

The Canadian Entomologist.

VOL. XXXVII. LONDON, OCTOBER, 1905.

No. 10

NOTES ON THE EARLIER STAGES OF SOME CANADIAN TIGER MOTHS OF THE GENUS *APANTESIS*.

BY ARTHUR GIBSON, CENTRAL EXPERIMENTAL FARM, OTTAWA.

Since the appearance of a paper in the May and June, 1903, numbers of the CANADIAN ENTOMOLOGIST, the writer has received for study either eggs or larvæ of several species of *Apantesis*, information as to the earlier stages of each of which was limited. The past three seasons in Canada have not been remarkable as to the abundance of material to collect, and Arctians, like many other kinds of moths, have been very scarce. Consequently not as many species have been received for study as had been hoped.

VIRGO.—331 eggs of this species were kindly forwarded in 1903 by Miss Caroline G. Soule. They were laid at Brandon, Vt., on July 23, 24 and 25, and hatched on August 5, 6, 7 and 8. The eggs of *virgo* are the same in appearance as those of other moths of the genus, but are larger, measuring in width at the base 0.8 mm., and in height 0.8 mm.; in shape semi-ovate. As notes were taken on the larval stages, these are presented herewith.

Stage I.—Length when hatched 2.5 mm. Colour at first sordid white, after feeding pale greenish. Head 0.4 mm. wide, dark brown, excepting clypeus, mouth-parts and space above ocelli, all of which are pale. Thoracic shield blackish. Tubercles shiny, blackish, i about one-fifth the size of ii, which is the largest; iii nearly same size as ii, others smaller than iii; ii, iii and iv encircled with blotches of pale orange. Bristles faintly barbed, black from i, ii and iii, silvery from other tubercles. Ventral surface pale. All the feet dull blackish; thoracic feet rather translucent.

Stage II.—Length just after moulting 4 mm. Head 0.6 mm. wide, blackish. Body after feeding dark sea green. A pale bluish dorsal stripe is present in this stage. Tubercles black, conspicuous, shiny, each bearing a bunch of bristles of varying lengths; dorsal bristles black, subventral ones silvery. The tubercles are surrounded or encircled with blotches, as

in previous stage, but the colour is now a distinct reddish brown. Spiracles black, close in front of tubercle iv. Thoracic feet black; prolegs slightly darker than ventral skin.

Stage III.—Length 7 mm. Head 0.8 to 0.9 mm. wide, black, shiny; slightly bilobed. Body dark, almost smoky, with a tinge of green, becoming paler ventrally. Dorsal stripe dull orange, rather indistinct. Along the sides, above tubercles iii and iv, are two series of dull orange dashes, one above each tubercle, not very distinct. Bristles as in last stage. Spiracles small, black. Thoracic feet blackish, prolegs concolorous with venter, darker exteriorly.

Stage IV.—Length 10 mm. Head 1.1 to 1.2 mm. wide, jet black. Skin of body velvety black, duller ventrally. Tubercles black, each bearing a bunch of finely barbed bristles, those from i, ii, iii and upper part of iv being black, lower bristles pale rusty. No markings on the body. Spiracles black.

Stage V.—Length 17 mm. Head 1.6 to 1.8 mm. wide, black as before, epistoma pale. The larvæ in this stage did not show any difference from Stage IV. The velvety black of the body is the same as in the mature larvæ.

On Sept. 26 six specimens moulted for the fifth time. At this date, and for some days previous, the larvæ, which were in a healthy condition, showed signs of hibernation, and practically ceased feeding.

Stage VI.—Length 30 mm. Head 2.4 to 2.6 mm. wide. In this stage the bristles from tubercles i, ii and iii in most of the specimens are all black, but in some there are rust-red bristles on the dorsum of segments 2, 3 and 4, particularly on segment 2. One specimen had all rusty bristles from all the tubercles, on segments 2 to 7 inclusive. Tubercles shiny, black. Spiracles orange. In one specimen these were all black. No markings of any kind on the body.

Unfortunately, not many of the larvæ came through hibernation successfully, although we tried several different methods of hibernating them. Those which did come through alive soon died.

Mature Stage.—In the May, 1903, number of the CANADIAN ENTOMOLOGIST notes are given on the mature larvæ. After this paper was written Mr. C. H. Young gave me three mature larvæ collected in May, near Ottawa, all of which showed traces of a dorsal stripe, and had tubercles i, ii and iii black; iv, v, vi, vii and viii all reddish excepting in one of the specimens, which had vii and viii almost black. One of these larvæ pupated on May 27, the moth emerging on June 24.

PARTHENICE.—A female moth was found on a blade of grass, at Meach Lake, near Ottawa, by Mr. C. H. Young, on Aug. 27, 1903. About 375 eggs were laid on the 29th and 30th. These were handed to the writer, along with the female moth.

The eggs were laid loosely like those of other species of the genus. Width at base 0.75 mm.; height same as width. The young larvæ hatched on Sept 12, 13 and 14, and were fed on plantain and dandelion.

Stage I.—Length 3 mm.; after feeding pale greenish. Head 0.35 mm. wide, black on cheeks, clypeus pale brown. Thoracic shield almost concolorous with tubercles. On each segment of body is the usual row of transverse tubercles. These are black, i very small, ii the largest, iii nearly as large as ii, but more elongate; all surrounded with reddish brown, the red particularly apparent at the close of the stage. Bristles finely barbed, those from the dorsal tubercles black; others silvery. Spiracles very small, black, close in front of tubercle iv. Thoracic feet pale, translucent; prolegs darker.

Many of the larvæ passed the 1st moult on Sept. 16.

Stage II.—Length 3.5 mm. Head 0.6 mm. wide, blackish, clypeus pale. In general the larvæ are pale brown, the food showing through giving the body a greenish tinge. In this stage there is a pale dorsal stripe. The skin between tubercles ii and iii is also pale, giving the appearance of a lateral band. The venter is paler than the dorsum. Towards the end of the stage the skin changes to a dull reddish brown. Bristles from dorsal tubercles black, from lateral and ventral tubercles silvery. Feet almost concolorous with venter.

On Sept. 23 a number of the specimens passed the 2nd moult.

Stage III.—Length 5 mm. Head 0.8 mm. wide, blackish, shiny; mouth-parts reddish. Body dark brown; skin immediately between tubercles ii and iii, iii and iv slightly reddish, below tubercle iv paler. Dorsal stripe flesh-coloured. Tubercles black, i very small; base of ii shining. Bristles faintly barbed, from dorsal and upper lateral tubercles all black, lower bristles silvery. Long bristles from dorsum of segments 12 and 13. Spiracles small, black, round. Thoracic feet black, shiny; prolegs dark exteriorly.

Some of the larvæ moulted again on October 5, and others soon afterwards.

Stage IV.—Length 8 mm. Head 1.0 mm. wide. The larvæ in general are blackish, with tufts of short black bristles. Under a lens the

skin appears as dark brown. The tubercles are black and shiny, ii with a polished base as in last stage. The dorsal stripe is now inconspicuous, in fact it is only the dark brown skin of the body showing against the black tubercles which gives the appearance of a stripe. Spiracles and feet same as in Stage III.

Soon after Oct. 5 the larvæ were placed out of doors for the winter. They were put in large glass jars which contained dried leaves, among which the larvæ crawled. A cheese-cloth covering was tied to the top of the jar, and this was laid on one side, in the driest place, among a clump of cedars.

On April 27, 1904, the jar was brought into the office, and it was found that 15 larvæ were alive. At this date the snow had all disappeared in open places, and none was left where the larvæ had hibernated. After being brought into the office they were very quiet, and would not eat anything until the 29th, when some fresh food was sprinkled with water, and by the morning of the 30th the larvæ were in splendid condition, and quite a lot of frass was in the jar. Length after coming out of hibernation 9 mm.

On May 3 one larva moulted, and by the 6th nine had moulted.

Stage V.—Length 12.5 mm. Head 1.3 mm. wide, black, shiny, slightly bilobed; epistoma, median suture and margins of clypeus pale. Dark hairy larvæ, darker on dorsum. Tubercles all black, shiny, small, ii large, with a polished base. Dorsal stripe inconspicuous as in last stage. Skin just between the lateral tubercles has a pinkish tinge. Bristles black, finely barbed. Spiracles black. Thoracic feet black, shiny; prolegs, upper half black, lower half reddish, almost salmon colour.

