the hind femora, apex of hind tibiae, tibial spines and tarsal claws, black. Hind tibiae colored like the body.

Length of body; ♂, 10–12; ♀, 16–17; hind femora: ♂, 7.5–8; ♀, 9.5–11; antenna: ♂, ♀, 8–8.5; tegmina: ♂, 1.7 × 2 to 2 × 2.5; ♀, 3 × 3.5 to 3.3 × 4 mm.

Three males, one female, Waycross, Ware Co., Ga., Aug. 11; fourteen males, one female, Denmark, Bamberg Co., S. C., Aug. 15.

Eotettix palustris sp. nov.

Intermediate in size and appearance between *signatus* and *pusillus*. Facial costa widest opposite base of antennae, equalling interspace between eyes, with convex sides convergent above and below, subparallel in lowest portion. Tegmina broadly oval with rounded apex, shorter than pronotum. Abdomen of male less upturned at tip than in *pusillus*; furcula well-developed, flattened or digitate; supra-anal plate triangular, its breadth nearly or quite equalling its length, the apex rounded, acute. Cerci conical, slender, tapering evenly, about three times as long as their basal width.

Color light yellowish green, brown above and on tegmina, with fuscous post-ocular stripes from eyes to tegmina. Hind tibiae red with black spines. This species and *signa-*

tus agree in lacking the fuscous markings on the abdomen characteristic of *pusillus*, and in possessing red hind tibiae. In *signatus* the apex of the supra-anal plate is usually very bluntly rounded, and the tegmina are as long or longer than the pronotum, broad lanceolate, with acute apex.

Length of body: ♂, 15–15.5; ♀, 21.5; hind femora: ♂, 10; ♀, 14; antenna: ♂, 8; ♀, 9; tegmina: ♂, 2 × 3.5 to 2.8 × 4; ♀, 3.5 × 5 mm.

Three males, one female, Live Oak, Suwanee Co., Fla., Aug. 10.

Melanoplus symmetricus sp. nov.

A long-winged species allied to *robustus*. Furcula wanting. Cerci stout at base, laminate and a little incurved at tip, broad, nearly symmetrical, the basal half or three-fifths a little longer than wide, with subequal, subparallel sides; the distal half or two-fifths broadened equally above and below into a transverse plate with axis perpendicular to that of the stem, its length one and two-thirds times the width of the stem, the apex smoothly convex (sometimes sinuous through extension of lower angle of lobe), the proximal sides straight and leaving the stem at an angle of 30° or 40°, the dorsal portion of the plate slightly broader and its angle more rounded than the lower.

General color brownish testaceous; hind tibiae red with black spines. Hind femora stout, flavous on outer lower face, coral red within on basal two-thirds, often showing indications of oblique fuscous fasciae.

Length of body: ♂, 28–30; ♀, 31–34.5; hind femora: ♂, 16–18; ♀, 19–20; antenna; ♂, 13.5–14.5; ♀, 11–14; tegmina: ♂, 20–22; ♀, 21–23; vertex to tip of tegmina: ♂, 30–31.5; ♀, 30.5–33.5 mm.

Three males, six females, Carrabelle, Franklin Co., Fla., Aug. 9.

Melanoplus divergens sp. nov.

A short-winged species of the same size and appearance as *islandicus* and its two relatives here described but belonging in a different series and easily distinguished by the subbifurcate cerci. Vertex blunt. Pronotum broad with flattened disk, subangulate at junction with lateral lobes, and moderately convex hinder margin, the mid-carina distinct on the metazone, absent from prozone. Prosternal spine short and variable, usually conical with acutely pointed tip but sometimes much broadened laterally with wide, bluntly rounded apex. Mesosternal interspace slightly transverse in the female, narrower than the lateral lobes, quadrate or a little transverse in the male. Metasternal interspace slightly transverse in the female, longitudinal in the male. Tegmina shorter than the pronotum, ovate, or ovate-lanceolate, with rounded apex, usually covering second abdominal segment but sometimes half this length, attingent in the male, separated in the female. The subgenital plate is truncate or even slightly emarginate at apex, the sides viewed from above nearly straight. The supra-anal plate is longer than wide, triangular, pointed at apex, the sides convex. Furcula moderately broad, about equalling the last segment in length. The cerci are quite distinctive, recalling those of *minor* in outline, being roughly boot-shaped, the base very broad, a little longer than wide, its sides parallel or convergent, the distal two-fifths bent abruptly upward at an angle of 35° or 40° narrowed to about one-half the width of the base and tapering to a broad, evenly rounded blunt apex. At the union of the distal portion with

the base the dorsal margin is deeply concave, the ventral margin strongly angulate, beyond the angle straight or a little concave, forming a sub-bifurcate organ as long as the supra-anal plate. The whole appendage is thick, strongly convex externally, especially on the tip, which is curved gently inward.

General color dark reddish brown above, yellowish beneath, the hind tibiae red. Post-ocular fuscous stripes on head and prozone and pronounced fuscous markings on sides of abdomen and hind femora. The female is sometimes yellowish brown above.

Length of body: ♂, 9–10; ♀, 11–20; hind femora: ♂, 8.5–9.5; ♀, 9.5–11; antenna: ♂, 6-6.5; ♀, 6–7; tegmina: ♂, 2–3, ♀, 2–4 mm.

Eight males, eleven females, Balsam, Jackson Co., N. C., July 24, about 5000 ft. Seven males, seven females, Aug. 19, 5000–6000 ft.

Melanoplus deceptus sp. nov.

Melanoplus viridipes in part. Scudder, Rev. Melanopli, p. 255.

Agreeing with *viridipes* in size, color, and markings but differing in the form of the cerci: in *viridipes* these organs taper somewhat regularly to the apex; in this species more or less of their distal third is distinctly broadened dorsally and obliquely excised at the end, the apex being acute and ventral; the ventral margin may be convex, straight, or slightly sinuous, the dorsal margin is concave in the mesial portion, sometimes strongly so. The whole organ varies much in breadth in different specimens.

Owing to its strong resemblance to *viridipes* this species has been confused with it by various authors and a specimen was included with the types of that species. The original descriptions and drawings, however, accurately delimit *viridipes* from this and the succeeding species.

Three males, eight females, Balsam, Jackson Co., N. C., Aug. 19, 5700–6100 ft. 1 male, Jasper, Pickens Co., Ga., July 26, 2600 ft. Three males, Vigo Co., Ind., June 8, received from Blatchley. One male, Indiana, Scudder collection in M. C. Z., type of *viridipes*.

Melanoplus similis sp. nov.

Very similar to *viridipes* and *deceptus*. The tip of the abdomen is less clavate and upturned; the basal half of the cerci tapers rapidly on the dorsal side to less than half the width of the base, sides of distal half parallel, apex transversely excised, the angles rounded, the dorsal one slightly more prominent; the ventral margin is nearly straight, though slightly concave and sinuous, the dorsal margin strongly concave in the middle, convex at base.

In color and markings this species strongly resembles *viridipes* and *deceptus* but possesses distinctive characters in the markings of the abdomen (as well as in the form of the cerci). In this species the subgenital plate is shining black, the preceding sternite greenish white with a very broad triangular fuscous spot extending across its posterior margin below the upturned subgenital plate from which it is separated by a lenticular pale space along the suture. In *deceptus* and *viridipes* the anterior margins of several of the abdominal sterna are conspicuously infuscated as well as both margins of the sternite preceding the subgenital plate.

Three males, Murphy, Cherokee Co., N. C., July 25.

Melanoplus celatus sp. nov.

Closely related to *M. islandicus*, agreeing with it in size, coloration, markings and form with the following exceptions.

Cerci of male similar to those of *islandicus*, stout at base, tapering equally, or more rapidly in basal portion, to a slender, flattened tip, once and a half or twice as long as width of base, symmetrical, the tip not bent upward nor grooved externally as usual in *islandicus*. Subgenital plate averaging shorter on the dorsal margin than in *islandicus*. Prosternal spine conic or cylindro-conic, the apex blunt, well-rounded, — in *islandicus* subpyramidal, acutely pointed, the sides flattened.

Five males, three females, Wytheville, Wythe Co., Va., Sept. 4 and 5, 3000 to 4000 feet.

Melanoplus sylvestris sp. nov.

This species also is a near relative of *islandicus* Blatchl., differing chiefly in the form of the male cerci, which, while of the same general structure, are narrower at base and have the distal half bent slightly upward and drawn out into a slender, compressed, substyliform tip, the whole appendage being once-and-three-quarters or twice as long as the width of base. The prosternal spine is very variable, ranging from subcylindrical with bluntly rounded tip to a more usual conical form with rounded apex.

Seven males, seven females, Blowing Rock, Watauga Co., N. C., July 19. Two females, Linville, Mitchell Co., N. C., July 18. Six males, six females, Loverings', Burke Co., (between Morganton and Pineola), July 13. Two females, Pineola, Mitchell Co., N. C., July 13; one male, (?) same place, Aug. 28. All at elevations of 3500 to 4000 ft.

The three species, — *islandicus*, *celatus*, and *sylvestris* — are evidently nearly related descendants of the same parent form, modified by isolation. Intergrades may yet be discovered. The male from Pineola is included with some doubt owing to differences in structure and season.

Melanoplus carnegiei sp. nov.

A short-winged species related to and resembling *scudderi* but with the cerci shorter, about as long as their basal breadth, equalling three-fifths of the supra-anal plate, triangular, acutely pointed, the sides straight or a little sinuous by reason of convexity of base; the ventral margin is usually the longer but sometimes the sides and base are subequal; thick at base, tapering evenly to the not at all incurved apex. Subgenital plate scoop-shaped, the end pointed, the apex rounded or slightly truncate. Furcula minute, barely discernible, scarcely half as long as last segment. Supra-anal plate triangular, longer than wide, pointed, the sides convex.

Pronotum resembling that of *scudderi* but scarcely as wide posteriorly; prosternal spine very variable, sometimes cylindrical and bluntly pointed, more usually flattened antero-posteriorly, apex broad and bluntly rounded or acute with straight sides. Tegmina shorter than in *scudderi*, nearly as long as pronotum, broad lanceolate with rounded apex, attingent or slightly overlapping.

Color and markings as in *scudderi*, the hind tibiae red.

Length of body; ♂, 14–17.5; ♀, 23–24; hind femora: ♂, 10–12, ♀, 13.5–14.5; antenna: ♂, 7–8.5, ♀, 8.5–10; tegmina: ♂, 2.5 × 4, 3 × 4.5; ♀, 3.5 × 6 mm.

Seven males, two females, Denmark, Bamberg Co., S. C., Aug. 15. One male, Spartanburg, Spartanburg Co., C. S., Aug. 16. One male, Blue Ridge, Fannin Co., Ga., July 25, 1700 ft.

Melanoplus strumosus sp. nov.

A small species with very small ovate tegmina, attingent in male, a little separated in female. Disk of pronotum twice (male) or once-and-a-half (female) as long as wide, mid-carina percurrent, lateral carinae barely perceptible mesially. Prosternal spine prominent, flattened cylindric, slightly curved backward, apex transversely excised, the angles rounded. Mesosternal interspace quadrate in female, slightly longitudinal in male. Metasternal interspace longitudinal, twice as long as wide (female), narrower in male. Tegmina obovate, two-thirds as long as pronotum. Hind femora stout, very obliquely bifasciate with fuscous. Hind tibiae glaucous, flavescent at base and tip, with black-tipped spines.

Male abdomen subclavate, the subgenital plate and preceding segment tumescent, broader than deep, and greatly elongated, the former elongate scoop-shaped, bluntly rounded at apex, its sides a little convex, especially at base. Supra-anal plate broader than long, somewhat trilobate at end by reason of deep, subapical lateral emarginations, the apex acutely pointed with straight sides, the basal three-fourths of each side smoothly convex, curving abruptly into the subapical emarginations. Its upper surface bears strongly raised edges and a prominent transverse ridge midway of its length, crossing two-thirds of its width. To this ridge extend, lying upon longitudinal ridges, the processes of the furcula; these are very broad at base, tapering equally to digitate, apically sinuate, tips which rest upon the ends of the transverse ridge, and enclose between them the shallow median sulcus, wide apically, narrow anteriorly. The base of the furcula and median portion of the segment bearing it are distinctly depressed; the median portion of the preceding segment is depressed to fit into this hollow, slightly elongated, widely and shallowly sulcate longitudinally, the sulcus transversely rugulose, with apical margin carinate opposite base of furcula. Cerci short and slender, about two-thirds as long as supra-anal plate, nearly three times as long as basal width, tapering evenly in basal half to one-fourth the basal width, distally bent gently upward and inward, the tip slightly expanded to about one-third the basal width, obliquely excised, the upper angle rounded, the ventral acute, the ventral margin convex or sinuous, the dorsal margin concave.

General color deep reddish brown above, whitish or flavescent beneath. Post-ocular fuscous stripe indistinct in female, deep black in male, percurrent, extending to abdomen, even suffusing the metepisternal pale fascia.

Length of body: ♂, 15; ♀, 17.5–22; hind femora: ♂, 10; ♀, 11.5–13; antenna: ♂, 6; ♀, 7; tegmina: ♂, 2 × 2.7; ♀, 2.5 × 3.5, 2.7 × 4 mm.

One male, two females, DeFuniak Springs, Walton Co., Fla., Aug. 5. Two females, Denmark, Bamberg Co., S. C., Aug. 15.

Melanoplus tribulus sp. nov.

A short-winged species of medium size. Disk of pronotum somewhat convex above, once-and-a-half (female) or twice (male) as long as wide, mid-carina percurrent, distinct, lateral carinae obsolete, hind margin a little convex, emarginate. Prosternal spine promi-

nent, conical, acutely pointed, in female somewhat flattened antero-posteriorly. Tegmina broadly ovate, about three-fourths as long as pronotum. Male abdomen subclavate, considerably upturned. Subgenital plate with the sides much expanded basally, the ventral face very short, convex, terminating in a very short, blunt, upwardly directed fuscous tubercle distinctly removed from the inner margin. Supra-anal plate shield-shaped, with convex sides, abruptly narrowed to terminate in an acute point with straight sides. Furcula consisting of a pair of small, straight, flattened, backwardly directed, rather distant processes, about as long as the last dorsal segment. Cerci slender, three times as long as basal width, tapering in basal third to about half the basal width, equal in middle fourth, expanding a little distally into a laminate, obliquely excised tip, the upper angle rounded, the lower acutely pointed, the whole organ gently incurved and the tip slightly decurved.

Color dark reddish brown above, white and flavescent beneath. Post-ocular stripe continued into fuscous of sides of abdomen, sometimes suffusing the metepisternal pale fascia. Hind femora with fuscous genicular lobes and indications of oblique fasciae. Hind tibiae fuscescent glaucous with black spines.

Length of body: ♂, 18.5–19; ♀, 26; hind femora: ♂, 10.5; ♀, 12.5; antenna: ♂, 10.5; ♀, 8; tegmina; ♂, 3.5–4.3; ♀, 4.5 mm.

Two males, one female, Jasper, Pickens Co., Ga., July 25, 2600 ft.

Melanoplus devius sp. nov.

This species is nearly related to *tribulus* here described, agreeing with it in size, form, and shape of subgenital plate. Mid-carina of pronotum percurrent. Prosternal spine typically cylindro-conic and rather bluntly pointed. Furcula small and very variable. Supra-anal plate usually distinctly ampliate basally. Cerci narrow from a broad base, two and a half times as long as basal breadth, tapering gently in both breadth and thickness in basal half, the distal half equal or a little expanded apically, laminate, transversely excised at apex, the upper angle more rounded than the lower, the dorsal margin sinuous, the ventral concave. The fuscous markings of the end of the abdomen of the male readily distinguish it from *tribulus*: in this species the posterior face of the apical tubercle and the sides of the subgenital plate, the sides and anterior and posterior margins of the preceding sternite, are infuscated. In the female the sides of the abdomen are nearly free from fuscous markings. Hind tibiae glaucous with black spines.

Length of body: ♂, 17–20; ♀, 22–26.5; hind femora: ♂, 10–11.5; ♀, 11.5–13; antenna: ♂, 9–10; ♀, 7.5–8.5; tegmina: ♂, 2 × 2.5, 2.5 × 4; ♀, 2.8 × 3.5, 3 × 5 mm.

Twenty-three males, twenty-one females, Wytheville, Wythe Co., Va., Sept. 4 and 5, 3000 to 3500 ft. One male, Topton, Cherokee Co., N. C., Aug. 21, 3000 to 4000 ft.

Melanoplus decoratus sp. nov.

Related to *decorus* (Scudder, Rev. Mel., p. 257, pl. 17, fig. 5). Vertex rather strongly protuberant, especially in female. Pronotum with mid-carina strong on metazone, weak or indistinct on prozone. Tegmina asymmetrically obovate, the costal margin more convex. Supra-anal plate nearly as broad as long, the sides convex or sinuate, apex rounded or acute, the supernumerary longitudinal ridges feebly developed or indistinct. Furcula processes broad at base, rather strongly divergent, tapering, the sides more or less sinuate, once and a half or twice as long as the last dorsal segment. Cerci broader than in *decorus*, especially at

tip, the apex transversely excised, the ventral apical angle produced, the dorsal well rounded, the extreme tip slightly recurved. Subgenital plate strongly constricted at base, (more than in *decorus*), the sides less ampliate basally, the apical tubercle much enlarged, produced, and curved upward, the ventral length of the plate almost or quite equal to its basal depth, the whole structure appearing more like a malformation than otherwise.

Color dark reddish brown, yellow beneath, sides of pronotum below post-ocular stripe white, the stripe percurrent, suffusing pale metepisternal fascia, continued nearly or quite to end of abdomen, sometimes rather faintly in female but more pronounced and constant than in the females of the other species here described. The body is stouter than in *decorus*, the hind femora shorter and stouter, and usually bifasciate.

Length of body: ♂, 15–18; ♀, 21.5–25; hind femora: ♂, 9.5–11; ♀, 10.7–12; antenna: ♂, 8.5–9.5; ♀, 8–9; tegmina: ♂, 2 × 3, 2.5 × 4; ♀, 2.8 × 4, 4 × 5 mm.

Two males, twelve females, Murphy, Cherokee, Co., N. C., July 25, 1800 ft. Two females, Topton, Cherokee Co., N. C., Aug. 21, 3000 to 4000 ft. One female, Blue Ridge, Fannin Co., Ga., July 25, 1700 ft. Three males, one female, Wytheville, Wythe Co, Va., Sept. 4 and 5, 3000 to 4000 ft.

Melanoplus australis sp. nov.

Related to *attenuatus*. Tegmina lanceolate with rounded tip, — in *attenuatus* elliptical, and almost truncate at apex. Furcula processes well-developed, broad at base, tapering (chiefly on inner side) to digitate tips, one-third as long as supra-anal plate, — in *attenuatus* one-fourth or less. Supra-anal plate resembling that of *attenuatus*, showing indications of the marginal dentate plication of that species. Cerci slender, very nearly symmetrical, three times as long as broad, the middle third narrowed to one-half or less of the width of the base, spatulate, with slightly emarginate symmetrical apex, the tip a little incurved, thin, and longitudinally inrolled, *i. e.*, from side to side convex externally, concave internally. Subgenital plate similar to that of *attenuatus*.

Color light yellowish green, without fuscous markings on sides of abdomen. Hind tibiae glaucous. Post-ocular fuscous stripe obsolete on metazone, interrupted on prozone by two narrow oblique yellowish green fasciae.

Length of body: ♂, 17; hind femora: ♂, 11.5; antenna: ♂, 12; tegmina: ♂, 2 × 3 mm.

One male, Savannah, Chatham Co., Ga., Aug. 14.

Spharagemon saxatile var. planum var. nov.

Differing noticeably from the specific type in the structure of the pronotum, the mid-carina, although of the same general form and profile, being lower throughout, and the disk of the metazone more nearly and constantly plane, instead of arched in longisection as is commonly the case in the type, especially in the female. Hind tibiae with an increased amount of infuscation distad of the pale basal annulus, in this respect sometimes approaching *bolli* in degree. The general color of the specimens at hand is a purplish red in consonance with the tint of the soil of the habitat; the pale X mark of the pronotal disk is lacking, and even the transverse fuscous bands of the tegmina are indistinct.

Twenty-two males, ten females, Wytheville, Wythe Co., Va., Sept. 4 and 5, 2300 ft., on a thinly grassed gravelly hill-slope.

AN ABNORMAL SPECIMEN OF *BEMBIDIUM SCUDDERI*.

BY ROLAND HAYWARD, MILTON, MASS.

While examining a number of examples of *Bembidium scudderi* recently received from Mr. H. F. Wickham from Humboldt Lake, Nev., I noticed a curious monstrosity in a specimen of that species which seems of sufficient interest to publish.

As is well known the dorsal punctures of the elytra are very constant both in number and position in our numerous species of Bembidium, and afford very useful characters for the subdivision of the genus into groups. With few exceptions they are two in number and are situated either on the third interval or the third stria. In two of our groups, one containing *lævigatum*, and the other *semistriatum* and *constricticolle*, they are placed in irregular rows on all the intervals. In two others they are three in number, being situated on the third stria in that of which *ricksecker*i is the type, while in the group containing *henshawi*, *consimile*, *scudderi* and *hageni* they are on the third interval.

In the specimen before me there are on the third interval of the left elytron the abnormal number of four punctures, while on that of the right there are three, placed as in normal specimens. On the left elytron the first puncture is in normal position, the second, however, is situated much nearer the base, while between it and the one nearest the apex, which is situated as on the right elytron, is interpolated an additional puncture, placed nearly midway between the second and fourth, but slightly nearer the latter. A curious fact to be observed is that only the first, second and fourth punctures are setigerous, the third showing no trace of seta. The setæ arising from the three dorsal punctures of the right elytron are also distinct.

Of course the case is a monstrosity only, showing as it does, in a small way, a deviation from bilateral symmetry, but it seems interesting that it should occur in a member of a group in which the normal number of dorsal punctures is in excess of that occurring in the vast majority of our species, and may possibly indicate an inherited tendency toward an increase in their number.

The group as a whole is confined to the western portions of our country and to Mexico. Only one species, *B. consimile*, occurs as far east as Nebraska, extending westward to Utah, while *henshawi* and *scudderi* occur in the region between western Wyoming and California. All three are found, as I learn from correspondents, on alkaline mud along the shores of saline lakes and ponds. Of the habits of *hageni* nothing is known.

SOME NOTES, AND DESCRIPTIONS OF FOUR NEW DIPTERA.

BY CHAS. W. JOHNSON, BOSTON, MASS.

Tabanus (Therioplectes) hinei, n. n.

Therioplectes being now considered at most only a subgenus of *Tabanus* necessitates the changing of *Therioplectes politus* Johnson (Entom. News, XI, 325, 1890) which is preoccupied in the genus *Tabanus* by *T. politus* Walker (The Entomologist, V, 256, 1871). I therefore propose for this species the new name *Tabanus hinei* in honor of Prof. Jas. S. Hine, who is making a special study of the Tabanidae.

During the past summer I have obtained four specimens of this species. Two males, Bridgewater, Mass., July 11, collected by Mr. Jos. A. Cushman, and two females, Woods Holl, July 25, and Auburndale, Mass, July 12, collected by the writer. The ♀ which has not been described, differs but little from the ♂ in general appearance except that the dorsal stripe of the abdomen is somewhat broader, with a slight dorsal spot or triangle on segments one to four, due chiefly to a small tuft of white hair, readily denuded. One of the males also shows a tuft of white hair on the second segment. Since writing the above I have seen three males of this species from Massachusetts, in the Museum of Comparative Zoölogy, Cambridge, one of which was labeled by Osten Sacken, "male of an unknown species."

Tabanus (Therioplectes) whitneyi sp. nov.

♀. Face, front and palpi reddish brown, frontal callus dark brown, narrowly triangular and extending as a narrow line to the base of the prominent ocelligerous tubercle; a space between the frontal callus and base of the antennae red; antennae red, third joint not excised, and showing no trace of a projecting angle; eyes apparently glabrous and a uniform brown, moisture failing to reveal the greenish bands so characteristic of the group. Thorax reddish brown, with grayish pollen forming four longitudinal stripes interrupted at the transverse suture, the two median stripes extending to the scutellum as a single dorsal line; pleurae reddish with gray pollen and red pile; scutellum brownish black, sides red. Abdomen reddish brown, a broad dorsal stripe and a wide lateral margin on all the segments, dark brown; the third and fourth segments bears a large quadrate central whitish area, the third having anteriorly a black triangle and the fourth a dorsal stripe, dividing it equally and leaving two regular squares; taking both segments together the maculation

resembles a large letter H. Wings hyaline, veins margined with brown. Length, 19 mm.

♂. Face and front reddish brown except the upper triangular portion of the latter which is bright red. Eyes minutely pubescent, ocelligerous tubercle very conspicuous. Pile of the thorax larger than in the female but the stripes less clearly defined. Abdomen a uniform reddish brown and the markings on the third and fourth segments less distinct; the brown margins of the veins are also less pronounced. Length, 17 mm.

The ♀ collected by Mr. Albert P. Morse, at Wellesley, Mass., is in the New England collection of the Boston Society of Natural History. The ♂ marked "N. Y.," (Osten Sacken), is in the Museum of Comparative Zoölogy, Cambridge. This peculiar species, with unicolorous eyes, prominent ocelligerous tubercle, and *non* excised antennae, connects more closely *Therioplectes* and *Tabanus*. Dedicated to Mr. C. P. Whitney of Milford, N. H., an enthusiastic student of the *Tabanidae*.

Anastoechus nitidulus Fabr.

Anastoechus barbatus Osten Sacken, Western Dipt. Bull. U. S. Geol. Sur. III, 252, 1897.

The distribution of this species in North America is somewhat peculiar. Baron Osten Sacken based his description chiefly on specimens from Wyoming, Colorado and California and also records a specimen from Nantucket collected by Mr. S. H. Scudder, the middle of September. Several years ago I received from the late Andrew Bolter for determination a specimen also taken at Nantucket. Specimens have also been collected by Mr. Samuel Henshaw. Recently in going over a collection of Diptera from Mr. A. P. Morse, I was interested in seeing several specimens from Provincetown, Mass., collected Sept. 8, 1890, and Sept. 5, 1891. Aside from the Massachusetts records I know of no other captures east of Wyoming and Colorado. It is apparently common throughout the Rocky Mts. and Pacific States. I have specimens from Phoenix, Ariz., and Ellensburg, Wash., while Messrs. Viereck and Rehn collected it in numbers in the Sacramento Mts., New Mexico. Mr. Coquillett (Trans. Amer. Ent. Soc. XXI 110) considers *A. barbatus* O. S. a synonym of *A. nitidulus* Fabr. of Europe.

Opsebius pterodontinus Osten Sacken, Berl. Entom. Zeit. XXVII. 299, 1883.

Opsebius agelenae Melander, Entom. News, XIII, 180, 1902.

In looking over the collection of insects at the Peabody Museum, Salem, Mass., I was somewhat surprised to see a specimen of this species bearing the following label: "Massachusetts, Packard Coll." The specimen having been exposed to

the light for a number of years, the pile is much lighter than on a specimen in my collection from "N. Ill.," and the abdomen is reddish brown not blackish brown. The wings of the two specimens show a marked difference in venation, the cross vein dividing the first posterior cell is wanting in the specimen from Illinois. Mr. Melander refers to the position of this vein as inconstant. The Massachusetts specimen has the projection on the costa very pronounced, with the sides nearly parallel, apex truncate, edges narrowly margined, and the center hyaline; in the other specimen the projection is conical and the costa more thickened.

The distribution of this rare species, based on six specimens, is as follows: Type from Dallas, Tex., Sept. 20; Austin, Tex., and Rochester, Wis. (Melander); N. Ill. (Bolter), Mass. (Packard). The ♀ is unknown. One of the Texas specimens was found by Mr. Melander entangled in web of *Agelena naevia* Bosc., having apparently issued from the shrivelled spider lying close by. The above synonymy was given by Dr. C. F. Adams in the Kansas Univ. Sci. Bull., XII, 32, 1903.

Acrocera fasciata Wiedemann.

Two specimens which agree in every respect with the brief description given by Wiedemann were bred from *Lycosa stonei* by Dr. T. H. Montgomery, Jr. (Proc. Acad. Nat. Sci. Phila. 1903, p. 68) who refers to the parasites as follows: — "One male and six females died from the effects of an endoparasitic dipterous larva. One spider contained two of these parasites, the others one each. After the parasite, whose bulk nearly equals that of the body of the spider, has eaten away most of the soft parts of the spider, it emerges through a hole it makes in the wall of the abdomen of the spider, and this emergence kills the host. It is strange that these spiders should live so long with such a huge parasite within them. A short time before the parasite escapes the spider acts in a peculiar manner, walking about spasmodically and often spinning aimlessly."

The larva is light yellow, 5 mm. in length, and resembles the figure given by Mr. J. H. Emerton (Psyche V, 404, 1890,) except that is more contracted towards the head, probably due to the alcohol in which it is preserved. The posterior half is globular in form, the anterior half showing quite clearly segmentation, and bear seven short, transverse, blackish, bristly roughened, pseudopodal ridges; on the posterior portion the ridges are usually divided and indicated by two small spots. The mouth parts show a mandibular structure.

The spiders from which Dr. Montgomery bred this species were collected in or near Philadelphia, Pa., and the two flies obtained, measure respectively 4 and 6

mm., a specimen from N. Illinois measures only 3 mm. Wiedemann's specimen came from Georgia. The larva described and figured by Mr. Emerton were taken at Waltham, Mass., in the spring of 1887, from the web of *Amaurobius sylvestris*, but he was unable to raise the adult fly. In May, 1889, he again visited the same locality and found several specimens in abandoned cobwebs and from a pupa succeeded in obtaining a fly of which an excellent figure is given, and I agree with Dr. Williston in referring it to *Acrocera fasciata* Wied.

Oncodes albiventris sp. nov.

Head black, antennae yellow. Thorax and scutellum black, shining, and covered with erect yellowish pile. Abdomen white, and marked with black as follows: — first segment with a large dorsal spot, the other segments with a short transverse basal band, which extends only over the dorsal third, and from which projects posteriorly, except on the last segment, a short dorsal triangle; third and fourth segments with a small spot on each side of the dorsal line near the posterior margin; all the segments with a small lateral triangle, most prominent on the last three segments; venter white, with a single transverse band on the last segment; the entire abdomen sparsely covered with whitish hairs. Legs yellow, coxae and basal half of the femora black, tips of the tarsi brownish. Wings hyaline, veins light yellow, tegulae whitish with a narrow hyaline margin. Length, 5 mm.

One specimen, Toronto, Ontario, Canada, July 18, 1896.

Argyra aldrichi sp. nov.

♂. Face, front and vertex silvery white, the latter about double the width of the face; cilia of the upper orbits black, and of the lateral and inferior orbits white. Antennae black, third joint slightly but evenly tapering to a blunt point, insertion of the arista almost apical. Thorax and scutellum shining green, humeri, pleurae and metanotum thickly covered with a whitish bloom. Abdomen slender, largely yellow, with black hairs, segments 2 to 4, narrowly margined with black, segments 5 and 6 black, with a white basal band; hypopygium black, the base of the small lamellae yellow. Coxae and legs light yellow, with delicate black hairs and bristles, hind tarsi black, outer portion of the front and middle tarsi brownish. Wing tinged with yellowish-gray, end of the fourth longitudinal vein but slightly inflected forward. Length, 5 mm.

