

APOCHEIMA RACHELAE, HULST.

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THE PREPARATORY STAGES OF *APOCHEIMA* *RACHELÆ* HULST.*

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A cluster of about 200 eggs of this rare moth was received from Mr. Norman Criddle in 1903. Oviposition took place at Aweme, Man., during the nights of April 20, 21 and 22, and the larvæ hatched at Ottawa on May 9 and 10.

To the notes made in 1903, further information has been added from a recent study of inflated larvæ.

Egg.—The eggs were laid in an agglutinated mass and when received (May 1) were yellowish in colour. On May 6-8 they turned pinkish, then black, and before hatching were beautifully iridescent. In shape, the egg is oval; height 0.6 mm.; breadth 0.3 mm.; the whole surface roughened.

The eggs were secured by confining the female moth in a collecting net-bag. Since, however, Mr. Criddle has found eggs under natural conditions, viz., on a twig or poplar (see figure 1, plate XIV) these had been deposited in a tightly compressed mass. On another occasion, a female which the same observer had in confinement laid the eggs in a cluster on her own body.

Larval Stage I.—Length 2.5 mm. Head 0.4 mm. wide, somewhat quadrate in shape, slightly depressed at vertex; dull black in colour, mouth-parts reddish brown, ocelli black. Body velvety black, with five transverse bands of white on abdomen; collar and stigmatal stripe white; thoracic feet black; prolegs concolorous with body.

Stage II.—Length 6 mm. Head 0.7 mm. wide, blackish brown, with conspicuous whitish patches, giving a mottled appearance; the lower half of clypeus and lower portion of epicranium reaching to ocelli, almost wholly whitish in some specimens; in others the front of head is mostly whitish, with a few dark brown spots on clypeus and inner margins of cheeks. The larvæ are now of a grayish-brown colour, with whitish longitudinal lines and

*Contributions from the Division of Entomology, Department of Agriculture, Ottawa.

streaks. Anterior third of thoracic shield mostly white. Transverse whitish bands on dorsum not so conspicuous as before. Tubercles on body blackish; setæ short, blackish.

Stage III—Length 13 mm. after moulting. Head 1.1 to 1.3 mm. wide, which now may be described as white, mottled with conspicuous dark brown, irregularly-shaped spots, mostly present on upper two-thirds epicranium. Body now pale mauve, above spiracles, venter darker, the whole skin marked with many black spots and streaks. The longitudinal stripes on the body indistinct, except three pale yellow stripes on venter, which are more apparent owing to the darker colour of the under surface of body. The transverse bands on dorsum are irregular and broken and in colour pale yellow. Stigmatal band whitish, blotched with yellow, broken, irregular, bordered with a wide blackish band beneath. Spiracles blackish. Thoracic feet dark brown, or black; prolegs concolorous with venter.

Stage IV (Fig. 2, plate XIV).—Length 21 mm. after moulting. Head 2.0 to 2.2 mm. wide. This stage is much the same as stage III, but the longitudinal stripes are now all yellow, and the skin is not so heavily marked with black spots and streaks. Transverse dorsal bands on abdominal segments as before. The lower joint only of each thoracic foot is now wholly black, the other joints being mostly white, banded above with black.

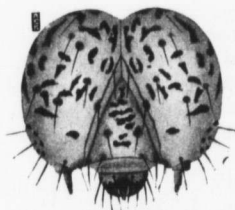


Fig. 15.—*Apoheimis rachele*, head of mature larva (X 33).

Stage V (Fig. 3, plate XIV).—Length 26 mm. after moulting. Head (fig. 15) 2.9 to 3.2 mm. wide, slightly indented at summit, flattened in front; whitish with yellowish tinge; mottled with brown as before; margined behind with black. Larvæ cylindrical in shape, and, in general, the same as Stage IV. Just after moulting the longitudinal stripes are plainly visible; as the larvæ grow these markings become less discernible. When mature and ready to pupate, the larvæ

may be described as pale mauve or pale yellow—the colour varying in the specimens—with numerous irregularly-shaped streaks and spots of brown, venter darker; the markings on the dorsum not so heavy as in previous stages. Tubercles black, very small, of

equal size; on segments 5 to 9 inclusive, tubercle iii is slightly above, and anterior to, the spiracle; iv is behind and almost in a line with the lower end of spiracle; v is below, and slightly anterior to, spiracle; same distance therefrom as iii. On segments 10 to 12, however, tubercle v is immediately below the anterior side of spiracle. On segment 12, tubercle iv is also below the spiracle. Spiracles black, oval in shape. Stigmatal band whitish, blackish border beneath irregular and not so conspicuous as in previous stage. Thoracic feet and prolegs as in Stage IV.

On June 4 some of the larvæ were mature and entered the earth for pupation. On this date they were 39 mm. in length and 4.5 mm. in width.

Pupa (fig. 4, pl. XIV).—Length 14-16 mm., 4.5-5 mm. in width at widest part; shining, reddish brown, thorax and wing-cases wrinkled. Abdomen moderately punctured, abdominal fold densely, very minutely, punctured in concentric rows. Spiracles black. Cremaster dark brown, bearing two divergent, almost straight, stiff, spines; close to the base of the cremaster there are also two, short, thick, blunt, spiniform protuberances, one on either side.

Most of the moths emerged (in a cool cellar) in the end of April and early in May, 1904. A breeding jar containing some of the pupæ was kept in the laboratory and in this moths emerged in January. Males and females were kept alive and in one instance, on January 9, a male and female mated and remained *in coitu* for 30 hours. In the wooden box in which the moths were confined there was an open crack in the bottom, and when the box was moved on January 11 it was noticed that the female had inserted

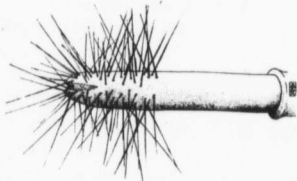


Fig. 16.—*Apocheilus rachele*, ovipositor, showing arrangement of hairs near the end (X 19).

her long ovipositor through the crack and laid eggs on the underside of the bottom close to the crack, the bottom of the box being slightly elevated above the lower edge of the sides. The ovipositor of the moth (fig. 16) measured in one instance 7.5 mm. in length; near and at the tip

it is distinctly pilose, the hairs being slender and of varying lengths.

From the fact that these female moths have such remarkably long ovipositors, it would seem strange that they should deposit their eggs openly, as indicated on the plate herewith. One would naturally expect that the eggs would be laid in crevices, or other recesses. Further observations on the egg-laying habits of the species are most desirable.

The captured females which we have vary in size from 11 mm. in length, by 4 mm. in width (at widest part) to 16 mm. in length by 6 mm. in width. Scales on outer half of rudimentary wings mostly reddish ochreous, remaining scales black. A sprinkling of reddish-ochreous scales also occurs on sides of thorax and abdomen and a conspicuous cluster on summit of head. A distinct dorsal band of these scales is present on thorax and abdomen. Balance of body, black, clothed with long, grey hairs. Antennæ filiform, black, hairy. Legs hairy, tarsal claw brown.

Food Plants.—The larvæ were fed on aspen (*Populus tremuloides*) and cottonwood (*Populus deltoides*). At Aweme, Man., the larvæ have frequently been collected by Mr. Criddle from aspen and also from several species of willow; on one occasion he found a larva about two-thirds grown on elm.