On May 10th ten specimens moulted.

Stage VI.—Length 16 mm. Head 1.6 to 1.8 mm. wide; same as in Stage V. Skin of body now blacker. In this stage three specimens had a flesh-coloured dorsal stripe, distinct on all segments; the others, with the exception of two, which had no markings, had the dorsal stripe also, but only on the thoracic segments. Tubercles all black and shining as before; iv and lower tubercles bear mostly rusty bristles. All the other bristles on the body are black. Spiracles black. Thoracic feet mostly brown, blacker towards base, shiny; prolegs, upper half black, lower half reddish. Later in the stage the skin of body below the spiracles changes to brownish, with a purplish tinge.

Two larvæ moulted on May 17th, four the day following, and a few others later.

Stage VII.—Length 21 mm. Head 2.0 to 2.2 mm. wide. Body in general velvety black, with bunches of stiff barbed bristles. Tubercles i and ii wholly black and shiny; iii black at base, but reddish at summit; all black bristles from iii. Tubercle iv nearly all reddish, only a ring of black at base. In the majority of specimens nearly all the bristles from iv were rusty, but in one or two these were almost all black. Bristles from tubercles below iv all rusty. Tubercles v, vi and vii nearly all reddish, viii mostly black. Spiracles black. The only trace of the dorsal stripe now is on the thoracic segments, where it is very faint. Towards the close of the stage the larvæ lose their black velvety appearance, becoming paler, particularly laterally and ventrally. All the feet wholly reddish. Length of this stage at close 30 mm.

One larva moulted for the 7th time on May 24th, two on the 26th, others soon afterwards.

Stage VIII.—Length 30.5 mm. Head 3 mm. wide, shiny, jet black, except median suture, lateral margins of clypeus and space on cheeks above ocelli, which are pale brownish. Skin of body on dorsum black, shading to dark gray ventrally, overlaid particularly on dorsum with streaks and blotches of velvety black. As the specimens varied somewhat, each was examined separately. Tubercles on dorsum of thoracic segments of the first specimen described were pale yellow, with black base, those on same segments on sides reddish. Tubercle i on abdominal segments black, about one-sixth the size of ii, which is also black, with a polished base. Both i and ii shining black, not dull. Bristles from i and ii black, finely barbed. Some of the bristles from tubercles on dorsum of thoracic segments are dull yellowish. The large pair of tubercles on dorsum of segment 13 mostly amber-coloured. Tubercle iii on all segments distinctly yellowish, with black base; iv, v, vi, vii and viii plainly reddish; bristles from iii all black; from iv and lower tubercles rusty, others black; from v and vi and ventral tubercles bright rust-red. Spiracles orange, with black rim, close in front of tubercle iv. Dorsal stripe in this specimen only present on thoracic segments. Thoracic feet reddish, darkened at tips; prolegs distinctly reddish, about the same colour as tubercles v and vi.

A second specimen examined had tubercle ii on all the segments with a touch of yellow at the summit, and in this specimen the dorsal

stripe was traceable but faint along the whole of dorsum, and tubercle iv had nearly all the bristles rust-red. In this larva the spiracles on the three posterior segments were black.

A third specimen was the same as the description above.

A fourth specimen had tubercle i on first three abdominal segments tipped with pale yellow, and nearly all the bristles on the dorsum of the thoracic segments were dark dull, rusty red; tubercle ii on anterior abdominal segments was touched with yellow as in the second specimen above noted, and tubercle iv had bristles all rust-red.

A fifth specimen showed no differences from any of the above.

A sixth specimen had a faint dorsal stripe on all segments, but otherwise had no characters other than those noted above.

In all the specimens tubercle iii was yellowish, and iv, v, vi, vii and viii reddish. In some tubercles i and ii are wholly black, in others these are tipped with yellow. In all the larvæ the thoracic feet and prolegs were reddish. The dorsal stripe was faintly present on all the segments in some specimens, while in others it was only noticeable on the thoracic segments.

Towards the end of May, 1903, Mr. C. H. Young also gave the writer three mature larvæ of *parthenice*, which were found by him at Meach Lake, a short distance from Ottawa. Notes on these were taken on May 28, on which date they were 42 mm. in length.

Specimen No. 1 had a flesh-coloured dorsal stripe indistinct in the incisures. Tubercles yellowish, those below the spiracles with a reddish tinge. All the feet distinctly reddish, about the same colour as the rust-red bristles from lower lateral tubercles. Began to spin cocoon June 6, emerged ♀ moth July 6.

Specimen No. 2 same as No. 1, only tubercles i and ii black, summits of others yellow, bases black, excepting ventral tubercles, which are wholly blackish. Feet all reddish.

Specimen No. 3: Tubercles i and ii wholly black, summit of iii yellowish, iv and v nearly all yellowish, ventral tubercles yellowish-red. All the feet reddish. Moth emerged July 16.

Another larva found April 20, 1904, by Mr. W. Metcalfe, and handed to me, moulted on May 1, on May 23, and again on June 2. On June 24 this specimen measured 41 mm. in length, but then suddenly died. It had a faint dorsal stripe, tubercles i and ii black, iii pale yellow, others reddish-yellow. All the feet reddish. I have little doubt that this larva was also that of *parthenice*.

From my observations I would say that the mature larva of *parthenice* differs from the mature larva of *virgo* in the size of body, size of tubercle i, colour of tubercles, particularly on the dorsum, and in having the thoracic feet red. The bristles from the tubercles are not so stiff in *parthenice* as they are in *virgo*.

Pupa.—Length 22-24 mm., width 8.5 mm.; dull black, conspicuously pruinose; yellowish or reddish in folds of abdomen. Thorax and abdomen bear short, black, stiff bristles. Spiracles black. Cremaster shiny, blackish; bristles capitate, reddish brown.

RECTILINEA.—In my previous notes, included in the above paper, I spoke of this Arctian as being "very rare in Canada." During 1903, however, the species was rather abundant at Aweme, Man., and a nice series of the moths was collected by Mr. Norman Criddle. While Dr. Fletcher was in the West, in 1903, he stopped off at Aweme, and among other interesting things collected some Arctian larvæ. These were received at Ottawa on June 25. Unfortunately, only one of these larvæ reached the pupal state; the moth emerged on July 25 and proved to be *rectilinea*. The length of the pupal state was 19 days. This larva was a handsome caterpillar, very rapid in its movements. In length it was 33 mm., the head black, epistoma yellowish; median suture and margins of clypeus pale, the latter dark reddish brown at vertex. Skin of body in general gray, mottled with velvety black. Dorsal tubercles of a yellow amber colour, those below the spiracles of a reddish tinge. Bristles from tubercles distinctly but finely barbed, those from tubercles above spiracles mostly black, with a few silvery ones intermingled; from lower tubercles all silvery, tipped with rust-red. Dorsal stripe distinct, not broken, of a bright pale yellow colour, tinged with red on the summit of each segment. Feet reddish; thoracic feet tipped with black.

This description agrees for the most part with the description of Stage VII in my notes already published* on the larvæ of this species.

Pupa.—Length 20 mm., width 6 mm., almost black, with a reddish tinge, paler in folds of abdomen; only slightly pruinose; abdomen and thorax bearing sparsely, short, inconspicuous bristles. Spiracles concolorous with segments. Cremaster reddish, shiny, bristles capitate, of varying lengths.

At Aweme the dates on which Mr. Criddle has taken the moths are July 26, 27, August 6, 15, 17 and 25. Mr. L. E. Marmont, at Roun-

*CAN. ENT., May, 1903.

thwaite, Man., took a specimen on August 5, and Mr. E. F. Heath tells us that he has taken the species at Cartwright, Man., in company with *parthenice*. Mr. Criddle has reared the larvæ on the Northern Bedstraw, *Galium boreale*, L., and on the Veiny Pea, *Lathyrus venosus*, Muhl.