One specimen, woods at Goose Neck, Shrewsbury River, near Long Branch, N. J., June 11, 1902.

Resembles *A. calceata* Loew, but the shape of the third antennal joint, and long, narrow abdomen without whitish bloom, distinguish this species. Dedicated to Prof. J. M. Aldrich, who has done so much to further our knowledge of the *Dolichopodidae*.

Platypeza (Calotarsa) ornatipes Townsend.

Calotarsa ornatipes Town., Can. Entom. XXVI, 50, 102; *Platypeza ornatipes* Banks, *l. c.* p. 88; Coquillett, *l. c.* 102; Williston, *l. c.* p. 116; Snow, Kans. Univ. Quar. III, 143, 207; Johnson, Ent. News, VIII, 254.

Among some Diptera collected by Mr. Owen Bryant on board the schooner "Sunshine" five miles east of the Isles of Shoals, Sept. 5, 1903, were thirteen specimens of this interesting species. Only the ♂ is known, and readily recognized by its remarkably exaggerated and elaborate hind tarsi. Later (Oct. 1.) I secured one specimen on the window of the Museum of the Boston Society of Natural History. Described from Illinois, and later recorded from Ithaca, N. Y.; Brookings, S. D., and North Mt., Pa., Sept. 3, 1897; this is the first New England record.

Mr. Bryant also captured on the schooner, associated with the above species, *Platypeza pallipes* Loew, *P. obscura* Lw. and *P. velutina* Lw. Strong westerly winds prior to that date had undoubtedly blown them from the mainland.

On Sept. 24, four specimens of *Platypeza pallipes* were taken on the windows of the Museum; two specimens of *P. obscura* at Auburndale, Mass., Sept. 13, and several specimens of *P. velutina* at Dedham, Cohasset and Auburndale, Mass., Sept. 4–20. The latter species has been bred by Prof. Roland Thaxter from *Agaricus campestris*. The pupa is flat, oval, with jointed thread-like processes on the sides of the segments; the larva is probably very similar.

Alophora magnapennis sp. nov.

♀. Face and front whitish, with white pubescence; vertex and a lunate spot above the base of the antennae brown, from the ends of the latter a brown line extends half way down the face; vibrissae black; antennae brown. Thorax black, prothorax with yellowish pubescence, divided by four black lines (the remainder of the thorax too much disfigured to describe). Abdomen bright red, covered with fine black hairs which are longer on the sides; all the segments bear a pollinose lateral margin. Legs reddish, with black hairs, on the under side of the basal half of the femora the hairs are white. Wings very broad, the costa excessively arcuate, grayish hyaline with dark brown covering the following portions:— the costal cells except a small triangle just before the tip of the first longitudinal vein, outer two-

thirds of the marginal, and the anterior and apical two-thirds of the submarginal cells, from the latter it extends broadly on each side of the apical cross vein, fourth longitudinal and posterior cross vein slightly beyond the fifth longitudinal vein, it also extends inward along the fourth longitudinal and anterior cross vein, leaving only the central portion of the first posterior and the basal posterior half of the discal cell hyaline. Calypteres whitish margined with yellow. Length, 12 mm.

One specimen, Montreal Island, Canada, from Mr. G. Chagnon. Its large size and broad, maculated wings readily distinguish this species.

Identification of Specimens.— The Cambridge Entomological Club is prepared to undertake the identification of adult forms in all orders, free of charge, for paid-up subscribers to Psyche. The privilege of retaining specimens after identification, for insertion in the collection of the Boston Society of Natural History, is reserved. Each specimen submitted should therefore have a label bearing a number or other distinguishing mark, and the sender should keep a memorandum of these labels.

A Department of Bibliography will be instituted in the next number of Psyche. Brief references to current entomological literature will be presented. This department will hereafter be a regular feature of the journal.

ON THE RELATIONS OF CERTAIN MYRMECOPHILES TO THEIR HOST ANTS.

BY CHARLES T. BRUES, COLUMBIA UNIVERSITY, NEW YORK CITY.

WASMANN, to whom we owe the bulk of our knowledge concerning myrmecophiles, divides the series of staphylinid bettles which live with the legionary ants into four biological groups.[1]

These are,

1. MIMICRY TYPE. Including those which mimic, to a greater or less extent, the color, form, actions and other characteristics of their hosts.

2. OFFENSIVE TYPE. (Trutztypus.) Including those not fostered or willingly tolerated by the ants, but living a precarious existence in their nests and only escaping destruction through the ants' inability to capture them.

3. SYMPHILY TYPE. Including those which are tolerated on account of some benefit which the ants derive from them, usually forms with glandular hairs that secrete substances agreeable to the ants.

4. INDIFFERENT TYPE. Less specialized forms whose relations are not so easily interpreted.

It is about the first two types that I desire to confine my present remarks.

We have naturally, not far to seek to find an explanation for the resemblance between the ants and many of their guests. It is evidently advantageous for the myrmecophiles to resemble their hosts in size, form, color, odor and any other attributes which the ants are capable of perceiving. This is, I think, perfectly evident, for all ants show the greatest good will toward the members of their own nest and the more their guests approach their own kind in appearance the more readily they are tolerated.

This applies most strongly to myrmecophiles which depend to a greater or less extent upon concealment for safety. Even in the case of forms which supply pleasant secretions to the ants or are beneficial to them in other ways, it must enter at least to some extent into their relations. Thus protected they may at times either deceive the ants as to their identity and pass unnoticed, or at least attract less notice than if they were entirely different from the ants in appearance. This is evidently the chief value of mimicry to the guests living with ants which can readily discriminate such objects as color and form. Among ants with a keen

[1] Verh. d. deutschen Zool. Ges., 1902. p. 86.

sense of sight then, guests of the mimicry type have probably been developed through a natural selection exercised by the ants of the nest in which they live. This selection tends to produce a convergence of the guests toward the form of their hosts.

In the case of certain blind ants, however, for example members of the genus *Eciton*, the cause for a mimicry of color (and perhaps also form) cannot depend upon the ants themselves, for they cannot see. Recently Wasmann [1] has taken a very peculiar view of this question. In regard to my suggestion (Amer. Nat. XXXVI, 367 (1902)) that the resemblance in color and form of *Ecitonidia wheeleri* Wasm. to *Eciton schmitti* Em. is due to the influence of outside enemies, he thinks that this is untenable. His chief objection with regard to color seems to be that the species of *Eciton* which have no external eyes have no known guests which mimic them in color, while those with rudimentary eyes, *e. g. Eciton schmitti* Em., have. He is evidently unaware of the fact noted by Wheeler [2] that the external eyes of *Eciton schmitti* are mere vestiges which have no connection with the brain, and are hence of absolutely no use! This, then, places *E. schmitti* on the same basis as the other species of *Eciton*, and we cannot say that they exercise any selection over their guests as regards color. The fact still remains that some ecitophiles are similar to the host ant in color while others are not.[3] However, with regard to the species of *Ecitonidia* which I have observed alive with its host ant (*Eciton schmitti* Em.), I am firmly convinced that its color resemblance is wholly for protection against insectivorous animals. No one can observe the files of this ant marching for long distances in the open glare of the Texas sun without being satisfied that color resemblance to its unpalatable host is very necessary to protect it from insectivorous enemies. On the other hand when one sees thousands of these same ants huddled together in a writhing mass in some small cavity under a stone, in company with specimens of *Ecitonidia*, it is hard to believe that the guests' presence is unknown to the ants, or that they could not get rid of them if they attempted to do so.

In spite of their blindness, it is probable therefore that Ecitons with such habits cannot as readily be deceived by a mimic as seeing ants which do not swarm in this manner.

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[1] Zool. Anz. Bd. XXVI, No. 704, p. 581.

[2] Biological Bulletin, III., p. 188. (1902.)

[3] Possibly after the habits of some of the tropical species of Eciton are more carefully studied, reasons for the color difference may become apparent.

NEW ENGLAND RECORDS FOR *ERITETTIX CARINATUS* SCUDDER AND *CONOCEPHALUS TRIOPS* LINN.

BY W. E. BRITTON, NEW HAVEN, CONN.

THE following species of Orthoptera, from the collection of the Connecticut Agricultural Experiment Station at New Haven, the writer believes have not hitherto been reported from Connecticut. Mr. A. P. Morse of Wellesley, Mass. has recently examined the doubtful material which the collection contained in this order, and I am indebted to him for making the determinations.

Eritettix carinatus Scudder.

Two adults: one taken by my assistant, Mr. B. H. Walden, at Southington June 30, 1903, in a dry field of grass and weeds. The other was taken at New Haven, June 16, 1902, by Mr. E. J. S. Moore, a temporary field assistant. Mr. Moore also took half grown specimens on October 31, 1902, at Mt. Carmel, nine miles north of New Haven, and on October 30, and November 2, 1902, at Maltby Park, in the town of Orange about three miles west of New Haven. Mr. Morse states (*in Litt.*) that this is the first New England record for the species.

Conocephalus triops Linn.

A single specimen taken by Mr. Walden in dry open fields near the Experiment Station at New Haven, October 3, 1902. This is the first undoubtedly native example to be recorded.

BOOK REVIEW.

The Orthoptera of Indiana. An illustrated descriptive catalogue of the species known to occur in the state, with bibliography, synonymy, and descriptions of new species. By W. S. Blatchley, State Geologist. Author's separate (Sept., 1903) from 27th ann. rep. dep. geol. and nat. res. Ind., 1902, pp. 123–471 + index, 3 pl., 122 cuts. Indianapolis, Ind.

This is distinctly the best account of the orthopterous fauna of a single state, prepared by a state official, and issued by the state, that has yet appeared, and forms an excellent example for others to follow. A similar work from each of the

larger states is a great desideratum. This is, however, impracticable. Prof. Blatchley has made a special study of the group for a number of years and brings to the preparation of this work experience such as few have and that can be gained in no other way.

The work is practical in plan, clear and simple in diction, attractive, readable, and altogether well adapted for use by the average person seeking information upon the subject. It contains much biological information secured at first hand during an extended experience in the field, and will be found invaluable to any student of the group as found in the central states, and to the special student as well. It contains a map of the state showing where collecting has been done, an introductory chapter on the external anatomy, life history and enemies of orthoptera, a very full bibliography, a brief but adequate glossary, and a chapter on the life zones of the state. Under each species are given its scientific and common names, a brief synonymy with references to the more important literature, its description, distribution, and biology. New species are described in Blattidae, Acridiidae, Locustidae, and Gryllidae. The plates and figures, derived chiefly from other sources, illustrate more or less effectively the more important genera and species, diagnostic characters, etc., and the pink form of a katydid in color.

The typography, though equal to the average in works from such sources, might have been much improved. A few errors and inadvertencies need correction, notably the use of tegmina for tegmen (pp. 135–6) and the repeated misspelling of Dichromorpha.

The chapter on the life zones is the only one which calls for especial remark or criticism here. The statements regarding the sources of the Indiana fauna and the relation of the species composing it to the life zones must be taken tentatively in details until fuller knowledge is available. Though several families of the group, — the Acridiidae in particular — are exceptionally valuable for the study of this problem it is impossible to draw correct conclusions on such points from study of a limited area, and the extralimital distribution of several of the species is widely at variance with the conclusions stated. — A. P. Morse.

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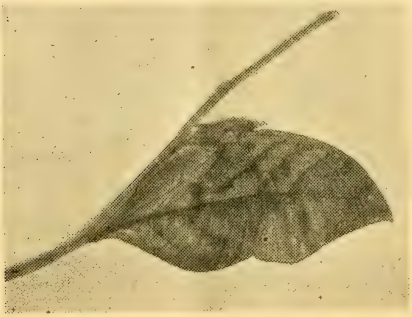

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A Regular Meeting of the Club is held in the Council Room of the Boston Society of Natural History (entrance on Newbury St.) on the third Tuesday of each month except July and August. Meetings begin at 7.45 p. m. Entomologists visiting Boston are cordially invited to be present.

EXCHANGES.

[Exchange notices (not over five lines) inserted free for subscribers. Notices will be inserted in the order in which they are received, and those at the top of the column will be removed only when it is necessary to make room for new ones at the bottom.]

AMARA. Being engaged in the study of this genus, I will determine specimens for collectors. These should be sent numbered. I am also anxious to obtain species in other genera of Carabidae not in my collection, from all parts of the world, and will purchase or exchange for same. Roland Hayward, Readville, Mass.

WANTED.—Eggs, larvae or pupae of grasshoppers, dragon-flies, beetles, bugs, etc. Will give tropical butterflies in exchange. Denton Bros., Wellesley, Mass.

WANTED.—Material for the study of the hybrid or polymorphic butterflies of the genus *Basilarchia*, including larvae or pupae of *arthemis* or *astyanax*, imagos of *proserpina* or *arthechippus*, or any specimens showing unusual characters. Liberal exchange. Specimens retained will be deposited in Museum of Comparative Zoölogy. W. L. W. Field, Milton, Mass.

LEPIDOPTERA—For exchange, fertile eggs of *Hemileuca maia*. Alfred C. Sampson, Sharon, Mass.

I have a few specimens of *C. calleta* and *cinctus* to exchange for rare *Sphingidae* or Pupae of same. W. T. Buxton, 17 Walter St., Somerville, Mass.

WANTED.—Ova, larvae or pupae of *Limenitis ursula* and *arthemis*. Will give cash or exchange H. H. Newcomb, 35 Court St., Boston, Mass.

Will collect Diptera, Hymenoptera, Hemiptera and Coleoptera. Would like in exchange, quantities of named or unnamed Buprestidae, Scarabaeidae, Cerambycidae and Chrysomelidae. Please write immediately to G. Chagnon, P. O. Box 186, Montreal, Canada.

APR 29 1904

PSYCHE.

A FAUNAL AND FLORAL TABULATION-SCHEME.

BY ALBERT P. MORSE, WELLESLEY, MASS.

In olden times learned cartographers drew at the king's command charts of the world as they imagined it to be, and placed thereon quaint representations of the strange creatures of their dreams or of legendary folk-lore handed down from who knows what horizon — dark hints, it may be, of the reptilian age, transmitted through the quivering nerves of fear. When some adventurous savage, wandering in a remote ravine of the unpenetrated fastnesses, first gazed upon the uncouth remains of gigantic monsters of the past emerging from the cliffs, who shall depict his amazement, his unfathomable awe, his naked terror? Who would not dream with him that in the far recesses of that weird land fierce shapes might yet be lurking? Does not the sea-serpent still survive?

Upon those charts mythical creatures flourished; leviathan sported here, behemoth ravened there, dragons of the prime uncoiled their scaly lengths in caverns of the under-world, valkyrs and furies peopled the atmosphere. Later, with increasing travel and observation, these delineations came to present more and more resemblance to the actual realities. Polar bears and elephants, walruses and camelopards, replacing the earlier monsters, frisked amid ice-floes, reveled in the jungle, or galloped over the wide karroo.

Pictures gave place to names of the beasts, strewn across the continents with a careless freedom exceeded only by that of the almanac weather-prophet whose "Signs of a storm" or "Grows milder with occasional showers and sometimes snow" scattered down the page contributes to the gayety of the rural mind.

At length the outline map appeared, tinted over the area known or supposed to be inhabited by a species, an indispensable adjunct to scientific study of the subject. Maps of this kind, illustrating the horizontal or surficial distribution, in regions of simple topography and when drawn on a sufficiently large scale, may represent the zonal distribution as well. But in mountainous regions and areas of complex topography a scale necessary to represent adequately the zonal distribution would often be impracticably large. It is for this purpose, and to facilitate by tabulation the study of faunal components, that I have devised the scheme here described.

The idea underlying it is this: — a combination of zonal and topographical features in a diagram in such manner as to present both the zonal and the approximate geographic distribution of the fauna or flora of a given territory, either past or present, in a graphic way, thereby facilitating the study of both kinds of distribution and the tabulation of results. Diagrams will differ according to the factors involved, — life-zones, societies, etc., on the one hand, and topographic regions, features, etc., on the other, but the plan is capable of wide application. The diagram here shown is designed with especial reference to the United States and Canada.

The seven life-zones (following Merriam) are arranged in a vertical series beginning with the Tropical at the bottom and ascending through the Lower and Upper Austral, Transition, Canadian, and Hudsonian, to the Arctic-Alpine. The meridional extent of the country is divided into an east and west series of regions, ten in number, based on the more salient features of topography, and named, beginning with the easternmost: — Atlantic, Appalachian, East Central, West Central, Plains, Cordilleran, Basin, Sierran, Californian, and Pacific. Each wider region is represented in the diagram by a column made up of a square area in each zone; each narrower region by a narrower column one-half or two-thirds as wide as the former. The tropical zone, being restricted to areas of inconsiderable size in three widely separated regions, — Florida, Texas, and Arizona, — is represented by small squares attached to the Lower Austral zone at the proper points. Subdivisions are indicated in the case of the Gulf strip and Austro-riparian sections of the Lower Austral, and the arid western and humid eastern divisions are separated by a double line.

But little attention relatively has been paid to the zonal distribution of particular groups of insects over a broad extent of country and there is a wide field for records in this line. Desiring to test the practical working and value of this scheme in relation to a group of animals whose zonal distribution has been carefully studied, I have applied it, at the suggestion of Mr. Glover M. Allen of the Boston Society of Natural History, to the genus *Neotoma*,[1] using for comparison a series of tinted maps, with excellent results.

In practical use the diagram is treated like the outline map, a copy being used for each species or variety, and the presence of a species in a given zonal area is indicated by a cross, dash, or other convenient and rapidly made mark (or tint if preferred), the totality of these marks indicating the *zonal distribution* and the *approximate geographical position as well*. This graphic element is believed to be a most valuable feature of this scheme, aiding greatly in the preparation of the

[1] See Dr. Merriam's paper in Proc. acad. nat. sci. Phila., 1894.

slips and in quick apprehension of the results. One has but to make trial of the scheme to be convinced. In tabulating, the slips may be quickly arranged and re-arranged as often and in as many ways as is desired for the purpose of securing facts or of testing hypotheses.

In case but few species are involved a suggestive method is to prepare the diagram on a sufficiently large scale and to place in each area the names of the species and varieties inhabiting it, noting how their distribution agrees with their systematic relationships. If the species are too numerous for names to be used, check-list numbers may be substituted, in different colors for different groups of species.

A more detailed statement of the distribution may be secured by dividing each square area into nine sub-areas (see diagram) and indicating these respectively, according to points of the compass, as central (C), north-central (NC), northeast (NE), east-central (EC), etc., parts of the area; N, E, S, and W indicating the series of three sub-areas in those portions of each area, MC for the meridian central or median series and ZC for the parallel or zonal central series. If preferred for the sake of brevity, instead of letters, these sub-areas could be indicated by numbers (arranged vertically, so that sub-areas bearing the same number would have the same relative position in wide and narrow areas).

nw	ne	nw	n	ne	1	4	7							n
wc	ec	wc	c	ec	2	5	8		w		mc		c	zc
sw	se	sw	s	se	3	6	9							s

A further step would be the use of abbreviations or other symbols for the zones and regions, enabling the distribution to be expressed by formulae: — thus the zones may be indicated by Roman numerals, I to VII, upward from the Tropical; and the regions by A, B, C, etc., (perhaps omitting I, owing to its use for the tropical zone), beginning on the Atlantic side, or the Pacific, as seemed preferable. Thus the distribution of a species known only from the upper Austral zone of eastern Nebraska would be represented by III G 5 (or III G c). The use of numerals would be preferable for brevity, letters would aid the memory. In the narrower areas, having their greatest extent from north to south, an east and west division into but two series of six sub-areas would probably be preferable to one of three series of nine. This sub-division could be carried to a much greater extent if found advisable.

Let us glance at another possibility. Suppose it were desired to make a study of the distribution of the 11,000 beetles of North America, or, indeed, of the entire fauna and flora of the country, with details of distribution of each of its component groups: — by using punched cards (instead of marked or tinted slips) in an auto-

matic tabulating machine the utmost accuracy and despatch could readily be secured.

Copies of the diagram as given in the accompanying plate will be furnished at cost, per 100 or more, to any one desiring to use them. Should the demand warrant so doing, arrangements will be made for its use with a tabulating machine.

THE ORDERS OF INSECTS, BY A. E. SHIPLEY, *Zoologischer Anzeiger*, XXVII, 259.— The author has made several changes and suggests seven new names, which "if adopted would give an uniform termination to all the twenty-two Orders which are now recognized in the class Insecta." The new classification is as follows: —

		Name suggested.	Old name.
Apterygota	1.	Aptera	Thysanura
	2.	Apontoptera, new name.	Collembola
Anapterygota	3.	Lipoptera, new name.	Mallophaga
	4.	Ellipoptera, new name.	Anoplura
	5.	Aphaniptera	Siphonaptera
Exopterygota	6.	Orthoptera	Orthoptera
	7.	Plecoptera	Perlidae
	8.	Psocoptera, new name.	Psocidae
	9.	Isoptera	Termitidae
	10.	Embioptera, new name.	Embiidae
	11.	Ephemeroptera, new name.	Ephemeridae
	12.	Paraneuroptera, new name.	Odonata
	13.	Thysanoptera	Thysanoptera
	14.	Hemiptera	Hemiptera
Endopterygota	15.	Neuroptera	Neuroptera
	16.	Mecaptera	Panorpatae
	17.	Trichoptera	Trichoptera
	18.	Lepidoptera	Lepidoptera
	19.	Coleoptera	Coleoptera
	20.	Strepsiptera	Strepsiptera
	21.	Diptera	Diptera
	22.	Hymenoptera	Hymenoptera

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE. — LIII.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Eustroma nubilata Packard.

Egg. Elliptical, flattening, depression and truncation all slight and rounded; uniformly and neatly hexagonally reticulate, the lines narrow, moderate, distinctly raised, a little waved and not rigid, suggesting the stellate sculpture. Pale yellow, turning red; size .8 × .6 × .5 mm.

Stage I. Head rounded, erect, pale whitish with numerous black dots, mouth brown. Body moderate, slender, finely annulate, feet normal, no shields. Pale whitish; a broad gray smoky subdorsal band, faint, clouded; similar but narrower subventral and medio-ventral ones, waved, clouded. Tubercles small, conical, brown; setae club-shaped, short, pale.

Stage II. Head squarish bilobed, sordid white, thickly checkered with black, leaving a pale streak on lobe above; width, .6 mm. Body cylindrical, moderate, sordid greenish white with waved brown lines. Dorsal line straight, expanded on the anterior edges of the segments; subdorsal straight above, subconfluent with the waved lateral line below, forming loops about tubercle iii; traces of upper subventral and broad lower subventral bands. Tubercles small, black, raised; setae short, brownish; thoracic feet brown-black, abdominal ones blackish bordered outwardly.

Stage III. Head bilobed, free, pure white with contrasted black angular dots filling the median suture broadly and covering the sides of the lobes, leaving a short streak above, the area about eyes and clypeus white; width .85 mm. Body moderate, normal, gray from blackish streaks and lines heavily overlaid on a whitish ground. Tubercles white, round, ii and iv large and prominent, the others comparatively inconspicuous. Segments finely annulate posteriorly. Feet pale, dotted with black. No distinct lines; dorsal line narrow, dark; traces of waved subdorsal and lateral white; subventer and venter with broader pale lines. Setae from black hair dots, pale brown, thick, flattened at tip. Later the black marks become reddish brown, a pale white streak is about tubercle ii and a black shade at tubercle iv.

Stage IV. Head white with black dots as before but thicker, covering most of the surface except a narrow streak across lobes to clypeus; width 1.4 mm. Body moderate, flatly outstretched, sordid gray; tubercle ii white, contrasted, an oblique pale shade from it down and anterior, to the pale subventral area. Other tubercles white, less conspicuous, iv with a black circle. The ground color is dotted with blackish and white, indicating waved subdorsal and lateral lines. Feet gray and blackish, the anal pair large, triangular, with a white line before. Setae short, thick, somewhat club-shaped, pale.

Larvae from Kaslo, British Columbia; they fed on *Epilobium*.

SPRING MOTHS, AND HOW TO CATCH THEM.

BY E. J. SMITH, NATICK, MASS.

THE moths of spring may be taken in three different ways. First, by going out at night with a lantern, and examining the blossoms of the "pussy willow": second, by tapping trees (especially sugar maples) and examining them by lantern light; and thirdly, by the use of a trap lantern. The first two methods are of use only for a short time in spring, but the last is equally good during the whole season. The early moths are mostly too sluggish to come to light in any numbers, but are attracted to willow blooms, and to the fresh sap of maple or birch trees in quantities; they will not fly away when disturbed, but will let go their hold and drop quietly into a jar or box held beneath them.

When feeding on sap the moths will often drop to the ground and feign death if the light of the lantern strikes them, and if there is any grass at the foot of the tree they are very hard to find. To avoid this difficulty, and turn the habit of the moths to my advantage, I take a hoe and scrape the ground bare for a space of two feet or more around the base of the tree, and beat it down smooth and hard. Then when the moths drop they are very easily seen, and can be picked up with forceps and dropped into a cyanide jar.

The moths which come to maple sap begin to fly very early in spring, usually by the third week in March if the weather is mild. The principal ones to be got in this way are species of *Xylina*, *Calocampa*, and *Scopelosoma*: occasionally one finds also *Pachnobia salicarum*, *Taeniocampa alia*, and *Jodia rufago*. Afterward the same species are to be found on the willow blossoms, together with *Taeniocampa subterminata*, *Homoglaea hircina*, *Nyctobia fusifasciata*, and others.

A little later the trap lantern will give the best results. In Entomological News for September, 1902, I gave a description of my lantern and method of using it, and Mr. Slingerland has given a very interesting account of his experience with trap lanterns in Bulletin 202 of Cornell University Agricultural Experiment Station. Briefly described, the lantern I use is a square box of wood with sides of glass, having top and smoke pipe similar to the old style street lanterns, and having holes at the bottom for ingress of air. The box must be large enough to contain an ordinary kerosene lamp with chimney, and is to be supported over a zinc lined wooden box about 16 inches square and 3 inches deep. In this latter box I place water and kerosene in equal parts, to a depth of about two inches. I obtain better results with such a combination than with the slight film of oil usually employed.

The moths fly to the light, and on striking the glass drop into the kerosene and sink as far as the water, where they float, and are thus out of the way of the next comers. The water keeps them out of contact with any dirt which may be at the bottom. In the morning I take the moths out by the legs with a pair of fine-pointed forceps, lay them on several thicknesses of old newspaper in the bottom of a good-sized pasteboard box, and leave them for a few hours to get rid of the bulk of the oil; then soak them in gasolene for several hours. When removed from the gasolene and laid on blotting paper to dry they soon appear as fresh and clean as though never wet. I have taken in this way about five hundred species. Below is a list of those taken during the spring months.

March 30.

Homoglaea hircina.

April: first half.

Copipanolis cubilis, *Eutolype rolandi*, *Psaphidia resumens*, *Pachnobia salicarum*, *Calocampa nupera*, *Nyctobia fusifasciata*, *Paleacrita vernata*, *Phigalia titea*, *Xylina* and *Scopelosoma*, several species.

April: second half.

Calocampa curvimacula, *Drasteria*, 2 species, *Lycia ursaria*, *Eutrapela alciphearia*, *Azelina peplaria*, *Abbotana clemataria*, *Celama triquetrana.*

May: first half.

Apatela xyliniformis, *A. oblinita*, *Crocigrapha normani*, *Phoberia atomaris*, *Ypsia undularis*, *Melalopha albosigma*, *Mesoleuca intermediata*, *Orthofidonia vestaliata*, *Homochlodes fritillaria*, *Anagoga occiduaria*, *Plagodis keutzingi*, *Hyperitis amicaria*, *Metanema quercivoraria.*

May: second half.

Deidamia inscriptum, *Sphinx gordius*, *Automeris io*, *Estigmene acraea*, *E. congrua*, *Isia isabella*, *Diacrisia virginica*, *Apantesis virguncula*, *A. rectilinea*, *A. arge*, *A. phyllira*, *A. phalerata*, *Arsilonche albovenosa*, *Balsa malana*, *Caradrina miranda*, *Hyppa xylinoides*, *Euplexia lucipara*, *Actinotia ramosula*, *Feltia volubilis*, *Mamestra detracta*, *M. grandis*, *M. rosea*, *Ulolonche modesta*, *Heliophila luteopallens*, *H. albilinea*, *H. multilinea*, *Graphiphora oviducta*, *Gortyna u-album*, *Euthisanotia unio*, *Autographa simplex*, *Abrostola urentis*, *Ogdoconta cinereola*, *Marasmalus ventilator*, *Eustrotia concinnimacula*, *Tarache candefacta*, *Euparthenos nubilis*, *Parallelia bistri-*

aris, Zale horrida, Ypsia aeruginosa, Homoptera unilineata, Melalopha inclusa, Nerice bidentata, Schizura unicornis, Endeilinea herminiata, Drepana arcuata, Falcaria bilineata, Eucymatoge intestinata, Euchoeca cretaceata, Hydriomena multiferata, Cosymbia lumenaria, Chlorochlamys chloroleucaria, Aplodes mimosaria, A. rubrifrontaria, Deilinea variolaria, Sciagraphia heliothidata, Lycia cognataria, Gonodontis duaria, G. obfirmaria, Euchlaena marginata, Metanema textrinaria.

[Mr. Smith's collecting is done at his home in Sherborn, Mass., near the Natick line. The locality is in a farming community (street-lights absent) and presents the usual diversity of environment characteristic of the sand-plain area of eastern Massachusetts: — orchards, fields, gardens and shade-trees; gravelly plains and ridges sloping down into sedgy meadows through which wind sluggish, alder-fringed streams; peat-bogs, bushy swamps, and woodlands consisting now chiefly of a young growth of deciduous trees but formerly containing large tracts of white pine. The elevation is about 170 feet, dropping to 140 at the streams, and rising to 260 or even 400 at distances of half a mile to a mile and a half in boulder-strewn hills of unmodified drift, with occasional outcrops or of drumlin formation. A. P. M.]

Change of Marking in the Males of a Spider (*Pellenes cristatus*). The peculiar markings of the male appear in many species of spiders after the moult before the last when they are not more than half grown, and after the last moult these markings become more distinct and deeper in color. In *Pellenes cristatus*, however, the young male before the last moult has a bright red spot on the front of the head below the eyes which disappears entirely when it becomes adult. I first noticed these spiders in the autumn of 1901 in their silk nests under sticks on the edge of the salt marshes at Ipswich, Mass. In the following spring Mr. G. W. Peckham visited Boston and he and I went on June 17 to the same place at Ipswich where we found again the young males with red faces and with them adult males with black faces and dull gray and drab markings. We thought at the time that the young males were *Pellenes caecutus*, a common species south of New York in which the face has a similar red spot both in young and adult males. Mr. Peckham afterward identified the black males as *Pellenes cristatus* supposed to be the same species as *Attus cristatus* described by Hentz.

In the spring of 1903 I went to the shore earlier in the season and about the first of May found the black males abundant in the dead grass washed up by the tide along the edges of the marsh and with them an occasional young male with a red spot on the face. I took these home alive and one of them soon moulted and came out a black male *P. cristatus* without any trace of the red marking.—*J. H. Emerton.*

ADDITIONAL NOTE ON NEMOTELUS.

BY A. L. MELANDER, PULLMAN, WASH.

It not infrequently happens that two entomologists publish independently on a certain subject. When the same species are simultaneously described in different journals there may be considerable doubt as to which name shall be used as it is often difficult to determine the exact date of publication of the descriptions.

