PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF

WASHINGTON

VOLUME 28

PUBLISHED BY THE SOCIETY
WASHINGTON, D. C.
1926

ACTUAL DATE OF PUBLICATION OF VOLUME 28.

Number 1—pages 1–24 inclusive . . . . . *January 30, 1926.*
Number 2—pages 25–52 inclusive . . . . . *February 26, 1926.*
Number 3—pages 53–70 inclusive . . . . . *March 27, 1926.*
Number 4—pages 71–94 inclusive . . . . . *April 21, 1926.*
Number 5—pages 95–114 inclusive . . . . . *June 4, 1926.*
Number 6—pages 115–150 inclusive . . . . . *June 28, 1926.*
Number 7—pages 151–166 inclusive . . . . . *October 12, 1926.*
Number 8—pages 167–190 inclusive . . . . . *December 15, 1926.*
Number 9—pages 191–222, I–IV inclusive . . . . . *January 15, 1927.*

PRESS OF
H. L. & J. B. McQUEEN, INC.
WASHINGTON, D. C.

TABLE OF CONTENTS OF VOLUME 28

NOTES AND NEWS ITEMS.

Catalogue of the Buprestidae of North America, North of Mexico, W. J. Chamberlin, published by W. J. Chamberlin, 1926.—A very complete catalogue of the Coleopterous family Buprestidae. Contains a list of the genera arranged alphabetically, the type species of each genus, the species arranged alphabetically under each genus with references to literature arranged chronologically, type locality, distribution, host plants and season found. There is also a list of authors and titles of articles relating to both recent and fossil species.

The work appears to be carefully and thoroughly done and the catalogue will be invaluable to any one working on this interesting and economically important family of beetles. Mr. Chamberlin deserves a great deal of credit for publishing such a work at his own expense.

—*H. E. Burke.*

VOL. 28 JANUARY, 1926 No. 1

PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

CONTENTS

PUBLISHED MONTHLY EXCEPT JULY, AUGUST AND SEPTEMBER

BY THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

U. S. NATIONAL MUSEUM

WASHINGTON, D. C.

Entered as second-class matter March 10, 1919, at the Post Office at Washington, D. C., under Act of August 24, 1912.

Accepted for mailing at the special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized July 3 1918.

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON

ORGANIZED MARCH 12, 1884.

The regular meetings of the Society are held on the first Thursday of each month, from October to June, inclusive, at 8 P. M.

Annual dues for members are $3.00; initiation fee $1.00. Members are entitled to the PROCEEDINGS and any manuscript submitted by them is given precedence over any submitted by non-members.

OFFICERS FOR THE YEAR 1926.

Honorary President . . . . . E. A. SCHWARZ
President . . . . . J. M. ALDRICH
First Vice-President . . . . . J. A. HYSLOP
Second Vice-President . . . . . J. E. GRAF
Recording Secretary . . . . . C. T. GREENE
Corresponding Secretary-Treasurer . . . . . S. A. ROHWER
U. S. National Museum, Washington, D. C.
Editor . . . . . CARL HEINRICH
U. S. National Museum, Washington, D. C.
Executive Committee: THE OFFICERS and W. R. WALTON, A. N. CAUDELL, T. E. SNYDER.
Representing the Society as a Vice-President of the Washington Academy of Sciences . . . . . A. G. BÖVING

PROCEEDINGS ENTOMOLOGICAL SOCIETY OF WASHINGTON.

Published monthly, except July, August and September, by the Society at Washington, D. C. Terms of subscription: Domestic, $4.00 per annum; foreign, $4.25 per annum; recent single numbers, 50 cents, foreign postage extra. All subscriptions are payable in advance. Remittances should be made payable to the Entomological Society of Washington.

An author of a leading article in the PROCEEDINGS will be given 10 copies of the number in which his article appears. Reprints without covers will be furnished at the following rates, **provided a statement of the number desired accompanies the manuscript:**

	4 pp.	8 pp.	12 pp.	16 pp.
50 copies	2.00	4.00	6.00	8.00
100 copies	2.25	4.50	6.75	9.00

Certain charges are made for illustrations and there are available rules and suggestions governing the make-up of articles. Immediate publication in any number may be obtained at the author's expense. **All manuscripts should be sent to the Editor.**

PROCEEDINGS OF THE
ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 28 JANUARY 1926 No. 1

SOME ARACHNIDS FROM THE CARLSBAD CAVE OF NEW MEXICO.

By C. R. Crosby, *Cornell University.*

OPILIONES PALPATORES.

Family PHALANGIIDAE.

Types of the new species described in this paper are to be deposited in the United States National Museum.

Leiobunum townsendii Weed.

Two specimens were received, one (Bishopp No. 11519) from the surface near the entrance to the cavern, April 13, 1924, and the other (11258) presumably from the cave itself. Both are not fully mature. This species was described from Las Cruces, N. M. I have specimens from Anhalt and Braunsfels, Texas, and from Manitou, Colorado. It is a common open-air form in this region and its presence in the cavern is probably accidental.

ARANEIDA.

Family PHOLCIDAE.

Physocyclus enaulus, new species.

Female.—Length, 4 mm. Cephalothorax nearly circular, depressed at the median groove, pale yellowish, marked in the middle with a brownish Y-shaped mark, the anterior arms extending a short distance along the cervical grooves, the surface sparsely clothed with stiff pale brownish hairs. The eyes situated on a brownish area, but the pale color of the back extends forward between the posterior median eyes.