ORNATA.—Mr. J. W. Cockle, the enthusiastic entomologist, of Kaslo, B. C., has been good enough to send me the following note, which I have pleasure in including here :

"Kaslo, B. C. Larva found on ground June 3, 1904. Length extended $1\frac{1}{2}$ inches. Face black. Skin of dorsum velvety black. Faint dorsal stripe, formed of irregular dashes, colour reddish-ochre. Tubercles shiny, black, most pronounced towards anus. Bristles slightly barbed and black, except a few on lower side of stigmatal tubercles, which are reddish-brown; substigmatal bristles of the same colour. A few bristles on segments 12 and 13 very long and fine, slightly roughened but not barbed. Anus brown. Thoracic feet shiny black; prolegs reddish brown. As I have so far only found one *Apantesis* here, viz., *ornata*, and its varieties, and two years ago secured one larva like the above, which duly emerged *achaia*, I have no doubt of the identity of this larva."

In 1902 Mr. Cockle sent eggs of *ornata*, but the larvæ from these all died after reaching Stage VI. The difference between these and Mr. Cockle's larva, above described, is that the latter had a broken dorsal stripe, while those reared in 1902 had no markings whatever on the body.

On May 12, 1905, a single mature larva was received from Mr. Cockle. This was 46 mm. long; width of head 3 mm. Body velvety black, shading to a slaty gray, with a purplish tinge. Tubercles all black, shiny, i about one-third the size of ii, which had a polished base. Bristles from dorsal and lateral tubercles all black, from tubercle v and lower tubercles all bright rusty. Spiracles wholly black. Faint traces of a dorsal stripe. Thoracic feet black.

On May 16 it spun a few threads of silk, but unfortunately died on the 18th.

NEVADENSIS var. INCORRUPTA.—Among some Lepidoptera sent to the Division for examination, by Mr. L. E. Marmont, of Rounthwaite, Man., were two specimens of *incorrupta* (♂ and ♀), which had been reared from larvæ found in June on *Castilleia sessiliflora*, Pursh, and described by Mr. Marmont as "yellowish brown larvæ, with a mixture of yellow, gray and black hairs; cream-coloured dorsal stripe, broken on each segment; large yellow warts across each segment. Spun up middle of

July (seven specimens), first moth emerged Aug. 6, and proved to be *A. nevadensis*, var. *incorrupta*; got 3 ♀ and 3 ♂, but could not get them to mate."

During the summer of 1904, Mr. Marmont found further specimens of the larvæ feeding on the same plant, some of which he was kind enough to send for study. Unfortunately, this food plant does not occur at Ottawa, and although the larvæ were offered several other low plants, they refused them, and soon died.

In June last, however, Mr. Marmont sent some more specimens, which arrived in perfect condition. These were found feeding on the same plant, *Castilleia sessiliflora*, but this year, although Mr. Marmont continued for a while to send us a supply of the food-plant, we had no trouble in getting them to eat dandelion and plantain.

The following description was made of the mature larvæ :

Length 38 mm. Head 3 mm. wide, shiny, wholly black, excepting median suture, lateral margins of clypeus, which are pale, and a few streaks of white above the ocelli. Skin of body gray, streaked and blotched with black, or purplish-black, which gives the whole larva a purplish tinge; skin paler ventrally. Dorsal stripe broken up on abdominal segments into spots, three on each segment, the central one of which is yellow and roundish, and immediately behind tubercle i; the other two spots are white. On the thoracic segments the dorsal stripe is almost complete. Tubercles on all the specimens very conspicuous, and decidedly yellow, almost ochre yellow; i nearly one-half the size of ii; iii not so large as ii, but larger than iv, v and vi. Bristles faintly barbed, and mostly whitish; some yellowish and black bristles from the dorsal tubercles. Spiracles black. Thoracic feet black, prolegs yellowish.

The cocoon of *incorrupta* is very slight, as in other species of the genus. One larva, which changed to pupa on July 3, produced the moth on July 20; another which pupated on July 7, emerged as moth on July 21.

Pupa.—Length 20 mm., width 6.5 mm., reddish-brown, paler in folds of abdominal segments; very slightly pruinose. Thorax and abdomen sparsely hairy. Spiracles black, with pale centre. Cremaster darker than abdomen, shiny, bearing capitate bristles of varying lengths.

Mr. N. Criddle tells me that he has found the larvæ of *incorrupta* at Aweme, Man., feeding on Lamb's-quarters.

SUPERBA.—On May 26, 1903, six mature larvæ of this species were received from Mr. E. P. Venables, of Vernon, B. C. The larva is a particularly striking one, and will doubtless prove to be one of the handsomest of the genus. The following notes were taken on the six specimens :

Length at rest 35 mm., extended 40 mm. Head 3 mm. wide, black, slightly bilobed, subquadrate; space above ocelli brownish, with dark mottlings; bases of antennæ pinkish; hairs on face black, of varying lengths. Body in general appearance blackish gray. Under a lens, however, the skin is seen to be streaked and blotched with white, particularly laterally. Ventral surface of body paler, of a greenish-brown colour. The white blotches are particularly intense between tubercles ii and iii. The six larvæ vary as to the intensity and numbers of the white blotches. In two specimens the whole body is streaked and blotched with white; and the black skin appears as markings of that colour on a white body. Dorsal stripe very distinct in all specimens; in one almost pure white, in the others pale yellow. In one of the specimens the dorsal stripe is broken up into spots, three on each segment. Tubercles in all the larvæ black and shiny, i about one-fifth the size of ii, which has a polished base, and is the largest; iii, iv, v and vi much the same size. Spiracles black, with a pale, indistinct orange centre, close in front of tubercle iv. Bristles faintly barbed, those from tubercles i, ii and iii being black and yellowish intermingled, those from iv and lower tubercles being either yellowish or rust-red. Thoracic feet black, prolegs reddish.

One specimen spun a little silk on May 28, but did not change to pupa until July 10. The cocoon is very simple, merely a slight covering, through which the pupa was quite conspicuous. Another specimen, which began to spin about a week later than the above, changed to pupa about July 29. The first moth (♂) emerged on August 17, and the one which pupated on July 29, on Sept. 1. In all, four moths were reared, the dates of the emergence of the other two being Sept. 4 and 10. Two larvæ were inflated.

Pupa.—Length 22 mm., width 7 mm., reddish-brown; two specimens dark reddish-brown, two pale reddish-brown, all paler in folds of abdomen. Thorax and abdomen sparsely hairy. Cremaster mahogany brown; bristles capitate, reddish-brown, of varying lengths. Whole pupa slightly pruinose.

One of the moths was kindly compared by Mr. Wm. Beutenmuller with the type of *superba* in the American Museum of Natural History, New York.

As it will be seen from the above description of the larvæ, these were much different from those of *incorrupta* received from Mr. Marmont.

VITTATA.—Another mature larva of this species came into the writer's hands the past season. This was found at Ottawa by Mr. J. W. Baldwin, under a piece of stone, on April 20. This larva answered in every way to the description which appeared in June, 1903, in the above-mentioned article, and no additional characters were observed.

On April 27 it spun a few threads of silk, and by the 29th had woven a slender cocoon. By the morning of May 1 it had changed to pupa. The moth, a ♂, emerged May 26. This larva had doubtless hibernated in the mature stage.

A NEW SUBAPTEROUS TIPULID FROM NEW MEXICO.

BY D. W. COQUILLET, WASHINGTON, D.C.

Over a year ago the writer received from Prof. T. D. A. Cockerell, for naming, a pair of Tipulids with aborted wings, taken on the summit of the Las Vegas Mts., in New Mexico. I suspected that they belonged to some normally long-winged form, but repeated comparisons have failed to convince me that they belong to any of those represented in the National Museum. They closely resemble *Limnophila costata*, Coq., which also inhabits high altitudes in the same region, but the joints of the antennæ are much shorter and broader, besides other differences. The 16-jointed antennæ, absence of a frontal gibbosity, the comparatively short terminal joint of the palpi, glabrous eyes and spurred tibiæ seem to ally this form more to the genus *Limnophila* than to any other genus known to me. As Prof. Cockerell wishes to refer to it in a forthcoming paper, the new form may be characterized as follows:

Limnophila? aspidoptera, n. sp.—Black, the bases of the antennæ, mouth-parts, sutures of thorax, lateral margins of abdomen, stems of halteres, bases of the femora, tibiæ and tarsi, ovipositor of female and inner portion of male hypopygium, yellow. Head and body gray pruinose, unmarked. Antennæ reaching to base of wings, rather robust, the second joint less than twice as long as wide, the fourth slightly wider than long, the following joints becoming successively longer than wide. Wings aborted, slightly shorter than the halteres, yellow on the basal half, the remainder chiefly brown. Halteres considerably elongated. Male claspers consist of a fleshy basal piece, to the inner side of which is attached a three-pronged, chitinous process. Ovipositor of female of nearly a uniform width, curved toward the apex, the latter bluntly rounded.