Distribution in Canada.—In Alberta males have been collected at Head of Pine Creek, April and early May (F. H. Wolley-Dod), Millarville, May 9 (A. F. Hudson); High River, March 12 (T. Baird) and at Edmonton, May 12, 1896 (F. C. Clare); in Saskatchewan; Saskatoon, April, 1913, and Regina, April 23 (T. N. Willing); in Manitoba; Rounthwaite, April 15, 25 (L. E. Marmont), Aweme, April 18-27 (N. Criddle); Winnipeg, April 29 (Hanham).

The photograph from which the plate was made was taken by my colleague, Mr. F. W. L. Sladen. Figs. 12 and 13 in the text were drawn by Mr. A. E. Kellet, artist assistant in the Division.

EXPLANATION OF PLATE XIV.

Apocheima rachelæ Hulst.

(All figures natural size).

1. Egg cluster on poplar.
2. Larva, Stage IV.
3. Larva, Stage V, mature.
4. Pupæ.

5. Female moth, bred specimen showing extended ovipositor.
6. Female moth, bred specimen, side view.
7. Female moth, specimen found on poplar.
8. } Male moths; bred specimens.
9. }
10. Male moth, collected at Winnipeg, Man.
11. Male moth, collected at Aweme, Man.

SOME PARASITES OF SIMULIUM LARVÆ AND THEIR POSSIBLE ECONOMIC VALUE.*

BY E. HAROLD STRICKLAND, DIVISION OF ENTOMOLOGY, OTTAWA.

During a year's residence at the Bussey Institution of Harvard University, in 1911, the writer had an opportunity of studying the Simuliid larvæ which abound in the streams of that locality. This study revealed the fact that a large percentage of these larvæ are attacked by parasites, the presence of which appears to result, in all cases, in the death of the host. Simuliid larvæ are most abundant in these streams from early March until May. Isolated specimens are found from then onwards till October, when other species occur in considerable numbers upon the rocks and vegetation in rapidly flowing parts of the streams.

A brief resume of the peculiarities in structure and habits of these interesting larvæ will be of advantage here, as their curious modifications have a very direct bearing upon their liability to parasitism.

The larvæ are to be found either solitarily or gregariously, according to species, attached by means of a caudal sucker to stones or vegetation, only in the fastest flowing water. Silken threads secreted from the salivary glands act as anchor lines, holding the larva in a vertical position, and retain a hold upon the support should the caudal sucker become detached. The cylindrical head bears on its anterior border two fan-like organs carried on elongate pedicels. When expanded, these fans form two very efficient bowl-shaped strainers, through which the water flows. They can be closed at will, and brought over the mouth orifice, carrying with them the small particles of vegetation, and diatoms which constitute the food of the larvæ. Since Simuliid larvæ,

*Contributions from the Division of Entomology, Ottawa.

unlike those of most Nematoceran genera, live entirely, and continually, below the surface of the water, they are apneustic, and all of the oxygen they require has to be extracted from the water through three supra-anal finger-like gills. The relatively small size of these accounts, in all probability, for the necessity of these larvæ living in fast flowing water, for when they are placed in still water they soon die, presumably of asphyxiation.

In maturing larvæ the histoblasts of the pupal and adult organs are well developed and most conspicuous. Thus on each side of the thorax can be seen the three leg-, the wing-, and the halter-histoblasts, as distinctly limited whitish areas. The pupæ of these flies resemble the chrysalids of the Heterocera with the exception of having all the spiracles closed, and the respiratory function being accomplished by a tuft of respiratory filaments situated on each side of the prothoracic region. These project far out of the slipper shaped cocoon in which the pupal stage is passed. The histoblasts of these filaments turn black in the later stages of larval development, and when the latter assumes the chestnut brown colour of maturity they appear as a black triangular area on each side of the prothorax.

The commonest Simuliid around Boston, in Spring, is *Simulium hirtipes*. In the larva of this species two classes of parasites occur. One of these is represented by a nemathelminth worm, belonging to or near the genus *Mermis*. The worm lives either singly, or in considerable numbers, coiled up within the body cavity of its host, where it occupies the ventral portion of the somewhat swollen abdominal region (Pl. XV, fig. 1). When one worm only is present it measures about three centimetres, which is nearly three times the length of its host. The greatest number of worms found in a single larva was twelve. In this case none attained to a greater length than 1 cm. The most striking effect of these parasites upon their larval host is that they so far inhibit the development of the histoblasts that pupation becomes impossible (fig. 2). This suppression of pupal and adult organs is accompanied by a slight increase in the size of the larval tissues, for most parasitised larvæ were from 2 to 3 mm. longer than their healthy companions. This condition is opposite to *Prothetely*, which name Kolbe ('03) ascribed to the several recorded cases in which larvæ of various orders had their

histoblasts so accelerated that the pupal, or in some cases adult, organs appeared as external structures in the as yet immature larvæ. Such cases have been recorded by Heymons ('06) in *Tenebrio molitor*, Hagen ('72) in *Bombyx mori*, and others in various Coleopterous larvæ. A study of the cases of prothetely now on record shows that they were all produced under artificial conditions. This would suggest that it is due to some pathological disturbance, which has caused an excessive stimulation of the enzymes, whose action brings about the multiplication of adult tissue forming cells, without appreciably affecting those of the larval tissues. It then follows that there are two sets of enzymes concerned in the maturation of holometabolic insects, one of which may be termed the "larval enzymes" and the other the "adult enzymes." The suppressed growth of the histoblasts in parasitised Simuliidæ would then be due to the worm decreasing the stimulating action of the adult enzymes by impoverishing them either in quality or quantity. This subject is discussed more fully in an earlier paper by the writer ('11), where this pathological condition is termed Methetely, in contradistinction to Kolbe's Prothetely.

The parasitised Simuliid larvæ are unable to pupate and are finally killed by the worm, which bores its way out through the "skin" and thus escapes into the water. Here it probably leads a free sexual life, as do the related nemathelminths found in grasshoppers of which it is only the larvæ that are parasitic. It is surmised that the larval worm passes into the body cavity of its host from the alimentary tract, into which it would be readily taken with the food. This worm was found during the spring in varying abundance in most of the streams examined. The largest percentage of infection was 25, equally distributed between the two species of *Simulium* present in that stream. It was never found in the fall, and has probably one generation only per annum.

During the spring there was a very high percentage of parasitism by various Myxosporidia S. L. (Sporozoa). When these were discovered, they had all sporulated, and were therefore at too late a stage in development for their taxonomic position, or life history, to be ascertained, but they were evidently related to the organisms causing the Pebrine disease of silkworms. The body of the parasitised larva becomes enormously distorted and swollen,

particularly near the apex of the abdomen (fig. 3). The skin, normally dark green in colour, is rendered almost transparent owing to its great distension, and through it can be seen a white irregular mass of parasitic material. Upon dissection, this parasitic mass is found to consist of countless spores. Four distinct types of spores were found in different localities. These represented, probably four, or even more, species. The simplest type was a plain ovoid, about 5μ by 3μ in size. Another, similar in size, had at one end a flattened disc. In a third, this disc was replaced by a stout flagellum-like organ about 2-3 times the length of the spore, while the fourth resembled the third, but had in addition two raised annulations around its equatorial region. The first type of spore represented, probably, a normal species of the genus *Glugea*, of which three more species were found during the following fall. Unless the spores bearing appendages belong to the Myxosporidia, S.S., which seems to be improbable, they represent entirely different types to anything previously described. Up to 80% parasitism was recorded, every case of which is believed to have been fatal. This could not be proved definitely since all *Simulium* larvæ kept under observation in captivity died. The following observations tend, however, to confirm this supposition. No pupæ containing parasites could be found, even where 80% of the larvæ had been infested. No reproductive organs were found in parasitised larvæ. There is very little fat body stored up in these larvæ. The voluminous proportions of the parasite would require an enormous rent in the ectoderm in order that it might escape, and were it to pass over into the adult it is inconceivable that the latter would be able to escape from the water when so hampered.