Posterior eyes nearly equal in size, in a recurved line, the median separated by considerably more than the diameter and subcontiguous to the lateral. Anterior eyes in a straight line, nearly equal in size, subcontiguous. Clypeus five times as wide as diameter of anterior median eye, marked with a broad light brownish band extending from the eyes to the margin, widened at base and at tip, narrower in middle part. Sternum, labium and endites pale yellowish. Sternum broader than long, rounded on the sides and behind. Labium much broader than long, sparsely clothed with short stiff dark hairs. Endites long, narrow, convergent, clothed with stronger hairs than labium. Chelicerae light yellowish-brown, white at base, slightly angulate externally, abundantly clothed

with long brown hairs; the inner tooth black, rather long, slender, curved. Legs pale with a dark ring near tip of femora, at base and near tip of tibia; femora gradually enlarged toward base. Palpi pale, last segment reddish brown.

Abdomen higher than long, compressed, rounded above, nearly straight below, dull grayish white, marked above and to a less extent on the sides with small grayish spots forming an indefinite herring-bone pattern on the back and leaving a lanceolate light area above the spinnerets.

The anterior process of the epigynum is rather short and projects straight downward (Fig. 1); when viewed from below and in front it is seen to be deeply and roundly notched with the opposing points slightly converging (Fig. 2). The posterior part of the epigynum is a strongly convex, transverse, plate, dark reddish-brown in color with a pale area at the middle behind; the posterior margin straight except at the ends where it appears to curve forward due to the overlapping of the posterior margin of the genital furrow. The latter is thickened, rounded, strongly protruding and light brown in color.

Type (female).—Carlsbad Cave, N. M. (Bishopp No. 11517). One specimen.

Family AGELENIDAE

Tegenaria antrias, new species.

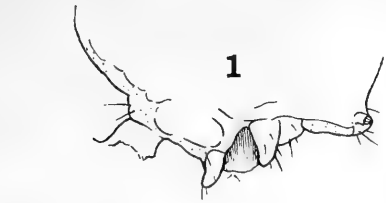
Female.—Length, 7 mm. Cephalothorax pale orange yellow suffused with gray; on the thorax the gray is darkest along the three radiating furrows and on the margin leaving an oval light space surrounding the median groove connected in front with the light area on the top of the head. Sides of the head marked with irregular dark lines coalescent behind and with a fine line running to each posterior eye in front.

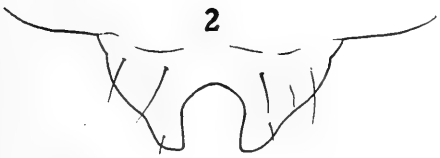
Posterior eyes in a slightly procurved line, the median a little smaller than the lateral, separated by a little more than the diameter and slightly farther from the lateral. Anterior eyes subcontiguous, in a slightly procurved line, the median slightly smaller than the lateral. Clypeus twice as wide as diameter of an anterior median eye.

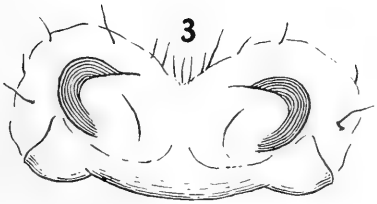
Sternum black on the sides with a yellowish median stripe which is broad in front with a scalloped edge and narrow behind; in the black areas are three yellowish spots on each side, the posterior pair being confluent with the median stripe. Labium, endites and chelicerae light brown. Lower margin of the furrow of the chelicerae armed with 4 small nearly equal teeth evenly spaced. Upper margin of the furrow armed near the tip of the claw with three small teeth, the middle one the largest.

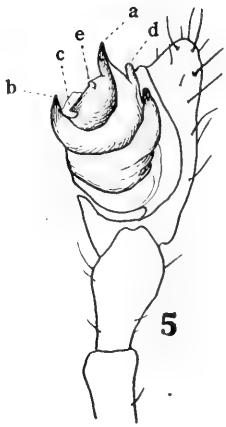
Legs pale orange yellow with grayish annulations, distinct only on the posterior femora. Abdomen above dull gray with a pattern of darker gray chevrons and irregular lines. Ventral side of abdomen same as above marked with dark gray spots and lines. Epigynum (Fig. 3) a transversely quadrangular plate with the posterior margin convex in the middle and gently emarginate each side. The openings are far apart near the anterior angles and in ventral view look like semicircular black grooves.

Type (female).—Carlsbad Caves, N. M. One specimen (Bishopp No. 11518).









CROSBY—ARACHNIDS FROM CARLSBAD CAVE.

Family ARGIOPIDAE.

Subfamily LINYPHINAE.

Group ERIGONEAE.

Dr. S. C. Bishop and I have been studying the group of spiders which have been for the most part placed in the genus Tmeticus by Emerton and Banks, and which I (1905) transferred to the genus Oedothorax. This is a composite group and will have to be broken up and the species redistributed. One of the species from the Carlsbad Cave falls in one of these new groups. In order that it may be properly placed the following from our forthcoming paper is here published.

"In America there are a number of species which, in the structure of the genital bulb, are closely related to *Erigone*, but which lack the great development of teeth characteristic of that genus. For this group the following new genus is proposed:

PARERIGONE Crosby and Bishop, new genus.

Genotype.—Erigone probatus Cambridge.

Abdomen without chitinized sclerites; chelicerae without lateral teeth; no true postocular impressions in the male. The embolic division of the genital bulb consists of an irregular plate without a true tail-piece and which bears the embolus in the form of a minute tubercle. The ventral corner of the plate bears a short simple erect process, not greatly prolonged and denticulate as in Montilaira Chamberlin or extremely elongate as in Catabrithorax Chamberlin.

Parerigone also includes the following: *Tmeticus contortus* Emerton, *Tmeticus entomologicus* Emerton, *Tmeticus tmeticus index* Emerton, *Tmeticus rectangulatus* Emerton, *Tmeticus trilobatus* Emerton, *Tmeticus simplex* Emerton."