Length 11 mm. A specimen of each sex collected June 28. Type No. 9033, U. S. National Museum.

October, 1905.

CENTRAL TEXAS COLEOPTERA.

BY W. KNAUS, MC PHERSON, KANSAS.

The last week in May, 1904, the writer spent on a collecting trip for Coleoptera in Central Texas. The places collected at were Ft. Worth, or more properly speaking, Station 6, five miles east of the city, on the electric line to Dallas, May 23; Granbury, on the Brazos River, May 24; Brownwood, on Pecan Bayou, May 25-26; Winchell, on the Colorado River, May 26-27; Brady, on Brady Creek, May 27; and Camp San Saba, on San Saba River, two hundred miles south-west of Ft. Worth, on May 27-28. This part of Texas was suffering for want of rain at the time of my visit, but results were fairly satisfactory, as one hundred and forty seven species were taken, as the list following shows.

Identifications of the species not readily recognized were made by Mr. H. C. Fall, of Pasadena, Calif.; Mr. H. F. Wickham, of Iowa City, Iowa, and Mr. C. Schaeffer, of Brooklyn, N. Y.

The bred specimens referred to in the list were from Mesquite wood, procured at Brownwood. No specimens emerged until the latter part of August.

- 14a *Cicindela Belfragei*, Salle; one specimen at Brownwood and one at Winchell.
- 38 *Cicindela rectilatera*, Chd., Granbury and Winchell, on moist mud near water.
- 40 *Cicindela punctulata*, Fab.; Station 6.
- 218 *Pasimachus punctulatus*, Hald.; a few specimens at Granbury.
- 219 *Pasimachus Californicus*, Chd.; several specimens at Brownwood.
- 265 *Clivina pallida*, Say; at Granbury, two specimens.
- 283 *Schizogenius lineolatus*, Say; not common at Brady.
- Schizogenius*, species between *depressus*, Lec., and *amphibius*, Hald.; several specimens at Brady.
- 292 *Ardistomis viridis*, Say; Brownwood, common.
- 388 *Bembidium intermedium*, Kirby; common at Brownwood.
- 391 *Bembidium versicolor*, Lec.; Brady and Brownwood, not common.
- 421 *Bembidium laevigatum*, Say, Granbury; several specimens.
- 463 *Tachys nebulosus*, Chd., Camp San Saba and Brady; several specimens near water's edge.
- 742 *Calathus gregarius*, Say; Station 6.
- 772 *Platynus extensicollis*, Say; Camp San Saba, common.
- 849 *Galerita atripes*, Lec.; Brady and Camp San Saba, a few specimens.

October, 1905.

- 876 *Tetragonoderus fasciatus*, Hald.; Camp San Saba, two specimens under stones at water's edge.
- 939 *Cymindis laticollis*, Say; Station 6, four specimens.
- 961 *Helluomorpha ferruginea*, Lec.; Winchell, six specimens under decaying wood.
- 1000 *Chlœnius laticollis*, Say; Camp San Saba.
- 1007 *Chlœnius prasinus*, Dej.; Granbury, a few specimens.
- 1008 *Chlœnius leucoscelis*, Chev.; Camp San Saba, common.
- 1012 *Chlœnius vafer*, Lec.; Camp San Saba, two specimens.
- 1014 *Chlœnius Nebraskensis*, Lec.; Camp San Saba, a few specimens.
- 1021 *Chlœnius Pennsylvanicus*, Say; Station 6, one specimen.
- 1045 *Oodes cupræus*, Chd.; Brownwood, on moist mud, near the water's edge.
- 1062 *Agonoderus partarius*, Say; Brady, two specimens.
- 1067 *Discoderus parallelus*, Hald.; Brady, common.
- 1083 *Harpalus caliginosus*, Fab.; Station 6, common.
- 1087 *Harpalus Pennsylvanicus*, DeG.; Camp San Saba, common.
- 1125 *Selenophorus pedicularius*, Dej.; Brady, three specimens.
- 1327 *Hydroporus dimidiatus*, G. & H.; Brady, common.
- 1502 *Cybister fimbriolatus*, Say; Brady, three specimens.
- 1576 *Ochthebius fasciatus*, Lec.; Brady, one specimen.
- 1592 *Tropisternus Californicus*, Lec.; Brady, three specimens.
Berosus, species; Brady, two specimens.
- 1617 *Chætarthria atra*, Lec.; Brady, one specimen.
- 1626 *Philhydrus nebulosus*, Say; Brady, several specimens.
- 1639 *Helochares maculicollis*, Muls.; Brady, one specimen.
- 9318 *Cymbiodyta morata*, Lec.; Brady, two specimens.
- 1672 *Cercyon melanocephalum*, Linn.; Camp San Saba, several specimens.
- 1698 *Necrophorus marginatus*, Fab.; Station 6.
- 1708 *Silpha inæqualis*, Fab.; Station 6.
- 2167 *Philonthus hepaticus*, Er.; Brownwood, common.
- 2170 *Philonthus flavolimbatus*, Er.; Brownwood, two specimens.
- 2182 *Philonthus alumnus*, Er.; Brownwood, two specimens.
- 2231 *Philonthus viridanus*, Horn; Brownwood, two specimens.
- 2251 *Actobius pæderoides*, Lec.; Brownwood and Brady, common.
- 2255 *Actobius terminalis*, Lec.; Brownwood, one specimen.
- 2278 *Xantholinus pusillus*, Sachse; Brownwood, two specimens.
Trogophlœus, three species; Brownwood and Brady.

- 2305 *Stenus renifer*, Lec.; Brownwood, Brady and Camp San Saba, common.
- 2376 *Stenus colonus*, Er.; Camp San Saba, three specimens.
Stenus species near *callosus*, Er.; Camp San Saba, two specimens.
- 2508 *Cryptobium sellatum*, Lec.; Camp San Saba, two specimens.
- 2782 *Apocellus sphaericollis*, Say; Brady, one specimen. All the above Staphylinids were taken on moist mud near pools.
- 3084 *Exochomus obsoleta*, Cas.; Camp San Saba, one specimen.
Exochomus contristatus, Muls.; Station 6.
Exochomus latiusculus, Cas.; Camp San Saba, one specimen.
- 3095 *Brachyacantha ursina*, Fab.; Station 6.
- 3149 *Scymnus caudalis*, Lec.; Camp San Saba, one specimen.
- 3206 *Languria laeta*, Lec.; Brownwood, common.
- 3219 *Ischyrys 4-punctatus*, Oliv.; Granbury, common on fungus.
- 3229 *Tritoma atriventris*, Lec.; Brownwood.
- 3344 *Lathropus vernalis*, Lec.; Brownwood, several specimens bred from Mesquite.
- 3418 *Dermestes marmoratus*, Say; Winchell, one specimen.
- 3490 *Hister abbreviatus*, Fab.; Winchell, two specimens.
- 3494 *Hister depurator*, Say; Brady, two specimens.
- 3515 *Hister subrotundus*, Say; Winchell, one specimen.
- 3610 *Saprinus fimbriatus*, Lec.; Granbury and Brady, several specimens.
- 9977 *Teretrius levatus*, Horn; twelve specimens, Brownwood, in larval burrows in mesquite.
- 3673 *Carpophilus pallipennis*, Say; Station 6 and Winchell, common in *Opuntia* flowers.
- 3673 *Var. floralis*, Er.; Winchell, common.
- 3689 *Colastus truncatus*, Rand.; Winchell, one specimen.
- 3917 *Lutrochus luteus*, Lec.; Camp San Saba, common, on stones in river.
- 3924 *Helichus suturalis*, Lec.; Camp San Saba, common, on underside of stones in river.
Elmis, two new species; Camp San Saba, under stones in river, one specimen; common.
- 3951 *Stenelmis vittipennis*, Zim.; Camp San Saba, common, under stones in river.
Stenelmis, two new species; Camp San Saba, under stones in water.
- 3970 *Heterocerus undatus*, Melsh.; Brady, one specimen.