Throughout the summer isolated specimens of *S. bracteatum* were present in the streams. These were casually examined, but no parasites were found. By the beginning of October larvæ of this species were abundant. *S. vittatum* was represented, also, by a few specimens, and by the middle of November *S. hirtipes* was once more hatching out from recently deposited egg masses. The latter species seems to aestivate throughout the Summer, for no signs of it were seen between the end of May and the beginning of October.

The larvæ present in the streams during the fall months were

found to be parasitised with species of two distinct Protozoan orders—namely, Gregarinida and Myxosporidia S. L. The former was represented by a single species, the taxonomic position of which was not ascertained. Larvæ parasitised by this species were conspicuous in presenting a white speckling over the entire surface of the body (fig. 4). This, upon closer examination, was seen to be due to innumerable small globular cysts, measuring up to .25 mm. in diameter, which either floated freely in the blood, or were still attached to the original seats of infection. The tissues invaded were the ectodermal epithelium, the cells of the fat body and the layer of pigment cells which cover the nervous system in these larvæ. The sexual organs were never found in parasitised larvæ.

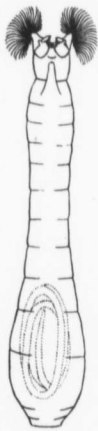
The cysts when sectioned, and stained with iron hæmatoxylin, were seen to be composed of a homogeneous mass of granular protoplasm in which was situated numerous free masses of chromatic material. In some young cysts there were vacuoles, but these were detected in living specimens only. In other fresh material there seemed to be a distinct ectosarc layer of a perfectly clear fluid. By the end of November a developmental stage was reached in which the protoplasm began to collect around the scattered masses of nuclear material, and the cyst contents were divided up into numerous uninucleate globular bodies. If a cyst were then dissected and allowed to float in water it soon bursts, liberating countless numbers of these minute globules which, within a quarter of an hour of their escape, began to move independently, and were soon actively darting around, in a limited area, in the water. Killed and fixed specimens revealed the fact that each was provided with a flagellum. No further study of these organisms was made. The larvæ thus parasitised had their histoblasts retarded, though to a less extent than those which contained *Mermis* sp. Since this parasite was present in about 50% of the larvæ in streams where it was found, it must have a distinct economic value. The retardation of the histoblasts is sufficiently pronounced to assure the death of the larvæ, which was in all recorded cases that of *S. bracteatum*. No other species of *Simulium* larvæ were present however, in the streams where this parasite was found.

The order Myxosporidia S.L. was represented by three species of the genus *Glugea*. These species received special attention, and

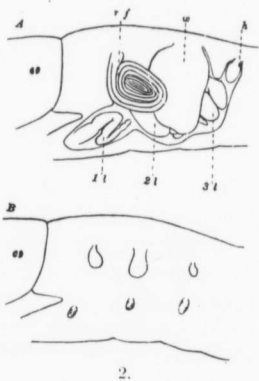
their life histories were worked out. The appearance of parasitised larvæ was similar to that of the specimens, found in Spring, containing other Myxosporidia S.L. The life history of the organisms is, in brief, as follows: a *spore* is taken into the alimentary tract of a very young larva. From this escapes an amœboid *germ*, which passes between the cells of the mesenteric epithelium, and thus gets into the body cavity. Here it attacks, and enters, a cell of the fat body, where it grows with great rapidity, soon bursting the cell and living free life in the body cavity of its host. It is now termed a *trophozoite*, and consists of a multinucleated mass of protoplasm. As the trophozoite matures, a small clearly constricted globule of protoplasm collects around each of the numerous nuclei, to form a spherical *sporont*. The single nucleus of the sporont undergoes three (or more in some species) divisions, thus forming eight nuclei, which in time become the centres of eight small bodies known as *sporoblasts*. Around each of these sporoblasts is secreted a thick shell, which activity is accompanied by a complicated internal development. This converts the sporoblast into a mature *spore*, which is capable of spreading the infection, which liberated in the water by the death and subsequent decay of its host.

It is believed that infection by this class of parasite can be accomplished only in the earliest stages of larval life, before the peritrophic membrane lines the entire surface of the mesenteron. The latter, it would seem, is the only part of the alimentary tract which would not resist the attacks of an unarmed germ. A fuller account of this exceptionally stout peritrophic membrane, and its development, has been published by the writer ('13). In this paper, also, the three Glugeid species discovered as parasites of Simuliid larvæ were described.

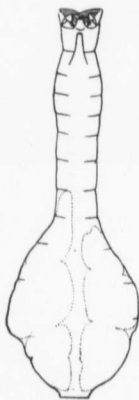
It will be seen, from the above descriptions of the various parasites of Simuliid larvæ found around Boston, that they are very conspicuous, and would readily attract the attention of an observer. Notwithstanding this fact, there are no other records of their occurrence in North America. This would appear to indicate that, in those sections of the country where species of *Simulium* are most abundant, these parasites do not exist, for in these places careful studies of the larval stages have been made by several observers. A Glugeid was described from the European



1.



2.



3.



4.

PARASITES OF SIMULIUM.

S. ornatum by Leger ('97), and another from a Brazilian ? species by Luta and Splendore ('04 and '08). Lutz ('09) also records the presence of a nemathelminth in Brazilian Simuliidae.

The parasites found in Simuliid larvæ around Boston during 1911 may be summarized as follows:

1. Parasites of the Spring brood of Simulium.
 Various Myxosporidia spp. up to 80% mortality.
 Mermis sp. up to 25% mortality.
2. Parasites of the Fall brood of Simulium.
 Glugea spp. up to 10% mortality.
 Gregarine sp. up to 50% mortality.

No experiments have been made upon the possibility of transferring these parasites from one species of Simulium to another, but so far as can be seen there should be no great difficulty in accomplishing this, for in all cases observed the parasites infected all species of larvæ present at the same time in the streams where the former occurred. There is, however, a seasonal variation of parasitism, for the species taken in the spring were not found in the fall, so that it is probable that only those species of Simulium whose life history coincides with parasitised species could be infected with the parasites of the latter.

EXPLANATION OF PLATE XV.

Fig. 1. Mermis parasites in situ.

Fig. 2. A, normal histoblasts of mature larva. B, histoblasts of full-grown larva containing Mermis, sp.; r f, respiratory filament histoblast; w, wing histoblast; h, halteres histoblast; l (1, 2, 3), leg histoblasts.

Fig. 3. Glugeid parasite in situ.

Fig. 4. Gregarine in situ.

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NOTES ON SOME SPECIES OF CECIDOMYIIDÆ.

BY WILLIAM BEUTENMULLER, NEW YORK.

Dasyneura hirtipes Osten-Sacken.

Cecidomyia hirtipes OSTEN-SACKEN, Mon. Dipt. N. Am., Vol. I, 1862, p. 195; Glover, MSS. Notes, Dipt. 1874, p. 8; Bergenstamm and Loew. Verh. zool. bot. Gesell. Wien., Vol. XXVI, 1876, p. 47.

Dasyneura hirtipes ALDRICH, Cat. N. Am. Dipt. 1905, p. 155.