Parerigone antraea, new species.

Male.—Length, 2 mm. Cephalothorax orange yellow, viewed from above rather broad, rounded on the sides, the sides convergent towards the front with a slight constriction at the cervical groove, broadly rounded across the front. Viewed from the side evenly ascending along the back to the posterior eyes with only a very slight depression at the cervical groove and gently arched just back of the eyes. Clypeus straight, somewhat projecting.

Posterior eyes in a straight line, nearly equal in size and equidistant, separated by a little less than the diameter. Anterior eyes in a straight line, the median much smaller than the lateral, close together but well separated from the lateral. Just below the anterior median eyes are two long stiff hairs directed forward and curving upward.

Sternum smooth, sparsely clothed with short stiff hairs. Chelicerae with a prominent tooth on face at the inner angle and with a row of small setiferous

tubercles on the outer margin. Legs and palpi light orange yellow. Abdomen probably gray (not in good condition).

Femur of palpus rather stout, armed below on the lateral side with a row of 5 or 6 spiniferous tubercles. Patella rather thick, curved downward. Ratio of length of femur to that of patella as 20 to 7. Tibia longer than patella, greatly widened distally, the dorso-lateral angle produced into a broad concave process which ends in two rounded teeth separated by a rounded emargination (Fig. 4). Paracymbium rather stout, strongly curved basally with the distal part more nearly straight with a small sharp hook at tip. The embolic division (Fig. 5) is boat-shaped, strongly curved upward in front and behind; the anterior tooth (*a*) recurved, sharp-pointed, the posterior tooth (*b*) stouter and more blunt. Between the two there is a thin longitudinal tooth (*c*) directed backward at the base of which lies a minute tubercle, the embolus. On the mesal side the edge of the embolic sclerite is extended upward as a broad plate which terminates distally in a rounded process (*d*). The median apophysis appears as a broad flattened curved process, the distal edge is turned up into a sharp tooth-like ridge, not shown in figure.

Female.—A little larger than the male. Epigynum (Fig. 6) a broad plate, transversely depressed, the sides convergent posteriorly and with the hind margin broadly and evenly concave with two rounded teeth projecting backward. Between these teeth at a lower level there appears a blunt tooth.

Holotype (male); *allotype* (female).—Carlsbad Cave, N. M. 1 ♂, 2 ♀.

Explanation of Plate 1.

Fig. 1. *Physocyclus enaulus.* Lateral view of abdomen to show epigynum. Fig. 2. *Physocyclus enaulus.* Anterior process of epigynum viewed from in front and below. Fig. 3. *Tegenaria antrias.* Epigynum. Fig. 4. *Parerigone antraea.* Right palpus of male, dorsal view. Fig. 5. *Parerigone antraea.* Right palpus of male, ventral view. *a*, anterior tooth of embolic division; *b*, posterior tooth; *c*, median tooth; *d*, anterior process of lateral projection of embolic division; *e*, opening of ejaculatory duct. Fig. 6. *Parerigone antraea.* Epigynum.

LOCATION OF INDIVIDUAL HOSTS VERSUS SYSTEMATIC RELATION OF HOST SPECIES AS A DETERMINING FACTOR IN PARASITIC ATTACK.

By R. A. Cushman, *U. S. Bureau of Entomology.*

In going through some old literature recently I happened on the following paragraph:

"Within the last few weeks specimens of a Chalcid were received from a most careful observer and excellent collector, with the statement that they were reared from the eggs of a sawfly deposited in a willow leaf. While I am not in the habit of discrediting any statement which this gentleman makes, the

fact remains that this parasite is plainly from the known habits of its near relatives an enemy of some lepidopterous leaf-miner, and that never under any circumstances could it have been an egg parasite. He had probably put his willow leaf in a pill box and had later found the parasites in the box. He did not examine the leaf carefully for traces of a leaf-miner or he would never have sent in the record."

This quotation reflects the idea formerly prevalent that hymenopterous parasites were closely confined in their host relations to certain groups and were possessed of an unerring instinct that guided them in their search for hosts. The author of the paragraph quoted would probably at present be the first to refute his own argument, for it now appears that, while he was essentially correct in his statement, his correspondent was in all probability entirely correct in his observations. Many parasitic Hymenoptera, especially those whose hosts are concealed within the tissue of their food plants, are in the habit of searching for their hosts in certain sorts of locations, the sort of location being of nearly if not quite as much importance as the systematic position of the host insect. Thus, *Epiurus pterophori* (Ashmead), normally a parasite of lepidopterous larvae living in weed stems, has been reared from the larvae of the sawfly, *Ametastegia glabrata* (Fallen), that had bored into weed stems for pupation. The sawfly larvae were not parasitized because they were a favorite host but because they were in the same sort of location as the favorite host. If they had sought out some other sort of location in which to pupate they would have escaped attack by this parasite.

The chalcid mentioned in the above quotation undoubtedly belongs in the same category, for some years ago I reared several specimens of a species of *Sympiesis* as external parasites of the eggs of the sawfly *Cimbex americana* Leach in willow leaves. There can be no doubt that the species of *Sympiesis* are typically parasitic on leaf-mining lepidoptera. But the habit of parasitizing leaf-miners frequently leads them to attacks insects of other orders living in the same situation. Thus apparently authentic records are published of the rearing of species of this genus from such leaf-mining hosts as *Odontota* and *Orchestes* among the *Coleoptera*, *Agromyza* in Diptera, and *Caulicampus* in the Hymenoptera. So far as the parasite was concerned in each of these cases the important factor was not the systematic relation of the host but the fact that it was mining in a leaf.

FIVE NEW TERMITES FROM PANAMA AND COSTA RICA.