- 4092 *Alaus lusciosus*, Hope; Brownwood, one specimen.
4251 *Drasterius asper*, Lec.; Winchell, one specimen.
4573 *Chalcophora campestris*, Say; Brownwood, one specimen, very large.
4699 *Acmæodera pulchella*, Hbst.; Winchell, on *Opuntia* flowers
Acmæodera neglecta, Fall; Winchell, common, on *Opuntia* flowers.
4872 *Chauliognathus scutellaris*, Lec.; Winchell, common.
5004 *Collops 4-maculatus*, Fab.; Winchell.
5038 *Anthocomus Erichsonii*, Lec.; Winchell, common, on *Opuntia* flowers.
5109 *Listrus senilis*, Lec.; Winchell, several specimens.
5111 *Dasytellus nigricorne*, Bland.; six specimens at Winchell.
5127 *Elasmocerus terminatus*, Say; Brownwood, bred from Mesquite;
larvæ in white part of wood.
5342 *Sinoxylon Texanum*, Horn; Brownwood, bred from Mesquite; perfect insects, tunneling vertically into wood.
5377 *Trogoxylon Californicum*, Cr.; Brownwood, bred from Mesquite;
larvæ in white part of wood, emerged from August to December, very common.
5435 *Canthon lævis*, Drury; Brownwood, Camp San Saba and Winchell.
5442 *Choeridium Lecontei*, Har.; Brady, two specimens.
5451 *Phanæus difformis*, Lec.; Granbury, one male and one female.
5453 *Phanæus triangularis*, Say; Camp San Saba, one female.
5458 *Onthophagus hecate*, Panz.; Winchell, common.
5463 *Onthophagus Pennsylvanicus*, Har.; Winchell, common.
10208 *Aphodius tenuistriatus*, Horn.; Station 6.
5738 *Lachnosterna cribrosa*, Lec.; Brownwood and Winchell.
Lachnosterna, new species, Station 6, one male, two females, under stones, near scrub oaks; species near *corossa*, Lec.
5842 *Strigoderma arboricola*, Fab.; Brownwood, common.
5869 *Ligyris gibbosus*, De G.; Brownwood and Winchell, common.
5892 *Phileurus cribrosus*, Lec.; Brownwood, one specimen in Mesquite stump.
5901 *Euphoria Kernii*, Hald.; Winchell, several specimens and a black var.
5938 *Trichius Texanus*, Horn; Winchell, two specimens.
6141 *Batyle suturalis*, Say; Winchell and Brady.

- 6169 *Cyllene crnicornis*, Chev.; Brownwood, several specimens bred from Mesquite, emerged from wood, Sept., Oct. Apparently the most common species boring in Mesquite.
- 6492 *Mecas pergrata*, Say; Winchell, one specimen.
- 6580 *Anomoea mutabilis*, Lec.; Winchell, one specimen.
Pachybrachys, species, Camp San Saba, several specimens.
- 6707 *Diachus auratus*, Fab.; Camp San Saba, two specimens.
- 6775 *Colaspis prætexta*, Say; Brownwood.
- 6971 *Graptodera foliacea*, Lec.; Camp San Saba, common.
- 7020 *Aphthona Texana*, Cr.; Station 6, one specimen.
- 7080 *Odontota rubra*, Web.; Station 6, two specimens.
- 7320 *Eleodes tricostata*, Say; Brownwood.
- 7391a *Nyctobates barbata*, Knoch.; Station 6, one specimen.
- 7433 *Blapstinus dilatatus*, Lec.; Station 6.
- 7438 *Blapstinus pratensis*, Lec.; Brady, two specimens.
- 7510 *Platydemia excavatum*, Say; Granbury, common on fungus.
- 7550 *Helops impolitus*, Lec.; Winchell, one specimen.
- 7573 *Helops farctus*, Lec.; Winchell, one specimen.
- 7679 *Eustrophus bicolor*, Say; Granbury, common on fungus.
- 7739 *Oxaxis cana*, Lec.; Camp San Saba, four specimens.
- 7780 *Mordella scutellaris*, Fab; Brownwood.
- 7847 *Mordellistena marginalis*, Say; Camp San Saba, Winchell, several specimens.
- 7915 *Macratria murina*, Fab.; Camp San Saba, one specimen.
- 7922 *Notoxus calcaratus*, Horn.; Camp San Saba, one specimen.
Nemognatha, new species, Winchell, not uncommon.
- 8045 *Gnathium Texanum*, Horn.; Camp San Saba, one specimen.
- 8068 *Macrobasis immaculata*, Say; Winchell, two specimens.
- 8079 *Epicauta trichrus*, Pall.; Winchell, two specimens.
- 8083 *Epicauta sericans*, Lec.; Winchell, several specimens.
- 8140 *Cantharis fulvipennis*, Lec.; Brownwood and Camp San Saba.
- 8491 *Lixus silvius*, Boh.; Camp San Saba, three specimens.
Smicronyx species, Camp San Saba.
- 8681 *Macrorhoptus estriatus*, Lec.; Camp San Saba, one specimen.
- 8760 *Acalles porosus*, Lec.; Winchell.
- 11055 *Tychius subfasciatus*, Var.; Casey, Camp San Saba, one specimen.
- 9221 *Cratoparis lunatus*, Fab.; Station 6.
- 9227 *Brachytarsus vestitus*, Lec.; Winchell, common.

THE INFLUENCE OF THE APIDÆ UPON THE GEOGRAPHICAL DISTRIBUTION OF CERTAIN FLORAL TYPES.

BY J. ARTHUR HARRIS, ST. LOUIS, MO.

The reciprocal relations of flowers and insects form a subject which has attracted many workers since Darwin and others showed the importance of this phase of biology. In the whole field of adaptation we have no better materials than those afforded by the morphology of flowers and insects considered in their relation to each other. The field has been most exploited by botanists, but some entomologists have also made valuable contributions to the literature of this subject, and their assistance has always been necessary for the identification of visitors observed.

Ecology, the phase of biology which considers the animal or plant in its relation to its environmental conditions, has been much pursued of recent years. One of the oldest phases, and one which at the present time, it seems to me, is not receiving the attention which it should, is that concerned with the mutual adaptations of flowers and insects.

The researches of Darwin early showed the importance of the classic studies of Koelreuter, Sprengel and Knight, and other workers immediately seized his ideas and proceeded to verify and elaborate them by observation, experiment and comparison. The tracing of the development of the various conceptions concerning the relations of flowers and insects during this most important period in the history of biology is a most fascinating exercise, but one which is quite out of place in this paper. Here we are concerned only with the problem of the influence of the insects upon the geographical distribution of the flora, and we shall make no attempt to go back beyond the classic work of Hermann Müller on Alpine flowers and their fertilization by insects.

The basis of the floral theory of Müller, as developed in the third portion of his *Alpenblumen*, is the proposition of the beneficial effect of crossing; so often as the progeny of cross-fertilization comes into competition for existence with the offspring of self-fertilization, it wins in the contest; only when the struggle for existence is absent may self-fertilization suffice for long-continued propagation. The supporting evidence for this thesis is two-fold: the direct proof of the extensive cultural experiments of Darwin and the indirect evidence yielded by the organization of flowers themselves.

While the importance of cross-fertilization has doubtless been overestimated by many writers, it hardly need be stated in this place that at the present time no argument need be advanced in its support. Admitting

that cross-fertilization is advantageous to the species, and that as a consequence close adaptations to certain agents well fitted to effect cross-fertilization have been evolved, it becomes at once evident that there will be an intimate correlation between the distribution of the plant and the agent upon which it depends for fertilization. This fact was recognized many years ago, and numerous attempts have been made to determine the effect of the insect fauna upon the constitution of the flora. Several of these investigations, especially those employing the statistical methods developed by Müller, have yielded results of great interest.