Male and Female.—Head red, clothed with red scales; antennæ brown. Neck red; thorax above, smooth, polished, blood-red, blackish above with a few erect brown hairs, pleura marked with black; scutellum red. Abdomen bright scarlet red with blackish appressed scales. Legs wholly black; coxæ reddish. Wings with a dense blackish pubescence. Halteres reddish or orange, the club black. Expanse 5.5-6 mm. Length 3.5-4 mm.

Gall.—Polythalamous, large bud-like and solid when immature, with a number of aborted leaves surrounding it. When mature, it is soft inside and filled with a white foam-like substance, in which are a number of long, narrow, larval cells. When the flies are ready to emerge, the gall bursts open and it is then of the appearance of a miniature cauliflower; the large white center surrounded by the dark green leaves, giving it the appearance of that plant. Diameter 50 to 25 mm.

The gall is formed at the tip of stunted stalks of the fragrant golden-rod (*Solidago graminifolia*) in June and July. When old, the white foam-like internal substance decays and the gall is then hard, woody and hollow inside, with a large opening on top. It remains on the bushes in this state over winter. I have collected the gall of *C. hirtipes* at Fort Lee, New Jersey, late in June, from which the adults began to emerge on July 6.

Dasyneura seminivora Beuten.

Cecidomyia (?) *seminivora*, BEUTENMULLER, Bull. Am. Mus. Nat. Hist., Vol. XXIII, 1907, p: 390, pl. XV., figs. 1-4 (larva and gall).

Male and Female.—Head and antennæ black. Thorax deep brown-black, somewhat shining, with erect hairs in the grooves; scutellum deep red. Abdomen deep red, covered with deep brown black scales above; under side wholly deep red with rather long, erect, dark hairs. Legs blackish above, pale brown beneath. Wings blackish hyaline with bluish reflection; extreme base of wings red. Halteres yellowish brown. Expanse 4 mm. Length 2 mm.

This species was heretofore known from the larva and gall only, and the adults are here described for the first time. The flies emerged from May 31 to June 15. The gall is a deformation of the seed-pods of certain species of violets.

Lasioptera podagræ, sp. nov.

Male and Female.—Head clothed with gray scales in front and behind; eyes black; antennæ deep brown, first and second joints dull red. Thorax narrowly banded on each side from the anterior portion of the scutellum, with gray and brown hair-scales. Along the middle of the thorax is a very broad golden brown band from the scutellum to almost the anterior portion. Scutellum marked with gray scales. Abdomen velvety black, with a row of large, broad gray marks on each side, decreasing in size toward the last segment. Under side: Thorax black marked with gray, abdomen wholly gray; legs black above, white on the joints, tarsi banded with white; femora beneath white from the base to about the middle. Wings hyaline with black scales, red at the extreme base and with a very small white mark at the middle of the costa. Halteres red or white. Expanse 2.50 mm. Length 1.50 mm.

Gall.—Polythalamous, consisting of an elongate swelling enlargement of the stems of a species of aster. Length 20 to 50 mm., Width 8 to 10 mm.

Habitat: Fort Lee, New Jersey; Bronx Park, New York City (W.B.).

Types: Collection Am. Mus. Nat. Hist.

Lasioptera linderæ Beuten.

Lasioptera (?) *linderæ* Beutenmuller, Bull. Am. Mus. Nat. Hist., Vol. XXIII, 1907, p. 398, pl. XIV., fig. 3-6 (gall and larva).

Male and Female.—Head black, face and posterior portion snowy white; antennæ black, first, second and third joints white. Thorax velvety black, broadly bordered with white around the anterior portion to the base of the wings. In the grooves are a few scattered pale brown hairs. Scutellum black, with a few long white hairs. Abdomen black, first segment white, second segment with a small white mark on the dorsum posteriorly, the two following segments each with a broad white band posteriorly, the remaining segments wholly black. Under side of abdomen broadly white. Legs pale brown or sordid white; tibiæ marked with black at the middle. Wings hyaline with black scales and a white mark at the middle of the costa and at the base of the wings. Halteres white. Expanse 3 mm.

The adults are here described for the first time. They emerge from the galls in June.

Lasioptera vernoniæ Beuten.

Cecidomyia (?) *vernoniæ* Beutenmuller, Bull. Am. Mus. Nat. Hist., Vol. XXIII, 1907, p. 389, pl. XV., figs. 7-8.

Male and Female.—Head white in front, black posteriorly; antennæ black; first and second joints white. Thorax deep velvety black, with a very broad white margin around the anterior portion to the base of the wings. In the two grooves of the thorax are a few scattered, white hairs. Scutellum scaled with white and with a few long hairs of the same colour. Abdomen deep velvety black, each segment with a very narrow white band posteriorly and not extending to the extreme sides of the abdomen. Legs black, with the joints pure white; coxæ white. Under side of abdomen broadly white. Wings blackish hyaline, with a white mark at the middle on the costa. Halteres white. Expanse 3.5 mm. Length 1.5 mm.

Heretofore, this species was known only from the larva and gall.

Cecidomyia meibomiæ Beuten.

Cecidomyia (?) *meibomiæ* BEUTENMULLER, Bull. Am. Mus. Nat. Hist., Vol. XXIII, 1907, p. 390, pl. XV, figs. 9, 10, 11.

Male and Female.—Eyes large, contiguous at the vertex, black; face semi-translucent, dull orange red. Antennæ yellowish brown with erect black hairs. Thorax dull, semi-translucent red, with rather long, blackish hairs in the grooves on top, forming two parallel lines, and a few hairs at the sides; scutellum dull semi-translucent red. Abdomen dull semi-translucent, orange red sparsely, with brown black hairs; tip of abdomen blunt. Under side of body dull red. Legs fuscous. Expanse 3.50 mm. Length 1.33 mm.

Since my description of the larva and galls of this species I succeeded in breeding the adults from galls collected in the Valley of the Black Mountains, North Carolina, in September 1906, and they are here characterized for the first time.

Cecidomyia clavula, sp. nov.

Female.—Head black, eyes large, contiguous, face pale orange; antennæ pale, semi-translucent, orange yellow, banded with black, hairs gray. Thorax above semi-translucent orange, tinged with red; underside orange. Abdomen orange, with yellow hairs. Legs white, with deep black bands. Wings hyaline yellow, with metallic blue and purplish reflections; a broad, dusky grayish, wavy transverse band a little beyond the middle, followed by a similar close to the outer margin; on the outer margin is a grayish patch almost connected with the preceding transverse band; costa yellow, deep black below the apex; fringes yellow. Halteres semi-translucent orange. Length 2 mm. Expanse 4 mm.

Very closely allied to *Cecidomyia variegata* of Europe. Bred from enlargements of the terminal twigs of Dogwood (*Cornus florida*). It is the gall described by me in the Bulletin Am. Mus. Nat. Hist., Vol. IV, 1892, p. 269.

Rhopalomyia remuscula Beuten.

Cecidomyia (?) *remuscula* BEUTENMULLER, Bull. Am. Mus. Nat. Hist., Vol. XXIII, 1907, p. 392, pl. XVII, figs. 7, 8.

Male.—Head black; antennæ fuscous. Thorax shining black above, with two pale, parallel lines dorsally, pleura yellowish brown; scutellum yellowish. Abdomen dull yellowish, covered with brown hairs. Wings blackish, hyaline. Halteres yellowish, knobs black. Legs fuscous. Length 2 mm.

Hitherto known only from the gall and the larva.

TWO NEW CANADIAN GALL MIDGES.

BY C. P. FELT, ALBANY, N.Y.