By Thos. E. Snyder, *U. S. Bureau of Entomology.*

During the summer of 1925, Dr. Harold Kirby, Jr., of Yale University, visited Panama and Costa Rica to collect living termites, for the purpose of studying their intestinal protozoa. Most of his time was spent at the station of the Institute for Research in Tropical America on Barro Colorado Island, Canal Zone, Panama.

In addition to collecting a large series of described termites, five new species were discovered, as well as the hitherto unknown soldier of *Kalotermes* (*K.*) *tabogae* Snyder, and the hitherto unknown winged adults of *Kalotermes* (*Calcaritermes*) *emarginicollis* Snyder, and *Armitermes* (*A.*) *chagresi* Snyder.

This collection by Kirby adds four species to the termite fauna of Panama. At present 42 species of termites, representing 24 genera or subgenera are known from Panama. On Barro Colorado Island in Gatun Lake, the site of the new tropical research station, 28 termites, representing 20 genera or subgenera have been found. It is believed that many more species will be discovered in Panama in regions hitherto unexplored.

Among a large series of two species of the subgenus *Calcaritermes* Snyder were numberous nymphs, on which there appears to be a new subgeneric character, enabling the separation of these nymphs from those in other subgenera of the genus *Kalotermes* Hagen. This character on nymphs of the soldier caste consists of a medianally divided, raised area posteriorly placed to the markedly emarginate pronotum; this area is light reddish in color and the surface is covered with asperities or surface roughenings, being similar to the ampulae on the dorsal surface of Coleopterous larvae, which serve the purpose of assisting the larvae in crawling through their burrows in wood.

Descriptions of the new species, the hitherto unknown castes and the nymphal character in species of *Calcaritermes* follow herewith.

Kalotermes (**Kalotermes**) **clevelandi,** new species.

Soldier.—Head light castaneous-brown, with reddish tinge anteriorly, lighter posteriorly; sides slightly convex; broadest posteriorly, with a depression on slope at epicranial suture; with scattered, long hairs, more numerous anteriorly. Eye spot blackish, suboval, placed on rim of antennal socket. Gula approximately half as wide at middle as where widest (anteriorly). Labrum tongue-shaped, narrowed at apex.

Mandibles black, reddish-brown at base; broad at base, sharp pointed and incurved at apex; left mandible with a sharp pointed marginal tooth at apical third, a molar with sharp anterior point, and another molar near middle; right

mandible with two larger, sharp pointed marginal teeth, one in middle, the other on basal third.

Antenna light yellow-brown with 12–14 segments (usually 12), segments bead-like; third segment castaneous-brown, subclavate and longer than fourth and fifth segments together; fourth segment shorter than second; last segment slender, elongate and subelliptical.

Pronotum light yellow-brown, deeply and roundly concave anteriorly where anterior margin is slightly serrate, anterior corners high, sides nearly straight, but angularly narrowed to posterior margin which is nearly straight except for a slight shallow median emargination; with few scattered long hairs.

Abdomen with tergites light yellow-brown, not hairy, but with a row of hairs near base of each tergite.

Legs with femora markedly swollen.

Measurements.—Length of entire soldier, 8.5 mm.; length of head with mandibles, 3.7 mm.; length of head without mandibles (to anterior), 2.3 mm.; length of left mandible, 1.5 mm.; length of pronotum, 1.2 mm.; length of hind tibia, 1.4 mm.; width of head (where widest posteriorly), 1.45–1.5 mm.; width of pronotum (from anterior to posterior margin), 1.35–1.4 mm.; height of head at middle, 1.4 mm.

Kalotermes (*Kalotermes*) *clevelandi* differs from *jouteli* Banks in its relatively longer third segment of the antenna, more emarginate and serrate anterior margin of the pronotum (which is similar to that of *marginipennis* Latreille) and its less hairy tergites. The black eye spot (also occurring in *jouteli*) separates *clevelandi* from other *Kalotermes* of this general region.

Type locality.—Ancon, Canal Zone, Panama.

Described from a series of soldiers collected with nymphs in a dry board of a floor at the type locality by J. Zetek on September 11, 1925. Named in honor of Dr. L. R. Cleveland of Johns Hopkins University in partial recognition of his excellent work on the intestinal protozoa of termites.

Holotype (soldier).—Cat. No. 28728, U. S. National Museum; paratypes in U. S. National Museum and with Kirby at Yale University, New Haven, Connecticut.

Kalotermes (Kalotermes) tabogae Snyder.

Soldier.—Head light castaneous-brown with a reddish tinge anteriorly; flat; sides approximately parallel; a depression on slope of epicranial suture; dense short and scattered long hairs. Eye spot hyaline, large, suboval. Gula slender in middle, not half as wide as where widest anteriorly. Labrum yellow-brown; tongue-shaped and straight at apex.

Mandibles black, with reddish tinge at base where broad, incurved and sharp pointed at apex; left mandible with a broad sharp pointed marginal tooth on apical third, a molar with a narrow sharp pointed apical tooth, and another molar slightly beyond middle toward the base; right mandible with two larger sharp pointed but broad marginal teeth, one in middle, the other nearer the base, margin of mandible roughened between first tooth and apex.

Antenna light yellow-brown; 14–15 segments, becoming longer but narrower toward the apex; third segment castaneous, subclavate, longer than fourth and fifth segments together; fourth shorter than second segment; last segment narrow, elongate and subelliptical.

Pronotum yellow, margins darker; not twice as broad as long; deeply roundly emarginate anteriorly where the margin is roughened or finely dentate; anterior corners high; posterior margin shallowly emarginate at middle; sides straight, narrowed posteriorly; with scattered long hairs.

Legs short, femora much swollen.

Abdomen with tergites yellowish, with fairly long hairs at base of each.