This phase of ecology is clearly one which demands for its complete development the co-operation of students of both sciences, and it is the purpose of the present paper to present briefly some results which seem to the writer to indicate the interdependence of certain phases of floral ecology and entomology and the importance both to botany and zoology of their investigation.

Some years ago, while studying the floral ecology of *Solanum* and *Cassia*, the writer was much impressed by the similarity of the floral structure of these systematically widely-separated genera and the identity of their ecological relations. Both genera are characterized by a widely-open perianth, elongate anthers basifixed on short filaments and opening by apical pores and usually connivent around a filiform style, terminating in a punctiform stigma. Upon examining the systematic literature it was found that forms in which the anthers open by apical pores, instead of the more common longitudinal slits, are characterized by stamens and perianth of the same form as those of these two genera. Certain genera from such systematically widely-separated families as the Liliaceæ, Pontederiaceæ, Commelinaceæ, Pittosporaceæ, Leguminosæ, Tremandraceæ, Solanaceæ and Rubiaceæ, and genera from some other groups, have a floral structure conforming in a remarkable degree to that exemplified by the familiar *Solanum* and *Cassia*. The floral structure in these families exhibits a wide range of form, and the close resemblance of these representatives, amounting to an almost identical habit, suggested the interest of a further investigation which might furnish some clue to the real nature of the parallelism. *Solanum* and *Cassia* are known to be adapted to pollen-collecting bees, and as the material and literature were examined the evidence that all the forms are adapted to fertilization by bees became quite considerable. It was also observed that these apically dehiscent forms seemed to be more abundantly represented in some regions than in others.

The parallelism of structure, the apparent identity of ecological relationship and the suggestion of some peculiarities of geographical distribution seemed to justify the extensive investigations necessary for the elaboration of the problem.

The final treatment of the various phases of the problem is not yet ready for publication, but quite a full discussion appears in the Sixteenth Annual Report of the Missouri Botanical Garden. It is the purpose of the present note to direct the attention of entomologists to a phase of ecology and biogeography, which is of interest to both botanists and zoologists, and requires the co-operation of both groups of workers.

The plant forms to be considered were limited to those in which the anthers open by terminal pores instead of the more general longitudinal slits. Detailed structural comparisons have shown that flowers with apically dehiscent anthers may be divided upon structural grounds into seven groups. Like most categories of classification, these groups are not sharply defined, but in some degree transgressive. The distinction between dehiscence by pores and by longitudinal splits and between the several types recognized is not an absolute one. The number of apically dehiscent genera or species might be increased or decreased by including forms in which the lateral slits first open more widely at the tip, or excluding all those in which the pores are finally supplemented by lateral slits. The number of genera as limited is, the writer feels confident, approximately right so far as may be determined from systematic literature and the examination of herbarium material. The groups, too, cannot be separated by sharp characters, but the questionable forms are but few as compared with those which do fall clearly into one of the recognized classes.

The classes recognized have been designated as the Araceous, Gramineous, Polygalaceous, Ericaceous, Dilleniaceous, Solanum-Cassia and Melastomataceous types. The first three of these represent well-defined groups, which are quite foreign to our present consideration. The Ericaceous type is not so sharply limited, and perhaps includes some forms which should have been placed in one of the other types. The Dilleniaceous, Solanum-Cassia and Melastomataceous types are the ones to which especial attention has been given.

The Dilleniaceous type has both whorls of the perianth usually developed, but one or both sometimes reduced, usually campanulate or rotate in disposition; *stamens indefinite in number*; filaments long or

short, free or variously united; *anthers mostly elongate, basifixed*; flowers usually actinomorphic throughout, but andrœcium sometimes zygomorphic; gynoecium of distinct or variously united carpels; flowers generally highly coloured and conspicuous.

To the Dilleniaceæ type have been assigned five genera of the Dilleniaceæ, five of the Elæocarpaceæ, three of the Ochnaceæ, and one each of the Theaceæ, Bixaceæ and Flacourtiaceæ. With the possible exception of the Ericaceous type, it shows the widest range of form of any group recognized; furthermore, it is the best known ecologically, and it is quite possible, or even probable, that its members are adapted to very different modes of pollination.

The Solanum-Cassia type may be characterized as follows: Perianth usually quite large, mostly actinomorphic, segments campanulate or *more generally patent or reflexed* in disposition; andrœcium of few members, usually 5 or 10, very rarely as many as 15, staminodia sometimes present, as reduced members of these numbers in zygomorphic forms, or more rarely from a multi-staminate andrœcium; filaments *much reduced in length*; anthers basifixed, oblong to sagittate or linear, often more or less connivent around the filiform style with its small, generally simple stigma, or at least erect, very rarely distant; flowers generally conspicuous and highly coloured.

The members of this type show a remarkable uniformity of structure. To it have been assigned 49 genera, as follows: *Mayaca* (Mayacaceæ), *Schænocephalum*, *Stegolepes*, *Rapatea*, *Saxo-Fridericia*, *Cephalostemon*, *Spathanthus* (Rapateaceæ), *Cartonema*, *Dichorisandra* (Commelinaceæ), *Monochoria* (Pontederiaceæ), *Walleria*, *Agrostocrinum*, *Dianella*, *Calcectasia*, *Luzuriaga* (Liliaceæ), *Conanthera*, *Cyanella*, *Zephyra*, *Tecophilea* (Amaryllidaceæ), *Cheiranthera* (Pittosporaceæ), *Cassia*, *Koompassia*, *Distemonanthus*, *Labichea*, *Dicorynia*, *Baudouinia*, *Duparquetia*, *Krameria*, *Martusia* (Leguminosæ), *Platytheca*, *Tetratheca*, *Tremandra* (Tremandraceæ), *Thomasia*, *Guichenatia*, *Lysiosepalum*, *Lasiopetalum* (Sterculiaceæ), *Ouratea*, *Brackenridgea*, *Godoya*, *Elvasia*, *Blastemonanthus*, *Wallacea*, *Schuermansia*, *Pœcilandra*, *Luxemburgia*, *Euthemis*, *Leitgebia* (Ochnaceæ), *Stemonoporus*, *Monoporandra* (Dipterocarpaceæ), *Kiggelaria* (Flacourtiaceæ), *Begonia*, sections *Solanthera* and *Parvibegonia* (Begoniaceæ), *Ardisia*, sections *Icacorea*, *Stylogyne* and *Monoporus* (Myrsinaceæ), *Gardneria* (Loganiaceæ), *Exacum*, *Cotylanthera* (Gentianaceæ), *Solanum*, *Cyphomandra* (Solanaceæ), *Argostemma* and *Strumpfia* (Rubiaceæ).

The Melastomataceous type includes, besides the Melastomatacæ, only *Storckiella* of Leguminosæ and *Maximiliana* and *Amoreuxia* of the Bixacæ.

In this type there is the same conspicuous, patent corolla and elongate, basifixed anthers as in the Solanum-Cassia type. Dehiscence by pores seems to be more specialized, since, in nearly all the forms, the anthers open by a single and usually minute terminal pore instead of two, as is commonly the case in other groups. The essential difference between this and the Solanum-Cassia type is the elongate filaments. These make possible the highly-organized anther of the Melastomatacæ. To this class belong clearly all of the 161 genera of the Melastomatacæ, except 12, in which the anthers open by more or less longitudinal slits.

A few genera in which the anthers exhibit more or less terminal poriform openings do not fall into any of the seven classes recognized. Our knowledge of these forms is not sufficient to justify establishing special classes for them or placing them in any of the groups already recognized. They have simply been designated as aberrant forms and like the first four classes, left out of consideration in the distributional tabulations.

(To be continued).

NOTES ON NEW PHILIPPINE HYMENOPTERA.

BY ROBERT E. BROWN, S. J., MANILA OBSERVATORY.

Dr. W. H. Ashmead, of the National Museum, Washington, D. C., has published from time to time in the CANADIAN ENTOMOLOGIST descriptions of new genera and new species of Hymenoptera from the Philippine Islands. As the great majority of these new insects were either collected or bred in the garden attached to the Manila Observatory, perhaps the life histories of some of them will not be without interest and value.