Cystiphora canadensis n. sp.,

The interesting midge described below was reared July 10, 1913, by Dr. A. Cosens, Toronto, Canada, from an inconspicuous flat, blister gall on the leaves of white lettuce or rattlesnake root, *Prenanthes altissima* or *P. alba*. This is the second American species of *Cystiphora* to be discovered and is easily distinguished from *C. viburnifolia* Felt by colorational and structural characters.

Gall.—Circular, diameter 5 mm., dark purplish with a paler center. There is no perceptible thickening of the tissues. The galls are placed irregularly between the veins.

Female.—Length 1.25 mm. Antennæ extending to the third abdominal segment, sparsely haired, dark brown; 13 or 14 segments, the fifth cylindrical, with a length twice its diameter; terminal segment either simple or composed of two closely fused segments. Palpi: first segment irregularly capitate, the second subquadrate, the third slender, with a length fully five times its diameter. Mesonotum shining dark brown. Scutellum, postscutellum and abdomen mostly reddish brown, the terminal abdominal segment fuscous, the tip of the ovipositor yellowish. Wings hyaline, the third vein uniting with the anterior margin at the distal ninth. Halteres pale yellowish. Coxæ and femora basally, fuscous yellowish, the distal portion of femora, tibiæ and tarsi mostly fuscous; claws slender, toothed, the pulvilli as long as the claws. Ovipositor with a length nearly half that of the abdomen, the basal half distinctly swollen and rather heavily chitinized, the distal half with a diameter about half that of the basal portion, tapering slightly to a narrowly rounded apex bearing a slender spur. Type Cecid a2441.

Hormomyia helianthi Brodie

1894, Brodie, William—Biol. Rev. of Ont., I, pp. 44-46 (Cecidomyia).

1909, Jarvis, T. D.—Ent. Soc., Ont., 39th Rep't., p. 83 (Cecidomyia).

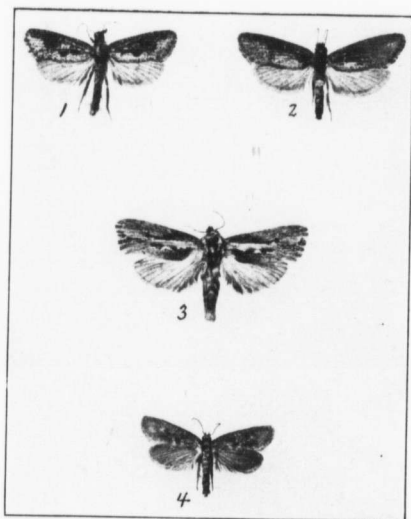
The axillary galls of this species occur on *Helianthus*. They are more or less cylindrical, occasionally flask-shaped and, according

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to the describer, have a length of 10 to 25 mm. and a diameter of from 1.5 to 5 mm. There may be 1 to 10 galls in an axil, firmly attached to the stem by an expanded base and projecting in various directions, usually upwards, often at right angles to the stem and occasionally downward. They occur on the upper third of the stems of *Helianthus decapetalus* and *H. divaricatus*, growing in open woods or in shaded situations. This gall occurs about Toronto, Ont., and has been collected at Evanston, Ill., by Mr. L. H. Weld. A species of *Torymus* has been obtained from this insect. Specimens of this midge were reared June 23, 1907, by Dr. A. Cosens, of the University of Toronto. The following descriptions are drafted from this material.

Male.—Length 2.5 mm. Antennæ probably extending to the fourth abdominal segment, sparsely haired, light yellow; 14 segments, the fifth binodose, the basal stem with a length one-half its diameter, the distal with a length about three-fourths its diameter, the basal enlargement subglobose, the distal subcylindric, slightly expanded apically and with a length nearly twice its diameter; three low, broad circumfili occur on each flagellate segment; terminal segment irregularly binodose, with an indistinct constriction near the basal third, the apex narrowly and irregularly rounded. Mesonotum yellowish brown. Scutellum and postscutellum fuscous yellowish. Abdomen dark yellowish brown, the genitalia fuscous yellowish. Wings hyaline, cōsta thickly haired, light straw, the third vein uniting therewith well beyond the apex, the fifth at the distal fourth, its branch near the basal half. Halteres, coxæ and femora basally yellowish, the distal portion of femora and tibiæ dark brown, the tarsi a little lighter; claws slender, evenly curved, simple, a little longer than the large pulvilli. Genitalia: basal clasp segment short, broad; terminal clasp segment stout, slightly curved and with a length thrice its diameter; dorsal plate short, very broadly and roundly emarginate, the lobes strongly divergent; ventral plate short, broadly rounded; style short, obtuse.

Female.—Length 3.5 mm. Antennæ nearly as long as the body, sparsely haired, light yellow; 14 segments, the fifth with a stem $\frac{1}{4}$ the length of the cylindric basal enlargement, which latter has a length $2\frac{1}{2}$ times its diameter and three irregular, anastomosing circumfili on the basal portion of the enlargement, with a fourth



NEW NORTH AMERICAN ANAPHORINAE.

1. *Pseudanaphora quadrellus*. Type ♂.
2. *Pseudanaphora quadrellus*. Type ♀.
3. *Neolophus antonellus*. Type ♂.
4. *Eulepiste antonellus*. Type ♂.

apical filum; terminal segment slightly reduced, with a length about twice its diameter and tapering suddenly to an obtuse apex; the surface of this segment is nearly covered with very irregular, anastomosing circumfili. Palpi yellowish, basal segment roundly quadrate, the second segment reduced, conical. Mesonotum reddish brown. Scutellum brownish, yellowish apically, postscutellum brownish yellow. Abdomen sparsely haired, dark brown. Halteres and coxæ yellowish. Legs mostly yellowish straw. Ovipositor when extended about as long as the abdomen, the terminal portion moderately stout and with indistinct, narrowly rounded apical lobes.

This species departs from the typical *Hormomyia* in the greatly produced ovipositor of the female and it is possible that it, with related forms, should be referred to a distinct genus.

Type, C. a2453.

SOME NEW NORTH AMERICAN ANAPHORINÆ.

BY WM. BARNES, M.D., AND J. MCDUNNOUGH, PH.D., DECATUR, ILL.

In sorting over a large accumulation of material belonging to the Tineid group called by Walsingham *Anaphorina*, we discovered several species which did not agree with the descriptions of any known North American species; these we venture to describe as new. We have followed Walsingham in the generic references, although Busck states that these genera are not tenable; we feel, however, that Walsingham's genera serve at least to define the position of the species in the group rather more clearly than if we had employed a more general term.

Neolophus antonellus, sp. nov. (Fig. 3.)

♂.—Antennæ strongly serrate and fasciculate; palpi rough-haired, upturned to well above front and rather closely appressed, ochreous, deep brown at base; collar brown at base, ochreous apically; thorax brown centrally, this portion rather sharply defined by pale ochreous patagia with light brown center. Primaries light brown with broad, very prominent pale yellowish stripe from base of wing through the fold to approximately the end of cell; upper margin of this stripe is rather even, bordered by a black line which curves slightly upwards and ends in a black discocellular dot;

lower margin irregular, the stripe projecting slightly about center of wing in small quadrate patch towards inner margin, bordered basally with blackish and with brown patch beyond the projection; outer boundaries of stripe diffuse, two faint narrow black lines extending beyond it on each side of vein 4 to termen; slight sprinkling of gray scales above anal angle; costa and inner margin shaded with black-brown basally; indistinct series of marginal dots extending from costa before apex to anal angle; fringes brown, cut by ochreous. Secondaries smoky ochreous at base. Beneath smoky brown tinged with ochreous. Expanse 33 mm.