In this way Dr. C. F. Adams and myself chanced to describe several species of the dipterous genus *Nemotelus*, Dr. Adams' paper appearing in the Kansas University Science Bulletin for November, 1905, page 221, and mine in PSYCHE in the number for October–December, 1903, pages 171–183. The two species described by Dr. Adams, *kansensis* and *abdominalis*, when judged by their descriptions certainly seem identical with two species described by me, *bellulus* and *trinotatus*.

Through the kindness of Dr. Adams I have secured typical specimens of his species and find characters not mentioned in the diagnoses by which the species can be separated. For the convenience of the future student these are given herewith.

Nemotelus abdominalis Adams.

Female: rostellum more elongate and conical than in *bellulus*, extending beyond the base of the antennae two-thirds their length. Abdominal marks extending half way into the segments. The pale fasciae of the abdomen are of the paired type mentioned in my analytical key, but are subconfluent medially and thus present the appearance of a transverse band. Length 4 mm.

Male: Rostellum projecting two-thirds the distance to the tip of the antennae: eyes contiguous for less than half their diameter, and evidently impressed along their line of contiguity: front tibiae with a narrow dark ring in the middle.

Nemotelus bellulus Melander.

Female: Rostellum shorter, beak-like, *i. e.*, bent downward at tip, reaching about half way to the end of the antennae: pale marks of abdomen marginal. Length 3–4 mm.

Male: Rostellum very short: eyes contiguous about half their diameter, and

less impressed, although more so than in *Wheeleri* Mel.: front tibiae with a suffused broad dark band.

The females of *kansensis* and *trinotatus* and markedly alike, but the males are entirely different. Dr. Adams suggested in a letter the possibility of a species with dimorphic males, but a close study reveals characters by which the females can be recognized, which indicates that there are two distinct species. The differences in the extent of the color markings of the abdomen and legs are not of value in separating these species. The characteristic differences between the two species may be stated thus:

Nemotelus kansensis Adams.

Female: 5.5 mm. Rostellum projecting beyond the eye more than the horizontal diameter of the eye: proboscis geniculate a little before the middle.

Nemotelus trinotatus Melander.

Female: Length 4.5 mm. Rostellum projecting not more than the diameter of the eye: proboscis geniculate at the middle.

The male of *kansensis* is at once distinguished from all the other species by the single conspicuous black fiscia on the fifth abdominal segment. *Slossonae* Johnson and *flavicornis* Johnson, the only other species with a black fascia so placed, are of small size and have the fourth segment also blackened. Moreover in these species the third vein is simple.

A Dipterous Parasite of the Box Turtle.— In Psyche, Vol. V, page 403, Dr. Wm. M. Wheeler mentions several cases of finding larvae of dipterous flies of the genus *Sarcophoga* in tumors in the skin of the Box Turtle. On July 28, 1902, I found another case of the same kind at Cold Spring Harbor, Long Island, N. Y., near the biological laboratory. The turtle had a swelling about an inch in diameter on the left side of the neck with a small opening directed forward that was usually nearly closed but could be easily stretched to quarter of an inch in diameter. Five larvae were taken out through this opening with forceps, one dead and partly decayed, the others alive and full grown. Placed in bottles with moist earth they buried themselves within a few hours. On July 31 one of them had pupated and the fly came out August 17. It is plainly a *Sarcophoga* but has not yet been examined by anyone familiar enough with this genus to determine the species. The fly and one of the larvae are in the Museum of Comparative Zoölogy in Cambridge, Mass.— *J. H. Emerton.*

WHEN TO COLLECT TABANIDAE.

BY CHARLES W JOHNSON, BOSTON, MASS.

WHILE the Tabanidae are to be found in considerable numbers during the late spring and throughout the summer, there is generally a certain time when they are unusually abundant. This depends to a great extent on the latitude. In Florida they are most numerous during the latter part of May and stock suffer severely unless protected. The most characteristic species of this region are *Tabanus trijunctus* Walk., *T. mexicanus* L., *T. fuscopunctatus* Macq., and *T. megerlei* Wied., while *Diachlorus ferrugutus* Fabr. is often very annoying.

In Georgia and the Carolinas they are more abundant during the first two weeks of June, the species more or less confined to this section being *T. turbidus* Wd., *T. fronto* O. S., *T. endymion* O. S., *T. tenera* O. S., and the two black species *T. lugubris* Macq., and *T. wiedemanni* O. S. During the latter part of June while cruising along the west side of the Chesapeake Bay in search of miocene fossils I found Tabanidae very plentiful.

But the principal captures I wish to record were those made at Riverton, N. J. On July 4, 1902, it was my good fortune to run across a gentle cow that was tethered on a low piece of land near a creek with springs and a pond in close proximity, an ideal breeding place for Tabanids, and the day, an ideal one for the imagos. The cow was the center of attraction. I was her friend and she seemed to understand thoroughly what I was doing. In about two hours I had captured 12 species and 98 specimens of the genus *Tabanus*. On the 6th I again visited my pet cow and was rewarded by two additional species, and 102 specimens, divided among the following species:

T. trimaculatus Pal.-Beau.	29	*T. fulvulus* Wied.	3
T. pumilus Macq.	18	*T. lineola* Fabr.	3
T. sparsus Whitney	16	*T. coffeatus* Macq.	2
T. trispilus Wied.	9	*T. costalis* Wied.	2
T. nivosus O. S.	8	*T. recedens* Walk.	1
T. stygius Say.	5	*T. lasiophthalmus* Macq.	1
T. superjumentarius Whit.	4	*T. cinctus* Fabr.	1

During the summer of 1903 I was equally fortunate in finding another gentle cow at Auburndale, Mass., but at no time did I find Tabanids very numerous. The following is a list of the species taken: — *T. hinei* Johnson, *T. superjumentarius*, *T. lineola* and *T. pumilus*, on July 12; *T. coffeatus*, *T. stygius*, *T. atratus* and *T. sparsus*, on August 2.

EFFECTS OF DEFOLIATION BY CATERPILLARS ON TREE GROWTH.

BY F. H. FOSTER, CLAREMONT, N. H.

In the year 1897 *Clisiocampa disstria* appeared in parts of Central and Western New Hampshire in great numbers and caused serious damage to forest and shade trees, especially to sugar maples. The insects appeared in still greater numbers in 1898 and 1899, when many trees in the infested districts were completely defoliated. Many old trees were killed outright and others fell into a state of hopeless decrepitude.

At the request of Mr. W. F. Fiske of the Entomology Division of the U. S. Department of Agriculture, who at the time of the *Clisiocampa* outbreak was assistant Entomologist at the New Hampshire Experiment Station, and who spent some time in studying the parasites of this insect, the writer recently procured a section of the trunk of a live sugar maple about eight inches in diameter which disclosed some interesting history.

The sugar orchard from which this specimen was taken had suffered very severely. Many trees in it have died and been cut up for fuel.

The last four annular rings in this tree corresponding to the seasons of 1900, 1901, 1902 and 1903 were the thickest rings in the tree, averaging one eighth inch making a total increase in diameter for the four years since the abatement of the *Clisiocampa* pest, of one inch. The rings next preceding, however, corresponding to the years of more or less complete defoliation, were thinner than any others in the tree and were somewhat indistinct and confused, suggesting a doubling more or less perfect of the rings in those years.

This doubling might be the result of a checking of the growth during early summer followed by another period of formation of wood tissue in late summer when the tree had put forth another partial crop of leaves. Allowing two of these rings for a year, the section plainly shows that the amount of wood formed annually during the years of the pest (1897, '98 and '99) was less than half the amount formed in the succeeding years or with two or three exceptions in any of the preceding fifty or more years of the trees' existence. Many trees in this orchard showed damage by borers, but the one examined was selected for its apparent freedom from injury from this cause in order not to have the case complicated by damage from other causes than *Clisiocampa disstria*.

SOME OF THE DIPTERA TO BE COLLECTED DURING APRIL AND MAY.

BY C. W. JOHNSON, BOSTON, MASS.

THE Diptera is one of the first orders to appear in considerable numbers in the early spring, and during the months of April and May many species occur which are not to be found at any other time. A number of peculiar *Mycetophilidae*, *Chironomidae*, and *Tipulidae* are to be found, while the *Bibionidae* are especially numerous during the first two weeks in May. *Bibio albipennis*, *B. femorata*, *B. pallipes* and *Dilophus breviceps* are frequently taken as early as the middle of April. The two sexes vary considerably and a comparative study of the spring and fall species is desirable.

In the *Leptidae* are many exceedingly interesting species, and the life history of most of them can be very readily studied. *Xylophagus lugens* appears about the middle of April, the larva can be found beneath the bark of decaying chestnut and oak. The only New England record for *X. abdominalis* is of a specimen bred from a larva found under bark by Mr. A. P. Morse, at Wellesley, Mass., April 15. *X. rufipes* and *X. longicornis* are recorded from New England without date. *Leptis plumbeus* should be found early in May about stumps and trees, followed a little later by *L. punctipennis* and *L. mystacea*. The species of *Chrysophila* rarely make their appearance before the first of June.

Many species of *Stratiomyidae* are to be found during May, *Actina viridis*, *Microchrysa polita*, and *Sargus viridis*, while *Stratiomyia discalis*, *Odontomyia interrupta* and *O. pubescens* frequent the flowers of the *Amelanchier canadensis* and *Pyrus arbutifolia*. Very few of the *Asilidae* make their appearance before June. *Nicocles politus* Say, recorded from Mass., was taken by the writer Apr. 15, in southern New Jersey, two or three species of *Crytopogon* are to be found in May, also *Daulopogon tetragrammus* and *D. terricola*. The latter has been collected at Chicopee, Mass., May 24.

Some of the most interesting forms of spring flies belong to the genus *Bombylius*. *B. major* is frequently found as early as the middle of April, and *B. pygmaeus* and *B. atriceps* about the middle of May. *B. pulchellus* should also be found in New England; it is taken in the vicinity of New York city from May 10–20. The *Empidae*, one of the families of smaller flies, contains a number of species which are quite common throughout the month of May.

In the family *Syrphidae* are many rare and interesting forms, which are only

taken at this time. The plum, sand myrtle (in southern New Jersey) willow and other early spring flowers, and the sap of maple, birch, etc., usually attract them in considerable numbers. *Chrysotoxum pubescens*, several species of *Pipeza*, *Chilosia*, *Syrphus* and *Sphegina* are to be found at this time, *Brachyopa vacua* frequents sap early in May, while several species of *Eristalis* and *Helophilus* frequent the early flowers. The large *Criorhina verbosa* was taken as early as March 30 (1902) at Medford, Mass., by Mr. C. A. Frost. *C. umbratilis* and *C. analis* are sometimes found in May but more commonly early in June. *Brachypalpus frontosus* often appears early in April.

Myopa vicaria and *M. vesiculosa* of the family *Conopidae* are to be found on flowers, especially the plum. In the *Tachinidae* many species appear quite early but almost all of them are to be found later. *Anthomyidae* are quite common, while the graceful *Cordylura* and the pretty winged *Tetanocera* are frequently taken. During the latter part of May those interesting Ortalids, *Pyrgota undata* and *P. valida* are to be found. Many *Sapromyzidae*, *Oscinidae* and *Ephydridae* may be collected by sweeping over the grass or in damp sheltered places for the latter. By far the most interesting species is the little "hammer headed fly" (*Sphyracephala brevicornis* Say) which is often taken on the leaves of the "Skunk cabbage" as early as April, although found much later. I captured a specimen at the Blue Hills, Mass., June 6.

The spring of the year is a good time to work out (in part) the life history of many species, the strange larvae one finds in old stumps, logs, or under stones, if taken carefully and kept under like conditions usually pupate in a short time and in a few days the imago appears. Notes and drawings should be made, or specimens of the larva and pupa, if you have duplicates, should be saved.

MEROPE TUBER. I am able to add another to the sixteen records given by Mr. Herbert S. Barber, in his interesting paper on the "Occurrence of the earwig-fly, *Merope tuber* Newman." (Proc. Entom. Soc. Wash. VI, 50). This specimen, a male, is in the local collection of the Wagner Free Institute of Science, Philadelphia. It was captured several years ago by Mr. Philip Nell, in Fairmount Park.— *C. W. Johnson.*

PELECINUS POLYTURATOR Drury. Two males of this species were collected in 1902 by Mr. Owen Bryant, at Cohasset, Mass. Mr. Bryant has presented them to the "New England collection" of the Boston Society of Natural History.— *C. W. Johnson.*

RECENT ENTOMOLOGICAL LITERATURE.

Asterisks indicate descriptions of new species of American insects, or of new genera.

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Banks, N. Notes on entomology, 68 Mar. 18.

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Brainerd, Dwight. Miscellaneous notes (inflation of caterpillars, etc). 4 Feb.

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Goury, G., et Guignon, J. Les insectes parasites des Renonculacées, 65 Mar.

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Howard, L. O. Sending insects through the mails, 5 Jan.

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Robertson, Chas. Synopsis of *Anthophila*, 4 Feb.
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Viereck, H. L. A handsome species of *Tachysphex* from Arizona,* 5 Mar.
Viereck H. L. *Thyreopus latipes*, 4 Feb.
Viereck, H. L. Two new species of the bee genus *Perdita* from Indiana and New Jersey,* 5 Jan.
See also under The General Subject: Anon., Castle.

PROCEEDINGS OF THE CLUB.

The Annual Meeting of the Cambridge Entomological Club was held in the Council room of the Boston Society of Natural History on the evening of January 19, 1904; President Morse in the chair; 17 members present. The record of the last meeting was read and accepted. Mr. Field presented a final report on the finances of the Harris Club. On motion of Mr. Newcomb it was voted to sell the library of the Harris Club at auction at the next meeting. The report of the Secretary for the year just closed was read and accepted. The report of the Treasurer was read, and the Chair appointed Messrs. Bolster and Bowditch to act as auditors. Mr. Samuel H. Scudder was unanimously elected to Life Membership in the Club. Mr. Hayward called attention to the fact that the Club's age was just thirty years and ten days, the first meeting having been held January 9, 1874.

The report of the nominating committee was presented and accepted, and the Club voted to instruct the Secretary to cast one ballot for the entire ticket. The officers thus chosen for the ensuing year are: President, J. H. Emerton; Secretary, W. L. W. Field; Treasurer, Roland Hayward; Members at large of Executive Committee, P. G. Bolster, H. H. Newcomb.

The announcement was made that hereafter until further action of the Club in the matter of the annual assessment of active members, each active member not in arrears should be entitled to receive PSYCHE regularly, and be reckoned a paid-up subscriber to that journal.

Mr. W. L. W. Field then exhibited specimens of *Basilarchia proserpina*, *B. arthechippus*, and other puzzling forms in the same genus, and called attention to the need of further study of these butterflies. Mr. H. H. Newcomb followed with a very interesting talk on *B. proserpina*, in the course of which he showed some unusual specimens.

It was agreed that a special meeting should be held on the evening of February 2. Adjournment was reached at 9.35.

A special meeting of the Club was held in the Council room on the evening of February 2, 1904. Ten members were present. The President being late, Mr. Morse was elected temporary Chairman. The record of the last meeting was read and accepted.

Mr. Newcomb showed some Mt. Washington material received from Mrs. Slosson, and also a series of specimens which he had prepared for the New England collection of the Boston Society of Natural History. Mr. Field showed a series of *Basilarchia arthemis* from Alstead, N. H., and a specimen of the same species from Milton, Mass. Mr. Morse showed a fine series of *arthemis* and *proserpina*, arranged in a case of the kind invented by himself, and described in the Journal of the N. Y. Entomological Society, vol. IV., p. 20. Mr. Newcomb read a letter from Dr. Seifert, setting forth the writer's views on the relationship of *Basilarchia proserpina* to *astyanax* and *arthemis*.

The books formerly belonging to the Harris Club were sold at auction by Mr. Newcomb.

The meeting was then adjourned.

The 234th regular meeting was held in the Council Room of the Boston Society of Natural History on the evening of February 16, 1904. Eight members present. In the absence of the President Mr. Johnson was appointed Chairman.

The record of the last meeting was read and approved. Mr. F. H. Foster of Claremont, N. H., was unanimously elected to Associate membership. Mr. Morse then gave a most interesting account of his recent collecting trip through the southeastern states. Discussion followed, after which the meeting was adjourned.

W. L. W. Field,
Secretary.

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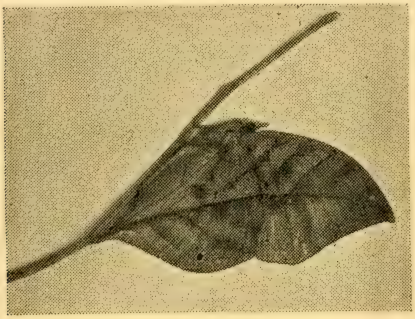

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EXCHANGES.

[Exchange notices (not over five lines) inserted free for subscribers. Notices will be inserted in the order in which they are received, and those at the top of the column will be removed only when it is necessary to make room for new ones at the bottom.]

AMARA. Being engaged in the study of this genus, I will determine specimens for collectors. These should be sent numbered. I am also anxious to obtain species in other genera of Carabidae not in my collection, from all parts of the world, and will purchase or exchange for same. Roland Hayward, Readville, Mass.

WANTED.—Eggs, larvae or pupae of grasshoppers, dragon-flies, beetles, bugs, etc. Will give tropical butterflies in exchange. Denton Bros., Wellesley, Mass.

WANTED.—Material for the study of the hybrid or polymorphic butterflies of the genus *Basilarchia*, including larvae or pupae of *arthemis* or *astyanax*, imagos of *proserpina* or *arthechippus*, or any specimens showing unusual characters. Liberal exchange. Specimens retained will be deposited in Museum of Comparative Zoölogy. W. L. W. Field, Milton, Mass.

LEPIDOPTERA—For exchange, fertile eggs of *Hemileuca maia*. Alfred C. Sampson, Sharon, Mass.

I have a few specimens of *C. calleta* and *cinctus* to exchange for rare *Sphingidae* or Pupae of same. W. T. Buxton, 17 Walter St., Somerville, Mass.

WANTED.—Ova, larvae or pupae of *Limenitis ursula* and *arthemis*. Will give cash or exchange H. H. Newcomb, 35 Court St., Boston, Mass.

Will collect Diptera, Hymenoptera, Hemiptera and Coleoptera. Would like in exchange, quantities of named or unnamed Buprestidae, Scarabaeidae, Cerambycidae and Chrysomelidae. Please write immediately to G. Chagnon, P. O. Box 186, Montreal, Canada.

JUN 27 1904

PSYCHE.

EARWIGS (*ANISOLABIA MARITIMA* BON.).

BY CHARLES BARROWS BENNETT, PROVIDENCE, R. I.

In the summer of 1901 I found a place near Cold Spring Harbor, N. Y., where there were many earwigs. As these insects are rather rare in New England, I watched them as much as possible, and also captured several, from which others were reared.

The Eggs and Young.

Eggs were laid mainly in the warmer months of July and August, and only a very few after the middle of September. When first laid the eggs were almost two millimeters (about one-sixteenth of an inch) in length, were cylindrical in form, and white, and covered with an almost transparent, glossy shell. (See Figure 1, e.) At first the color of each egg was uniform throughout, and its shape was regular. After some days the contents became separated into a clearly outlined embryo and a colorless liquid. The embryo was of a crescent shape and the side of the egg on which it was became a little larger and less regular than at first. After about seventeen days — although the time varied with varying conditions of temperature, humidity, etc.— the young emerged from the egg. Their length at that time was seven and a half millimeters (about five-sixteenths of an inch), not including the length of the antennae. (See Figure 1, d.) They had, even then, forceps, or nippers, shaped like those of the adult female, although, of course, much smaller in size. At this stage the antennae were longer in proportion to the length of the body than they were in the adult. In a few other points also the young differed slightly from the adult, but for the most part they resembled them in miniature. Their color when newly hatched was almost white, but soon became almost black above and brownish below, the same as that of their parents.

Growth and Development.

I was not able to ascertain positively how many times the young earwigs shed their skins; it was probably four times. The fact that the general characteristics remained the same until the last change, together with the fact that they speedily devoured their own cast-off skins, made it difficult to be sure, at times, whether or

not a change had been made. The last change, I think, was usually made in the spring following the year in which the eggs were hatched; that is to say, they usually winter in the nymph stage. In confinement, however, I have had them winter also in the adult stage.

All the young up to the last nymph stage have ten plates, or tergites, on the

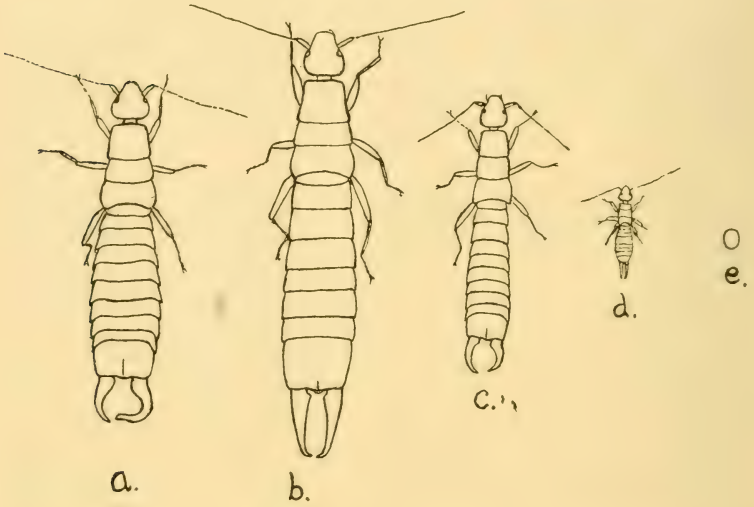

Fig. 1

dorsal surface between the last pair of legs and the terminal forceps. In the last part of the nymph stage, however, some of the females have only nine plates fully showing, with just the tip of a tenth. I found that this was due to the fact that the plate next to the last — that is, the ninth — gradually slid under the one anterior to it — or the eighth — until it was nearly lost to sight. No male earwig that I have ever seen had this peculiarity.

Adults.

The females, after they have shed their skins for the last time, have only eight plates on the upper side of the abdomen. The easiest way, therefore, to distinguish the adult female from the young is to count the number of its plates; for the general shape both of the body and of the forceps is essentially the same in both. The case of the males is different. Although until the last change of skin their forceps were not distinguishable from those of the adult females or the young of either sex, after that the forceps were much more curved. (See Figure 1, a, b, and c; a and c are adult males, and b is an adult female.) Their plates also, after this last moult, seemed to overlap each other along the sides of the abdomen to a greater extent than did those of either the females or the young. The posterior end of the abdomen seemed broader in proportion to the size in the male adults than in the other sex or in the younger earwigs. The abdominal plates also remained ten in number, as in the nymph stage. The legs of both male and female adults were of a uniform tan color, while those of the young were generally more or less dotted with black. Female adults are, as a rule, longer and otherwise larger than the males. The size of the full-grown insects which I have seen varied from almost sixteen millimeters (five-eighths of an inch) to nearly thirty-five millimeters (about one and three-eighths inches), not in either case including the length of the antennae. I have not been able to ascertain the length of life of earwigs when wild, but one which I still have in confinement has lived about twenty-one months. The females were three or four times as numerous as the males.

Hardiness.

Earwigs seem to be capable of great endurance. They are accustomed to live near water, and when disturbed they frequently enter the water. One of them remained under water for an hour and five minutes or more when disturbed above water. It showed little sign of being weakened by its experience. They are capable of recovery from quite serious injuries. Once when an earwig was by accident nearly torn in two just below the last pair of legs, and was consequently paralyzed for a while in one leg and most of its abdomen, I pushed in all the viscera as far as possible with a wooden toothpick, and then closed the opening. In a short time it seemed to be as well and as able-bodied as ever. They easily succumb to lack of water; if kept in a dry place they soon die.

Food.

It is certain that these earwigs are at least partly carnivorous. Any dead insect not protected by too tough a covering will serve them as food. In captivity they also eat cooked fish, chicken, and mutton, and both raw and cooked beef. They probably would also eat raw fish, fowl, or flesh of any kind if given them. The fact of their eating their own cast-off skins has been already noted. Whether or not they eat any vegetable food is a question, despite the common belief that they do. Certainly I have never seen one that did. I caught and dissected three earwigs and found that the alimentary tract of two contained animal matter only — very small insects, etc. In the stomach of the third, it is true, there were a few particles of starch, but this may have been accidentally eaten together with animal matter. Those which I have freshly caught, and those which I have kept in confinement for some time, would readily eat animal matter, but refused vegetable matter.

Some Habits Noticed.

I found that the earwigs were not at all afraid of entering the brackish water in the bay at Cold Spring Harbor, where they were found. Some voluntarily swam about from place to place. Perhaps they more properly floated than swam, for their movements were mainly on the surface of the water, and often their backs were perfectly dry. When frightened, however, they would often crawl to the under side of some floating object and hide themselves under water.

Earwigs easily dig holes in the sand. Those which I have observed used only their mouth-parts in digging. They never kicked or pushed the earth out with their feet.

Earwigs do not seem to be nearly as much afraid of the light as are our common centipedes (*Lithobius americanus*). They are said to be nocturnal in their habits, and to hide themselves by day "in any dark cranny that they can find," but those which I studied often apparently preferred the light to the darkness, although as a rule they chose the darkness.

I have observed that whenever the ground was wet an earwig walking over it would so twist its heavy abdomen that the narrow side rather than the flat bottom would come in contact with the ground and thus serve as a runner to support its weight.

Egg Laying and Care of the Young.

When about to lay her eggs the female would make a little chamber for herself in the ground about half an inch deep, and one, or one and one-quarter, inches

wide. This was hollowed out beneath a log or some other object that rested on the ground. In making this chamber she carried the earth out in her mouth-parts, as already suggested, a little at a time, just as an ant would do. She never seemed to use her forceps for either digging or carrying the earth. The chamber is made perfectly clean; no sticks or bits of wood or pebbles are allowed by the more careful females to remain inside. Here she deposits her eggs. In the chamber of one wild earwig I counted about ninety eggs, but none of those I have had in captivity laid quite so many at one time, some laying only twenty-five or less. Immediately after the eggs were laid the female picked them up in her mouth-parts, one at a time, and wiped them all over. It looked, indeed, as if she rolled them in her mouth. However that may be, when the process is over the eggs are all clean and glossy. Then she places them in a neat pile and stands guard over them. Whether or not it be true with the wild insect, some of the females I have kept for observation have, before their eggs were hatched, moved them all several times from place to place, carrying them one at a time. Some of my earwigs refused to touch food of any kind, so far as I could see, from the time they laid their eggs until the young were hatched, while others would leave their eggs at times to get something to eat. Several times the females, after caring for their eggs a while, have eaten them. I have reason to think, however, that in nearly every case the eggs had already spoiled or dried up before this occurred. The females continued to guard their young for a few days after they were hatched. When, however, they had once left her to seek for food for themselves, they could not safely return lest she should endeavor to eat them.

One earwig which I kept in confinement deposited four fairly large batches of eggs in one summer.

Uses of the Forceps.

The opinion has been advanced that the main use of the forceps is to furnish the earwig with an instrument with which it may fold away its delicate wings. That this is certainly not the only use I was assured by observing those which I kept in captivity. In the first place these were wingless,—the *Anisolabia maritima*, Bon., —yet had thoroughly developed forceps. In the second place I detected at least three uses to which the forceps were put without regard to wings. These were (a) for defense, (b) for offense, and (c) as feelers in mating.

(a) That the earwigs used their forceps defensively was apparent. When one was picked up, it always tried to pinch its captor; when touched or molested by another insect in any way, it always used its forceps; in fact these forceps were the chief, and seemed to be almost the only, weapon of self-defense which they

had. (b) The use of the forceps offensively may have been less important, but was scarcely less evident. I have often seen large earwigs in confinement chase and catch with their forceps crickets, sand-fleas, and even smaller earwigs, which they then proceeded to eat. When a victim was once caught, generally no amount of struggling freed it again from the powerful grasp of the forceps. When the victim continued to struggle for some time, the earwig which had caught it would, as I have often noticed, curve its own body sidewise until it took the shape of the letter U and its mouth could be brought into contact with its prey. Then the earwig would proceed to eat the living food it was holding. I have also seen earwigs clutch their victims in their forceps and drag them about from place to place. The deliberate manner in which some earwigs in confinement have chased

Figure 2.

and caught their prey, while I was observing them, convinces me that in their native state also they must at times use their forceps offensively, yet their progress seemed to be too slow to allow them to catch uninjured crickets or sand-fleas in the open. The earwigs which I watched would, when hunting, walk forward until their antennae touched a desirable object; then, with wonderful speed, they would swing the abdomen sidewise at a very sharp angle until the forceps were where the antennae had been, when they would instantaneously snap the prey if it had not escaped. If it had, the earwig, with scarcely a moment's delay, would continue its expedition. (c) Earwigs also use their forceps in mating. Although these forceps are so strong, they are yet very sensitive. One earwig can hardly touch with its antennae the forceps of another without the second one immediately knowing it. When mating, the two earwigs, after having located each other, approach each other

back to back until the forceps touch. Then the male completely inverts the end of his abdomen and, of course with inverted forceps, proceeds to back under the female until the required position is reached. (See Figure 2.)

The forceps of the male and of the female differ, as we have already noticed, those of the male being the more rounded and irregular. (The original type seems to have been that of the female, for both sexes have this type until the last stage.) The shape of the male forceps also varies greatly, male differing from male (see Figure 1, a and c) in a marked manner, while that of the female is always the same. I wondered at first why the forceps of the male should be curved as they are. I noticed that the right one frequently laps a little over the left when they are closed, and that it is usually a little more bent than the left. When I saw that the male in mating inverts his forceps and that therefore the right is the one to touch the ground, I could readily see at least one advantage in the present shape. The right is the more bent of the two, often with the point at right angles to his body, or sometimes even pointing a little forward. It would, therefore, not offer the obstruction to his backward movement that it would if his forceps were shaped like those of his mate. This applies certainly to the earwigs which I had in confinement. Still so great is the difference both in shape and dimensions of other species of earwigs that I dare not state it as a rule applicable to all.

NEW SPECIES OF NOCTUIDS FOR 1904. NO. 2.

BY JOHN B. SMITH, SC. D., NEW BRUNSWICK, N. J.

Xylophasia unita, n. sp.

Ground color dull ashen gray, the maculation well defined and black. Head mottled, front with alternate white and blackish lines. Collar pale at base; a black transverse line above the middle, then smoky to a gray tip. Patagia black edged and with an inner submarginal line. Disc of thorax powdery. Primaries with a black longitudinal line at base, extending almost to the t. a. line, somewhat diffuse inferiorly. There is also a blackish shading along inner margin. Basal line geminate, blackish, broken. T. a. line geminate, outer part a little broader and blacker, even throughout; a little outcurved in the interspaces, outcurved over cell and a little incurved below; inner line blackish, lunulate, best marked below vein 2; outer line even, slender, smoky; included space gray. S. t. line narrow, whitish, forming an obvious W, preceded by sagittate black dashes at the middle and followed by a smoky shading. There is a series of small black terminal lunules. The median shade is from costa, outwardly oblique, darkening the space between the ordinary spots, inwardly angled below the reniform and running close to the t. p. line. A black bar connects the median lines just above vein 1. Claviform moderate, narrowly outlined in black, smoky. Orbicular large, oval, oblique, not well defined, gray. Reniform moderate in size, kidney-shaped, gray, without definite outline. Secondaries dull whitish with a faint yellowish tinge, becoming smoky outwardly, fringes whitish; a narrow median line. Beneath, primaries smoky gray, even, with a partial outer line; secondaries whitish, powdery, with a smoky discal lunule and a narrow, well marked extra median line.