Microplitis Philippinensis, sp. n., Ashm. Fam. Braconidæ.—Bred in the Manila Observatory. This hymenopteron was bred for the first time from the larva of the Sphinx moth, *Cherocampa oldanlandiæ*, Fab., but later on it was bred from three other species of Sphinx, viz.: *Metopsilus acteus*, Cram., *Cherocampa celerio*, Linn., and *Panacra mydon*, Walker. It would appear from many observations that the parasite only attacks the larvæ in their earlier stages, for we have never found a full-grown Sphinx larva parasitized by *M. Philippinensis*. When the

October, 1905.

larval parasite is full-grown it eats its way out through one of the anterior segments of its host and proceeds to spin its cocoon. The cocoon is fastened by one end to the body of the caterpillar at a small distance from the place of emergence. The cocoon itself is an elongated oval of yellowish-white silk, about 6 mm in length, and is fastened to the leaf underneath the body of the larva by a stout strand of silk, which thus also secures the caterpillar to the leaf and prevents its moving. In about a week the adult *M. Philippinensis* cuts a neat round hole from the top of the cocoon and escapes. Dr. Ashmead's description is as follows: Length, 4.5 mm. Black; face in front finely, closely punctate, opaque, the thorax above shining, but minutely punctured, the metathorax very coarsely reticulated with a sharp median carina; palpi yellowish; legs black or fuscous, the front femora at apex and beneath their tibiae and tarsi, and other legs from tip of femora are yellowish; the hind tibiae are very stout, and are more or less brownish or reddish outwardly from the middle to near the base. Wings with the apical third fuscous, the basal two-thirds subhyaline, the stigma and veins black.

Nesolynx flavipes, new genus, new species, Ashm.—Bred in the Observatory Garden. This minute hymenopteron is a parasite of the above-mentioned insect, *M. Philippinensis*. On one occasion, when the latter had spun its cocoon on the back of a Sphinx larva, we noticed that a number of small black hymenoptera were hovering round the caterpillar, and as several seemed to alight on the cocoon itself we caught a few, and collected the cocoon and placed it in a test tube with a wad of cotton as a stopper. *M. Philippinensis* ought to have emerged at the end of the week, but nothing appeared even at the end of two weeks. After three weeks, however, that is three weeks after having observed the small Hymenoptera alight on the cocoon, 32 *Nesolynx flavipes* emerged, and on examining them they were seen to be of the same species as the Hymenoptera previously seen. As the *N. flavipes* were probably laying their eggs when first obtained and observed, it would show that the whole life cycle of the insects is completed in three weeks.

Kradibia Brownii, sp. n., Ashm. Fam. Agaonidæ.—Bred in the Observatory Garden.

Sycoryctes Philippinensis, sp. n., Ashm. Fam. Torymidæ. Sub-Fam. Idarninæ.—Bred in the Observatory Garden. Both of these insects were obtained from the same fig tree, viz.: *Ficus heterophylla*, Linn., or *Ficus aspera*, Forst. The *Kradibia* is the ordinary fig-wasp, while the

Sycoryctes is a parasitic fig insect. These insects are interesting, inasmuch as they are the first fig insects to be discovered in the Philippine Islands.

Oencyrtus papilionis, sp. n., Ashm. Fam. Encyrtidæ.—Bred in the Observatory Garden This species was bred from the eggs of three distinct species of Papilios, viz.: *P. alpenor*, Cram.; *P. agamemnon*, Linn., and *P. rumanzovia*, Esch. As many as five and six *O. papilionis* were bred from each egg. We do not know the exact period.

Charops papilionis, sp. n. Fam. Ichneumonidæ. Sub-Fam Ophioninæ.—Bred in the Observatory Garden. This comparatively large species (length, 10.5 mm.) was bred from the larva of *Papilio agamemnon*, Linn. The egg was laid in the body of the larva after the second moult, and the caterpillar moulted a third time and was preparing to moult for the fourth time when the parasite reached the vital organs and killed it. When the *O. papilionis* emerged it left the shell of the larva perfectly empty.

NEW SPECIES OF CULICIDÆ.

BY JOHN A. GROSSBECK, NEW BRUNSWICK, N. J.

The following new species of mosquitoes have been found in New Jersey during the present summer (1925) in the course of the investigation conducted by Dr. John B. Smith.

Culex pallidohirta, sp. nov. ♀.—Head brown, occiput clothed with yellowish scales and a few dark brown ones intermixed; antennæ brown, the basal joint and basal half of following one dirty yellow; proboscis brown, with whitish scales scattered over the surface save at the apical fourth; palpi brown, tipped with silvery white, four jointed, apical joint minute, flattened, spiny. Mesonotum covered with pale brown scales and with a narrow median furrow obsolete on posterior portion, bounded on each side by scales of a slightly darker colour; a lateral line of pale yellow scales beginning near the posterior margin and extending to the middle of the lateral margin of the mesonotum also encloses these darker scales; scutellum pale brown with creamy-yellow bristles on the posterior margin; metanotum evenly pale brown; pleura yellowish-brown with patches of whitish scales; halteres dirty white. Abdomen creamy with a metallic silvery-gray lustre in life, somewhat darker with grayish shadings in pinned specimens; genitalia dark brown. Legs cream coloured, the anterior part of all femora and also anterior part of tibia of fore leg brownish; the apical two or three joints of fore and mid tarsi

October, 1925.

also brownish; claws all uniserrated; wings hyaline with slender brown scales and broad whitish ones, petiole of first sub-marginal cell about half the length of this cell. Length 4.5-5 mm.

Types, 2 females in the New Jersey Experiment Station collection. This species is at once recognizable by its silvery lustre and cream-coloured legs.

A single specimen of this species hatched May 5th out of a lot of larvæ and pupæ sent in by Mr. Brehme, who collected them as *Culex Canadensis* from the Orange Mountains. The remaining larvæ were immediately put into alcohol and the pupæ left to develop; but all *Canadensis* emerged from the pupæ and no larvæ distinguishable from that species could be found. Another collection in the same locality was made several days after the first and from this lot another female hatched May 26th. Of the numerous other larvæ with which they were associated all were *Canadensis* and one *Corethra cinctipes*. We had evidently gotten hold of the tail end of the brood; no larvæ remaining.

Culex saxatilis, sp. nov. ♀.—Head brown, occiput covered with yellowish white scales and some dark brown ones; antennæ and proboscis dark brown, the former with scattered whitish scales; palpi brown, apparently three jointed, the fourth being minute, pointed and wholly retracted within the third joint. Mesonotum clothed with rich brown scales and pale yellowish ones at the margins; two naked lines extend down the anterior part and two pale yellowish spots are on the centre of the dorsum which become more or less diffused posteriorly; scutellum brown with yellowish scales and long black bristles on the posterior margin; metanotum grayish brown; pleura light brown with small patches of dirty white scales; halteres yellowish. Abdomen dark brown, all segments with apical white bands which become broad laterally, till, beneath, it is white with dark brown basal corners. Legs black, coxæ, base and under side of femora and a small spot at the knee creamy; claws simple; wings hyaline, the scales brown, petiole of first sub-marginal cell about one-third the length of this cell. Length 4.7-5 mm.

Types, six females in the New Jersey Experiment Station collection. Distinguished from *Culex territans*, its nearest American ally, by its large size, dark colour, broadly banded abdomen and spotted thorax.

Pupæ of *Culex saxatilis* were found August 31st on Garret Mountain (Paterson), in a rock-bottomed pool, associated with larvæ and pupæ of *C. pipiens*. In the afternoon of the same day two females emerged together with several *pipiens*. Sept. 1st, 5 others, all females, hatched with more *pipiens*. Later emergences were all *pipiens*. As in the preceding species the last of the brood was collected in the pupal stage; no larvæ remaining.

MISCELLANEOUS NOTES.

BY T. D. A. COCKERELL, BOULDER, COLO.

GENERA OF DIPTERA.