Habitat: San Antonio, Texas. 1 ♂. Type. Coll. Barnes.

Eulepiste pyramellus, sp. nov. (Fig. 4.)

♂.—Antennæ annulate; palpi rather smooth, upturned to above front, but not appressed; front pale ochreous, thorax darker; primaries an admixture of pale gray and brown scales, maculation very indefinite and indistinct, in well-marked individuals consisting of a brownish blotch in cell near base, another at end of cell and a third midway between these two above inner margin, these latter are at times connected outwardly by a whitish oblique waved line which is usually more or less obsolete; indistinct costal and terminal dark dots; secondaries and underside unicolorous smoky brown. Expanse 23 mm.

Habitat: Pyramid Lake, Nevada. 4 ♂. Type. Coll. Barnes.

The species appears to be intermediate between *hirsutus* Bsk. and *occidens* Bsk.

Pseudanaphora quadrellus, sp. nov. (Figs. 1, 2.)

♂.—Antennæ very slightly serrate below, palpi upturned, roughly haired, brown; thorax chocolate-brown; primaries chocolate brown shaded with pale ochreous especially along inner margin and termen; costa with alternate striae of chocolate-brown and ochreous; slight ochreous tinge in cell; dark discocellular dash; inner margin broadly ochreous, more or less striate with brown, upper edge of this ochreous stripe irregular with prominent blunt tooth of ground-colour projecting downward towards middle of inner margin; before and after this tooth the margin is rounded, bent sharply upwards beyond origin of vein 3 as far as vein 7, bending again at right angles and attaining termen below apex, forming a large subquadrate terminal ochreous patch; faint ter-

minial row of dark dots; fringes checkered brown and ochreous with pale basal line. Secondaries pale smoky brown with ochreous terminal line and checkered fringes. Beneath smoky brown, costa of primaries apically ochreous with 3 or 4 brown striæ, narrow terminal ochreous line, secondaries and fringes as above.

♀.—Palpi short, hairy, porrect; primaries more uniform chocolate brown with only faint traces of ochreous along inner margin; a paling of the ground colour represents the quadrate terminal patch so prominent in the ♂. Expanse ♂ 25 mm. ♀ 28 mm.

Habitat: Palmerlee, Ariz. 7 ♂, 3 ♀. Types, Coll. Barnes.

The species is allied to *davisellus* Beut., but should be readily distinguished by the dark apex and subquadrate ochreous terminal patch with sharply defined inner edge. The males vary in the amount of brown striations on the ochreous area in some there are scarcely any, in others they show a tendency to obscure this area more or less completely.

EUGONIA CALIFORNICA BDV. IN THE PACIFIC NORTHWEST.

During the summer of 1912 there was an unusual occurrence of the caterpillars of *Eugonia californica* in a number of places throughout the states of Washington, Idaho, and also British Columbia. They were reported as being present "by the millions" and defoliating the buckbrush or ceanothus (*Ceanothus velutinus*). It was even reported that the caterpillars were blocking the trains at Clayton, a village about 30 miles north of Spokane, Wash. This story was not exaggerated in the least, as I had occasion to ascertain.

On the 18th of June I visited the field of devastation at Clayton. When I first arrived at the place, I thought the caterpillars to be those of *Vanessa antiopa*, but such they did not prove to be. I saw that there were a great many of the caterpillars and started to step off the distance across the small area ahead of me, but I soon found that it was not a matter of yards or rods, but of miles. As far as could be seen to the westward, the ceanothus looked as if it had been scorched by fire. All the bright, green glossy leaves had been eaten, and the branches were entirely bare except for the millions of crawling, spiny, dark caterpillars. They were crawling

everywhere—on the ground, over sticks, stones, logs, stumps, up in the young pines above one's head, on the fence posts, up and down the timbers of railroad bridges, in the water, and even on the rails of the railroad. Some of the caterpillars were about one-third grown, some were nearly mature, while a few were hanging pendant, like fruit, preparatory to pupation. All about one could hear the incessant rattle of their feeding, and the patter of their falling excrement like the patter of summer rain. The ground was covered with excrement. Thousands of the cast skins were to be seen on the naked branches. Where the railroad train had been blocked countless thousands of the dead and crushed caterpillars were found, their bodies covering the ground for rods. In the midst of this field of devastation stood willows, pines, roses, firs, tamaracks, grasses and lupines all untouched. Just as I was leaving the place, I noticed that the ground was covered with caterpillars, all crawling in the same direction. I found that they had completely defoliated the ceanothus bushes where they had been and were now on their way to find other food.

Two days later, in Spokane, I found a few acres of ceanothus on a hill side completely defoliated as at Clayton. Here many of the caterpillars had transformed to chrysalids. Several times they were noticed to shake themselves violently until the bushes shook from the effect.

On July 7 I found millions of the caterpillars on the south slope of Moscow Mt., Idaho. Some of these were parasitized by an undetermined species of Braconid.

On July 13, when I again visited the place of infestation at Moscow Mt., I found that all caterpillars and all chrysalids were gone. The caterpillars had evidently not migrated, for all around as far as I could see the ceanothus had not been touched. Even had the caterpillars migrated that would not explain the absence of the chrysalids. I think that the total disappearance of these caterpillars and chrysalids was no doubt due to birds. A similar disappearance of all the caterpillars in the other districts visited seems to confirm this opinion.

These caterpillars were reported from the following places: Chelan, Wn.; Brownsville, Wn.; Moscow Mt., Idaho; Nelson, B.C.; Peachland, B.C., and Clayton, Wash.

M. A. YOTHERS.

NOTE ON THE OVIPOSITION OF *Aedes calopus*
MEIGEN.

BY JAMES ZETEK, ANCON, CANAL ZONE.

The writer was taking the adults from a lot of breeding cages and, by accident, one female *Aedes calopus* escaped. Hardly more than two minutes later he turned his attention to an uncovered cage containing water and larvæ of *Culex coronator* D & K, and discovered a mosquito resting on the side of the jar, the tip of its abdomen extending and touching the water, depositing eggs. This occurred at 4.10 p.m., July 2nd, 1913. The mosquito was *A. calopus*, and most probably was the one that had escaped a moment before. The cage was covered with gauze.

When the cages were examined at 1.00 a. m., July 5th, very young larvæ of the yellow-fever mosquito were seen in this particular jar. The egg instar is about 60 hours. These larvæ were allowed to mature, and from them emerged 14 ♀ and 18 ♂ adults.

The female which had deposited these eggs had no blood meal, nor any other food than which was present in the air and water. In the original cages of *Aedes calopus*, copulation was frequently noted, occurring chiefly in the daytime. In the act the male is underneath, clasping the female, the two mosquitos facing each other. The male clasped the female as frequently in flight as when at rest. In one cage, containing one male and many females, the male copulated three successive times during the half hour under observation.

The rapidity with which the mosquito found water suitable for oviposition after its escape is remarkable, and places emphasis upon the cautions to be taken while working with disease-transmitting insects or pests.

PHLEBOTOMUS AND VERRUGA.