Expands 1.56 inches = 39 mm.

Habitat:— Calgary, Alberta, Head of Pine Creek, June 26; F. H. Wolley Dod.

One female, in good condition. The species resembles and is allied to *cinefacta;* but differs in the uniform bluish ash gray, the even black bar connecting the median lines and in the clearer better defined markings.

I have another female example from Corvallis, Oregon, which I refer here with considerable doubt. It may come within the range of variation; but more material is needed for positive decision.

Xylophasia enigra, n. sp.

Ground color a deep smoky brown, without contrasting maculation of any kind. Head without maculation. Collar with an obscure black median line. Thorax heavily built, vestiture thick, an admixture of gray scales along the margins of the patagia. Abdominal tuftings well marked. Primaries with all the markings just traceable: the basal and median lines geminate a little darker, included space a little gray. S. t. line a little paler than the ground, forms a very small W, and is variably emphasized by preceding and following shades. There is an obscure, diffuse median shade, oblique from the costa between the ordinary spots then close to the t. p. line, darkening a little the outer portion of the median

space. There is a series of black terminal lunules, followed by a very narrow pale line at base of the otherwise dark fringes. The latter are also narrowly cut with pale and a little notched at the outer margin. Claviform small, concolorous, barely outlined by darker scales. Ordinary spots obscure, not defined, more or less paler marked, of moderate size. The orbicular is oblique, narrow ovate. Reniform upright, a little constricted centrally. Secondaries smoky yellowish, darker outwardly, with a dark discal lunule and with yellowish fringes. Beneath whitish, powdery; primaries more smoky on disc, with a paler terminal space, a discal spot, an extra-median and a s. t. dusky line; secondaries with a small discal spot, a well defined extra median line and a diffuse sub-terminal shade.

Expands 1.36–1.50 inches = 34–37 mm.

Habitat: Calgary, Alberta, Head of Pine Creek, July 3 and 7; F. H. Wolley Dod.

Three good males. This is one of those obscure species that have no positive characters and depend for their standing upon the absence of any that distinguish others. It is a little like *fumosa;* but has entire secondaries. The absence of black in the basal space excludes it from *ferens* which it otherwise resembles in size and general habitus.

Xylophasia rorulenta, n. sp.

Allied to *suffusca* in general appearance and heretofore confused with it. Mr. Dod has sent me a series for examination and after including my own examples I have separated out as *suffusca* those examples in which the ground is of an even lilac gray, the reddish suffusion is uniform, and neither the ordinary spots nor the terminal space contrasts strongly.

In the new species either the reniform or terminal space, or both, contrast strongly, and are violet or lilac gray. The s. t. line is more sharply defined, the preceding marks blackish and more contrasting as well as more numerous. The lower half of the wing tends to a gray which is best marked on the inner margin. The upper half of the wing is reddish, pulverulent and is darkest on the costa. Altogether this is a more vivid species.

Habitat: — Calgary, Alberta, June and July; Winnipeg, Manitoba; Denver, Colorado, in May; New York without date or specific locality.

Ten good examples equally divided as to sex are before me, and twelve of *suffusca* have been used in the comparison.

Cleoceris discolor n. sp.

Ground color a somewhat intense clay yellow, marked with black and gray so as to leave a blotchy appearance. Head clothed with a mixture of black and white hair and scales, giving it a gray appearance; an obscure, whitish interantennal line. Collar yellow at base, upper half mottled with black and white. Thoracic disc and center of patagia gray, mottled with yellow scales. Abdomen paler yellow. Primaries with the median lines obscured, yet traceable; t. a. nearly upright: t. p. squarely and only a little exserted over the cell, and a little incurved below. Basal space yellow, outer half blackish except along the inner margin and just below the median vein, where the yellow shade extends to the t. a. line and a little beyond. Median space black except along costa where it is yellow mottled, along the t. a. line where it is indented as already stated, and except for the ordinary spots, which are discolored. The orbicular is round or nearly so, with a few dusky scales in center. Reniform oblong, upright, with a dusky central line. The s. t. space is black on the costa; but the

black narrows toward t. p. line, leaving the space yellow below the middle of the wing. S. t. line broken, black, a little diffuse, somewhat irregular. Terminal space outwardly powdered with black. A series of black terminal lunules. Secondaries whitish at base, with a narrow, dusky, extramedian line, a smoky outer border with a paler submarginal line, and whitish fringes. Beneath, a pale lustrous gray; secondaries uniform; primaries with a paler terminal space and a little mottling on the disc.

Expands 1.25 inches = 31 mm.

Habitat: —Taos, New Mexico, August 20th.

One female, in good condition. It is more than probable that this will be found to be a distinctly variable species and the proportion of the yellow and black may be decidedly inconstant. It is likely, however, that the discolored ordinary spots form a constant feature and in this may be found the obvious distinction from the other described species.

Pleroma cinerea n. sp.

Ground color a very light ashen gray, maculation smoky brown and not contrasting. Head a little paler, sides of the palpi and a little interantennal tuft smoky. Collar with a blackish median line surmounted by a whitish shading. Disc of the thorax smoky as are also the loose basal tufts on the abdomen. Primaries without ordinary spots, the median lines distinct on costa only. T. a. line single, broad, diffuse, outwardly oblique, reaching the median vein and then lost. T. p. line geminate, the two parts well separated, equally distinct, outwardly oblique, reaching the subcosta only, the inner line there lost. The outer line is broken there, but becomes visible again as a smoky line which forms the inner border to a smoky shading which starts from the apex and extends obliquely inward to the middle of the submedian interspace. At that point a blackish streak crosses the line, limits the shade and reaches the s. t. line. The s. t. line is indicated by a series of interspatial black marks and streaks, more or less obviously bordered by a whitish area, the most prominent of which is above the anal angle. The fringes are a little wavy, gray, with a broad white interline. Secondaries smoky yellow, more whitish at base, fringes whitish. Beneath, primaries smoky, with an outer line indicated on costa: secondaries more whitish, powdery, with a brownish extra median line and a small discal spot.

Expands 1.40 inches = 35 mm.

Habitat: — Corvallis, Oregon, at light, Sept. 11; Washburn.

One male, in fair condition. The species is obviously distinct from those previously described by the very oblique costal indication of median lines and by the oblique dusky shading which extends from the outer third of the submedian interspace to the apex.

Xylina fletcheri n. sp.

Ground color deep blue gray, a little powdery. Front with an obscure line; collar with a slender, black median line; a blackish line at the base of the wings. Abdomen smoky with a slightly reddish tinge, the lateral tuftings distinct. Primaries with costal region slightly paler at base, the veins narrowly black dotted except No. 1, which is rather obviously blackish. A slender black basal streak which extends to the end of a long outward tooth of the t. a. line. This t. a. line is marked on the costa, and is only fragmentarily traceable afterward. It makes a long inward tooth in the cell, a very long outward tooth in the sub-

median interspace and seems to reach the inner margin on the median shade. T. p. line faintly traceable in one example as a narrow, strongly crenulate line. The median shade darkens the space between the ordinary spots, runs from above the orbicular to base of reniform, thence to the middle of the hind margin. It is obscure, diffuse and tends to obsolescence. S. t. line is a series of smoky sagittate spots which tend to run together and do not reach the costa. Orbicular rather small, ovate, upright or a little oblique, neatly black ringed, complete within the cell; but in two examples there is a supplementary spot faintly indicated. Reniform upright, broad, a little constricted centrally, lower angles tending to extend, outlined by black scales, a few brown scales in center. Secondaries lustrous, smoky, with a reddish tinge toward base, a vague dusky discal spot and reddish fringes. Beneath, primaries smoky, with a powdery paler terminal space; secondaries reddish gray, powdery, with a distinct blackish discal spot and a smoky extra median line which tends to obsolescence.

Expands 1.70–1.90 inches = 43–48 mm.

Habitat: Ottawa, Ontario, October 3–7; Dr. J. Fletcher.

One male and four females: all good specimens. Resembles *ancilla* in appearance and general characters and with it belongs to the *georgii* series. As compared with *ancilla* this species is more even in color, has much smaller spots and has traceable median lines, at least the t. a. being marked in all cases. The general pattern is the same.

Xylina ancilla, n. sp.

Ground color dark bluish gray, powdery. Head with a black frontal line; basal segments of antennae scaled with white; collar with a narrow black median line; patagia with a black line at base of wings. Primaries very uniform in color, the veins black marked, though not prominently so, costal half of basal space the palest part of the wing. There is a narrow black basal streak in the submedian interspace. An obscure dusky shade angles on this line near base, extending outwardly to costa and to the inner margin, the upper portion forming the limit of the basal paler area. The median lines are lost. A diffuse median shade which tends to obsolescence starts from costa above orbicular, angles outward to the base of reniform, then inward to the middle of inner margin. A slightly irregular series of small sagittate black spots indicates the s. t. line. A series of obscure dusky terminal lunules. Claviform wanting. Orbicular large, irregularly oval, oblique, with an appendix below the median vein, concolorous, more or less distinctly outlined by black scales. Reniform large, broad, upright, a little dilated inferiorly where it is darkened by the median shade and relieved by a few brown scales — the only color patch on the wing. Secondaries smoky, a little paler at base, lustrous, with a darker discal lunule and whitish fringes. Beneath, primaries ranging from reddish gray to dark smoky, the paler examples with a dark discal spot. Secondaries reddish gray, powdery, with a conspicuous black discal spot, and an extra median, somewhat wavy dark line.

Expands 1.50–1.75 inches = 37–43 mm.

Habitat: Calgary, Alberta, Head of Pine Creek, September 18, Mr. Dod; Cartwright, Manitoba, October 6, Mr. Heath; Wellington, British Columbia, September 7, Mr. Bryant.

One male and two females, in good condition. The species is allied to *oregonensis* Harv., but is of a very dark blue gray, with much less contrast, and inconspicuous maculation. The scant material indicates a considerable range of variation and that the more uniform examples may be confused with well marked *georgii* or *holocinerea*.

Xylina vertina, n. sp.

Ashen gray with a bluish tint, more or less powdery. Head with smoky and black powderings, with a black frontal line. Collar a little brownish at base, to a narrow black median line, above which is a distinct white edging. Patagia with a black line at base of primaries. Abdomen a little rufous. Primaries with the veins narrowly black marked, the entire surface a little mottled, smoky along the costa, the distinct outwardly angled smoky median shade forming the most obvious character. There is a slender black basal line. T. a. line geminate, the two parts widely separated, black, dentate, distinct only from costa to median vein, the outer part touching the orbicular, a long tooth marking its termination on the inner margin. T. p. line geminate, marked in the costal area only. S. t. line marked by a series of sagittate black spots. There is a series of small black terminal lunules. The median shade is smoky, diffuse, outwardly oblique from costa so as to darken the reniform, then inward so as to reach the inner margin at about its middle. Orbicular round or ovate, of good size, a little paler, narrowly outlined by black scales. Reniform large, upright, centrally somewhat constricted, dilated inferiorly, incompletely outlined, darkened by the median shade and by a powdering of rusty scales. Secondaries smoky with a reddish tinge, a little darker outwardly, fringes whitish. Beneath, primaries smoky, with a reddish powdery terminal area and a blackish round discal spot. Secondaries reddish, powdery, with a smoky discal lunule.

Expands 1.75–1.92 inches = 44–48 mm.

Habitat: Corvallis, Oregon, September 8, at light; British Columbia — no date.

Two males in good condition. The species belongs to the *georgii* series, differing from them all in the more elongate primaries, the confused mottling, and the very distinct median shade. Incidentally it may be noted that all the species of this series have a black line on the outer side of the hind tibia.

Xylina merceda, n. sp.

Ground color a deep ashen gray without any reddish admixture. Head and thorax almost mouse gray, a little powdery, collar with an obscure transverse line. Primaries with all the maculation present, not well written, only the paler orbicular standing out in any relief whatever. There is no black line, streak or dash at base. Basal line marked only on costa by geminate blackish lines which tend to become lost. T. a. line geminate, blackish, tending to become lost; irregular, variably outcurved in the interspaces. T. p. line geminate, vague at best, inner line lunulate, almost crenulate, outer a mere shading, irregular; but as a whole nearly parallel with the outer margin. S. t. line consists of a somewhat irregular dusky shade, more or less broken up into triangular, hardly sagittate spots, outwardly marked by whitish scales. A series of blackish terminal lunules tends to become obsolete. There is a diffuse, obscure median shade angulated on the reniform. Claviform very small, loop-like, not always traceable. Orbicular oval, oblique, large, with a submedian annex, paler than the ground and with blackish margins. Reniform large, upright, a little constricted, margined by black scales within which is a somewhat paler annulus. Secondaries dull whitish or yellowish at base, darkening outwardly to the whitish fringes, markings of underside faintly reproduced. Beneath, primaries smoky, with a powdery pale terminal area: secondaries pale, powdery, with a broad outer shade line and a dark discal lunule.

Expands 1.44–1.58 inches = 36–39 mm.

Habitat: Cartwright, Manitoba, October 1, 6, November 1; Mr. Heath.

Three female specimens, in fair condition, no two alike. In one dark example all the maculation is present as described, in the palest everything is vague and just traceable.

The species is allied to *unimoda* than which it is smaller, altogether different in ground color, the primaries shorter and broader. From *winnipeg* it differs yet more in the absence of all the smoky powdering as well as in details of maculation.

BAPTARMA, n. gen.

Head small, closely applied to the thorax, hardly retracted; eyes ovate, moderate in size; front broad, protuberant, with a large central depression which is roughened, surrounded by a distinct rim, and has a small central ridge inferiorly; tongue well developed; palpi moderate, slightly exceeding the frontal protuberance; antennae moderate in length, quite stout, similar in both sexes: vestiture thin divergent hair. Thorax stout, vestiture thin, divergent, hairy, collar and patagia marked but not at all prominent or uplifted; legs short and stout, tibiae not spinose except that there may be either one or two stout curved spines at the outer side of tip on the anterior pair; anterior tarsi with three or four stout curved spines on the basal joint and one each on the second and third joints, making a series of seven or eight stout curved spines on the outer side of the foot between the tip of the tibia and the fourth tarsal joint. Abdomen short, conic, untufted. Primaries small, trigonate, apex drawn out, costa somewhat depressed, outer margin oblique, arquate: secondaries proportionate, venation normal.

The peculiar armature of the fore-legs, combined with the head characters and the absence of other tibial armature should make this easily recognizable.

Baptarma felicita n. sp.

Head, thorax and abdomen black, the vestiture with an admixture of yellow and scarlet hair that gives the effect of a wash or film of these tints. Primaries blackish with a wash of carmine, terminal space a little grayish powdered. There is a small yellow spot at the point in the median cell preceding the reniform; there is a larger, somewhat lunate yellow spot at the point beyond the reniform which would, normally, mark the end of the median space; there is a large, oblong, rectangular blotch in the submedian interspace, occupying what would normally be the outer half of the median space. Secondaries scarlet with a broad black border on all save the costal margin: fringes with a carmine tinge. Beneath, both wings have the disc scarlet, shading to purplish or carmine over the black marginal bands.

Expands .90–.95 inches = 22–24 mm.

Habitat: Yuma County, Arizona, in April; Mr. Hutson.

One male and one female in good condition and one somewhat defective additional female. The three specimens are very much alike and are readily distinguished by the scarlet secondaries: this scarlet by the bye is variable and less intense in flown examples. So, also, the overlay of purplish or carmine scales on the primaries is apt to be lost, giving the insect a dull smoky, instead of a brilliant purplish tinge.

Behrensia hutsonii n. sp.

Ground color white with an admixture of pale brown scales giving it a somewhat smoky or creamy tint. Head and thorax immaculate, the vestiture somewhat loose and divergent. Primaries with all the maculation very distinct, smooth and even, the scales a little lustrous. Basal space whitish, with a light brown powdering, becoming white at the t. a. line which is thus emphasized. Basal line black, geminate, distinct, broken. T. a. line begins at costa about one third from base, is inwardly toothed on the median vein, curves outwardly below this and yet on the whole is inwardly oblique, reaching the inner margin well within the basal third. The line is single, black, preceded by a white shade to the inner margin, where it is geminate below vein one. The median space is a very light smoky brown, darkest at the t. a. line and lightening somewhat to the t. p. line which is white, a little diffuse outwardly, starts from costa at about one fourth from apex and runs inwardly oblique, with an incurve in the sub-median interspace, to the internal margin a little beyond the outer third, where it is marked by a black point. The s. t. space is pale smoky brown and darkens outwardly to define the white s. t. line, which forms two even sinuations and reaches the inner margin at the anal angle. Terminal space powdery, more so at the apex, with two or three golden brown spots filling the interspaces at about the middle of the margin. Fringe whitish, marked with dusky at about the middle of the margin. The orbicular is moderate in size, irregular, oblique, narrowly white ringed. Attached to it, below the median vein, is a loop-like accessory spot which is also white ringed and a little darker than the ground. Reniform rather small, narrow, upright, a little constricted, incompletely white-ringed, a little darker inferiorly. Secondaries soiled whitish, a little darker outwardly, fringes white. Beneath, whitish, powdery, maculation of the upper side vaguely reproduced.

Expands 1–1.10 inches = 25 — 27 mm.

Habitat: Yuma County, Arizona, in March, Mr. Hutson.

One male and one female, both in good condition save that the antennae are gone. This is a really handsome little species which can hardly be mistaken. It is utterly different in appearance from *B. conchiformis* and may eventually prove a distinct generic type; but from such material as I have at present I prefer to leave matters as above. The female is the larger of the specimens; otherwise they are much alike.[1]

Erastria panatela n. sp.

Ground color dull reddish luteous, powdered with rusty red and smoky. Head and thorax as dark as the darkest portion of primaries; without definite maculation. Primaries with all the maculation obscure. The powdery reddish area extends along the inner margin for two thirds from base, then comes a yellowish band which extends obliquely to the apex and in which the black dotted t. p. line is in part defined. The terminal space except at apex is again red brown and powdery. There is a series of distinct dusky terminal lunules, of good size. T. a. line obscurely indicated by darker scales and a less powdery included space. Orbicular diffuse, powdery, indefinite, less powdery than the surroundings. Reniform obscure, of good size, partly outlined by black scales, partly marked by the clear ground and further indicated by a darker central shade. Secondaries whitish, soiled, powdery, with a vague

[1] Congeneric with and allied to *Autographa albovitta* Ottol., which is not an *Autographa*.

discal lunule and a smoky terminal line. Beneath primaries smoky, very powdery: secondaries paler and less powdery, with an obvious discal spot and a somewhat indefinite extramedian line.

Expands .84–.92 inches = 21–23 mm.

Habitat: Winnipeg, Manitoba, in July; Mr. Hanham: Calgary, Alberta, Head of Pine Creek, July 23, at light; Mr. Dod.

Three males and one female, none of them in very good condition. This is one of the broad winged species, like *muscosula* or *includens* and resembles the latter, somewhat, in type of maculation. The generic reference may require modification when a revision of the group is made.

PROCEEDINGS OF THE CLUB.

The 235th regular meeting was held in the Council room of the Boston Society of Natural History on the evening of March 15, 1904. President Emerton in the chair; fifteen members and six guests present. The minutes of the last meeting were read and accepted. Mr. Field made a brief oral report on behalf of the Publication Committee, and Mr. Newcomb reported the progress of the Library Committee.

It was voted to hold an exhibition of insects, open to the public, during the coming autumn, and the Chair was authorized to appoint a committee to arrange details.

Mr. Newcomb presented translations of certain passages from a recent issue of the Japanese entomological journal, "Insect Life."

Mr. Newcomb then gave a most interesting account of *A Collecting Trip in Colorado* and showed specimens and photographs.

Adjourned at 9.35.

W. L. W. Field.
Secretary.

WINTERING LARVAE.

BY F. H. FOSTER, CLAREMONT, N. H.

PROBABLY every one who has attempted to carry hibernating lepidopterous larvae through the winter has, like the writer, had the baffling experience of complete failure as a general rule, with perhaps an occasional hardy survivor or two as a rare exception.

One successful experience, however, brings much encouragement, and as I succeeded in wintering a brood of *Haploa* larvae and bringing forty of them through alive and well this spring, an account of the method followed may be useful to others.

The larvae were fed indoors until the frost killed their food plants. This was not until November, as the favorite food locally of this genus, *Cynoglossum officinale*, is quite hardy and survives the early frosts. The breeding cage in which the larvae were reared is five inches wide by twelve long, and eight inches high. The sides and ends are of glass set in a wooden frame. The bottom, which is open, rests on a shallow wooden tray containing a little earth and the top is covered by a removable lid consisting of a wooden frame covered with gauze. When the food supply failed, the cage and larvae were carried into a rather dimly lighted room where the temperature was about 50° *Fahr.* After a few days the larvae ceased eating entirely and appeared lethargic.

The cage was then filled quite full of dead leaves nearly dry, and the whole wrapped in several thicknesses of paper to exclude the light. During the winter the cage was kept in a cold attic, and later, as spring approached, in a cool, dry cellar. No careful record of temperature was kept but it probably averaged about 40°. From time to time the cage was opened and the dead leaves lightly sprinkled with water. This was doubtless of importance, as previous experiments indicated that too much and too little moisture are equally destructive to larvae hibernating in confinement. Too much moisture promotes fungus growths, while too little causes the larvae to dry up. The exclusion of light may also be a factor of consequence. In the latter part of March some *Cynoglossum* plants which had wintered in a tub in the cellar began to put out new leaves, and about the 10th of April the breeding cage was brought into a warm, light room and its wrapping removed. Only a few larvae were in sight, but the stimulus of light and warmth soon brought many others to the top of the cage, and in the course of twenty-four hours some forty appeared and were transferred to new, clean quarters, with fresh

food, and all were soon actively eating. At this writing all have passed the last moult and some are preparing to pupate.

One swallow does not make a summer, and it is perhaps not safe to conclude that this method of treatment would always bring success; but after experimenting for four winters with many larvae of this genus, indoors and out, under varying conditions, with practically complete failure, it is gratifying to be able to record this one success.

PROCEEDINGS OF THE CLUB.

A special meeting was held in the Council room on the evening of March 28, 1904. President Emerton in the chair; ten members present. The minutes of the last meeting were read and accepted. Mr. W. L. W. Field spoke briefly on *Methods of Labeling* specimens of insects, dwelling especially upon the importance of topographic data such as are kept by botanists. Mr. Field also showed two specimens of *Papilio turnus*, both females of the yellow type, but showing great difference in the extent of the black markings, and a specimen of *Chrysophanus thoe* taken in Alstead, N. H. Mr. Newcomb showed a "white-banded *ursula*" (see the February number of Psyche, page 4) from Long Island. Mr. Morse then presented *A Faunal and Floral Tabulation Scheme*, illustrated by many maps and diagrams. Informal discussion followed.

The 236th meeting was held in the Council room on the evening of April 18, 1904. President Emerton in the chair; eleven persons present.

The record of the last meeting was read and accepted. Mr. Wm. P. Henderson of Boston was unanimously elected to active membership. The Chair announced the appointment of Messrs. Buxton, Denton, and Sampson to serve as Exhibition Committee.

It being impossible for Dr. Hans Gadow to be present and address the Club as announced, the members present then performed for their own benefit some of the simple experiments on the pigments of butterflies' wings for which Dr. Gadow had supplied directions. Mr. Emerton exhibited the cocoon of a hymenopterous parasite reared from the spider *Steatota borealis*, and some *Staphylinidae* found in a colony of *Termes*. Mr. Blackburn showed a number of early moths captured at electric lights. Mr. Field presented brief abstracts of some recent entomological literature.

It was voted to hold a special meeting on the evening of May 3. Adjournment was reached at 9.40.

W. L. W. Field,
Secretary.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—LIV.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Hyperitis trianguliferata Packard. The life history of this species has been described by Professor G. H. French (Can. ent., xviii, 105, 1886) from Californian larvae, with four stages. I present my own descriptions, however, as I have noted some points not mentioned by him and the larva has not been otherwise referred to.

Egg. Elliptical, rounded, one diameter less, no flattening nor depression; truncation marked, oblique. Longitudinal ribs low, obscure, straight, few, about six visible on the broad side, joined by cross-striae, forming cells three times as wide as long; ends reticulate Pale yellow; size 1 × .7 × .6 mm.

Stage I. Head rounded, testaceous, a little darker on the vertex, eye black, mouth brown. Body moderate, not greatly elongate, rapidly looping or held rigid with a thread. Whitish, a broad dorsal band of smoky olivaceous and a still fainter ventral one, scarcely more than a shade. Feet pale; tubercles very small, brownish; setae moderate, glandular tipped; no shields.

Stage II. Head rounded, the lobes full, sordid whitish with black dottings on the lobes and around the mouth; width .6 mm. Body moderate, greenish, shaded with blackish olivaceous dorsally, with subdorsal and lateral lines indicated by white segmentary dashes. a white stigmatal line with black and gray spots, tubercle iv largest on joints 7 and 8. Venter orange tinted, obscurely lined and marked by blackish blotches at the tubercles. Tubercles roundedly elevated; setae obscure; feet pale with dark lines; a geminate ventral whitish band.

Stage III. Head whitish with pale brown dots forming bands curved transversely, antennae prominent, pale, ocelli black; width 1.1 mm. Body moderate, the segments enlarged centrally by the conical tubercles, especially joint 7. Pale brown; subdorsal line broken into white dashes, the longest one on joint 5, edged with black shading; sides shaded; substigmatal band broad, yellowish white, illy defined but distinct; a paler subventral line; centers of segments subventrally and venter medially black shaded; tubercles conical, black, ii prominent, especially on joint 7. Feet pale; setae very short; anal shield and leg plates pale.

Stage IV. Head round, cuneiform, the lobes full above, held flatly; light and brown mottled on the sides, pale over the face and vertex; width 1.7 mm. Body cylindrical, joints 2 and 3 depressed, their feet appressed, those of joint 3 erected; straight, stick-like, joint 7 humped dorsally, tubercles ii forming high cones on joints 7 and 9, less so on joints 6 and 8, small on joints 5, 11 and 12. Whitish green, washed with brown of light and dark; an oblique lateral streak on joints 3 and 4, the fronts and backs of the high tubercles, irregular marks and blotches on the sides, especially of joints 7 to 9 and a partly continuous subventral band. Ordinary markings lost. Feet of joint 10 brown behind, pale before; thoracic feet bright red shaded. Faint whitish washed longitudinal lines.

The larvae fed on currant (*Ribes sanguineum*); bred from eggs obtained at Kaslo, British Columbia.

RECENT ENTOMOLOGICAL LITERATURE.

Asterisks indicate descriptions of new species of American insects, or of new genera.

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68 Science, New York City.
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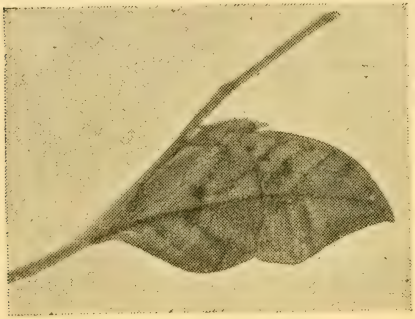

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EXCHANGES.

[Exchange notices (not over five lines) inserted free for subscribers. Notices will be inserted in the order in which they are received, and those at the top of the column will be removed only when it is necessary to make room for new ones at the bottom.]

AMARA. Being engaged in the study of this genus, I will determine specimens for collectors. These should be sent numbered. I am also anxious to obtain species in other genera of Carabidae not in my collection, from all parts of the world, and will purchase or exchange for same. Roland Hayward, Readville, Mass.

WANTED.—Eggs, larvae or pupae of grasshoppers, dragon-flies, beetles, bugs, etc. Will give tropical butterflies in exchange. Denton Bros., Wellesley, Mass.

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THE OVIPOSITION AND CARNIVOROUS HABITS OF THE GREEN MEADOW GRASSHOPPER (*ORCHELIMUM GLABERRIMUM* BURMEISTER). — PLATE V.

BY JOSEPH L. HANCOCK, CHICAGO, ILL.

IN the early part of September, 1903, I caught several pairs of the orthopteron, *Orchelimum glaberrimum* Burm. (Pl. V) in a meadow among some coarse herbage. After keeping them alive under observation for several days in a large vivarium jar, they were allowed the freedom of flowers on the center table in my room. I found these insects very wild at first, but they afterwards became tamed and so adjusted to the indoor surroundings that they entered into conjugation. The means used in subjugating them were gentle treatment, occasional supply of water for drinking, and plenty of picked plants in blossom for foraging. The latter were often replenished during my various excursions afield. On the 6th of September a female was noticed exhibiting rather restless actions among the loosely spread stems of one of the bouquets of flowers above mentioned, and soon after I found her ovipositing in a stem of the bur marigold. The method of oviposition was thereafter studied and found of such peculiar interest that a detailed account is here offered. Before selecting the marigold as the proper plant for her immediate needs, *Orchelimum* tested a number of different kinds of plants by biting the stems. It was curious to see how quickly a decision was arrived at when she was engaged in this search. Grass, for instance, or other kind of plant distasteful to her, was either ignored entirely, or was subjected to a brief mouth test. When at last, after jumping from plant to plant, going up and down in the quest, the coveted stem was found, she started very vigorous biting, moving her head from side to side in an endeavor to get a stronger hold with her jaws. A gash into the outer layer of the stem was soon made, about an eighth of an inch in length, the insect finally going back over the course of the incision with the evident purpose of more deeply penetrating to the pith. During this first stage in the process the female stands with her head directed downwards, but as soon as the spot is prepared with the mouth she reverses her body preparatory to the act of oviposition. Firmly grasping the plant stem with her feet, she curves the abdomen underneath, at the same time bringing the pointed extremity of the ovipositor into the breach made in the stem

above described. Now she stands with her ovipositor under the abdomen with the blades slightly imbedded, but gradually as it is worked within the stem she almost imperceptibly moves forward a little at a time. Finally when the ovipositor is buried to its utmost length it is directed backwards. It is now appreciated how well adapted the beautiful curve and structure of the organ are for this purpose. A moment later the blades are spread apart, allowing the elongate egg to be lodged within the center of the pith, the latter having been pressed to either side for the accommodation of the egg. During this process the female is very quiet, the only noticeable movement being an occasional quiver of the abdomen. As soon as the first egg is deposited, she withdraws the ovipositor and immediately turning around she again bites the same spot, spending several minutes chewing the fibers and pinching the sides together with her powerful jaws. This is done in order to use the same opening to deposit the second egg as about to be described. She next moves a little way down the stem, but this time her head is directed downwards so that she may insert her ovipositor in the same hole but deposit the second egg in a reversed position to that of the first. No sooner is this second egg laid and her ovipositor removed than she turns about and treats the spot for the last time to the same manoeuvring of biting and pressing the sides together as before witnessed. The two eggs thus far laid have their anterior poles directed end to end with a slight distance between them. When the third and fourth eggs are about to be deposited she moves down the stem to a new site about half an inch away, varying the distance, and the process with its several stages is repeated. The interior of the stem is finally filled for a considerable distance with eggs, about ten minutes being consumed in the deposition of each one. It was during the critical moment when an egg was being deposited that I seized upon the opportunity of photographing the female as shown in the accompanying illustration. She had made nine incisions up to this time and was in the act of laying the eighteenth egg. Some of these incisions are easily seen in the illustration. When the eggs hatch doubtless two young escape from the same scarified point. On removing one side of the stem containing the eggs, in a longitudinal direction, they were found to lie with their corresponding poles nearest together throughout.