Measurements.—Length of entire soldier, 9 mm.; length of head with mandibles, 3.9–4 mm.; length of head without mandibles (to anterior), 2.6 mm.; length of left mandible, 1.6 mm.; length of pronotum (from anterior to posterior margin at sides), 1.6 mm.; length of hind tibia, 1.4 mm.; width of head (where widest posteriorly), 2.2–2.4 mm.; height of head at middle, 1.5 mm.; width of pronotum, 2.15–2.25 mm.

The soldier of *Kalotermes* (*Kalotermes*) *tabogae* is larger than that of *marginipennis* Latreille; the head is not as high in relation to its width (is flatter) and is hairier; the antenna has 2 to 3 more segments; the mandibles are broader and shorter in relation to width of the head, and the marginal teeth are markedly different both in shape and position; the anterior margin of the pronotum is more deeply and angularly concave, the serrations are less marked.

Described from a series of soldiers and nymphs collected by H. Kirby, Jr., on September 11, 1925, at the type locality (Taboga Isld., Panama) in a large colony in dead, dry log on beach near native village,

This species was described in 1924 from the winged adult only. These soldiers are deposited in the U. S. National Museum; additional specimens with Kirby at Yale University.

Kalotermes (Rugitermes) kirbyi, new species.

Deälated female adult.—Head black or very dark brown; smooth; shining; with a few, scattered, long hairs. Post-clypeus white, slightly tinged with yellow; labrum light castaneous, broadly rounded at apex. Eye grayish, large, separated from lower margin of head by a distance less than the diameter of an eye. Ocellus hyaline, raised, projecting, separated from eye by a distance slightly less than the short diameter of an ocellus.

Antenna castaneous, basal segments lighter colored (broken ? beyond tenth segment); segments beadlike, becoming longer and broader toward apex; third segment subclavate, longer than second or fourth segments; fourth segment shorter than second.

Pronotum yellow, contrasting markedly with dark head and wing scales; broader than head; anterior margin concave; sides roundly narrowing to posterior margin which is shallowly concave; with scattered long hairs.

Legs dark brown, except apices of tibiae and tarsi which are yellow.

Abdomen with tergites dark brown, a row of fairly long hairs at base of each; cerci dark colored and fairly long.

Measurements.—Length of entire deälated female adult, 7 mm.; length of head to tip of labrum, 2 mm.; length of pronotum, 1.1 mm.; length of hind tibia, 1.3 mm.; long diameter of eye, 0.402 mm.; width of head at eyes, 1.6 mm.; width of pronotum, 1.8 mm.

Kalotermes (*Rugitermes*) *kirbyi* has a large eye, a long and broad pronotum, and greater part of legs dark colored. A deälated male found with this typical female and soldier has the pronotum black and a slightly smaller eye, otherwise having the same characters.

Soldier.—Head light yellowish-brown, darker anteriorly; broadest posteriorly; dense long hairs near depressed epicranial suture becoming scarcer posteriorly; front gradually sloping. Eye spot hyaline, large to small, narrow to broad, subelliptical on rim of antennal socket. Gula at middle only one-third as broad as where broadest at front.

Antenna light yellow, basal segments darker; with 12 segments; segments beyond third of about the same size; third segment subclavate, very elongate, nearly as long as the fourth and fifth segments together; fourth shorter than second segment; last segment short, slender and suboval.

Mandibles (Fig. 1) black, except at base where reddish-brown and broad; sharp pointed and incurved at apex; left mandible with one sharp pointed marginal tooth on apical third, in the middle a molar with the anterior point sharp and another blunt molar near the base; right mandible with apical margin roughened or slightly serrate and two large sharp pointed teeth near the base.

Pronotum lighter colored than head, whitish with tinge of yellow; slightly broader than head; anterior margin roundly concave; sides roundly narrowing to posterior margin which is convex except for a shallow median emargination; with scattered long hairs.

Legs with femora swollen.

Abdomen with tergites yellowish, and a row of long hairs on each.

Measurements.—Length of entire soldier, 7.5 mm.; length of head with mandibles, 4.1 mm.; length of head without mandibles (to anterior), 2.6 mm.; length of left mandible, 1.45 mm.; length of pronotum, 0.95 mm.; length of hind tibia, 1.2 mm.; width of head anteriorly, 1.65 mm.; posteriorly, 1.85 mm.; height of head at middle, 1.6 mm.; width of pronotum, 1.95 mm.

The soldier of *Kalotermes* (*Rugitermes*) *kirbyi* usually has fewer segments to the antenna than most species of *Rugitermes*, but this is a variable character, as the segments range all the way from 11 to 15 (12 in holotype).

Type locality.—Cartago, Costa Rica.

Described from 1 deälated, female adult and 1 soldier, collected at the type locality on August 15, 1925, by H. Kirby, Jr., for whom this species is named.

Holotype (soldier).—Cat. No. 28729 U. S. National Museum; morphotype (deälated female adult) and topotypes (soldiers)

in U. S. National Museum; paratypes with Kirby at Yale University.

Kalotermes (Cryptotermes) breviarticulatus, new species.

Winged adult.—Head light yellow-brown (specimens slightly immature?); markings on front of head similar to those in *C. dudleyi* Banks, placed anteriorly to the line defining the epicranial suture and connecting with ocelli; with few, scattered, long hairs. Eye black, not round, projecting, separated from lateral margin of head by a distance less than the long diameter of an eye. Ocelli hyaline, projecting, subelliptical, nearly touching eyes.

Antenna yellow; with 14 segments, becoming longer and broader toward apex; third segment slightly longer than fourth.

Pronotum approximately of the same color as the head; shallowly emarginate anteriorly and posteriorly; sides roundly narrowing toward posterior margin; with scattered long hairs.