It would appear that an addition is likely to be made to the ever-increasing number of cases of the relation of insects to disease. In certain of the valleys of the Pacific slope of the Peruvian Andes,

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in South America, an obscure disease, known as *Verruga*, has existed for years. Recently, the possibility of the transmission by some species of insect, or tick, has been seriously entertained, and we now learn from "Science" (August 15th, 1913) that Mr. Charles H. T. Townsend, who was some time ago especially charged by the Peruvian Government with the investigation of the insect transmission of verruga, injected a dog with triturated females of *Phlebotomus* on July 11th, and on July 17th secured as a result an unmistakable case of verruga eruption. The gnats used for the injection were secured on the night of July 9th, in Verrugas Canyon, a noted focus of the disease. This is the first experimental transmission of verruga by means of insects, and adds a notable case to the list of insect-borne diseases. The details of the experiment will appear shortly. Further transmission work in laboratory animals will be pursued at once, both by injections and by causing the gnats to bite.

C. G. H.

A NEW LEPTODESMID FROM MONTANA.

BY RALPH V. CHAMBERLIN, CAMBRIDGE, MASS.

The following description is published separately in order that the name may be available for early use.

Leptodesmus (Chouaphe) elrodi, sp. nov.

Light brown to very deep brown and brownish black, the background sometimes rather obscurely chestnut. Carinal and anal process in darker individuals orange, in paler even more yellowish; the first dorsal plate also paler, yellowish, oblong anterior margin. The metazonites may be paler caudally.

Head with the median sulcus deep. Vertex moderately finely uneven or coriaceous, bearing several long bristles across vertex and also in clypeal region above those of labial border. Antennae of moderate length. First or cervical dorsal plate narrower than the second one, anteriorly strongly convex; caudal margin moderately deeply concave mesally; laterally margined. Caudolateral angles with caudal side nearly straight. Dorsum strongly arched; anterolateral corners of plates convexly rounded, in the second to fifth plates a little extended cephalad, but in others more and

more sloping off caudad. Caudal corners in about the second to the eighth plates bent moderately forward, then becoming straight in a few and then bent caudad, and in the last few forming a distinct but always distally rounded process; edges of lateral carinae narrowly elevated; pores opening ectad; nineteenth plate much shortened, its processes reduced; metazonites with transverse furrow distinct; surface to naked eye appearing nearly smooth and shining, under the lens finely coriaceous, more strongly roughened laterally. Sternites smooth, glabrous. A deep transverse sulcus at middle and a weaker median longitudinal one crossing it at right angles. Anal process in dorsal outline subtriangular, distally subcylindric, the tip a little depressed; a transverse row of four bristles near middle of length and toward and on tip about eight more. Anal scale semilunar in outline, but with the anterior margin weakly convex, bearing a bristle on each side a little in front of caudal margin. Anal valves elevated along mesal border, each bearing a bristle a little ectad of mesal edge near middle of length and a second one in line with it farther caudad. Legs clothed with stiff hairs, which proximally are sparse, but distally, and especially on dorsal surface, become more dense and at the same time shorter. Male gonopods consisting of two long prongs, of which the posterior one is distally slender and style-like and curves evenly, first dorsal and somewhat mesad and then back proximad. The anterior branch just proximad of the curve in the first one expands into a subtriangular plate on the dorsomesal side, which along its distal or caudal edge bears several short teeth, of which the one at angle is the longest; the prong continues beyond this on a more slender blade which bends abruptly dorsad or dorso-ectad and bears on its proximal edge and mostly on distal portion a series of long, curved, spine-like processes. (See fig. 17).

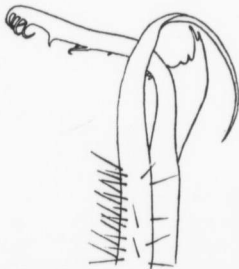


Fig. 17.—*Leptodesmus elrodi*, caudoventral view of distal portion of right male gonopod.

Locality.—Montana (Flathead Lake).

The specimens forming the types of this species were collected by Dr. C. C. Adams in the summer of 1912. The species is named in honour of Prof. Morton J. Elrod, of the University of Montana, who is doing much in aiding the advancement of our knowledge of the Natural History of Montana.

A NEW PAMPHILA FROM NEW MEXICO (LEPIDOPTERA).

BY HENRY SKINNER, M.D., SC.D.

Pamphila margarita, n. sp. The male expands 14.5 mm. and the female 15.5 mm., the measurements being taken from the base to the apex of one wing. The colour of the species is tawny olive (Ridgway) and the same colour as *pittacus* Edwards. There is a very faint stigma in the male and on the primaries three vitreous subapical spots; a rectangular spot, constricted in the middle, at the end of the discoidal cell; three spots in an oblique line across the median interspaces, the middle one being the largest and triangular in shape, and the lower one is somewhat linear, with the inner end pointed. The secondaries have a crooked transverse row of four vitreous spots below the middle of the wing; the lower two are small and parallel to the margin, while the upper two are larger and at right angles to the margin. Fringe dirty white. Underside: Primaries with the spots repeated and also on the secondaries, but larger, and there are in addition a few spots at the base of the wing. The female is like the male, but larger, and the spots are more conspicuous.

This species is allied to *pittacus* Edw. and looks much like it. The transverse row of spots on the upper side of the secondaries of *pittacus* consists of four, straight, distinct rectangular spots, and the two species may be separated by the difference in this row of spots.

Described from a number of specimens of both sexes submitted by Mr. R. C. Williams, the species being named in honour of his wife. They were captured at Jemez Springs, New Mexico, May 26th to June 9th, by Mr. John Woodgate. The type is in the collection of the Academy of Natural Sciences of Philadelphia.

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A NEW SPECIES OF ELASMIDÆ OF THE GENUS
EURYISCHIA HOWARD FROM AUSTRALIA,
AND A NEW *PODAGRIONELLA*.

BY A. A. GIRAULT, NELSON, N.Q., AUSTRALIA

The following species has, in my own mind, served to confirm the position of *Euryischia* Howard in the family Elasmidæ. It was captured with the sweeping net January 6th, 1913, from foliage and grass along the Cape River, Capeville, Pentland, Queensland.

Genus *Euryischia* Howard.

1.—*Euryischia sumneri*, new species.

Female.—Length 2mm.

Black-blue, the distal third or more of the fore wing distinctly embrowned (from about distal fourth of marginal vein to the apex); postmarginal vein somewhat longer than the long stigmal, and over half the length of the marginal. Cephalic tibiæ and tarsi brownish, also the tegulæ; caudal coxæ normal for the family, but the caudal femora enlarged and compressed. Scutellum finely alutaceous, the scutum the same but clothed with dense, black, stiff bristles. Antennæ yellowish, club 3-jointed, funicle 3-jointed, the distal joint wider than long; the first subquadrate, the club ovate, larger than the funicle; no ring-joint. Both mandibles tridentate, the inner tooth broad and truncate, shorter. Pedicel longer than any of the funicle joints. Forewings proximad with several very long bristles from the blade. Posterior tibial spurs white.

(From one specimen, $\frac{2}{3}$ -inch objective, 1-inch optic, Bausch and Lomb.)

Male.—Not known.

Habitat.—Australia—Capeville (Pentland), Queensland.

Type.—In the Queensland Museum, Brisbane, the above specimen on a tag plus a slide bearing the head.

Dedicated with much respect to Charles Sumner for his orations on war.

Genus *Podagrionella* Girault.

1.—*Podagrionella pentlandensis*, new species.

Female.—Length 5.10 mm., exclusive of ovipositor.

Very similar to the type of the genus, but the antennal club darkens at tip, the flagellum reddish brown, the pedicel darker.

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The abdominal petiole is shorter, very short, wider than long; the distal two funicle joints are slightly wider than long; the cross dash on the fore wing is the only fuscation present in these wings. The whole body is more robust, the abdomen stouter and longer. Otherwise structurally like *fasciatiennis*, with which I have compared it. Mandibles tridentate.