The eggs are slender and beautiful flesh-colored objects when freshly laid; they are nearly straight, about six mm. long and seven tenths mm. in width. The anterior pole is very slightly tapered, with bluntly rounded apex; the posterior pole is more distinctly reduced and the apex narrowly rounded. Usually the eggs are skillfully guided to their destined place within the pith, but that they sometimes meet with accident I can attest from observation. Occasionally through defective working of the mechanism, I have noted temporary arrest of oviposition due to

the egg sticking between the blades. When this happens the ovipositor is withdrawn, and turning up the tip underneath the body in a forward direction the female deliberately spreads the blades apart with her mouth and seizing the offending egg she immediately devours it. An egg which I took away from the female just as she was going through this performance was compressed transversely and somewhat distorted. This seemed to show that excessive lateral pressure brought to bear by the blades had caused the failure of the egg to be deposited.

It may be of interest to note that Riley ('84 Stand. Nat. Hist., p. 187, II) mentions that this species oviposits in the stems of various pithy plants, and especially in the tassel stem of Indian corn. I have not been so fortunate thus far as to observe this species ovipositing while it was in a free state of nature.

Carnivorous Habits.

I was once attracted to a cricket which was jumping about in a lively manner in one of my vivarium jars, and when I went nearer to make out what caused the disturbance I found that the cricket was frantically escaping from the depredations of a female *Orchelimum*. She had pounced upon her mate on the earth at the bottom of the jar, and seizing him by the back, near the base of the wings, she then jumped on the stem of a plant, in the meantime carrying her prey crosswise in her mouth. She paused here, and holding her mate's body between her front legs she ate the larger portion of the soft parts, after first eating a hole in the back. The manner in which this individual handled her prey indicated that the long spines of the first and middle tibiæ are occasionally used and connected in this species with its carnivorous habits. Blatchley has recorded ('02 Orth. Indiana, p. 384) the fact that the allied species, *vulgare*, feeds upon the bodies of small moths which in some way it manages to capture, while on another occasion he observed a female on the flower of a golden-rod feasting on a soldier beetle.

Professor V. L. Kellogg, of Stanford University, will spend the coming academic year on leave of absence in Europe. Personal letters will be forwarded. Requests for reprints of papers or for specimens, etc., should be addressed, to avoid delay, to the Department of Entomology, Stanford University, Calif.

ONE OF THE SMALLEST DIGGER WASPS.

BY HENRY L. VIERECK, PHILADELPHIA, PA.

Ammoplanus ceanothae n. sp.

♀ 2.5 mm. Submarginal cell without a stump of a vein, as in *Ammoplanus columbianus*.

Clypeus convex, smooth, slightly rounded out on the anterior margin; front shining, very finely sculptured, bearing no impression; anterior ocellus about on a line with the posterior margin of the eye, distance between the posterior ocelli less than the distance between them and the nearest eye margin; pedicellum nearly as long as the first two joints of the flagellum, joints of the flagellum subequal; pronotum smooth with no sharp margins; dorsulum sculptured much like the front, in addition it has some sparse rather distinct fine punctures; mesopleurae sculptured like the dorsulum; metathorax dull granular, flat, with two longitudinal raised lines fairly close together; abdomen shining, apparently impunctate; pubescence pale, inconspicuous.

Black; antennae and legs testaceous, partly brown; mandibles, clypeus and tegulae brown.

Type locality, Lehigh Gap, Pennsylvania, where it was taken 17 July, 1899, 11, 12 July, 1900, and 29 June, 1901; on the latter date it was caught on the flowers of *Ceanothus americanus, L.*

Type Acad. Nat. Sci., Phila.

A NEW SPECIES OF ROACH OF THE GENUS KAKERLAC (*LOBOPTERA* AUCT.) FROM SOUTHERN TEXAS.

BY JAMES A. G. REHN, PHILADELPHIA, PA.

Recently Mr. C. Schaeffer, of the Brooklyn Institute of Arts and Sciences, submitted to the author for determination a single specimen of a species of the genus *Kakerlac* (*Loboptera* of authors). On comparison with the figures and descriptions of the previously known species of the genus it appears to be new.

Kakerlac schaefferi n. sp.

Type: ♀; Esperanza Ranch, Brownsville, Cameron Co., Texas. (C. Schaeffer). Brooklyn Institute of Arts and Sciences.

Allied to *K. americana* (Scudder)[1] and *K. annulicornis* (Saussure and Zehntner),[2] but differing from the former in the more compressed anterior portion of the body, the narrower tegmina and the more arcuate pronotum; from *annuli-*

[1]Proc. Davenport Acad. Nat. Sci., VIII, p. 93. [2]Biol. Cent. Amer., Orth., I, p. 54.

cornis it can be separated by the narrower form, broader tegmina and comparatively longer pronotum.

Size small; form elongate ovate, depressed; surface glabrous. Head rather narrow, the anterior margin extending beyond the pronotum; interspace between the eyes broad, but slightly less than that between the antennal bases, tumid; eye subreniform, depressed; antennae short, not quite equal to the body in length, flagelliform. Pronotum with the length less than the posterior width, moderately arched; anterior margin subtruncate, posterior truncate, lateral margins straight with the anterior angle very broadly rounded and the posterior rectangulate, with the extreme angle rounded. Mesonotum with the posterior margin truncate; metanotum broadly and shallowly emarginate. Tegmina short, but slightly exceeding the mesonotum, narrow, hastate; apex bluntly angulate; internal margins separated by a space almost double the width of the single tegmen. Abdomen broader than the thorax; supra-anal plate truncate, very broadly obtuse-angulate; cerci short, slightly longer than the supra-anal plate, fusiform, apex rather attenuate; subgenital plate rather large, not projecting beyond the supra-anal plate, apical margin evenly arcuate. Anterior femora with the anterior inferior margin bearing four median spines and with the apical portion finely spinulose, posterior margin unarmed; tibiæ but slightly more than half the length of the femora. Median femora bearing three spines on the anterior margin, one apical, two median, posterior margin bearing six spines of which the apical are smaller than the median; tibiae slightly shorter than the femora. Posterior femora with the anterior and posterior margins each armed with three spines, two median and one apical; tibiae slightly longer than the femora; posterior metatarsi slightly longer than the remaining tarsal joints.

General color black becoming burnt sienna on the limbs, cerci and margins of the thoracic segments.

MEASUREMENTS.

Total length	10.6 mm.
Length of pronotum	2.5 "
Greatest width of pronotum	3.8 "
Length of mesonotum	1.5 "
Length of metanotum	1.5 "
Length of tegmina	1.6 "
Greatest width of abdomen	5.5 "

I take pleasure in dedicating this interesting species to Mr. Schaeffer who collected the type.

THE CALLS OF SPIDERS.

BY FRED. H. LAHEE, NORTH CAMBRIDGE, MASS.

During the months of April and May, there is a certain spider, namely *Lycosa kochii* (of the family *Lycosidae*), which is very abundant in our oak woods. On a warm, sunny day at this time of year, if you watch the male of this species, you will notice that he is earnestly engaged in something that occupies his entire attention. He runs a little distance, then stops, moves on again, and again pauses a moment, generally on the surface leaves; and thus he continues, often covering many yards in an hour or two. If the air is very still a certain clicking or purring will be heard every time the spider rests. Since this operation has, I believe, never been fully described before, it may not be out of place to give an account of it here.

The sound is made by the male's tapping or drumming upon the dry leaves with the tips of his palps. It is very similar to the low stridulation of a cricket when it is beginning to chirp. The sound is continuous while it lasts, but varies in quality and loudness. It consists of, first, a steady, but extremely faint purring, which seems to be produced by very rapid and very short strokes of the palps. Then the sound grows rather louder, but is still so low that the ear must be less than a foot distant in order to hear it. Lastly, the whole concludes with a much sharper purr or click, varying according to the number of times the palps strike the leaf. Sometimes only the first, or the first and second portions are produced on the same leaf, sometimes all. The last part is nearly always accompanied by an up-and-down motion of the abdomen. This at first misled me to believe that the abdomen was the only instrument employed, but, although this frequently even touches the leaf, the palps are, nevertheless, the principal organs. Of this fact I am fully convinced in reference to the last portion of the sound. I have seen the performance at close range with a lens. The palps are curved to form an arc of perhaps 60 to 72 degrees. They are moved up and down like a hammer and strike the leaf directly downwards. It is the blow of their horny tips which causes the sound. As nearly as I could make out, they are used together, not alternately. They are not scraped or drawn across the surface of the leaf. In the preceding description the terms "click" and "purr" have been employed merely to indicate the frequency of the impact, not at all the method or means of producing it.

Although personally I am of the opinion that these are sexual calls, I shall let the subject rest here until further researches have been carried out. I shall be very much obliged to any person who sends me additional information in regard to this matter.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—LV.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Hyperitis amicaria Herrich-Schaeffer. Dr. Packard has copied a figure of Abbot's of the larva; there is a description by Mr. Saunders extant (Can. Ent., III, 209, 1871) and I have described the last two stages from New York larvae (Ent. News, V, 62, 1894). My description agrees with Abbot's figure, but Saunders seems to have had quite a different larva, while the larvae here described from British Columbia are different from either. My New York specimen was of the form *amicaria* and so was probably Abbot's, since it is called *nyssaria* by Guenée. What form Saunders had, I cannot tell; he called it *alienaria*. The British Columbian specimens are of the form *alienaria* H.-S., rather smaller than Eastern specimens and with the transverse-anterior line less angled. It would appear possible that these supposed varieties represent species. The Eastern forms must be bred again.

Egg. Elliptical, flattened above and below, forming a distinct flat area in the middle of the side; ends essentially alike without distinct depression or truncation. Reticulations regularly hexagonal, obscure, nearly obsolete on the sides, more distinct in the flattening. Waxy white, shining; size .75 × .5 × .4 mm. Laid singly, adherent.

Stage I. Head round, erect, luteus, eye black, mouth brown; body moderate, not elongate, but rapidly looping. No markings; tubercles and setae invisible; pale yellowish, green from the food, the incisures folded yellowish.

Stage II. Head rounded, luteous, slightly pruinose whitish; width .5 mm. Body moderate, translucent green from the food, segmental incisures folded, yellowish; no marks; tubercles and setae invisible.

Stage III. Head bilobed, thick, oblique, yellowish green, not shining; width .95 mm. Body moderate, the segments finely annulate, green, translucent; a narrow white subdorsal line on joints 2 to 13. Segmental folds form yellowish bands; feet green; tubercles obsolete; setae minute, brownish swollen tipped.

Stage IV. As before; width of head 1.4 mm. Subdorsal line rather broad, yellowish white, not contrasted. Rather short, the segments not much longer than wide; a ventral yellowish white band and a similarly colored spot on tubercle vii. Joint 9 is slightly thickened dorsally.

Stage V. Head slightly bilobed, whitish green, mottled with darker green, slightly purplish spots; width 2.1 mm. Body cylindrical, a double rounded hump on joint 9, the segments wrinkly annulate posteriorly. Green or washed with brown; subdorsal line broad, diffuse, whitish or only pale, the humps on joint 9 spotted with dark brown, the tubercles indicated by brown dots; spiracles black ringed; setae dark, pointed, not long. A row of obscure whitish spots subventrally anteriorly on the segments and a broad ventral band scarcely paler than the ground color. Later the head has a purplish vertical shade on the lobes and the body is strigose with purplish.

The larvae were fed on wild cherry. Eggs from Kaslo, British Columbia.

A REVISED LIST OF THE DIPTERA OF BERMUDA.

BY CHARLES W. JOHNSON, BOSTON, MASS.

THE following list which comprises all previous records, together with several additional species collected by Mr. C. Abbott Davis is brought together to show concisely our present knowledge of the Diptera of the Bermudas, and the work necessary to a more satisfactory condition.

The first recorded Diptera were a few without positive determination in "The Naturalist in Bermuda" by J. Matthew Jones, page 123, 1859. In the "Visitor's Guide to Bermuda" by the same author, 1876, page 143, is a list of seven species determined by Baron Osten Sacken, and two by Walker. Dr. P. R. Uhler ("Observations on the insects of the Bermudas,") in "The Bermuda Islands" by Angelo Heilprin pages 152–158, 1889, records three species. Dr. Fred. Dahl, "Land-fauna of the Bermudas," Plankton Expedition, Vol. I, A, 1892, page 109, records about eight species. The most complete account bearing on the Diptera is that given by Prof. A. E. Verrill in his work "The Bermuda Islands," published in the Transaction of the Connecticut Academy of Arts and Sciences, Vol. XI, pages 740–749, 1901–02. In this work about thirty-three are recorded.

The present list contains about fifty species; of this number, fifteen have been added by the collections made by Mr. Davis during a part of July and August, 1903, and one by Mr. T. L. Montgomery in March, 1897. The fauna seems for the most part to have been derived from the United States and West Indies, and is probably being gradually augmented from these sources. The richness of the flora would indicate a greater number of species and careful collecting at all seasons of the year will undoubtedly add many species to the fauna.

TIPULIDAE.

Dicranomyia distans O. S. This seems to be the only species recorded. Prof. Verrill refers to several undetermined species, and Mr. Davis captured *Pachyrrhina ferruginea* Fabr. on the vessel *en route*.

CULICIDAE.

Culex sollicitans Walk. Several specimens of this and the following species were taken by Mr. Davis, July 24 and 25.

Culex taeniorhynchus Wied., July 25.

Culex fatigans Wied. This species is recorded by Theobald in his Monograph

of the Culicidae I, p. 28, from collections made in July, 1899, by Dr. Eldon Harvey.

Stegomyia fasciata (Fabr.). The yellow-fever mosquito. This species, recorded by both Theobald and Verrill, was also taken by Mr. Davis.

Chironomidae.

Orthocladius, sp. Recorded by Prof. Verrill.

Bibionidae.

Dilophus sp. Recorded by J. M. Jones in 1876.

Scatopse atrata Say. Determined by Mr. Coquillett and recorded by Prof. Verrill.

Stratiomyidae.

Odontomyia sp.? Under this genus two species are referred to by Dr. Uhler.

Tabanidae.

Tabanus nigrovittatus Macq. Several specimens were taken by Mr. Davis, July 14–22. This is probably the species referred to by Dr. Uhler as "one of the smaller horse-flies related to *T. lineola* Fabr., but in color resembles the *T. cincta* Fabr."

Tabanus sp. "Of rather large size and with a large green head, is also common" (*Verrill*).

Asilidae.

Asilus? sp.? "A Robber-fly belonging to Asilus or some allied genus is described in Miss Hayward's notes" (*Verrill*).

Dolichopodidae.

Sciapus chrysoprasus Walk. The species referred to as "*Psilopus chrysoprasinus* Wied." by Dr. Fr. Dahl, is undoubtedly the same.

Phoridae.

Phora sp. Recorded by Prof. Verrill.

SYRPHIDAE.

Mesogramma marginatum Say. A number of specimens were collected by Mr. Davis at St. Georges, July 9.

Allograpta obliqua Say. A common species of the islands, obtained by Mr. Davis, July 8–11. Also reported by Mr. Jones in 1876, and by Prof. Verrill.

Eristalis tenax Linn. One specimen was collected by Mr. Davis on July 10.

Lathyrophthalmus aeneus Scop. Two specimens were taken by Mr. Davis, July 14 and 21. This species which is more familiarly known as *Eristalis aeneus* was also collected by Dr. Fr. Dahl in 1892.

SARCOPHAGIDAE.

Sarcophaga carnaria Linn. Both Prof. Verrill and Uhler refer specimen to this species. Among the numerous specimens collected by Mr. Davis the true *S. carnaria* is not represented. The specimens are nearer *S. rabida* Walk. also recorded by Prof. Verrill, but the present unsatisfactory condition of our Sarcophagids prevents me from positively determining the species.

Sarcophaga sp.? A smaller form of which a number of specimens were collected by Mr. Davis, July 8.

Helicobia helicis Town. Two specimens were collected by Mr. Davis.

Sarcophagula sp. Recorded by Dr. Dahl.

Calliphora vomitoria Linn. Recorded by Prof. Verrill.

Lucilia sericata Meig. Numerous specimens were collected by Mr. Davis.

Lucilia latifrons Schin. Recorded by Dr. Dahl. and also by Prof. Verrill. Probably only a variety of the preceding.

Lucilia caesar Linn. Recorded by Prof. Verrill.

MUSCIDAE.

Musca domestica Linn. Common. The smaller form in which yellow is the predominating color of the abdomen is the *M. basilaris* Macq. It hardly deserves varietal distinction.

Stomoxys calcitrans Linn. Recorded by Prof. Verrill.

ANTHOMYIDAE.

Ophyra aenescens Wied. A number of specimens were collected by Mr. Davis at St. Georges, July 9; also by Mr. T. L. Montgomery in March, 1897.

Anthomyia lepida Meig. Recorded by Jones, 1876.

Fannia femorata Loew. Several specimens were collected by Mr. Montgomery in March, 1897.

Limnophora cyrtoneurina Stein. Obtained by Mr. Davis, July 14.

Mydaea sp. ? One imperfect specimen collected by Mr. Davis July 17.

"*Phorbia ceparum* = *Anthomyia ceparum*," "Onion fly." "We were told that this species occurs, but obtained no specimens of it." (*Verrill.*)

Fucellia fucorum Full. This is probably what is meant by "*Incellia fucorine*" in Jones' list. Dr. Dahl also refers to a species as *Fucellia* sp.

Scatophagidae.

Scatophaga sp. ?. Recorded.

Sciomyzidae.

Tetanocera spinicornis Loew. Collected by Mr. Mobray, May 30, and by Mr. Davis, July 8.

Tetanocera pictipes Loew. Recorded by Jones in 1876.

Ortalidae.

Chætopsis aeneus Wied. Recorded by Jones, 1876.

Trypetidae.

Aciura insecta Loew. Two specimens were collected by Mr. Davis at St. Georges, July 9.

Tephritis picciola Bigot. Several specimens were taken by Mr. Davis at St. Georges, July 9. *Trypeta humilis* Loew, is a synonym.

Ceratitis capitata Wied. "Peach-fly." This species was first recorded from Bermuda by Messrs. Riley and Howard as "A Peach Pest in Bermuda," Insect Life, III, p. 5, figs. 1, 2; also p. 120, 1890. This species, which also infests the orange, was probably introduced from Madeira, the nearest locality from which it was previously recorded.

Sepsidae.

Piophila casei Linn. The cheese-fly. Recorded by Prof. Verrill.

EPHYDRIDAE.

Ephydra austrina Coq. One specimen collected by Mr. Davis.

Paratissa pollinosa (Will.). A number of specimens were collected by Mr. Davis, August 5.

DROSOPHILIDAE.

Drosophila punctulata Loew. A number of specimens were obtained by Mr. Davis at St. Georges, July 9.

Drosophila ampelophila Loew. The fruit-fly. Record by Prof. Verrill as very abundant on decaying fruit, associated with other related species.

AGROMYZIDAE.

Ophthalmomyia lacteipennis Loew. Two specimens were collected by Mr. Davis at St. Georges, July 21.

BORBORIDAE.

Limosina fontinalis Full. One specimen was obtained by Mr. Davis.

Limosina sp. One imperfect specimen, much smaller than the preceding. Dr. Dahl also records an undetermined species found on dead sea-weed.

DIESTRAMMENA UNICOLOR IN NORTH AMERICA. — I have lately received a female of this East Asian species which was captured in a greenhouse in Chicago, Ill., from Mr. W. J. Baumgartner. Its congener, *marmorata*, reported to have established itself in conservatories at Minneapolis, is likewise of Asiatic origin. Both species doubtless owe their introduction to commercial importations of foreign plants, among the wrappings of which they easily secrete themselves. — A. P. MORSE.

TANYPUS DYARI COQUILLET: PUPA AND ADULT EXCLUSION.

BY A. ARSÈNE GIRAULT, PARIS, TEXAS.

WHILE walking along the edge of a small mountain pond near the town of Blacksburg, Virginia, March 14, 1903, my attention was attracted to numerous pupal casts scattered over the surface of the water, especially numerous along the margin of the pond, clinging to pieces of old logs and fence-rails extending out into the water.

Simultaneously with this, grayish, slenderly built flies were occasionally seen rising from the water, and were at once connected with the floating exuviae. A few moments later they were observed emerging from their pupal skins.

Pupae.— The pupae locomote by quick, jerky, motions of the abdomen, the caudal end of which is forked; violent outward movements send them forward in a kind of a jerky revolving motion not unlike an acrobat turning many somersaults from some high position, though, of course, the pupae do not actually revolve, but apparently so.

They resemble mosquito pupae; light brown, shaded along the stigmatal line with olivaceus; eyes prominent, oval, deep brown; two brownish siphuncles are borne on the dorso-lateral aspect of thorax, one on each side; the latter protrude from the water when the insect takes its position at the surface of the water, which is often the case.

Normally, the pupae remain at the bottom of the pond, near the edge, under sticks and leaves, and when the latter are disturbed, shooting out in all directions. They are often seen at the surface, beside logs, where they rest with the abdomen curved under against the head and thorax.

Emergence takes place from a longitudinal rent in the thorax, and the fly uses the pupal skin to a certain extent as a float or support while its body and wings are drying. This, of course, is excepted, if it can find other support, which is often the case, as when the pupa has drifted against a log or a leaf, the excluded fly then abandoning the pupal skin for the more substantial support afforded by whatever object it may have drifted against. If in open water, and the wind is blowing, the fly perchance takes a short cruise, before it finally rises.

Exclusions — Pupa observed in about $\frac{1}{2}$ inch of water; very restless, and much paler than normal; lay quiet for awhile, extended full length and gave violent jerks with abdomen as if straining to break pupal skin. Very restless, then listless; floated about on surface of water, and finally came to rest against a bunch of grass growing in the water.

A well defined suture along the thoracic meson; at 12 : 46 P. M., with great suddenness, thorax parted along the meson, and the head and thorax shot out, as it were. In 50 seconds the wings and greater part of body were out, while in 5 seconds more the fly was resting on the surface of the water completely excluded. At 12 : 48 (2 minutes), the pupal skin was discarded and thrown aside, and the adult floated off. During the interval of time between the exclusion of the wings and the discarding of the pupal skin, the fly was simply resting on the surface of the water, the tip of the abdomen being supported by the cast skin. After floating a short distance, the body rapidly drying, it flew several yards and alighted on the water, and at 12 : 50 P. M. it again flew a short distance to the shady side of a log in the water. Took flight at 12 : 56 P. M.

In another case exclusion occupied six minutes, and the fly flew away eight minutes afterwards. The pupa was at first cruising over the water, the half excluded wings acting as sails, until it came to rest against a half submerged log, upon which the adult crawled as soon as free from the pupal skin.

Pupae and adults were present until April 28.

A Supposed Cynipid Gall from the Roots of Goldenrod (*Solidago*).

Desc. Gall. — Flattened, clustered, fleshy, bud-like, root-galls; dark olive green, tinged with garnet; soft, flabby to touch; multicellular, the larval cells long; taste neutral, like parsley; tuber-like when large.

Diameter: 4–11 mm. (single galls.)

Locality: Ridgeley, W. Virginia.

History. — Occasional; larvae and parasitic pupae present; no adults obtained; 22 Aug. 1903.

A. Arsène Girault, *Paris, Texas.*

PROCEEDINGS OF THE CLUB.

A SPECIAL meeting was held in the Council room on the evening of May 3, 1904; President Emerton in the Chair; twelve persons present. The record of the last meeting was read and accepted. A letter from Mr. A. H. Clark, telling of his recent experiences on Union Island, West Indies, was read. Mr. Emerton showed a specimen of the red-faced immature male of the spider *Pellenes cristatus*, and the imago of the parasite whose cocoon was shown at the last meeting. He also made some remarks on *Lycosa nidifex*, and showed a living adult female of that species. Mr. Sampson showed several pupae of *Harrisimemna trisignata*, in cavities in a piece of wood. Mr. C. A. Frost showed a box of miscellaneous insects, mostly Diptera and Hymenoptera, destined for the New England collection. The remainder of the meeting was devoted to informal conversation. Adjournment was reached at 9.50.

The 237th regular meeting was held in the Council room on the evening of May 17, 1904. President Emerton in the chair; twelve members and one guest present. The record of the last meeting was read and accepted. It was voted to authorize the officers to act for the Club in arranging terms on which sets of PSYCHE should be sold. Mr. C. A. Frost of Malden was unanimously elected to active membership.

Mr. Newcomb exhibited two photographs, one representing a specimen of the purple-striped form of *Actias luna*, the other the remarkable *Basilarchia* which he showed at a recent meeting. He further showed a fine specimen of *Memythrus similans*, reared from a pupa found by Mr. Bowditch. Mr. Blackburn showed a living female *Lycosa carolinensis*, and Mr. Emerton contributed some remarks on the habits of these spiders. Mr. Emerton then showed some beetles of the genus *Bledius* from the wet sand at Ipswich, with photographs of their burrows.

The Publication Committee and the Exhibition Committee were asked to submit reports at the next meeting. A few books were sold, and the meeting was adjourned.

W. L. W. FIELD,
Secretary.

RECENT ENTOMOLOGICAL LITERATURE.

Asterisks indicate descriptions of new species of American insects, or of new genera.

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2 Transactions American Entomological Society, Philadelphia.
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Anon. Dr. Hans Herman Behr (obit.), 5 Apr. **Dod, F. H. W.** Jocular entomology, 4 June. **Dyar, H. G., and Caudell, A. N.** The types of genera, 6 xii, 120. **Grinnell, F.** An early collector in California (P. J. M. Lorquin), 5 June. **Lankester, F. R.** The structure and classification of the Arthropoda, 151 Mar. **Smith, J. B.** Some remarks on classification, 5 June. **Snow, F. H.** Lists of Coleoptera, Lepidoptera, Diptera and Hemiptera collected in Arizona by the entomological expedition of the University of Kansas in 1902 and 1903, 156 xii (whole series), May, 1904. **Viereck, H. L.** A case for Schmitt boxes, 5 June. **Webster, F. W.** Relation of the systematic to the economic entomologist, 5 June. **H. F. W.** The Rev. P. Jerome Schmitt (obit.), 4 July.

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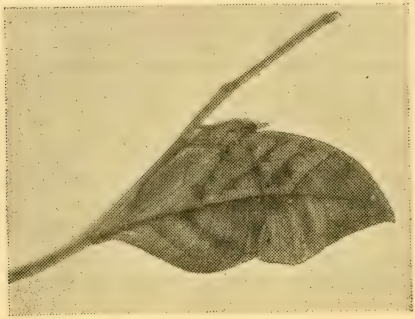

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THE DEVELOPMENT OF THE ROSTRUM IN RHYNCOPHOROUS COLEOPTERA.— Plates VI–IX.

BY ETHEL M. MCCLENAHAN, LAKE FOREST, ILL.

I. Introductory.

Much has been learned of late from the study of the development of parts which suddenly appear externally in insects at transformation. There remain a few such parts which have not as yet received the attention of investigators. One of these is the rostrum of rhyncophorous Coleoptera. Notwithstanding its size and singular appearance, and the interest bestowed upon it as an adult structure by systematists, I cannot discover that its development has received any attention whatever. Although it is long, often longer than legs or wings, and although appendage-like in appearance, it is not an appendage in the same sense as these, but is a prolongation of the front part of the head and carries the antennae upon its sides and the mouth parts at its tip.

Dr. Le Conte, in the preface to his synopsis of the Rhyncophora of North America, in enumerating important questions for further study in the groups, said, "The homologies of the parts of the head, by reason of which the front portion becomes extended into a beak, and the basal piece on the under surface (which separates the gular sutures in normal Coleoptera) disappears, are also worthy of attention." This study of the development of the rostrum has been undertaken because it seemed likely to yield answers to some of these questions of the systematist, and at the same time to throw some new light on the general problems of metamorphosis.

I have used, mainly, the two species of Rhyncophora, *Mononychus vulpeculus* Fabr. and *Balaninus nasicus* Say. The former lives its whole developmental life in the capsules of the blue flag — a period of about nine weeks.[1] *Balaninus nasicus* (Plate VI, fig. 1) is known as the acorn weevil. The adult bores a hole into the developing acorn and in it lays her egg. This takes place in the summer or early fall. It soon hatches into a small white larva and grows rapidly, living upon the

[1] A detailed life history of this species has been given by Professor Needham. *Biol. Bull.* Vol. I, pp. 179–191.

meat of the nut which, as a rule, it will have wholly consumed by the time it is grown (Plate VI, fig. 2). When the nut falls the larva leaves it, buries itself in the earth at considerable depth, which is probably to avoid freezing. Ordinarily but one larva lives in a nut, though two and even three are sometimes found. Since in this case they are invariably smaller there is an evident lack of nourishment.

The adults appear above ground any time after the first of June, some even as late as July or August.

My material, which abundantly represented all stages of metamorphosis, was obtained by collecting a large quantity of acorns of the white oak (*Quercus alba*) when they fell in autumn, and placing them on a box filled with earth and grass sod. In a very little while the larvae bored out, entered the earth and buried themselves near the bottom of the box. This was kept in the Laboratory where the normal temperature was about 21° C. and probably never lower than 18° C.

Specimens were taken out at weekly intervals and fixed. Through the winter there were no signs of metamorphosis. This suddenly took place in the spring.

The first imago was seen April 9th, and within the next two weeks they were abundantly found. April 23 the remaining specimens which represented all stages of development were taken out and fixed. This does not agree with Miss Murtfeldt's results, but if left undisturbed they might possibly not have emerged until much later.[1]

Balaninus nasicus Say (Plate VI, fig. 1), representing the extreme development of the Rhyncophorous rostrum, and, being the species I had under observation and control, has been the chief subject of study for the following paper. The account of the larva in particular is drawn wholly from *Balaninus* while *Monenychus* has served best for the study of internal metamorphic processes.

Methods — For fixation 70 % alcohol, first heated to boiling, was used with excellent results; paracarmine was used for staining *in toto* with a counterstain of orange or methyl blue on the slide; haematoxylin was mainly used for staining sections followed by eosin or picro-fuchsin as counterstain; whole preparations were stained with borax-carmine and differentiated with acidulated alcohol.

The development of the rostrum will be best understood by studying the parts concerned, firstly, in the larva, which has no rostrum; secondly, in the adult, which has it complete; and thirdly in transforming larvae and pupae, which show every phase of its growth.

---

[1] Excellent accounts of the habits of *Balaninus* have been published by Dr. John Hamilton in *Can. Ent.*, Vol. 22, pp. 1–8, 1890, and Miss Mary E. Murtfeldt in *Insect Life*, Vol. VI, p. 318, 1894.

II. The Larva.

The larvae of *Balaninus nasicus* Say vary considerably in size. The average larva, however, is about 15½ mm. from tip to tip; measured over the back, as it lies in its ordinary curled position, about 18 mm.; and 4 mm. in diameter. It is uniformly white in color with brown mandibles and an imperfect dorsal prothoracic shield of yellowish chitin. On each side are four rows of very small setae, two on either side of the spiracles. The ventral setae arise from conspicuous prominences. A few scattering ones lie on the under side of the body.

This larva (Plate VI, fig. 2) is of a very degenerate type. It has no organs except those for feeding. It wholly lacks eyes, antennae and legs. Correlated with the absence of eyes, the brain is destitute of optic lobes. The head is unusually small and the short, and close-set face and mouth parts give no hint of the remarkable extension they will undergo at transformation.

Mouth Parts.