Wings hyaline, costal area golden yellow-brown; membrane finely punctate; in fore wing subcosta with 4 long branches to costa; median vein bent up to subcosta at about two-thirds of the length of the wing (near the origin of the third long branch of the subcosta); cubitus a little above middle of wing, branching to apex and sometimes bending up to subcosta near apex.

Legs with pulvillus present between the claws.

Abdomen with tergites light yellow-brown; a row of long hairs at base of each tergite; cerci and styli both present.

Measurements.—Length of entire winged adult, 8.5–8.75 mm.; length of entire deälated adult, 5.25–5.5 mm.; length of head (to tip of labrum), 1.4 mm.; length of pronotum (not at median), 0.7 mm.; length of fore wing, 6.4 mm.; length of hind tibia, 0.8 mm.; diameter of eye (long diam.), 0.25 mm.; width of head (at eyes), 0.95 mm.; width of pronotum, 0.95 mm.; width of fore wing, 2 mm.

The winged sexual adult of *Kalotermes* (*Cryptotermes*) *breviarticulatus* is close to *dudleyi* Banks, but is smaller and has fewer segments to the antenna.

Soldier.—Head castaneous-brown (with a reddish tinge) to piceous at front; in profile slightly concave in middle dorsally; sides convex; longer dorsally than ventrally; surface smooth; front projecting, bulging at middle, surface uneven or roughened; anterior margin of head cleft medianly (but not deeply) by a V-shaped lobe; anterior margin with a slightly elevated rim. Eye spot hyaline, prominent, subelliptical, narrow, at an oblique angle to lateral margin of head. Between antennal socket and mandible is located a piceous, narrow, anteriorly projecting knob, not markedly conical and curving outward-laterally.

Mandibles short, stout, pointed and incurved at apex, gouge-like, not flat; on left mandible, one broad marginal tooth near apex and traces of another near base; on right, one broad marginal tooth near apex, but margin also denticulate near base; marginal teeth not prominent or marked on either mandible.

Antenna tinged with yellow; short; 7 segments; third segment yellow-brown,

subclavate, longer than second or fourth segments; from fourth segment to sixth, segments broader and wedge-shaped; seventh segment slender, subelliptical.

Pronotum yellow, anterior margin yellow-brown with reddish tinge; elevated; jagged or irregular in outline, deeply and angularly emarginate medianly and shallowly emarginate posteriorly; sides roundly narrowing toward posterior margin; with scattered long hairs.

Presternal processes castaneous-brown with reddish tinge; as a broad plate, concave medianly.

Abdomen with tergites tinged with yellow; tergites with short hairs and a row of long hairs at base of each; cerci present.

Measurements.—Length of entire soldier, 4.5 mm.; length of head with mandibles, 1.7 mm.; length of head without mandibles (to anterior margin, dorsally), 1.4 mm.; length of head without mandibles (to anterior margin, ventrally), 1.3 mm.; length of left mandible, 0.4 mm.; length of pronotum (not at median), 0.8 mm.; length of hind tibia, 0.7 mm.; width of head, 1.35–1.40 mm.; height of head (at middle), 1.0 mm.; width of pronotum, 1.3–1.35 mm.

The soldier of *breviarticulatus* is smaller than *dudleyi* Banks and has few segments to the antenna and has the front projecting and not concave.

Type locality.—Taboga Isld., Panama.

Described from five winged adults and two soldiers collected by H. Kirby, Jr., at the type locality on September 11, 1925.

Holotype (soldier).—Cat. No. 28765, U. S. National Museum; morphotype, winged adults; paratypes with Kirby at Yale University.

Kalotermes (Calcaritermes) emarginicollis Snyder.

Winged adult.—Head dark castaneous-brown, with reddish tinge; smooth; shining; with scattered long hairs. Eye black, not round, projecting, separated from lateral margin of head by a distance less than the long diameter of an eye. Ocellus hyaline, small, projecting suboval, nearly touching eye.

Antenna light yellow-brown; 13 segments, bead-like, becoming longer and broader toward apex; third segment slightly shorter than second but normally, slightly longer than fourth; last segment elongate, slender and subelliptical.

Pronotum of same color as head; anterior margin broadly, roundly concave; posterior margin nearly straight; sides roundly narrowed posteriorly; with long hairs. On the border of the posterior margin of pronotum is a narrow band of raised rugose areas which appear as longitudinal striae; this area is indicated in the nymph of the sexual adult.

Wings dusky brown, costal veins darker; membrane coarsely punctate; in fore wing the median vein is close to and parallel to subcostal vein; cubitus in about middle of wing, with branches to apex of wing and branches and subbranches to lower margin of wing.

Legs with femora dark castaneous-brown; tibiae yellowish, with three dark-colored elongate spines at base; pulvillus present.

Abdomen with tergites dark castaneous-brown, with a row of long hairs in middle and a row of shorter hairs at base of each; cerci not prominent; styli present in males.

Measurements.—Length of entire winged adult, 7.0–7.5 mm.; length of entire deälated adult, 4.6–4.9 mm.; length of head (to tip of labrum), 1.25–1.3 mm.; length of pronotum (anterior to posterior margin), 0.7 mm.; length of fore wing, 5.75 mm.; length of hind tibia, 1 mm.; diameter of eye (long diam.), 0.275 mm.; width of head (at eyes), 1.1 mm.; width of pronotum, 1 mm.; width of fore wing, 1.6 mm.

Nymph of the sexual adult.—Eye spot pink. Wing pads fairly elongate. Meso-notum with asperate or rugose area not as elevated as in nymph of soldier; brownish rather than light reddish in color. Pronotum longer and less emarginate than in nymph of soldier; with a line (which also appears in winged adult) indicating limits of rugose area on posterior border.