Some of the generic names used for Scatophagidæ will stand or fall according to one's notion of homonymy. Becker, in 1894, proposed the name *Orthacheta* (cf. Index Zoologicus); Aldrich, in the interest of orthography, has altered this (Cat. N. A. Diptera) to *Orthocheta*. Now, Germar long ago used *Orthochetes* for a beetle, while Cossmann, in 1890, used *Orthochetus* for a mollusc. I do not pretend to say what ought to be done with such a mix-up; it comes back to the old question, whether an error in spelling (which may hypothetically be attributed to the printer) must be maintained; and again, if not, whether the differences in the termination suffice to prevent homonymy. To the last question I should answer yes, and so retain the fly, mollusc and beetle names.

In the same year Becker named another Scatophagid genus *Megophthalma*, and Aldrich (l. c.) alters this to *Megophthalma*. Is this to be held invalid because of the earlier *Megophthalmus*, Curtis?

Aldrich credits *Pogonota* and *Okenia* to Becker. It is *Pogonota*, Zett., 1846 (*Okenia*, Zett., 1840, preoccupied).

In the Blepharoceridæ, Kellogg has a genus *Philorus*. Is this a homonym of *Philoros*, Walker, 1854, a word with the same derivation, applied to a valid genus of moths?

In Anthomyidæ, *Tetrachata*, Stein, Berl. Ent. Zeits., 1898, p. 254, is a homonym of *Tetrachata*, Ehrenb. The Dipterous genus may be called *Parasteinia*, n. n., type *Parasteinia unica* (*Tetrachata unica*, Stein.)

There are several other homonymous generic names in our list of Diptera; the attention of their authors has been called to them, and it is hoped that substitutes will be provided.

SOME NOCTUID MOTHS.

Euxoa brunneigera, Grote.—Hampson remarks (Cat. Lep. Phal. IV., 270) that "the form from Colorado is paler and grayer brown, the markings of fore wing sometimes obsolescent, the hind wing paler towards base." I think this Colorado insect is a valid subspecies, which may be termed *E. brunneigera Masoni*. The specimen before me is from Mr. J. Mason's collection, and is from Glenwood Springs, Colorado. I compared it with the excellent series of true *brunneigera* in the National Museum, and found that it differed by the lighter and redder colour, the broader primaries, and the much fainter median band. *E. citricolor*, Grote, also occurs at Glenwood Springs (Mason collection).

Ac. ntia neomexicana, Smith, notwithstanding the name, was not described from New Mexico. Fortunately the name is justified by a specimen in the National Museum, collected by myself at Las Cruces, N. M., in April.

Cinophanus Dyari, Ckll.—Described from New Mexico, is also found in the Huachuca Mts., Arizona. (In coll. U. S. National Museum.)

TWO PARASITIC HYMENOPTERA.

I have recently described two parasitic species, basing my conclusions as to their distinctness on published descriptions. I gave the types to the National Museum, and when recently in Washington took occasion to compare them with their nearest allies.

Proctotrypes Coloradicus, Ckll., is darker and rather more robust than *P. pallidus*, Say. Dr. Ashmead thinks it is a form of *pallidus*, and this is very likely the case. I will take the opportunity to record that *P. rufigaster*, Prov. (det. Ashm.), was collected by myself at Monument Rock, Santa Fé Canon, New Mexico. This is the first record of the genus from New Mexico.

Porizon Vierecki, Ckll., differs from the allied *hyalinipennis*, Cress., (type compared) by the white veins of the wings, and especially by the much more slender hind femora. *P. hyalinipennis* has thick femora in both sexes.

A NEW DEXIID PARASITE OF A CUBAN BEETLE.

BY D. W. COQUILLET, WASHINGTON, D. C.

Thelairoides ischyri, new species.

Black, the antennæ, palpi, labella and front corners of the first two abdominal segments pale yellow, the last segment and hind edge of the preceding orange yellow. Front at narrowest part one-fifth as wide as either eye, the upper three pairs of frontal bristles much larger than the others, one pair beneath insertion of antennæ, facial ridges strongly diverging below, antennæ slender, almost as long as the face, the third joint five times as long as the second. Mesonotum gray pruinose, a broad fascia behind the suture, and four vittæ in front of it black, three postsutural and two sternopleural bristles. Abdomen bearing marginal bristles on the last three segments, and with a discal row on the last one; abdomen polished, the last three segments narrowly whitish pruinose on their bases. Pulvilli much shorter than the last tarsal joint. Wings hyaline. Length, 6 mm.

A male specimen bred from the beetle, *Ischyrius flavitaris*, Lec., in April, at Santiago de las Vegas, Cuba, by Dr. George Dimmock. Type No. 8458, U. S. National Museum.

October, 1905.

CÆNOCEPHUS IN AMERICA.

BY J. CHESTER BRADLEY, ITHACA, N. Y.

Heretofore the genus *Cænocephus*, Konow, has been known only from Siberia, and by a single species. Two undescribed species from western United States occur in Dr. Alex. D. MacGillivray's collection (Cornell University), one of them also in the collection of the American Entomological Society, and at the request of Dr. MacGillivray I here describe them.

Length 11 mm; wings slightly tinged with yellow; second and third abdominal segments in part red. *Konowi*, n. sp.

Length 16 mm; wings somewhat smoky; second, third and fourth abdominal segments entirely red *Aldrichi*, n. sp.

Cænocephus Aldrichi, n. sp.—Black; legs except coxæ and trochanters, abdominal segments two, three and four red; wings somewhat smoky. Length 16 mm.

Antennæ almost filiform, slightly thickened mesally, the first segment of the flagellum slightly exceeding the second. Head minutely punctured above. Pronotum subquadrate, deeply notched posteriorly. Wings somewhat smoky, the hind wings without a cubital cell. Posterior trochanters and the rest of the legs except the coxæ red; no spines on the posterior tibiæ. Abdomen rather long, black, the second, third and fourth segments entirely red.

Habitat—Juliaetta, Idaho. Type in the collection of Cornell University.

I take pleasure in dedicating this large and beautiful species to the collector, Prof. J. M. Aldrich.

Cænocephus Konowi, n. sp.—Black, legs and a band near the base of the abdomen red; wings stained yellow. Length 11 mm.

Head black; clypeus somewhat prolonged and almost truncate, slightly triserrate; mandibles deeply toothed, yellow; occiput very minutely punctured, polished, covered with very minute black pubescence; flagellum black, eighteen segmented, very slightly thickened mesally, first segment somewhat longer than the second. Pronotum quadrate, shining as in the rest of the trunk. Wings stained slightly yellow; posterior ones without a complete cubital cell. Legs red, or the coxæ and fore and middle trochanters black; no spurs on the tibiæ before the apex. Abdo-

men black, second and most of the third segment reddish yellow, or in one paratype the second and third segments red, the apex of each black in the middle.

Habitat—Washington; Moscow, Idaho (Prof. J. M. Aldrich). Type and one paratype in the collection of the American Entomological Society and one paratype in the collection of Cornell University.

I dedicate this species by permission to Rev. Fr. W. Konow, whose work on the Phytophagous Hymenoptera stands alone.

A REMARKABLE FLIGHT OF *CORISA*, "WATER BOATMEN."

BY D. LANGE, ST. PAUL, MINN.

Between 2 and 3 o'clock on the afternoon of Oct. 11, 1904, I observed a remarkable flight of "Water Boatmen" at St. Paul, Minn. Thousands of them were flying hither and thither over several asphalt-paved streets, which had just been watered, and on which the sun was shining; the temperature was about 60° F. in the shade, the sky was clear, and there was no wind. The insects evidently mistook the wet asphalt for water. Thousands of them alighted, and were held fast by the film of mud until they died. About 5 o'clock I noticed on one street a struggling "Boatman" to every square inch of surface.

Have these insects regular autumn swarming days like ants, or do they migrate from one body of water to another in search of favourable winter quarters? The lakes and ponds about the city were full of water, and therefore this general flight was not caused by any scarcity of the element. Prof. F. L. Washburn, who identified the insects for me, found that there were ten to twenty males to one female, and I did not see any of them mating. These insects are frequently attracted to the electric lamps at night, but I never before found them flying in the daytime.

A few individuals of *Corisa* and a number of "Whirligig beetles" were flying here during the afternoon of Oct. 28, the weather being fine and the temperature about 55°.

THE ANNUAL MEETING of the Entomological Society of Ontario will be held at the Ontario Agricultural College, Guelph, on Wednesday and Thursday, Oct. 18 and 19.