Save for a slight reduction in maxillae and labium the mouth parts are much like those of other beetle larvae. The labrum is broadly rounded and supports near its edge ten spines and on the dorsal surface two or three pairs additional. At the middle of its posterior edge it is slightly produced backward into the clypeus. The mandibles (Plate VIII, fig. 12 *md.*) are somewhat triangular in outline with an ill-defined tooth upon the inner edge and two larger ones at the tip. They are moved by two large muscles (Plate VIII, fig. 12 *ab. m.*^{2} and *ad. m.*^{3}) which occupy the greater part of the head. The adductor is (*ad. m.*^{3}) larger and is attached through a stout tendon to the inner basal angle of the mandible. It is made up of numerous straight fibres, some of which arise from the wall of the head, others from a median dorsal chitinous endoskeletal ridge. The fibers of the abductor (*ab. m*^{2}.) are all attached to the latero-ventral wall of the epicranium. These unite into a short tendon which connects with the outer basal angle of the mandible.

Maxillae (Plate VIII, fig. 12, *mx.*) are comparatively simple. Cardo and stipes meet at a right angle. The latter is fused with the lacinia, which is armed on its edge with a row of ten spines. The galea is two jointed with four minute prominences on its tip. Palpus is wanting. Three sets of muscles serve to move the maxilla — two adductor and one abductor. The larger adductor (Plate VIII, fig. 12, *ad. m.*^{1}) is inserted near the tip of the lacinia. It is a compact band of fibers and takes its origin at the rear of the head. The lesser adductor (Plate VIII, fig. 12, *ad. m.*^{2}) springs from the ventral part of the tentorium and is inserted

near the middle of the stipes. The abductor (Plate VIII, fig. 12, *ab. m.*[1]) springs with the latter from the tentorium and is inserted on the external angle of the stipes beyond the basal hinge. Four large spines arise from the external face of the maxilla; one near the union of cardo and stipes; two near the base of the galea and one upon the basal segment of the galea.

The *labium* (Plate VIII, fig. 12, *l.*) is considerably reduced and its parts consolidated. The mentum is large. Paraglossae are broad; the glossa is triangular; the palpi are short and two jointed. Two pairs of muscles (Plate VIII, fig. 12, *l. m.*) take origin in the posterior region of the head and are inserted into the tip of the labium.

Thus there appear among the muscles that move the mouth parts two pairs springing from the tentorium and belonging to the maxillae; and five pairs springing from the hinder parts of the walls of the head:

Two large pairs belonging to the mandibles.

One lesser pair belonging to the maxillae.

Two still smaller pairs belonging to the labium.

The relations of these muscles will be found of importance when the shifting of parts in development is considered.

Anterior Parts of Alimentary Canal and Salivary Glands.

The *Alimentary Canal* agrees in general with that of other phytophagous beetle larvae. The esophagus is short, merging into the proventriculus at the end of the prothoracic segment. Numerous dilator muscles arranged along the esophagus are attached to the dorsal wall of the head immediately back of the labrum.

The *proventriculus* or crop is large and cylindrical in shape, slightly tapering at its posterior end into the long and twisted ventriculus, along each side of which is arranged in a longitudinal series a row of somewhat conic caeca, whose individual length is somewhat less than the diameter of the ventriculus.

The *Salivary Glands* consist of a single pair of long, tortuous, simple tubes lying at the sides of the esophagus. The tubes are slender, showing about two and a half cells in cross section, the individual cells rounded externally, giving an irregular outer surface to the gland, and internally the cavity winds a tortuous course between the internal prominences of the cells. The nuclei are more or less hemispherical, often more or less concave on the inner face and they always extend on that face numerous conic or jagged processes toward the lumen of the gland.

III. Imago.

The most striking peculiarity of the adult beetle, a characteristic of all Rhyncophorous Coleoptera, is a prolongation of the anterior part of the head which forms the rostrum. It is with this part that we are chiefly concerned. An understanding of its development will be best had if its structure in the adult beetle is first clearly understood and compared with that of the larva, just described.

The rostrum of Rhyncophora is unique in that it is not made up of elongated mouth parts as in Hymenoptera, Hemiptera, Diptera and Lepidoptera; not even in part, as in scorpion flies (Mecoptera); but it is the greatly elongated fore part of the head, the part between the eyes and the mouth; and it bears the mouth parts, which are similar in shape to those of other Coleoptera, at its apex. It varies from $3\frac{1}{2}$ to 7 mm. in length in *Balaninus nasicus*, being generally longer than the entire body of the weevil. It is gently decurved and has a deep groove on each side for the reception of the reflexed scape of the antenna. In it the usual sutures between the head sclerites are entirely obliterated by fusion and the scanty external evidence as to its composition is derived from the position of eyes, antennae and the mouth parts. This alone indicates that it is composed of fused frons, genae and gula of the normal insect head — a view which ontogeny substantiates, as we shall see under a subsequent heading.

Mouth Parts.

In these two weevils at least the mouth parts, generally speaking, show rather close correspondence with those of the larvae. They are more elongate and have sharper cutting edges.

Each mandible bears also at its base a singular process as long as (Plate IX, fig. 18) or longer than (Plate IX, fig. 15) the body of the mandible. This process projects posteriorly down the pharynx to the entrance of the esophagus. It is thickly beset with posteriorly directed prickles similar to those of the surrounding pharyngeal wall.

This process doubtless serves for the propulsion of the food down the narrow passage-way of the anterior end of the alimentary canal. With the swinging of the mandibles upon their hinges the two pharyngeal processes appended to their inner basal angles, lying side by side in the pharynx are drawn forward and pushed backward. Such is the direction of the prickles that the backward movement carries the food along.

After discovering these pharyngeal processes, I searched for some account of

them in such entomological literature as was accessible. The mouth parts of the Coleoptera having been so much used in classification I could scarcely believe that these were undescribed, yet I have not discovered any mention of them.

Maxillae have the same parts as in the larva, though more highly differentiated. The edge of the lacinia is covered with a dense fringe of hairs. The galea is four jointed and the palpus is wanting.

The *labium* (Plate IX, fig. 19) is quite different in its shape from that of typical Coleoptera. The sub-mentum is long and broader at the middle than at the ends. The mentum is of about the same length but more slender. The paraglossa is short and widens at the anterior end beyond which a long narrow glossa projects. Both are tipped with numerous small spines. The palpi are small and simple.

The *Hypopharynx* is well developed, at least in *Mononychus* (Plate IX, fig. 14, *hy*), with a free tip and covered with recurved prickles.

The *muscles* which move mouth parts lie in the more convex part of the head in very much the same positions as in the larva. The tendons which are there either short or altogether wanting, have developed with the rostrum. They lie upon the ventral side and connect the muscles in the head proper with the appendages at the apex. (Plate IX, fig. 14, *t*.)

The *antennae* are situated upon the beak from one to two mm. from the more convex part of the head. The scape is very long. The slender pedicel has seven segments. The ovate club consists of three or four, more or less, consolidated segments.

Two sets of muscles move each antenna. Their fibers originate in the tentorium and shortly unite into four uniformly thread-like tendons which are inserted upon the round basal piece of the scape; two, probably used for making the forward movements, upon the inner side; and two, which make the opposite backward movements, upon the outer side (Plate IX, fig. 14, *am.* and *ant.*).

The Shifting of Mouth Parts in Balaninus.

The relative positions of mouth parts differ considerably in these two species. In *Mononychus* the order is that of normal Coleoptera. During the metamorphosis of *Balaninus*, however, a curious shifting in positions of mandibles and maxillae takes place. The exterior sides of the mandibles turn ventrally, approximating the normal positions of maxillae. The maxillae, in turn, are pushed dorsally between mandible and mouth, the brush-like edges of their laciniae protruding between mandible and labrum. The mandibles then move vertically as described by Dr. Horn (Amer. Philos. Soc. Trans., p. 457, 1873), who conceived them as working upon each other like the blades of a pair of shears.

Alimentary Canal, Salivary Glands, etc.

These have considerably altered the proportions they have in the larva. The salivary glands are not the same, but a new development; new armature has been differentiated in the walls of the proventriculus, and new tracheal branches have penetrated the rostrum.

The pharynx passes over into the esophagus (Plate IX, fig. 14, *oe*) which extends as a slender tube back into the prothorax and there abruptly widens into a barrel shape proventriculus (*pv*). This in *Mononychus* is lined with eight double rows of transversely placed sharp edged plates of chitin; each row containing about sixty plates. The ventral wall of the pharynx (Plate IX, fig. 17) is made of thick chitin and is incapable of contracting or expanding. That is the function of the dorsal wall which is lined with but a thin coat and covered with prickles. The short elevator muscles (Plate IX, fig. 14 *m*, and figs. 16 and 17) are attached in two longitudinal rows to this wall and aid in swallowing by drawing out the folds of the dorsal wall and enlarging the cavity. Around this side are several rows of semi-circular muscle bands which contract it again into its position of rest. The esophagus is wholly surrounded by circular muscles.

Close beside the mandibular abductor tendons lie a pair of simple tubular salivary glands which extend directly through the rostrum to the dorsal part of prothorax where their ends are twisted with many convolutions (Plate IX, fig. 14; *s. gl.*).

A single pair of tracheae distribute their branches through the beak.

IV. Metamorphosis.

External Features of the Metamorphosis of the Head.

A comparison of larva and imago shows great changes in both internal and external anatomy. The larva merely exists to eat and grow and accumulate fat for its metamorphosis. It lives a sequestered, inactive life and only the organs necessary for such a life are developed. The adult, on the contrary, lives the active life of ordinary beetles. It possesses wings, legs, eyes and antennae in addition to the larval structures.

The transformation from the degenerate larva to the highly organized adult beetle, whether it occurs immediately at the end of growth, as in *Mononychus*, or after a long period of quiescence with suspension of all vital activity, as in *Balaninus*, when it does begin takes place rapidly.

As a preliminary, certain of the old larval structures are gradually broken down. The fat in the anterior end of the body disintegrates and is made ready to be used in building up the new structures of the imago.

As the old muscles of the head disintegrate the whole anterior end shrinks away from the chitin and the new head begins to take shape. If the chitin be removed at this stage we find the condition shown in Plate VI, figs. 3, 4 and 5. The antenna and mouth parts have begun to form but are still very crudely shaped; the rostrum is already apparent, though broad and short and with walls transversely corrugated.

The antennae also are forced into many folds by reason of their rapid increase in length. The folds suggest the segmentation of the adult antenna. Real internal segmentation, however, does not take place until the pupal stage.

More folds occur on that part of the rostrum immediately back of the labrum than posterior to the base of the antenna. This in the adult is the longer part of the beak.

The mouth parts of the old larva are thick, broad and shapeless, yet resemble in general outline homologous parts in the adult. The labrum is short and slightly bilobed. In the very old larva the large mandibles, always very prominent, are somewhat, though not deeply, serrated on their inner edges and otherwise quite similar in form to the stout biting jaws of the adult. Ventral views of the developing rostrum (figs. 4 and 5) show the bilobed maxillae and trilobed labium. The labial glossa and paraglossae at this stage are large and distinct. In *Mononychus* (fig. 4) the hypopharynx protrudes beyond the labrum.

A faint differentiation of tissue upon each side of the epicranium shows the outline of the large compound eye. Near the center of this is a small opaque spot where the optic lobe of the brain is developing.

The Development of the Beak.

In its general characteristics the hypodermis is the same for all the parts of the head. From the beginning of metamorphosis it is very thick. The cells are large, multiply rapidly and become closely crowded together and elongate. The nuclei are oblong and large, occupying fully one third of the cell. They are filled with large chromatin granules.

With the multiplication of cells and increase in size of the parts the hypodermis is forced into folds. In this way the entire beak and antennae are crowded under the old larva skin. When the pressure is removed by the shedding of this skin these parts stretch out (Pl. VIII, figs. 10 and 11), assuming suddenly more than half their final length, and the pupal stage is entered upon.

Plate VIII, fig. 10, is a semidiagrammatic optic section of the head of a newly formed pupa of Mononychus, seen from the front. It will be seen that the rostrum is relatively short and broad, narrower in the middle portion than in its apical third. At its tip are the crudely shaped mouth parts. The mandibles as yet show no development of their pharyngeal processes. The hypopharynx is an elongate ridge upon the pharyngeal floor. The salivary glands of the imago are just making their appearance as little sacculated ingrowths from the floor of the mouth. Fig. 13 is a section of a similar but slightly older specimen, showing the cellular structure. Here the pharyngeal processes (*m*) of the mandibles are budding. The upturned salivary gland is cut obliquely off, and the tubular ingrowths that will constitute the adductor (t^1) and adductor (t^2) tendons of the mandibles are clearly shown. While these are clearly ingrowths of hypodermis, and therefore quite distinct in their nature from the muscle fibres inserted upon them, it is very probable that they are being formed in the larva, and are drawn out to great length *pari passu* with the extension of the beak, and maintain throughout their connection with the muscle fibers in the head. The hypodermis of the mandibles and of the adjacent parts of the distal end of the rostrum show the characteristic peaked cells with nuclei settled down against the chitin, characteristic of hypodermis generally when its cells have been greatly crowded and thereafter greatly stretched apart.

Fig. 11 is an optic section of a somewhat older pupal head. Aside from the progress seen in the development of the antennae (which will be discussed under another heading), several changes are seen: the salivary glands are rapidly extending toward the head, one a little in advance of the other, the beak is increasing in length, and the mandibles are becoming toothed. At this age the tendons, which, as shown in fig. 13, are not tendonous at all, but distinctly cellular in structure, begin to show that wasting away of the cells with the deposition of chitine in the lumen, which will ultimately result in the disappearance of these cells altogether.

The further progress of the development of the salivary glands will consist in their prolongation backward beneath the esophagus around the sub-esophageal ganglion, and up into the dorsal side of the prothorax, where they become convoluted, as seen in Plate IX, fig. 14. Figs. 16 and 17 of Plate IX are cross sections of the beak in pupa and imago respectively, but taken at different levels. In fig. 16 the tendons have much the same appearance as the glands; but in fig. 17 the tendon that is to be, shows no cavity, but instead a central chitinous rod surrounded by a thin peripheral layer of cells. The salivary glands, on the other hand, are distinctly glandular in both stages but distinctly more slender in the imago than in the pupa, owing doubtless to their stretching out. There is another kindred structure seen here also. The beak is penetrated by two tracheae which enter from the ventral side of the prothorax as shown in figure 14, pass to the dorsal side at the base of

the beak and extend to the tip giving off branches en route. A cross section of these tracheae as they appear in the pupa (fig. 16 *tr.*) is remarkably like a section of tendon or of salivary gland: but in the adult (fig. 17 *tr.*) they are seen to be lined with chitin — not filled with it, as are the tendons.

The further development of the beak consists in the thickening and proper shaping of its chitinous walls, the appearance of scales developed from mother-cells early differentiated in the hypodermis, the shaping and perfecting of the armature and articulations of the mouth parts, the elongating of the pharyngeal processes of the mandibles and the development of the prickles upon their surfaces, and the differentiation between dorsal and ventral walls of the pharynx in which they lie, as already described under the account of the adult, and as shown in fig. 17, the developing of the semicircular muscles on the dorsal side of the pharyngeal wall, and the circular muscles about the esophageal wall, and the two rows of elevator muscles attaching to the chitin of the dorsum of the beak in both regions.

The Development of the Antennae.

The antennae of Rhyncophora show considerable differentiation of segments, being geniculate at base and clubbed at apex — a condition that is attained by them in early pupal life as shown in Plate VIII, fig. 11. At this stage the composite nature of the club is apparent and the segments of the pedicel lack much of their definitive length and slenderness and complexity of structure. In the pupa when first formed (fig. 10) these parts are hardly differentiated: the scape is exceedingly short, and segmentation is incompletely indicated, even in the pedicel. But the younger specimens (larvae) already referred to (Plate VI, figs. 3–5) show already indications of a terminal club and a geniculate base. It is doubtful whether all the transverse constrictions and convolutions that appear at this time really represent the segments that will appear later, for these are probably due in a large part to growth within the narrow confines of the loosened head capsule.

To find the beginnings of the antenna one must study sections of the head of the full grown larva before metamorphosis has begun, and before the chitinous head capsule has been loosened. Then one may find in the position of the base of the larval antennae in other coleopterous larvae the antennal buds — mere disks of thickened hypodermis, not invaginate nor in any way removed from the surface, surrounded by a circular groove and a circular ridge of hypodermis (the equivalent of the peripodal membrane of "imaginal discs") as shown in Plate VII, fig. 6. The shallow internal cavity is filled with fat cells and leucocytes. Already there appears a thin layer of neuroblast (?) cells, attached to the inner ends of the hypodermis

within the cavity. With the beginning of metamorphosis, and the disintegration of larval fat providing material for growth, and the loosening of the larval cuticle allowing room for expansion, the antenna rapidly extends itself, and the transverse wrinkling begins. Fig. 7 is from a section of the antenna of a larva in an early stage of metamorphosis. The hypodermis still appears composed of closely crowded elongate and compressed cells with elongate nuclei filled with chromatin granules, the cell layer being thickest at the distal end. It shows within more abundant fat and leucocytes, a better development of the neuroblastic layer, and the beginning of the development of muscle fibres. Fig. 8 is from an older larva, nearer the time of pupation, and shows the same features throughout, a little better developed. Fig. 9 is from a section of the club after the extension that takes place when the larval skin is cast. It shows at once the transition in form of the cells of the hypodermis to the peaked type, with the nucleus settled down upon the chitin layer and a long internal process reaching the basement membrane — a type entirely characteristic of such conditions of crowding and subsequent extension,[1] best exemplified here at the place where the extension has been greatest as in the segment at the base of the club.

The neuroblastic layer here is still better developed, and the segmentation of the club is still very distinct. The further development of the antenna consists in the elongation of the scape, the better differentiation of the segments of the pedicel, the consolidation of those of the club, the perfecting of the articulations, and the development of the abundant sense organs which are presumably associated with the neuroblastic lining cell layer.

The Question of Homologies.

What has become of the gula, so constant in normal coleoptera? What has become of the labrum? What are the limits of the lateral sclerites of the head? These questions have grown out of the fact that in the adult distinct sclerites are not discoverable; and the evidence derived from the development of these parts has not proved as clear and complete as might have been wished. Several features of the newly formed beak already alluded to (Plate VIII, fig. 10), seem to bear upon these questions. The constriction at about two thirds its length marking as it does internally the transition from pharynx to esophagus, probably marks also externally the proper base of the mouth parts, the junction of labrum and clypeus above and of labium and gula below: that is, this dilated front end probably corresponds with the periphery of the mouth opening in other coleoptera. At this level there begins

[1] See on the mechanics of this process, Comstock and Needham, *Amer. Nat.*, vol. XXXIII, pp. 856–857.

on the floor of the beak within two longitudinal chitinous ridges separated by a distance equal to one third the diameter of the beak and extending backward to the head. These would seem to represent the fusion of the gula at its lateral edges with the genae, and thus to mark the position of gular sutures. Thus the gula would seem to be better marked off from neighboring sclerites than these are from each other.

Grateful acknowledgment is due Miss Mary E. Murtfeldt for specimens of different species of Balaninus; to Miss Elizabeth Andrews for the use of preparations; and especially to Professor J. G. Needham, whose kind advice and daily assistance made these studies not only possible, but also very pleasant.

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Explanations to the Plates.

PLATE VI.

Fig. 1. Adult beetle, *Balaninus nasicus* Say.

Fig. 2. Full grown larva of same.

Fig. 3. Dorsal view of head end of pre-pupa of *Mononychus vulpeculus* Fabricius, removed from the larval skin, showing foldings of rostrum and antennae, outlines of the developing compound eye, and the fore wing.

Fig. 4. Ventral view of mouth parts, antennae and rostrum of same.

Fig. 5. Similar view of *Balaninus nasicus*.

PLATE VII.

Figs. 6, 7 and 8. Three stages in the development of the antenna in the larva of *Mononychus vulpeculus*. Fig. 6 is from an old but still active larva; fig. 7 is from a larva in process of metamorphosis; fig. 8 is from a larva near transformation to pupa.

Fig. 9. Longitudinal section of the club of the antenna of a newly formed pupa of *Mononychus vulpeculus*.

n, neuroblastic cell layer, in all the figures of this plate.

PLATE VIII.

Fig. 10. Dorsal view of head of newly formed pupa of *Mononychus vulpeculus*, semi-diagrammatic optic section; *ant*, antenna; *t*, *t*, tendons of antennal muscles; *s*, tip of the chitinous pupal sheath enveloping the entire body; *oe*, esophagus; *hp*, hypopharynx; *s. gl*, salivary gland; *md*, mandible; *mx*, maxilla; t^1 and t^2, adductor and abductor tendons of the mandible; *hy*, hypodermis.

Fig. 11. Similar view of a somewhat older pupa, showing progress in the development of the salivary glands, mandibles and antennae; lettering as before.

Fig. 12. A divided dorsal view of a dissection of the head of a grown larva of *Balaninus nasicus;* the right side shows the mandible and its muscles in place; the left side shows these removed, exposing the maxilla and its muscles, the brain and the labial and esophageal muscles. *br*, left cerebral ganglion; *c*, nerves going to the mouth parts; *1*, *2*, *3*, *4*, esophageal muscles, detached; *ad.* m^1 and *ad.* m^2, adductors of the maxilla; *ab.* m^1, abductor of the maxilla; *ad.* m^3, adductor of the mandible; *ab.* m^2, abductor of the mandible; *l*, labium; *l. m.* labial muscles other lettering as in fig. 10.

Fig. 13. Frontal section of the tip of the beak in a young pupa of *Mononychus vulpeculus*; t_1, abductor, and t_2, adductor tendons of the mandible in process of development as invaginations of the hypodermis, hy; *c*, chitin; *m*, pharyngeal process of the mandible budding; other lettering as in fig. 10.

PLATE IX.

Fig. 14. Sagittal section of head and part of prothorax of imago of *Mononychus vulpeculus*, slightly diagrammatized in order to bring into view esophageal and antennal muscles, etc.: *am*, antennal muscles; *ant*, antenna; *tr*, trachea; *m*, esophageal muscles; *oe*, esophagus; *mp*, pharyngeal process of the mandible; *hy*, hypopharynx; *l*, labium; *t*, base of the abductor tendon of the mandible, with muscle attached; *tnt*, tentorium; *g*, subesophageal ganglion; *br*, cerebral ganglion: the frontal ganglion lies directly before it upon the esophagus; *pv*, proventriculus; *s. gl*, salivary gland.

Fig. 15. Mandible of same, with its adductor (t^1) and abductor (t^2) tendons and muscles and its pharyngeal process (*mp*) attached.

Fig. 16. A cross section of the beak of a young pupa of *Mononychus vulpeculus* about midway its length: *f*, fat cell; the tendons of the mandibles (t^1) lie farther from the middle line than those of the maxillae (*t*), other lettering as in fig. 14.

Fig. 17. Cross section of the beak of an imago of the same species, through the pharyngeal region, showing the swallowing apparatus of the pharynx; *md. t*, tendons of the mandible; *mx. t*, tendons of the maxilla, other lettering as in fig. 14; four scales are represented in black, protruding through the chitin layer.

Fig. 18. Mandible of *Balaninus nasicus* with tendons and pharyngeal process (*mp*) attached.

Fig. 19. Labium of same: *p*, palpus; *gl*, glossa.

Eurema lisa in New Hampshire. — I have to record the capture of a male of this species at Alstead, N. H., Aug. 27, 1904. It was flying in upland meadow country at an altitude of about 1100 feet, and five and a half miles from the Connecticut River. The specimen is fresh and uninjured. This appears to be the first recorded occurrence of the species in the western portion of the state. Previous records are almost strictly confined to the towns near the seacoast, though one is from the Merrimac valley.—James A. Field.

ON THE NORTH AMERICAN SPECIES OF SIPHONELLA.

BY C. F. ADAMS, CHICAGO, ILL.

Baron Osten-Sacken in his Catalogue listed five species in this genus, placing *plumbella* Wied. therein on the authority of Loew. After a study of type material Mr. Coquillett has removed *obesa* Fitch, placing it as a synonym of *Chlorops assimilis* Macq. In material which I have studied I have recognized two European species and three new ones. Several specimens of *S. laevigata* Fall. were collected by Dr. Hough at New Bedford, Mass., and one specimen of *S. trilineata* Meig. comes from Colorado. The species appearing under the name *nigrirostra* comes from Grenada, W. I., and is one of several Diptera worked out by Dr. Williston and myself for the British Museum. The manuscript is not yet published, but the species is sufficiently characterized, for the present paper, in the following table:—

Table to the Species.[1]

1.	Thorax vittate	2.
	Thorax not vittate	6.
2.	Antennae wholly yellow	*plumbella* Wied.
	Antennae at least with tip infuscated	3.
3.	Halteres brownish black	*reticulata* Loew.
	Halteres yellow	4.
4.	Mesonotum with three lines	5.
	Mesonotum with five lines	*quinquelineata* n. sp.
5.	The mesonotal lines consist of shallow sulci	*parva* n. sp.
	The mesonotal lines consist of brown colored vittae	*trilineata* Meig.
6.	Thorax pollinose	7.
	Thorax shining	8.
7.	Antennae largely black	*latifrons* Loew.
	Antennae largely yellow	*cinerea* Loew.
8.	Face yellow	*inquilina* Coq.
	Face black	9.
9.	Anterior and middle tibiae largely black	*laevigata* Fall.
	Anterior and middle tibiae yellow	*nigrirostra* Adams.

[1] After this paper had gone to press I noticed that Dr. J. B. Smith in his "Insects of New Jersey," page 696, has reported *Siphonella pumilionis* Bjerk. from Riverton, N. J. After examining specimens of this species I find that it will stand next to *quinquelineata* in the table, and will be known from it by having the thorax yellow, marked with black vittae, instead of black, marked with brown vittae.

Siphonella parva n. sp.

Upper half of front, and occiput black, with gray pollen; lower half of front, antennae except tip of third joint, face, cheeks, and palpi yellow, proboscis black. Thorax gray pollinose, short pile yellowish white, mesonotum with three indistinct, shallow sulci; halteres yellow. Hind margins of abdominal segments yellowish. Legs yellow, all femora, and hind tibiae blackish centrally. Wings hyaline, third and fourth veins parallel. Length 1.5 mm.

One specimen. Colorado.

Siphonella quinquelineata n. sp.

Black, gray pollinose, mesonotum marked with five brown lines. Occiput, frontal triangle, and frontal orbits grayish pollinose; front brownish black, anterior margin and a median line fulvous; antennae brownish black, inner sides of joints yellowish, face, cheeks, and palpi yellow, proboscis with basal half black, apical half yellow. The two lateral vittae of the mesonotum short and very indistinct, the very short pile yellowish white; halteres yellow. Abdomen brownish black, posterior margins of segments yellowish. Legs with coxae, femora, and middle and hind tibiae largely black, remaining parts yellow. Wings hyaline. Length 1.7 mm.

Four specimens, Opelousas, La., and Tipton, Ga. April, June, and October.

Chryptorhynchus lapathi in Minnesota.—In view of Mr. Kirkland's article in Psyche, Vol. 8, p. 37, June, 1899, in which he describes the finding of this introduced beetle in Balm of Gilead poplar in Massachusetts, it may interest the readers of Psyche to know that we have found it here this last spring, illustrating the steady westward progress of this unwelcome immigrant. Burgess found it in Ohio a few years ago. Cooley of Montana reports seeing one specimen in 1899 in Montana. It was brought here and from here sent away up into the northwestern corner of North Dakota, in a shipment of nursery stock (Carolina Poplars) from New York State. — *F. L. Washburn, St. Anthony Park, Minn., Sept. 29, 1904.*

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—LVI.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Sciagraphia granitata Guenée. A mature larva was described by me as this species (Ent. news, v, 63, 1895) under the determination of the late Dr. Hulst. This is apparently an error, but I cannot now find the specimen on which Dr. Hulst made the determination. It does not appear in the National Museum series of *granitata*.

Eggs were obtained from captive females at Kaslo, British Columbia. The larvae fed on spruce, choosing the needles of the previous year which they closely matched by their dark bluish green color.

Egg. Elliptical, rounded, the ends very nearly alike, no distinct truncation; well flattened but without any flat areas; reticulations coarse, distinct, raised, hexagonal, the cell areas concave, resembling a thimble, about alike all over. Sordid bluish green; size .8 × .6 × .4 mm. Hatched in six days.

Stage I. Head bilobed, full, sutures depressed, bright orange, shining. Body moderate, a little flattened, normal; pale yellow, translucent, green from the food, no markings; anal feet project laterally, segments coarsely annulate; tubercles elevated, concolorous; setae pale, rather short, capitate.

Stage II. Head luteous, eye black, mouth brown; width .5 mm. Body moderate, rather stout, sordid green, the dorsum with very fine, obscure, grayish olivaceous longitudinal lines; a broad stigmatal whitish band, not contrasted; venter lined like the dorsum; feet blackish except the anal pair. Tubercles small, blackish; setae short, dark.

Stage III. Head rounded, flat before, a little higher than joint 2, whitish luteous, the sutures dark: width .8 mm. Body moderate, not elongate, blackish green with a broad white stigmatal stripe. Ground color olivaceous with blackish dotted geminate dorsal, subdorsal, lateral, substigmatal, subventral and medioventral lines. Thoracic feet blackish, the abdominal ones olivaceous. Tubercles small, black, in pale rings; setae rather long, dusky.

Stage IV. Head smoothly rounded, clypeus level, luteous green, a broad smoky black band at sides above, brownish before eyes; ocelli in a whitish field, labium blackish shaded; width 1.2 mm. Body moderate, not elongated, feet normal; dark green, heavily shaded with blackish. Dorsal and subdorsal lines narrow, whitish, the sides more heavily black shaded; stigmatal line broad, white, diffusely edged; illy defined pale subventral and medioventral lines, both narrow. Feet blackish; tubercles small, dark, obscure; setae dusky.

Stage V. Head rounded, slightly bilobed, clypeus level, broad; shining bluish green with a very broad band of black on the sides of the lobes, a little checkered in brown on its edges; width 1.8 mm. Body cylindrical, moderate, normal, smooth; bluish green like the old spruce needles, shaded with white; a white addorsal border to the dorsal vessel; white subdorsal lines, faint at the ends, both greenish white, not contrasted; an irregularly mottled triplicate black lateral band, touching the lower edge of the subdorsal line, not reaching the faint white, diffuse stigmatal line. A similar, less distinct triplicate subventral band, touching a faint white, ventral line. Thoracic feet brown, those of joint 10 green, of joint 13 black shaded. Tubercles concolorous, obsolete, setae rather long, black. Later olivaceous blackish spots show distinctly on joints 6 to 8 in the substigmatal band.

The larvae entered earth to pupate early in July; no moths emerged.

BLACK BACKGROUNDS FOR BUTTERFLIES.

BY W. L. W. FIELD, MILTON, MASS.

It is the common practice of entomologists to arrange collections of insects in boxes lined with white paper. Against such a background the darker specimens stand out in sharp relief, and the effect is certainly pleasing. With no expectation of bringing about the general abandonment of this practice, but merely with a view to introducing a useful alternative, I submit these notes on the advantages attending the use of black backgrounds.

Specimens of lepidoptera exposed to strong light are almost sure to fade, and every entomologist will recall museum collections in which many of the species are quite misrepresented by the bleached examples on view. I think it is generally recognized that the white paper behind the specimens, acting as a reflector, materially hastens the fading process. Indeed it has been found that lepidoptera displayed in any of the various patent mounts in which the wings are closely applied to a white surface keep their colors appreciably longer than those elevated on pins above the bottom of a white-lined case. In the patent mounts the reflector is smothered so far as its action on the specimens is concerned.