Nymph of the soldier.—Eye spot not visible. Meso-notum (Figs. 2, 3) with asperate or rugose area elevated; latter light reddish in color. Asperate area on meso-notum appears in mature soldier. Fore tibiae without spur which occurs in mature soldier.

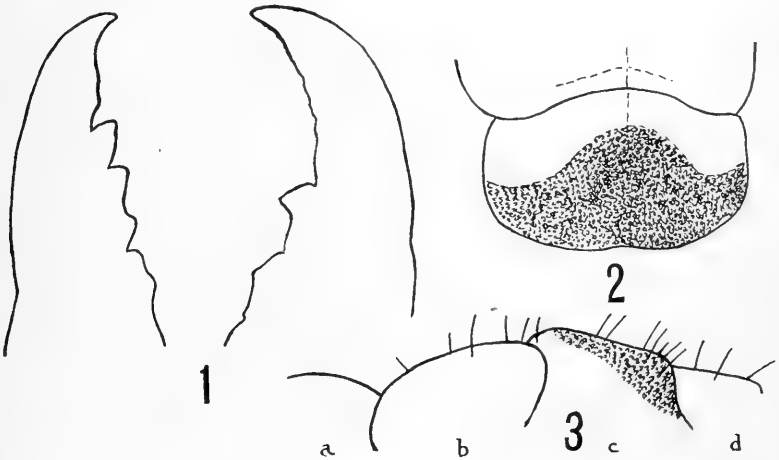


Fig. 1. *Kalotermes* (*Rugitermes*) *kirbyi* Snyder. Soldier. View of mandibles to show marginal teeth.

Fig. 2. *Kalotermes* (*Calcaritermes*) *emarginicollis* Snyder. Nymph of soldier. Dorsal pigmented asperate ampula on meso-notum.

Fig. 3. *Kalotermes* (*Calcaritermes*) *emarginicollis* Snyder. Nymph of soldier. View of same in profile to show how the area is elevated; (a) head, (b) pronotum, (c) meso-notum, (d) meta-notum.

Described from a series of winged adults collected with soldiers and nymphs at Estrella, Costa Rica, on August 26, 1925, by H. Kirby, Jr. These specimens are deposited in the U. S. National Museum, Kirby having additional material.

This species was described in 1924 from the soldier caste alone. The present specimens are the first winged adults that have been collected.

Armitermes (Armitermes) chagresi Snyder.

Winged adult.—Head light gray-brown, light dots at base of each hair giving a punctate appearance, lighter colored at base of antenna; broadly oval, with dense long hairs. Fontanelle hyaline, large, but smaller than an ocellus, suboval, and depressed; area about fontanelle lighter colored.

Eye black, large, projecting, close to lateral margin of head. Ocellus hyaline, large, suboval, projecting, close to eye. Post-clypeus yellow, arched and bilobed. Labrum yellow.

Antenna light yellow-brown; 15 segments, becoming longer toward apex; third segment very slightly longer than second or fourth; last segment slender, elongate and subelliptical.

Pronotum lighter colored than head; emarginate posteriorly; sides roundly narrowed posteriorly; with dense, long hairs.

Wings hyaline, costal area and basal veins darker (yellow to light yellow-brown); membrane with dense, short hairs. In fore wing, median vein closer to cubitus than to subcostal vein and with branches to apex of wing; cubitus slightly below middle of wing, not reaching apex, with approximately 10 branches or subbranches to lower margin of wing.

Legs yellow to light yellow-brown, elongate, slender.

Abdomen with tergites light yellow-brown; tergites with dense, fairly long hairs; cerci not elongate.

Measurements.—Length of entire winged adult, 11.5–11.75 mm.; length of entire deälated adult, 6.15 mm.; length of head to tip of labrum, 1.35 mm.; length of pronotum (from anterior to posterior margin at sides), 0.6 mm.; length of fore wing, 9.5 mm.; length of hind tibia, 1.7 mm.; diameter of eye (long diam.), 0.45 mm.; width of head (at eyes), 1.2 mm.; width of fore wing, 3.3 mm.; width of pronotum, 1.05 mm.

Described from a series of winged adults collected with soldiers and workers at the type locality (Barro Colorado Isld., C. Z., Panama) by Harold Kirby, Jr., on September 6, 1925.

This species was described in 1924 from the soldier caste alone. These specimens are deposited in the U. S. National Museum; additional specimens with Kirby at Yale University.

Nasutitermes (Subulitermes) kirbyi, new species.

Soldier.—Head yellow; not straight in profile (nasus elevated), but otherwise fairly straight; a slight depression in middle; pear-shaped and slightly constricted back of antennae; a row of four long hairs anteriorly and a row of two hairs posteriorly; also a few scattered very fine microscopic hairs, especially noticeable posteriorly.

Nasus castaneous with a reddish tinge; fairly long; tending towards conical; not very slender; beset with dense short hairs.

Antenna light yellow-brown; 12 segments, becoming longer and broader toward apex; third segment shorter than either second or fourth segments; last segment shorter, slender and subelliptical.

Pronotum tinged with yellow, anterior margin darker; short hairs and a few long hairs on anterior margin.

Abdomen with tergites dirty grey tinged with yellow; tergites with dense short hairs and a row of long hairs at base of each.

Measurements.—Length of entire soldier, 3.1 mm.; head with nasus, 1.35 mm.; head without nasus (to anterior margin), 0.9 mm.; length of nasus, 0.45 mm.; length of pronotum, 0.15 mm.; length of hind tibia, 0.7 mm.; width of head (at broadest portion), 0.7 mm.; width of pronotum, 0.32 mm.