Male.—Not known.

Described from one female captured by sweeping miscellaneous foliage and grasses along the Cape River, Capeville, Pentland, Q., January 6th, 1913.

Habitat.—Australia—Queensland, Capeville (Pentland).

Type.—In the Queensland Museum, Brisbane, the above specimen on a tag with a slide bearing posterior femur and head.

CONSTITUTION OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

Incorporated 1871.

SECTION I.—(OBJECTS AND MEMBERSHIP).

1.—The Society shall be called "THE ENTOMOLOGICAL SOCIETY OF ONTARIO," and is instituted for the investigation of the character and habits of insects, the improvement and advancement of Entomological Science, and more especially its practical bearing on the Agricultural and Horticultural interests of the Province. The Society shall consist of not less than twenty-five members.

2.—The Society shall consist of four classes, viz.—Members, Life Members, Honorary Members and Corresponding Members.

3.—Members shall be persons whose pursuits, or studies, are connected with Entomology, or who are in any way interested in Natural History and who are resident within the Dominion of Canada.

4.—Life Members shall be persons who have made donations to the value of \$25 in money, books or specimens (the two latter to be valued by competent persons) or who may be elected as such at the General Meeting of the Society, for important services performed, and after due notice has been given.

5.—Entomologists residing outside Canada may be elected Corresponding Members of the Society, but such membership will not entitle them to the publications of the Society except on payment of the subscription to the Journal of the Society.

6.—Honorary Members shall be members of high standing and eminence for their attainments in Entomology.

7.—The number of Honorary Members shall be limited to twenty-five.

8.—The Officers of the Society shall consist of a President, a Vice-President, a Secretary-Treasurer, and not fewer than three, and not more than five, Directors, to form a Council; all of whom, with two Auditors, shall be elected annually at the Annual General Meeting of the Society, and shall be eligible for re-election. The said Council shall, at their meeting, appoint a Curator.

SECTION II.—(ELECTION OF MEMBERS).

1.—All candidates for Ordinary or Life Membership must be proposed by a member at a regular meeting of the Society and be balloted for; the affirmative vote of three-fourths of the members present shall be necessary for the election of a candidate.

2.—Honorary Members must be recommended by at least three members, who shall certify that the person named is eminent for his Entomological attainments; the election in their case shall be conducted in the same manner as laid down for other members.

3.—Corresponding Members shall be elected in the same manner as Honorary Members.

4.—Whenever any person is elected a member in any class, the Secretary shall immediately inform him of the same by letter, and no person shall be considered a member until he has signified his acquiescence in the election.

5.—Every person elected a member is required to pay his first contribution within one month of the date of his election; otherwise his election shall be null and void.

SECTION III.—(CONTRIBUTIONS).

1.—The annual contribution of members shall be one dollar; all contributions to be due in advance on the first day of January in each year, the payment of which shall entitle the member to a copy of all the publications of the Society during the year. All

new members, except those elected at and after the Annual General Meeting and before the following first of January, shall be required to pay the subscription for the year in which they are elected.

2.—Every member shall be considered to belong to the Society, and as such be liable to the payment of his annual contribution, until he has either forfeited his claim or has signified to the Secretary, in writing, his desire to withdraw, when his name shall be erased from the list of members.

3.—Whenever any member shall be one year in arrear in the payment of his annual contribution, the Secretary shall inform him of the fact in writing. Any member continuing two years in arrears shall be considered to have withdrawn from the Society, and his name shall be erased from the list of members.

4.—Life and Honorary Members shall be required to pay an annual contribution.

SECTION IV.—(OFFICERS).

1.—The duties of the President shall be to preside at all the meetings of the Society, to preserve good order and decorum and to regulate debates.

2.—The duties of the Vice-President shall be the same as those of the President during his absence.

3.—The duties of the Secretary-Treasurer shall be to take and preserve correct minutes of the proceedings of the Society, and to present and read all communications addressed to the Society; to notify members of their election, and those in arrear of the amount of their indebtedness; to keep a correct list of the members of the Society, with the dates of their election, resignation or death and their addresses; to maintain the correspondence of the Society, and to acknowledge all donations to it. He shall also take charge of the funds of the Society and keep an accurate account of all the receipts and disbursements, and of the indebtedness of the Members, and render an Annual Report of the same at the Annual General Meeting of the Society, in the manner required by the Act respecting the Board of Agriculture and Arts.

4.—It shall be the duty of the Curator to take charge of all books, specimens, cabinets, and other properties of the Society; to keep and arrange in their proper places all donations of specimens;

to keep a record of all contributions of books and specimens, with a list of the contributors; and to oversee and direct any exchange of specimens. He shall also report annually to the Society on the condition of the specimens and cabinets under his care.

5.—The Officers of the Society shall form a Council who shall have the direction and management of the affairs of the Society. The Council shall meet once in every quarter, the time and place of meeting to be appointed by the President, and notice to be given by the Secretary at least ten days beforehand.

6.—The Council shall draw up a Yearly Report on the state of the Society, in which shall be given an abstract of all the proceedings, and a duly audited account of the receipts and expenditure of the Society during their term of office; and such report shall be read at the Annual General Meeting.

SECTION V.—(MEETINGS).

1.—Ordinary Meetings shall be held once a month, on such days and at such hour as the Society by resolution may from time to time agree upon.

2.—The Annual General Meeting of the Society shall be held at the place and during the same time as the Exhibition of the Agricultural and Arts Association is being held in each year, to receive and deliberate upon the Report of the Council on the state of the Society, to elect Officers and Directors for the ensuing year and to transact any other business of which notice has been given.

3.—Special Meetings of the Society may be called by the President upon the written request of five members of the Society, provided that one week's notice of the meeting be given, and that its object be specified.

SECTION VI.—(BRANCHES OF THE SOCIETY).

1.—Branches of the Society may be formed in any place within the Dominion of Canada on a written application to the Society from at least six persons resident in the locality.

2.—Each Branch shall be required to pay to the Parent Society fifty cents per annum for each paying member on its list.

3.—Every Branch shall be governed by the constitution of the Society, but shall have power to elect its own officers and enact by-laws for itself, provided they be not contrary to the tenor and spirit of the Constitution of the whole Society.

4.—All Members of the Branches shall be Members of the Society and entitled to all the privileges of Members.

5.—No Corresponding or Honorary Member shall be appointed by the Branches, but such members may be proposed at General Meetings of the Society by any Branch as well as by the individual members.

6.—Each Branch shall transmit to the Parent Society, on or before the first of September each year, an Annual Report of its proceedings, such report to be read at the Annual General Meeting.

SECTION VII.—(ALTERATION OF CONSTITUTION).

1.—No article in any section of this Constitution shall be altered or added to, unless notice be first given at an Ordinary Meeting of the Society, or of a Branch, and the alteration or addition be sanctioned by two-thirds of the members present at the next ensuing meeting; the Secretary of the Society, or of the Branch, shall then notify the Secretaries of all the other Branches; when the sanction of all the Branches has been obtained in the same manner, the alteration or addition shall become law.

SECTION VIII.—(SUBSCRIPTION PRICE OF MAGAZINE).

The Annual Subscription Price of the CANADIAN ENTOMOLOGIST shall be two dollars (\$2.00), postage included, payable in advance. Members of the Society who have paid their annual dues shall receive the Magazine free of charge, as stated in Section III, Clause I, of the Constitution of the Society.

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