The reflection from white backgrounds is fatiguing to the eyes of anyone who has occasion to examine closely a long series of specimens. This is a more serious difficulty, since it renders unnecessarily wearisome the study of any collection kept in white-lined drawers or boxes. The use of tints interferes with the correct analysis of the colors of the specimens. If white is to be abandoned, the obvious substitute is black.

For black backgrounds I have used a good quality of coated paper, which may be bought from dealers in school supplies in sheets measuring 24 × 20 inches. The price is four cents per sheet. This paper has a slight gloss, but the objections to this are offset by the hard, smooth quality of the surface. It may not prove to be very durable, for coated papers are apt to be disappointing in this respect. A more expensive paper might be found which would give longer service.

Specimens displayed against the black background look well, the white and yellow butterflies in particular making a fine appearance. Dark species are not unduly obscured. There is no fatiguing glare, and the risk of damage to valuable specimens through exposure to light is considerably diminished.

PROCEEDINGS OF THE CLUB.

The 238th regular meeting of the Club was held in the Council room on the evening of June 21, 1904. President Emerton in the chair; sixteen members present. Mr. Blackburn showed a large longicorn beetle (*Callipogon* sp.) captured near a fruit store in Boston. Mr. Sampson showed a remarkable monstrosity in the shape of a five-winged *cecropia*. Mr. Denton exhibited butterflies mounted to illustrate protective resemblance, and Mr. Blackburn showed a collection of moths obtained at lights near his house. Mr. Low exhibited a specimen of *Mygale hentzii*, and Mr. Johnson spoke on variation in the wing-venation of the Tipulid *Amalopis inconstans*. On the arrival of the Secretary, who was late, the record of the last meeting was read and accepted; after which the meeting was adjourned.

By invitation of Mr. Emerton, the 239th regular meeting was held at 194 Clarendon Street on the evening of September 20, 1904. The President in the chair; eleven members present. The record of the last meeting was read and accepted. On behalf of the Publication Committee, Mr. Field reported recent sales of back volumes of Psyche. Mr. Emerton and Mr. Denton told of the plans thus far made for the exhibition. Mr. Johnson offered to lend boxes to exhibitors, and to receive exhibits sent to Boston by out-of-town exhibitors.

Mr. Blackburn showed a very large number of specimens of Lepidoptera recently added to the collection he is forming of species taken within the limits of a single city block in Woburn Mr. Newcomb told of some recent observations on the temperature-control of the chirping of crickets. Mr. Rogers reported the capture of *Pieris rapae* and *Colias philodice* in copulation. Mr. Johnson exhibited larvae, pupae and imagos of the Tipulid *Limnobia triocellata*, obtained from fungi at Riverside, and also showed enlarged drawings of the larva and pupa. Mr. Frost reported the capture of *Cicindela hentzii* in Framingham, near the Wayland line. Mr. Emerton showed photographs of the tracks made by various insects in the sand at Ipswich, — one of them, the larva of *Vanessa antiopa*, which he had found feeding on the grass *Ammophila arenaria*.

The meeting was adjourned at 9.20.

A special meeting was held at 194 Clarendon Street, on Tuesday evening, September 27, 1904. Attendance, fourteen. Mr. Emerton presided, and Messrs. Nathan Banks and A. N. Caudell were present as guests. The meeting was devoted to informal conversation, the principal topic being the influence of temperature on the stridulation of orthoptera.

W. L. W. Field, *Secretary*.

RECENT ENTOMOLOGICAL LITERATURE.

Asterisks indicate descriptions of new species of American insects, or of new genera.

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The General Subject.

Anon. The Reverend Jerome Schmitt [obit.]. 5 Sept. **Banks, N.** Notes on the structure of the thorax and maxillae in insects, 102 vi, 149, pl. I. **P. P. C.** Robert McLachlan [obit.], 5 Sept. **Crampton, H. E.** (a) Variation and selection in Saturniid Lepidoptera, 140 May; (b) Experimental and statistical studies upon Lepidoptera: I. Variation and elimination in Philosamia cynthia, 143 Mar. and July. **Goury, G. et Guignon, J.** (a) Les insectes parasites des Renonculacées,

(fig.) 65 May; (b) Les insectes parasites des Berberidées, i, 65 Sept. **W. F. K.** Robert McLachlan (obit.) 10 June 2. **Kunze, R. E.** Protective resemblance, 5 Sept. **Shreve, F.** Some plants which entrap insects (ill.), 160 Sept. **Wesche, W.** The labial and maxillary palpi in Aptera, 161 ix, pt. 5.

See also Wickham under Coleoptera.

Economic Entomology.

Anon. The cotton boll weevil, 68 Oct. 7. The red ant versus the boll weevil, 157 June. **McCaw, W. D.** Walter Reed [Deals with mosquitoes in relation to yellow fever], 160 July.

See also Marlatt, under Hemiptera, and Cook and Wheeler, under Hymenoptera.

Arachnida.

Lankester, E. R. The structure and classification of the Arachnida (reprint from Encyc. Britt., 10th ed.), 151 Sept. **Scheffer, T. H.** (a) Four new spiders from Kansas,* (b) The egg cocoon of the triangle spider, 5 Oct.

Odonata.

Butler, H. The labium of the Odonata, 2 April. **Williamson, E. B.** (a) A new species of *Psolodesmus* from Formosa, 5 Sept.; (b) Additional dragonfly records for western Pennsylvania, 5 Oct.

Neuroptera.

Banks, N. Neuropteroid insects from New Mexico,* 2 April.

Trichoptera.

Banks, N. Two new species of caddice-flies,* 102 vi, 140. [A new genus, *Glyphopsyche*, is described.] **Ulmer, G.** Ueber die von Herrn Prof. Yngve Sjostedt in Kamerun gesammelten Trichopteren,* 159 i, 411. [A new genus, *Protomacronema*, is described.]

Orthoptera.

Caudell, A. N. (a) Some orthoptera taken at Moose Jaw, Assiniboia, 4 Aug. (b) On a collection of non-saltatorial orthoptera from Paraguay,* 6 xii, 179. [Two

new genera, *Paraleptynia* and *Ceratiscus*, are described.] **Rehn, J. A. G.** (a) Notes on the orthoptera of the Keweenaw Bay region of Baraga co., Mich., 5 Sept., Oct.; (b) Two new species of North American *Stenopalmatinae*,* 5 Oct.

Hemiptera.

Heidemann, O. Notes on North American *Aradidae* with descriptions of two new species,* 102 vi, 161. **Kirkaldy, G. W.** Ueber Notonectiden. 38 vi, 93. **Marlatt, C. L.** The discovery of the native home of the San Jose scale in eastern China and the importation of its natural enemy, 160 Aug.

Coleoptera.

Aurivillius, C. Neue oder wenig bekannte Coleoptera Longicornia,* 159 i, 313. [The following new genera are described: *Coptoeme*, *Eugoides*, *Niphoparmena*, *Peritragus*, *Cyrtocris*.] **Beyer, G.** A few notes on *Brenthidae*, 6 xii, 168. **Chittenden, F. H.** (a) A species of the Tenebrionid genus *Latheticus* in the United States, 6 xii, 166; (b) On the species of *Sphenophorus* hitherto considered as *simplex* LeConte,* 102 vi, 127; (c) On the species of *Sphenophorus* hitherto considered as *placidus*, Say,* 102 vi, 130. **Felsche, C.** und **d' Orbigny, H.** Coprophagen der Ausbeute des Herrn Prof. Dr. Yngve Sjostedt,* 159 i, 399. [A new genus, *Pseudopedaria*, is proposed.] **Hunter, W. D.** and **Hinds, W. E.** The Mexican cotton boll weevil, 7 no. 45. **Wickham, H. F.** (a) Reduplication of the tarsus in *Hydrocharis*, 5 Sept.; (b) The influence of the mutations of the Pleistocene lakes upon the present distribution of *Cicindela*, 3 Sept.

Diptera.

Adams, C. F. Notes on and descriptions of North American Diptera,* 155 ii, 433. [26 new species are described and tables to the species of the following genera are given: *Xylophagus*, *Chrysopila*, *Leptis*, *Icterica*, *Urellia*, *Limosina*.] **Aldrich, J. M.** The genus *Psilopus* of authors, 4 Aug. **Brimley, C. S.** and **Sherman, F., Jr.** List of the *Tabanidae* (Horse-flies) of North Carolina, 5 Oct. **Coquillett, D. W.** (a) New Diptera from India and Australia, 102 vi, 137; (b) New North American Diptera,* 102 vi, 166. [Four new genera — *Bibiodes*, *Dioctrodes*, *Metapogon* and *Sinophthalmus* — and 53 new species are described.] **Dyar, H. G.** (a) The larva of *Culex punctor* Kirby, with notes on an allied form, 6 xii, 169, pl. IX; (b) brief notes on mosquito larvae, 6 xii, 172. **Dyar, H. G.,** and **Knab, F.** Diverse mosquito larvae that produce similar adults, 102 VI.

Eckel, L. The resin-gnat and three parasites, 140 May. **Felt, E P.** and **Young, D. B.** Importance of isolated rearings from Culicid larvae, 68 Sept. 2. **Knab, F.** The epistomal appendages of mosquito larvae, 6 xii, 175, pl. X. **Ludlow, C. S.** Mosquito notes,* 4 Aug. **Osburn, R. C.** The Diptera of British Columbia, II, 4 Aug. **Portevin, G.** Contribution au catalogue des Diptères de Normandie, 65 July. **Villeneuve, Dr.** (a) Contribution au catalogue des Diptères de France, I, cont., 65 June, Aug. **Webster, F. M.** The so-called human flea, *Pulex irritans*, infesting the opossum, *Didelphys virginiana*, 4 Aug.

Lepidoptera.

Barnes, W. New species of North American Lepidoptera,* 4 Aug. **Busck, A.** A new name for the Tineid genus, 6 xii, 177. [For *Brackenridgia* Busck, preoccupied, the name *Paraclemensia* is proposed.] **Druce, H.** Descriptions of some new species of butterflies belonging to the family *Erycinidae* from tropical South America,* 14 Aug. [2 pl. in color.] **Dyar, H. G.** (a) Two new forms of *Oeneis* Hubner,* 102 vi, 142; (b) two notes on Tineid moths, 6 xii, 178; (c) Notes on synonymy and larvae of *Pyralidae*,* 102 vi, 158. [A new genus, *Cacotherapia*, is described.] **Lathy, P. I.** A contribution towards the knowledge of the Lepidoptera-Rhopalocera of Dominica, B. W. I., 14 Aug. **Schaus, W.** New species of American Heterocera,* 2 April. **Taylor, G. W.** The *Geometridae* in The Moth Book, 4 Aug.

See also Crampton, under The General Subject.

Hymenoptera.

Ashmead, W. H. Descriptions of new Hymenoptera from Japan,* 6 XII, 146. [A new genus, *Cerapteroceroides*, is described.] **Brues, C. T.** A new species of *Ecitipora*,* 5 Sept. **Cameron, P.** New Hymenoptera mostly from Nicaragua,* 142 I, 46. **Cockerell, T. D. A.** Some little-known bees of the genus *Colletes*, 5 Oct. **Cook, O. F.** (a) An enemy of the cotton boll weevil, 158 no. 78; (b) Report on the habits of the kelep, or Guatemalan cotton boll weevil ant, 7 no. 49; (c) Pupation of the kelep ant, 68 Sept. 2. **Embleton, A. L.** On the anatomy and development of *Comys infelix* Embleton, a hymenopterous parasite of *Lecanium hemisphaericum*, 161 ix, pt. 5. **Fielde, A. M.** (a) On the artificial creation of mixed nests of ants; (b) Effects of light-rays on an ant, 140 May; (c) Observations on ants in their relation to temperature and submergence, 140 Aug.; (d) Portable ant-nests, 140 Sept. **Fullgren, A.** On some Hymenoptera Aculeata from the Cameroons, 159 i, 425. [A new genus, *Aeluroides*, is described and fig

ured.] **Kieffer, J. J.** (a) Descriptions of some new Hymenoptera from California and Nevada,* **142** I, 41; (b) Beschreibung neuer Proctotrypiden und Evaniiden,* **159** i, 525. [Among the new species described are 11 from Texas, 2 each from Wis., Ill., and N. J., and 1 from Nev. and Mex.] **Picard, F.** Note sur l'instinct du *Pompilus viaticus*, **65** May. **Swenk, M. H.** A new *Colletes*,* **5** Sept. **Viereck, H. L.** (a) Additions to Sphegoidea: (b) The North American cuckoo-wasps of the genus *Parnopes*,* **2** April; (c) A bee visitor of *Pontederia* (pickerel-weed),* **5** Sept. [n. g., *Conohalicoides*, n. sp.]; (d) The American genera of the bee family *Dufouroides*,* **5** Oct. [New genera, *Nechalictoides*, *Cryptohalictoides*.] **Viereck, B. L.** and **Cockerell, T. D. A.** The *Philanthidae* of New Mexico, II,* **6** xii, 129. [Tables of species are given and 19 new species are described.] **Viereck, H. L. et al.** Synopsis of bees of Oregon, Washington, British Columbia and Vancouver, III,* **4** Aug. **Wheeler, W. M.** (a) The ants of North Carolina, **148** xx, art. XXVI; (b) on the pupation of ants and the feasibility of establishing the Guatemalan kelep or cotton weevil ant in the United States, **68** Sept. 30.

See also Eckel, under Diptera.

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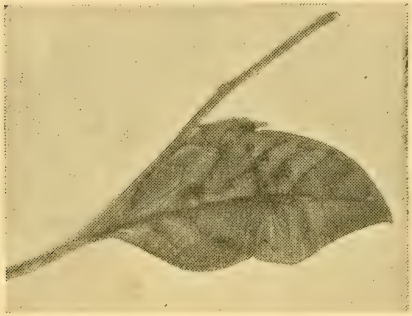

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EXCHANGES.

[Exchange notices (not over five lines) inserted free for subscribers. Notices will be inserted in the order in which they are received, and those at the top of the column will be removed only when it is necessary to make room for new ones at the bottom.]

AMARA. Being engaged in the study of this genus, I will determine specimens for collectors. These should be sent numbered. I am also anxious to obtain species in other genera of Carabidae not in my collection, from all parts of the world, and will purchase or exchange for same. Roland Hayward, Readville, Mass.

WANTED.—Eggs, larvae or pupae of grasshoppers, dragon-flies, beetles, bugs, etc. Will give tropical butterflies in exchange. Denton Bros., Wellesley, Mass.

WANTED.—Material for the study of the hybrid or polymorphic butterflies of the genus *Basilarchia*, including larvae or pupae of *arthemis* or *astyanax*, imagos of *proserpina* or *arthechippus*, or any specimens showing unusual characters. Liberal exchange. Specimens retained will be deposited in Museum of Comparative Zoölogy. W. L. W. Field, Milton, Mass.

LEPIDOPTERA—For exchange, fertile eggs of *Hemileuca maia*. Alfred C. Sampson, Sharon, Mass.

I have a few specimens of *C. calleta* and *cinctus* to exchange for rare *Sphingidae* or Pupae of same. W. T. Buxton, 17 Walter St., Somerville, Mass.

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Correspondence desired regarding Rhopalocera of North and South America, especially Argynnis, Papilio, Morpho, Caligo. Exchange or otherwise. T. H. Shepherd, 15 Hope View, Carr Lane, Shipley, Yorks., England.

ABNORMAL LEPIDOPTERA.

The plate which we publish herewith shows an interesting group of abnormal moths and butterflies.

Fig. 1 is a much reduced likeness of a specimen of *Attacus cecropia* ♀, reared by Mr. A. C. Sampson of Sharon, Mass., and now in the collection of Mr. H. H. Newcomb. This moth has a supernumerary wing, proceeding from the thorax just in front of the normal right primary, and though imperfectly expanded constituting in all its recognizable features a duplicate of that wing. In other respects the moth seems to be a perfectly normal specimen.

Fig. 2, likewise reduced from the original, shows an asymmetrical *Telea polyphemus* ♂, reared by Mr. J. H. Rogers, Jr., of Medford, Mass., and now in his collection. The left primary and right secondary are elongated, while the right primary and the left secondary are shortened and compressed. Gauged by the combined areas of primary and secondary, the right and left sides of this specimen are approximately equal.

Fig. 3 is a life-size view of a male specimen of *Olene leucophaea*, reared in 1901 by O. Seifert, Esq., and now in the collection of Mr. E. J. Smith. The moth has four antennae.

Fig. 4 shows a female *Colias philodice* taken by Mr. J. H. Rogers, Jr., at Medford, Mass., of which the wings of the left side are yellow and those of the right side white. The specimen is asymmetrical also, the wings of the left side being larger than those of the right and differing from them in shape.

All of the foregoing were photographed by Mr. H. H. Newcomb.

Figures 5, 6, and 7 were contributed by Mr. William Beutenmüller.

Fig. 5 represents an "hermaphrodite" (or more properly a gynandromorphous) example of *Pieris brassicae*, taken in Germany by Mr. E. Daecke; and Figures 6 and 7 give two aspects of a specimen of *Automeris io* presenting the same phenomenon. (It is worthy of notice that in each of these cases the left side is the one bearing the female characters.) This specimen came from the vicinity of New York City, and was reared from the larval state by the late S. Lowell Elliot. Mr. Beutenmüller has already published an account of it in the American Museum Journal, Vol. 11, 1902, p. 39.

NOTES ON THE INSECTS OF BARBADOS, ST. VINCENT, THE GRENADINES, AND GRENADA.[1]

BY AUSTIN H. CLARK, BOSTON, MASS.

The island of Barbados is unique among the islands of the Lesser Antilles in being truly oceanic in the sense of not having had any land connection since the introduction of its present — comparatively speaking — meagre fauna. It differs from all the other islands in being flat, and superficially of coral formation, and is separated from them by soundings of between 1000 and 1500 fathoms, while the nearest (St. Vincent and St. Lucia) are about 100 miles away. The fauna is wholly made up of common and generally distributed West Indian types, except where, as in the case of some of the birds, prolonged isolation has given rise to forms different from, though closely related to, others on neighboring islands. In the case of the insects they have been brought there either by winds or on floating wood, etc. Of course many have been accidentally introduced by man. There is no other island in the world so highly cultivated as Barbados, the forest having everywhere given place to the cane field; and this doubtless accounts for the paucity of its lepidopterous fauna to some extent.

The economic entomology of this and the other West Indian Islands has received considerable attention from the Imperial Department of Agriculture for the West Indies, and is dealt with in their periodicals, the "West Indian Bulletin," and the "Agricultural News," both published at Bridgetown, Barbados.

The butterflies observed here were very few, both in species and in numbers, although I have visited the island at all seasons of the year. The commonest is *Callidryas eubule*. Others frequently seen are *Agraulis vanillae*, *Junonia coenia*, *Colaenis julia*, *Eurema lisa* (?), *E. elathea* (?), several *Lycaenas*, and a number of skippers. *Pontia monuste* and *Anosia plexippus* are occasionally met with.

St. Vincent is high and rugged, with a large area of forest; in fact only the lower parts of the river valleys have been cleared of trees. In the woods, along the mountain paths, *Papilio polydamus* is very common, the larvae feeding on various species of wild *Aristolochia*. This species on St. Vincent appears to be above the average in size, with more yellow on the wings than in specimens from other localities. It is very abundant, and is sometimes found on the lower levels. I was surprised to find *Dione juno* common in the St. Vincent woods, taking the place of *Agraulis vanillae* of the lowlands. There is a very large brilliant blue *Thecla* common in the highlands, and on one of the mountain ridges I obtained a freshly

[1] These notes were made during a recent visit to the islands, beginning in July, 1903, and ending in September, 1904.

emerged specimen of *Rothschildia splendens*. On the lower lands I found *Colaenis julia*, *Callidryas eubule*, *Agraulis vanillae*, *Eurema lisa*, *E. elathea*, *E. albula*, *Eudamus proteus* and others of that group, various *Lycaenas* (including *Hemiargus hanno*) and a number of skippers common. *Pontia monuste* and *Anosia plexippus* occurred, but were not abundant; *Anartia jatrophae* was common about Kingstown, *Junonia coenia* was numerous in all the hotter and more desolate districts, and I saw three specimens of *Hypolimnas missippus*, one (a female) on November 6th, 1903, another (also a female) on November 9th, and a male on November 10th. The first was on Kingstown Hill, and the other two in the Botanic Garden. This insect is rather rare on St. Vincent; the protective coloration of the female is here of not the slightest use, as there is no other butterfly anything like it, and this may account for its not gaining a foothold in these islands.

On October 2nd, 1903, I ascended the Soufrière, which very recently (1902–1903) has been in active eruption. The vegetation on the volcano, and all about it, in fact over almost the entire northern third of the island, has been entirely destroyed, the district now being merely a desert of light brown ash and scoria. About the base and up the sides of the mountain the "Guinea grass" has begun to grow again, and farther down there are large numbers of castor oil plants. About one fourth of the way up from the leeward side there is a patch of bananas, and by the side of it a patch of sugar cane which have come up through the thick covering of ejecta, and mark the site of what was once somebody's garden. They are quite conspicuous, being the only signs of plants of any size on that part of the mountain.

As one looks from the crater of the volcano down on the devastated Carib country toward Georgetown, the thin covering of Guinea grass gives the landscape a fresh, green appearance, and it is hard to realize that not long ago in this very district two thousand lives were lost by an outburst from this mountain. Some mosses and an occasional fern may be found now in sheltered spots inside of the "new crater" which broke out in eruption in 1812.

Insects of various kinds are very common all the way to the summit, being rendered especially conspicuous by the lack of vegetation. Of butterflies, *Vanessa cardui* was almost the only kind seen, but this was very abundant, collecting on the bits of chewed sugar cane and slivers of cane rind thrown down by the porters of parties which had recently made the ascent. These butterflies were found even on the rim of the crater; and their occurrence was particularly noticeable, as I have never seen the species at any other point on St. Vincent, nor on any other of the West India Islands (including Trinidad) although very likely it is found occasionally. I never saw it in Venezuela, although in parts of that country the conditions are somewhat like those existing to-day in the northern part of St. Vincent.

One example of *Callidryas eubule* was met with near the summit, flying before the strong northeast wind, and near the same place I found a dead skipper. Most of the insects seen were Hemiptera, the commonest being the black and red "cotton-stainer." There were also many of the yellow-brown wasps (*Vespa*?) known locally as "Jack Spaniards." About the rim of the crater, more especially along the southern side, there were hundreds of dead insects (mostly Hemiptera) which had apparently been killed by the sulphurous fumes which are continually pouring out.

As a whole, St. Vincent is rich in insects when compared with Barbados, although there do not appear to be many moths. I found *Utetheisa* abundant, as on all the islands I visited, but only saw one Noctuid. The absence of the *Heliconidae* and other similar families is noticeable, as one would think that the hot and damp valleys of this island would offer special inducements to them; and such a great number is found in Trinidad that it is rather strange none have strayed up here, or been accidentally introduced. The mole crickets (of which there are two species here) are a serious menace to agriculture, being exceedingly abundant, probably as a result of the introduction of the mongoose, which has killed off a large ground lizard which is said to feed on them.

The "screw-worm" fly (*Compsomya*) occurs, but is not very common. I only observed it once. On the neighboring island of St. Lucia it is numerous, and a great pest to the stock raiser. It is locally supposed to have been brought into that island by ships carrying mules from the Southern States to South Africa.

A brilliant steel blue mosquito, peculiar to St. Vincent, is abundant in the forests, being found everywhere, but I never met with it in the lower altitudes.

On the Grenadines, the lowland butterflies of St. Vincent are common; on Bequia and southward *Cystineura hypermnestra* is abundant in the dry woods, and on Canouan we first meet with *Phoebis argante*, which is common from that island to the continent of South America. *Pontia monuste* is the commonest butterfly of the Grenadines, although not at all abundant on St. Vincent. There are no *Papilios*, and the large blue *Thecla* and *Dione juno* do not occur, although the latter reappears on Grenada. The "Jack Spaniard," so abundant on Barbados and St. Vincent, building its nest everywhere under the eaves of houses, under the sills of windows, about the mouths of caves, or under the branches of trees, does not occur on Union Island, although it is very common on Mayreau and the northern Grenadines. The islands to the south of Union are free from this species also, but another wasp, a small black insect with white abdominal bands, known locally as the "maribunta," is common on Grenada; it builds a large nest, usually rather high up in the trees.

Mosquitoes are exceedingly abundant on the Grenadines, especially in the

lowlands of Carriacou; and unless a person travels with a net, sleep is almost impossible. They appear during the wet season, from June to November.

The parasol ant or "gros-tête" is numerous on Carriacou, where it was probably introduced from Trinidad by small trading boats plying between the two islands, as it does not occur on the other Grenadines, nor on Grenada. This insect is a great pest, making it impossible to raise roses and a number of garden vegetables and other plants. It is very fond of the flowers of the red hibiscus.

On Carriacou also there is a large millipede, locally called the "congeree," which appears here to have reached the northern limit of its distribution. It is very common on the higher lands, and a banana or mango skin thrown down anywhere soon becomes a mass of them.

The butterflies noticed on Grenada were the same as those on St. Vincent, with the addition of the two species (*Cystineura hypermnestra* and *Phoebis argante*) which do not extend farther than the Grenadines, and also *Historis odius* and *Avartia amathea*. *Papilio polydamus* and the large blue *Thecla* of St. Vincent are lacking. *Erebus odora* and *Herse cingulata* are common here, and on Carriacou, and very likely on St. Vincent as well, although I did not find them on that island.

The object of my trip to these island was to make a study of the birds, and I unfortunately found it impossible to bring back a collection of insects; but I am sure that this region, where the South American fauna meets the West Indian, would yield most interesting results to the student of geographical distribution in insects, as it has in regard to its birds and mammals; besides which a host of new forms would be brought to light, as shown by the results of collections which have been made on St. Vincent and on Union Island.

HEMILEUCA BUDLEYI.

BY CAROLINE GRAY SOULE, BROOKLINE, MASS.

THE cocoons came from Mexico. Early in June the moths began to emerge and mated readily.

On June 9th the first eggs were laid. They were opaque, porcelain-white, set on end, with a thin and transparent spot in the upper end, through which the contents showed green. In ten days a black dot appeared in the green spot and increased in size until it filled it. This was the head of the larva. The eggs grew grayish, and hatched on the twenty-eighth day, July 7th.

The hatchlings had large black heads, and their yellow bodies tapered from head to anal end. The setae were shining black, and the branching spines on the dorsum of the thoracic segments were long. Their legs were shining black, props yellow the anal ones having a black patch on each.

At first the larvae crawled constantly, spinning as they went, and moving very rapidly. They did not eat the eggshells.

Although the eggs were laid on several successive nights all hatched within a few hours.

The larvae rested in a dense group on a leaf of wild cherry or on the tin, and fed in close rows, all headed in one direction.

The first moult occurred in seven days. The head was black. The body was black with long, yellow, branching spines, more like those of *maia* than any other. The legs and props were black.

The second moult came in seven days. The larvae were all black with yellow spines, more branching and longer than before, those on the thoracic segments being of a more orange color, the others of bright canary yellow. If the caterpillars stayed on the leaf on which they had fed they spun very little silk to moult on, but if they moved to another leaf they spun a dense mat of silk. They ate their skins after each moult.

The third moult came in seven days, and made the larvae more velvety black and more golden yellow than before, and the spines larger and still more branching.

The eversible sacs were conspicuous on the black skin, like white papillae, appearing and disappearing with almost the regularity of the ticking of a clock except when the caterpillar was disturbed or in motion. At this stage I found that each company of larvae contained some much smaller than the rest, and these were in danger of harm from the crowding of the larger ones, so I removed all the small ones to a tin by themselves, where they throve and grew much faster than before.

I found that one larva in a tin alone would not thrive, but stopped eating and

died. Two in a tin would eat, but not heartily, and six or eight were needed to make a success of life, at this stage.

The fourth moult came in nine days. The caterpillars were as before except that the long spines on the thoracic and anal segments were of a dull buff color, much longer and more branching than the others. Few larvae ate their skins after this moult. A few left the group and fed on separate leaves, but most of them fed in close rows as before, lying as near each other as their spines would allow.

Before each moult the yellow color disappeared from the spines, leaving them like little glass tubes. This time the caterpillars spun the leaf to the twig, then spun a mat on the leaf and lay side by side to moult.

The fifth moult took place ten days after the fourth, bringing no change of color except a white dot at each end of the spiracles, which hitherto had been difficult to find, even with a lens, they were so black, but had now a whitish line at the opening, as well as a dot at each end. The larvae ate most of their cast skins. The eversible sacs were still more noticeable, but no odor was perceptible. Ten days later there was a faint, pleasant odor when the boxes were opened.

The caterpillars ate voraciously, and seemed to have no instinct in choosing their leaves. I found that certain saplings had specially succulent-looking leaves and gave them to several sets of larvae. In every case the larvae had the symptoms of severe colic but would not refuse the leaves. By giving them older leaves from a tree, not a sapling, I could cure the sick, but they would not choose the older leaves themselves, taking whichever kind was nearer. They were now a little over four inches long, and the most superb caterpillars I ever saw.

On August 28th, twelve days from the last moult, they emptied the intestines and, two days later, spun dark brown cocoons, drawing leaves together around them, and sometimes spinning to a twig. Each cocoon had one end open, and, about half an inch within this open end, a grating of silk across the cocoon, admitting air.

The pupae were not formed — or did not cast the larva-skin — until September 12th, sixty-seven days from the egg.

Part of a second brood omitted the fifth moult, pupating instead of moulting, while the rest of the brood moulted five times. This second brood was sixty-nine days in passing from egg to pupa.

The spines of *budleyi* urticated as much as those of *io*, rather more in the last stage, but with no lasting effect.

My larvae preferred *Prunus virginiana*, and would not eat *P. serotina* after the second moult, but those I sent to Miss Eliot, half of each brood, fed wholly on *P. serotina*.

When the caterpillars reached the length of four inches, or nearly that, I had but two in each large tin to insure their having plenty of space and food supply.

The cocoons made by the larvae fed on *P. virginiana* were more tan colored than those of the larvae fed on *P. serotina*, which were very dark brown, almost blackish.

SPIDER CALLS.

BY WM. T. DAVIS, NEW BRIGHTON, STATEN ISLAND, N. Y.

In the August PSYCHE, Mr. Fred. H. Lahee gives an account of the drumming habits of *Lycosa kochii*. On Staten Island I have on several occasions heard the purring spiders, once as early as March 24th. On a warm day in April, 1887, I made this note; "A number of spiders were running about and when they came to a dead leaf in the proper position, they struck their palpi rapidly against it, producing quite a noise thereby. I could not see that they attracted one another though I suspect they were all males that produced the noise, in which case they would naturally keep at a distance."

In his chapter on "Notes by the way" in Pepacton, Mr. Burroughs writes:— "I have discovered, also, that we have a musical spider. One sunny April day, while seated on the borders of the woods, my attention was attracted by a soft uncertain purring sound that proceeded from the dry leaves at my feet. On investigating the matter, I found that it was made by a busy little spider. Several of them were travelling about over the leaves as if in quest of some lost cue or secret. Every moment or two they would pause, and by some invisible means make the low purring sound referred to."

These additional references do not add anything new to Mr. Lahee's observations, but have been submitted at the suggestion of Mr. Emerton, who has kindly identified one of the drumming spiders from this island as a male *Lycosa kochii*.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—LVII.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Aplodes darwinata Dyar. A discussion of this form will be found in my paper on the fauna of the Kootenay District of British Columbia (Proc. U. S. Nat. Mus. xxvii, 903, 1904).

Egg. Elliptical, perfectly flat above and below, one end a little depressed, no truncation, its area represented by a slight oblique irregularity. Reticulations indicated only by the slight pores at the angles in a neatly hexagonal pattern. Orange ochraceous, shining, later dull reddish. Size 1.1 × .7 × .5 mm. Hatched in 9 days. The larvae ate willow.

Stage I. Head rounded, erect, not shining, orange ochraceous, with short, stout, slightly swollen setae. Body very short and robust, flattened, winged by lateral projections. Yellow brown, a narrow dorsal line and band above the lateral wings dark brown; no shields. On joint 2 dorsally three of the setae are raised on irregular club-shaped papillae; on joints 5 to 9 seta i is similarly elevated, a truncate papilla, bearing the seta on the anterior aspect. On joints 5 to 8 seta v is pushed dorsad in line with iv and the two raised on an angular prominence. Tubercles small blackish, setae short, swollen tipped, ii especially flattened fan-shaped and cleft at tip. Broad, illy defined subventral and ventral bands. Tubercle i of joint 12 is elevated on a papilla.

Stage II. Head rounded bilobed, brown, densely granular in paler; width .5 mm. Body flattened with wing-shaped, double pointed projections on the sides of joints 5 to 9. Tubercles on joints 2, 3 and 12 conically produced. Light brown dorsally with many pale granules, tubercles papillose, setae minute. A broad dark brown area subventrally below the projections with light granules. Venter contrasting light brown; feet all pale. The larva does not bear any attached objects on the projections.

Stage III. Head rounded bilobed, dark brown, pale granular, face washed with whitish except the sutures; width .8 mm. Body as before, the projections of joints 6 to 8 pronounced, bent upward. Dorsal tubercles of thorax and joint 12 highly papillose; anal feet triangular. Light brown, densely pale granular, sides below the projections dark brown; dorsal line dark.

Stage IV. Head higher than wide, flat before, bilobed, rounded, sutures deep, finely papillose roughened; width 1.1 mm. All pale whitish brown, finely papillose granular, the spicular granules pale. Nearly unmarked; a series of triangular brown dorsal spots on the anterior edges of the segments of joints 6 to 8, the under sides of the projections of joints 5 to 9 and a subdorsal dash on joint 12 dark brown. The prominences consist of the four corners of the collar, two on the posterior edge of joint 2, side angles on joints 3 and 4, slight projections on the sides of joints 5 and 9, distinct double tipped ones on joints 6 to 8; tubercle ii on joint 12 a high cone. Tubercles and setae obsolete, the fine granules almost furry.

Stage V. Head rounded bilobed, clypeus depressed at apex, granular; all pale creamy brown, black shaded in sutures and on sides; width 1.6 mm. Body exactly as before, creamy brown, soft velvety, spicular granular, scarcely marked except darker shades on the under sides of the projections and a brown subdorsal bar on joints 11–12.

PROCEEDINGS OF THE CLUB.

The 240th regular meeting was held at 194 Clarendon Street on the evening of October 18, 1904; President Emerton in the chair; attendance 11. The minutes of the last meeting were read and accepted. Mr. J. W. Dow was unanimously elected to Active Membership.

Mr. Emerton showed a number of small spiders secured by sifting dead leaves. Mr. Sampson displayed a collection of hymenoptera and Mr. Swett one of lepidoptera. Mr. Frost showed specimens of the weevil *Attelabus rhois* with its nests, from the speckled alder at Wales, Me., and also showed its parasite *Omphale elongatus*. The meeting was then adjourned.

The 241st regular meeting was held in the rooms of the Appalachian Mountain Club, Tremont Building, Boston, on the evening of November 15, 1904; President Emerton in the chair; 21 persons present. The records of the last meeting were read and accepted. Messrs. J. A. Cushman, F. H. Lahee, H. Parker, W. R. Pearmain, I. L. Shaw and M. D. Smith were unanimously elected to Active Membership. Details of the management of the exhibition were discussed. The topic of "Instinct and Intelligence in Insects," announced for discussion at this meeting, was not touched upon, but by vote of the Club was registered for the next meeting. Mr. Field made a brief report on behalf of the Publication Committee. The remainder of the evening was devoted to the arrangement of exhibits and informal conversation.

W. L. W. Field,
Secretary.

RECENT ENTOMOLOGICAL LITERATURE.

Asterisks indicate descriptions of new species of American insects or of new genera.

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The General Subject.

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Economic Entomology.

Washburn F. L. Economic Entomology at the World's Fair, 68 Dec. 2.
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Arachnida.

Crosby. C. R. Notes on some *Phalangidae* collected near Ithaca, N. Y., 6 xii, 253.

Odonata.

Walker, E. M. The Nymph of *Gomphus furcifer* Hagen, 4 Dec.

Ephemerida.

Moore, R. M. Courtship of Mayflies, 5 Nov.

Neuroptera.

Banks, Nathan. A list of Neuropteroid insects, exclusive of Odonata, from the vicinity of Washington, D. C.,* 102 vi, 201. [174 species are recorded, including descriptions of 9 new species and one new genus, *Protophila*.]

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Thysanoptera.

Daniel, S. M. New California Thysanoptera,* 5 Nov. [One new genus, *Caliothrips*.]

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Bueno, J. R. de la Torre. A list of certain families of Hemiptera occurring within seventy miles of New York, 6 xii, 251. **Distant, W. L.** (a) Rhynchotal notes (Heteroptera),* 11 Sept. [New genera *Ostorodias*, *Arnulphus*, *Amphiareus*, *Lippomanus Sesellius*]; (b) Rhynchotal notes (Homoptera),* 11, Oct.–Dec. [New genera *Ioba*, *Muansa*, *Sadaka*, *Koma*, *Munza*, *Yanga*, *Kongota*, *Umjaba*, *Ugada*, *Aruuta*, *Antankaria*, *Rihana*, *Cacama* and *Oria*]. **Girault, A. A.** *Anasa tristis* DeG.; history of confined adults; another egg parasite, 5 Dec. **Green, E. E.** On some *Coccidae* in the collection of the British Museum, 11 Nov. **Heidemann Otto.** Notes on a few *Aradidae* occurring north of the Mexican boundary,* 102 vi, 229. [3 new species are described]. **Kirkaldy, G. W.** Über Notonectiden (Hemiptera),* 38 xxiii, 111. [The new generic name *Buenoa* is proposed for the American species of *Anisops*]. **Osborn, H.** Notes on South American Hemiptera-Heteroptera,* 141, V. 195. [5 new species are described]. **Reuter, O. M.** (a) Capsidae palearcticae novae et minus cognitae,* 163, xlvi, 18 [a new genus, *Alloeonycha*, is described]; (b) Capsidae persicae a Dom. N. A. Zarudny collectae enumeratae novaeque species descriptae,* 162, IX, 5. [Two new genera Charitocoris and Trachelonotus are described]. **Schwartz, E. A.** Notes on North American *Psyllidae* Pt. 1,* 102, vi, 234 [6 new species and a new genus, *Euphalerus*, are described].

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new species of *Histeridae* and notices of others,* 11 Aug. [New genera *Macrolister*, *Pachylister*, and *Enicosoma*]. **Mainardi, A.** Richerche somatometriche sul *Mesocarabus rossii* Dejean, 164 vol. xxi, 1904. **Needham, J. G.** Beetle drift on Lake Michigan, 4 Nov. **Powell, P. B.** The development of wings of certain beetles and some studies of the origin of the wings of insects, 6 xii, 237. **Reitter, E.** Ein neuer blinder *Brachynus* aus Deutsch–ostafrika,* 38 xxiii, 178. [A new genus, *Brachynillus*.] **Schaeffer, C.** New genera and species of Coleoptera,* 6, xii, 197. [New genera *Paraptorthodius*, *Pentanodes*, *Phanosolena*. Synoptic tables of the genera *Languria*, *Actenodes*, *Fidia*, *Myochrosus*, *Anthubus*.] **Walker, J. J.** Description of a new coleopterous insect from Bounty Island,* 11 Oct. [New genus *Thomosis*.] **Waterhouse, C. O.** Observations on Coleoptera of the family *Buprestidae*, with descriptions of new species, 11 Oct., Nov. **Weise, J.** (a) Synonymische Bemerkungen zu Gorham, Biologia Centrali-Americana, Vol. VII, *Coccinellidae*, 45 pt. ii, 1904, p. 359; (b) Einige neue Cassidinen und Hispinen,* 45, pt. ii, 1904, p. 433. [New genera *Miltinaspis*, *Cyanaspis*, *Decatelia*, *Probaenia*.] **Wickham, H. F.** The systematic position of the *Aegialitidae*, 4 Dec.

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Butler, A. G. The butterflies of the group *Callidryas* and their seasonal phases, 11 Dec. **Dyar, H. G.** (a) Description of new forms of the genus *Illice*

Walker,* 102 vi, 197 [4 new species and 4 new varieties are described]; (b) a new Phycitid from the foothills,* [*Lactilia fiskeella*] 102 vi, 221; (c) A new Tortricid from the sea shore * [Ancylis maritima], 102 vi, 221; (d) A few notes on the Hulst collection,* 102 vi, 222 [A number of corrections are suggested, and one new species, *Catopyrrha hulstii*]; (e) Poison ivy caterpillars, 6 xii, 249. **Gibson, A.** Note on *Macronoctua onusta* Grote, 4 Dec. **Hampson, G. F.** The Lepidoptera-Phalaenae of the Bahamas,* 11 Sept. [A new genus, *Eutrichocera*, and 33 new species]. **Kearfott, W. D.** (a) *Coleophora tiliaefoliella* Clem., 4 Nov. (b) Notes on the life history of *Polychrysia formosa* Gr., 5 Nov. **Lyman, H. N.** Note on *Haploa contigua* Walk., 4 Dec. **Murtfeldt, M. E.** The rose-bud feather-wing [*Platyphila rhododactyla* Schiff], 4 Nov. **Packard, A. S.** Change of the name *Mesoleuca* to *Meroleuca*, 6 xii, 250. **Pearsall, R. F.** A review of our Geometrid classification No. 2, 4 Dec., **Skinner, H.** A new Thecla from the Northwest.* 5 Nov. **Slingerland, M. V.** Correction of the name of the grape-berry moth, 4 Dec. **Swinhoe, Chas.** New species of Indo-Australian and African Heterocera, 11 Aug. [A new genus, *Diceratucha*]. **Walsingham, Lord.** Algerian microlepidoptera,* 8 xl, 214, 265 [New genera *Leobatus*, *Proactica*, *Eremica*, and *Apotistatus*]. **Wolley Dod, F. H.** List of Macro-Lepidoptera of Alberta, Cont., 4 Dec.

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A Correction. — The paper by C. F. Adams, entitled "Notes on and Descriptions of North American Diptera" appeared in the Kansas University Science Bulletin, and not in the State College Bulletin of Pullman, Washington, as stated in the October number of Psyche.

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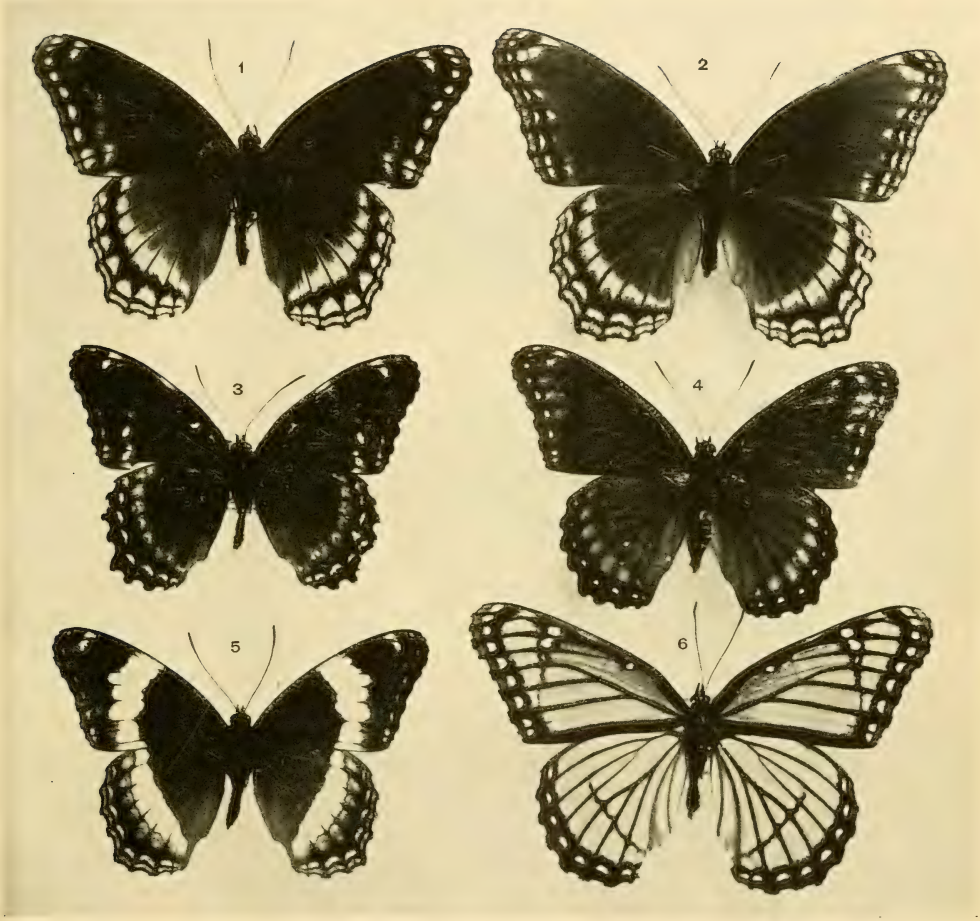

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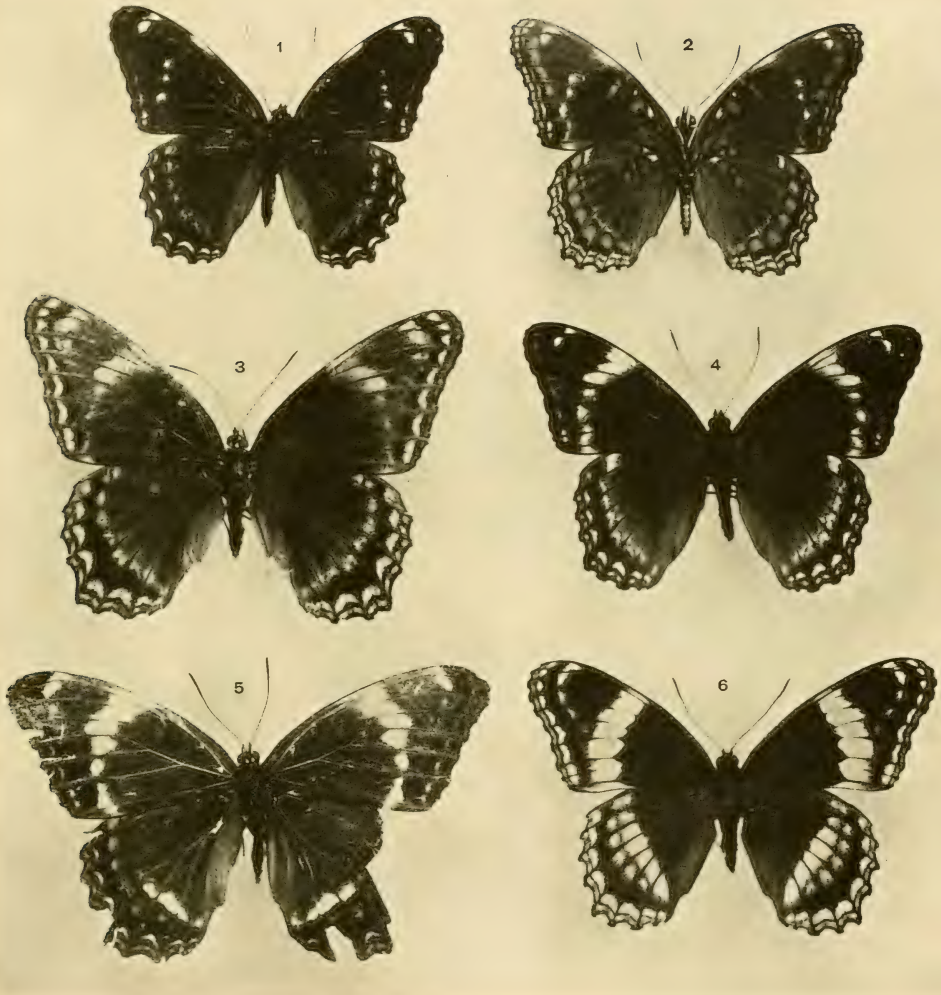

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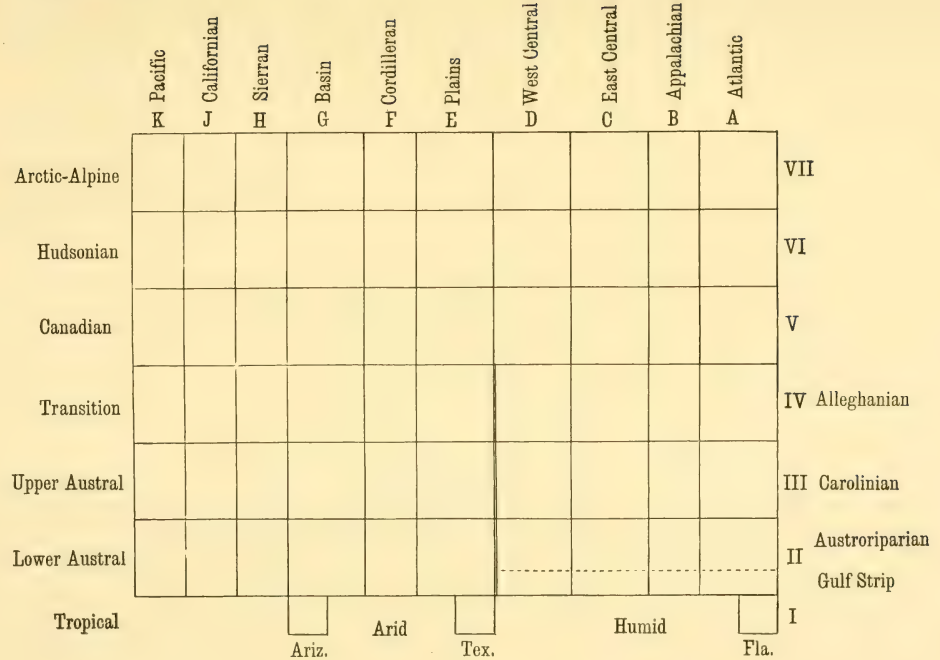
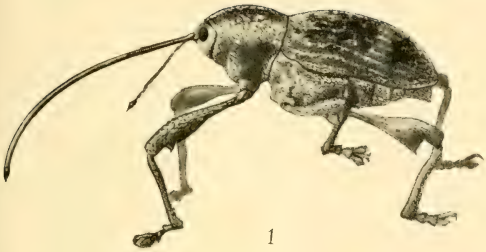


MORSE: — TABULATION-SCHEME.

The green meadow grasshopper, *Orchelimum glaberrimum* Burm., ovipositing in the stem of the bur marigold. In each scarified spot, two eggs are laid in opposite directions, their anterior poles being disposed end to end. Photographed from life by Dr. J. L. Hancock. Magnified about two diameters.



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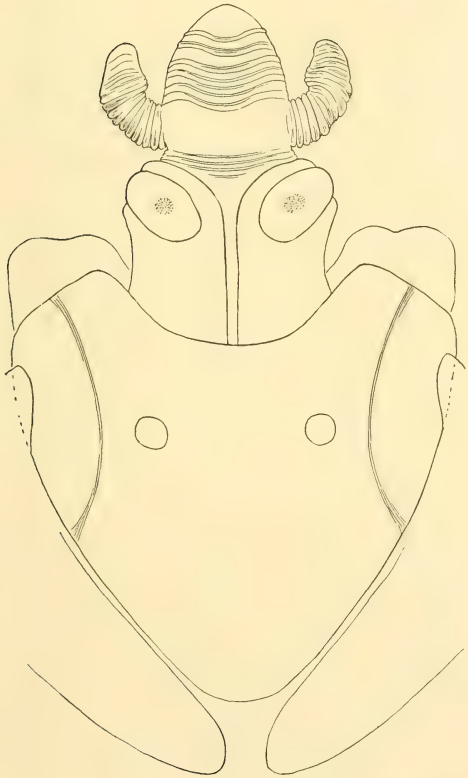

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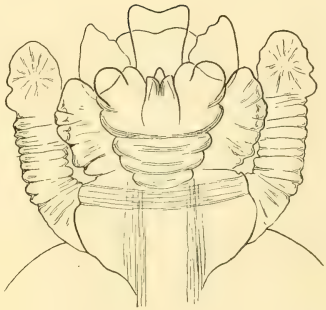

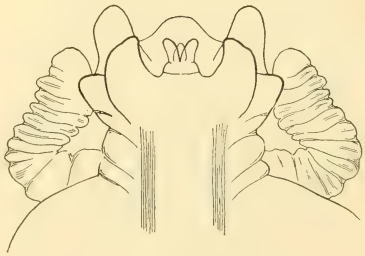

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McCLENAHAN: DEVELOPMENT OF THE ROSTRUM.

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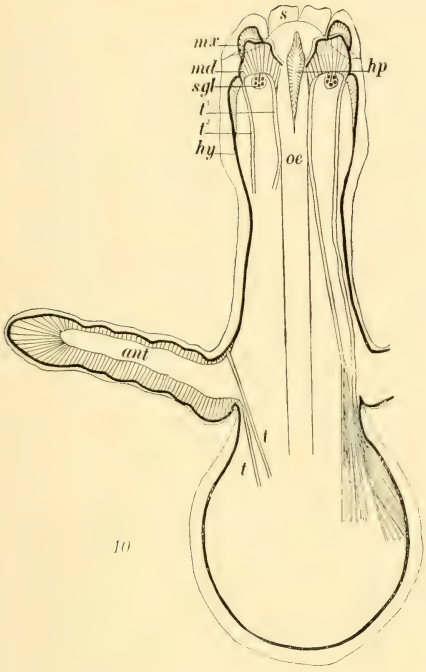
McCLENAHAN: DEVELOPMENT OF THE ROSTRUM.



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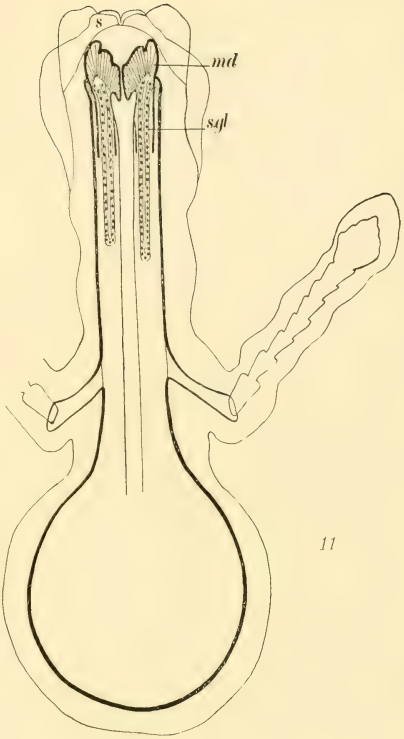

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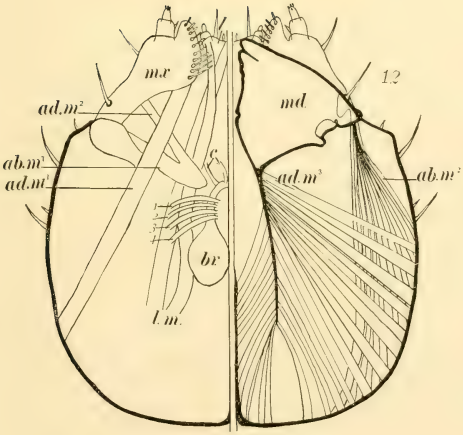

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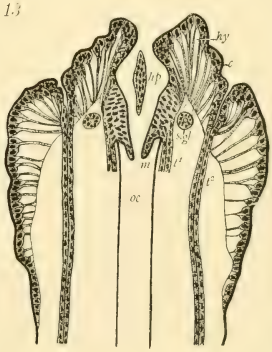

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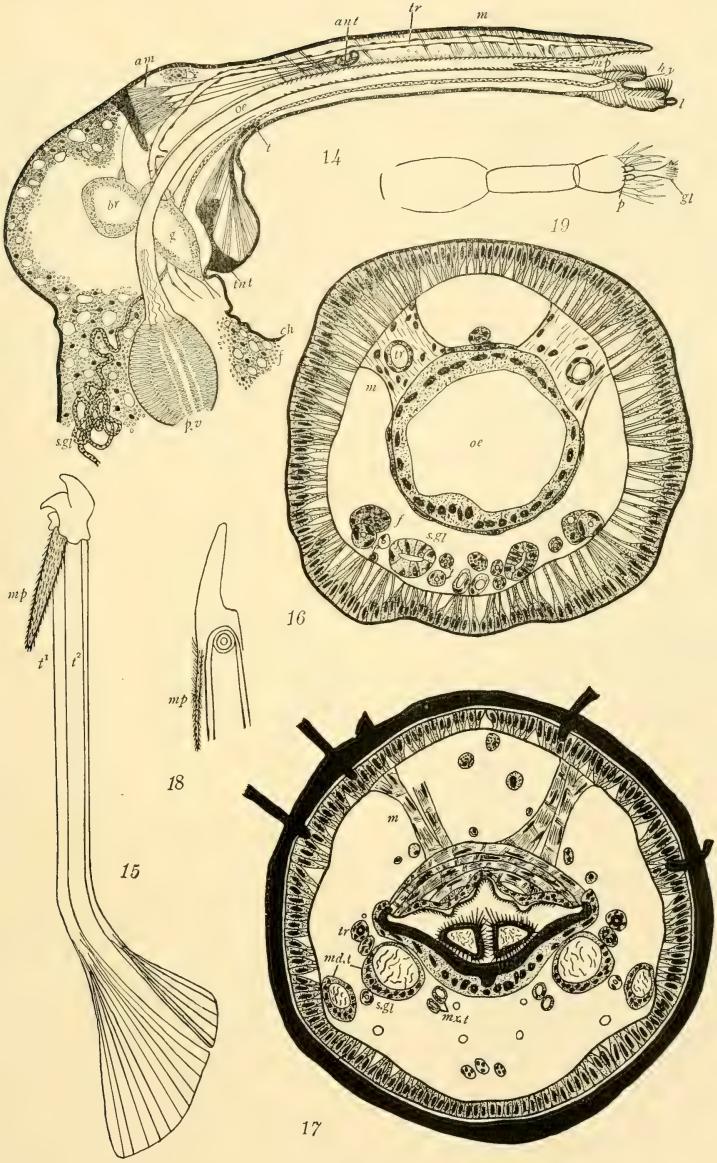

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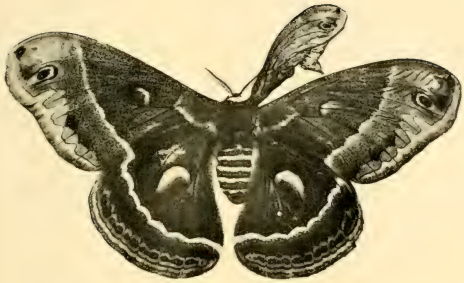

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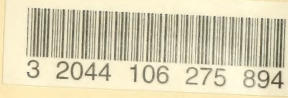
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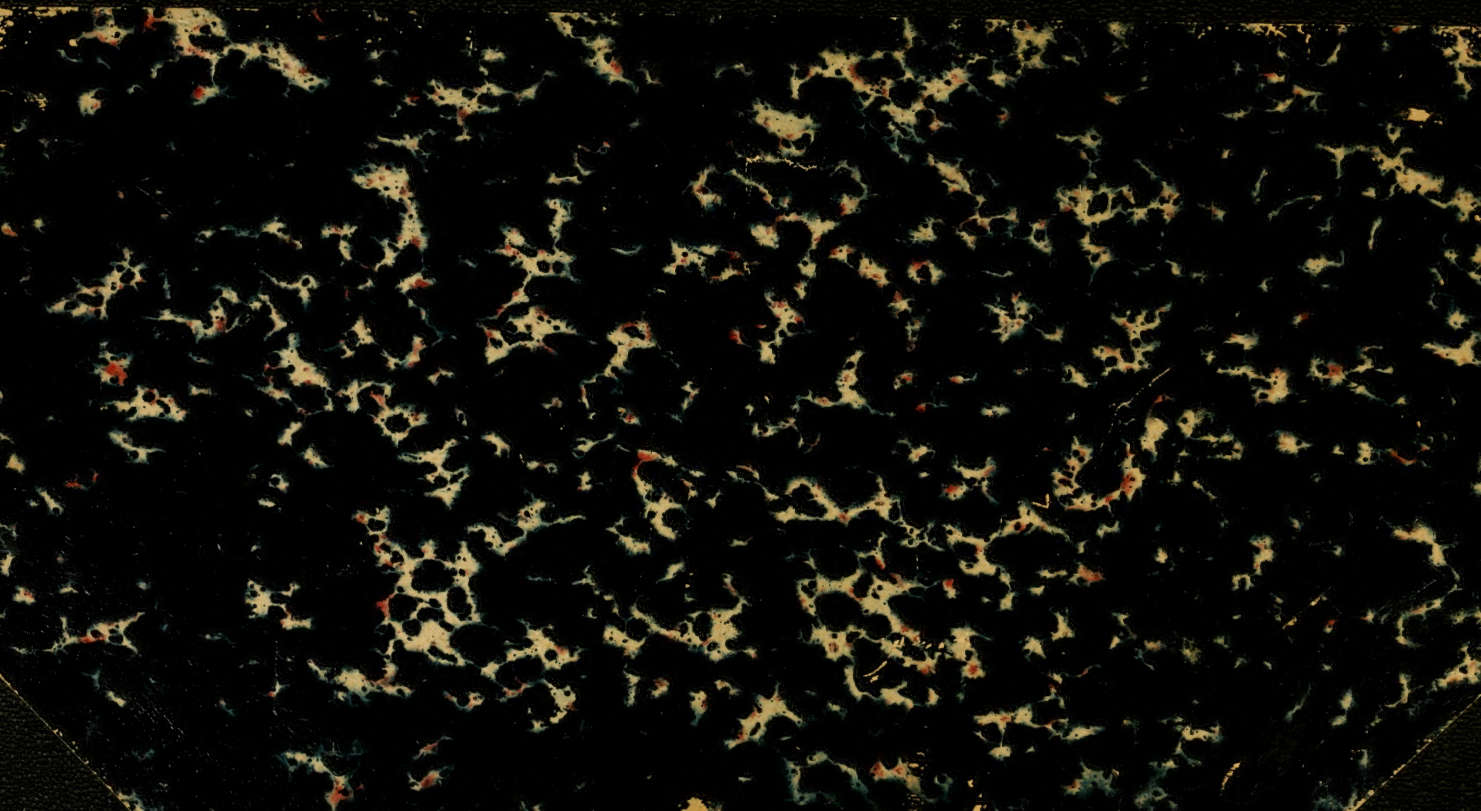
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