Nasutitermes (*Subulitermes*) *kirbyi* has a shorter nasus than *raripilis* Emerson of British Guiana, and the head is not so elevated or convex anteriorly; the head is broader and the nasus darker colored than in *oculatissimus* Emerson of British Guiana; the nasus is not as slender as in *osborni* Emerson of British Guiana.

Type locality.—Barro Colorado Island, C. Z., Panama.

Described from a series of soldiers collected with workers at the type locality by Harold Kirby, Jr., on September 3, 1925, in a small rotten log in the jungle beside the Wheeler trail, a short distance from the station, and associated with a large colony of *Orthognathotermes wheeleri* Snyder. This species is named in honor of Harold Kirby, Jr., of Yale University.

Cotypes, soldiers.—Cat. No. 28730, U. S. National Museum; topotypes with Kirby at Yale University.

Nasutitermes (Convexitermes) clevelandi, new species.

Soldier.—Head yellow; somewhat pear-shaped dorsally; convex in profile; with a slight median depression; slightly constricted back of antennae; with fairly numerous, scattered, long hairs and denser shorter hairs. Nasus deep reddish-brown, conical, thick at the base, covered with dense short hairs.

Antenna light yellow-brown; 11 segments, becoming longer and broader toward apex; second, third, and fourth segments approximately subequal; last segment shorter, slender, subelliptical, slightly pointed at apex.

Pronotum pale, tinged with yellow.

Abdomen with tergites tinged with yellow; tergites with dense fairly long hairs and a longer row of hairs at base of each.

Measurements.—Length of entire soldier, 2.4–2.5 mm.; length of head with nasus, 1.05–1.1 mm.; length of head without nasus to anterior margin, 0.65–0.7 mm.; length of nasus, 0.4 mm.; length of pronotum, 0.1 mm.; length of hind tibia, 0.6 mm.; width of head where widest posteriorly, 0.5–0.55 mm.; width of pronotum, 0.32 mm.;

Nasutitermes (*Convexitermes*) *clevelandi* has a less robust nasus than *pallidus* Snyder from Bolivia, the front of the head

at the base of the nasus is less elevated, and the third segment of the antenna is relatively longer.

Type locality.—Barro Colorado Island, C. Z., Panama.

Described from a series of soldiers collected with workers at the type locality on September 5, 1925, by Harold Kirby, Jr. Named in honor of Dr. L. R. Cleveland of The Johns Hopkins University, who has done such excellent work on the intestinal protozoa of termites.

In another colony collected nearby on the same day were nymphs of the sexual winged adults. In these the antenna has 14 segments, the third segment being shorter than the second but longer than the fourth segment; the long diameter of the eye is 0.2 mm.; the length of the hind tibia is 0.75 mm.

Cotypes, soldiers.—Cat. No. 28731, U. S. National Museum; coparatypes with Harold Kirby, Jr., at Yale University.

NEW U. S. LEPIDOPTERA RECORDS WITH NOTES.

By Wm. Barnes and F. H. Benjamin, *Decatur, Illinois.*

Cropia templada Schaus.

Eudipna templada Schaus, Proc. U. S. N. M., vol. 30, 1906, p. 97.
Cropia templada Hampson, Cat. Lep. Phal. B. M., vol. 7, 1908, p. 270, text fig. 42.

Described from Oaxaca, Mexico. The Barnes Collection possesses a single male, Brownsville, Texas (Geo. Dorner), compared by Mr. Schaus with the type and series in the U. S. National Museum.

AZENIA Grote.

Genotype.—Azenia implora Grote.
Azenia Grote, Papilio, vol. 2, 1882, p. 186 (*implora* sole species and therefore type).—Hampson, Cat. Lep. Phal. B. M., vol. 9, 1910, p. 375 (type designated, *implora*).

Hampson places in this genus one Egyptian, two Australian, and two North American species. The exotic species are probably not strictly congeneric with *implora* and possibly need a new genus erected for them.

A. implora has a large trifed corneous process on the frons. *Edentata*, the other included North American species, is discussed below.

STIRIODES Hampson.

Genotype.—Metoponia obtusa Herrich-Schaefer.
Stiriodes Hampson, Cat. Lep. Phal. B. M., vol. 9, 1910, p. 245 (type designated,

obtusa. Under *Stiriodes* Hampson places *obtusa* (*obtusula*), *perflava*, *demo*, *procida* and *umbria*).

The difference between this genus and *Azenia* as exemplified by their genotypes is that *Stiriodes* does not possess the three teeth on the corneous process to the frons. Otherwise the two genera are practically identical.

Stiriodes edentata Grote.

Azenia edentata Grote, Can. Ent., vol. 15, 1883, p. 25.—Hampson, Cat. Lep. Phal. B. M., vol. 9, 1910, p. 378, text fig. 176.

race **procida** Druce.

Metoponia procida Druce, Biol. Centr.-Amer., Het., vol. 1, 1889, p. 304, pl. 28, fig. 11.

Stiriodes procida Hampson, Cat. Lep. Phal. B. M., vol. 9, 1910, p. 248.

form **nepotica** Dyar.

Stiriodes nepotica Dyar, Proc. U. S. N. M., vol. 42, 1912, p. 71.

form **umbria** Druce.

Metoponia umbria Druce, Biol. Centr.-Amer., Het., vol. 2, 1898, p. 491, pl. 94, fig. 28.

Stiriodes umbria Hampson, Cat. Lep. Phal. B. M., vol. 9, 1910, p. 248.

The type of *edentata* is in the Museum of the Brooklyn Institute and we possess a compared specimen. The species is correctly identified in collections, but Hampson's figure of the frons is rather exaggerated, showing the frontal process more serrate than it really is. The frons is, in reality, intermediate, but we prefer to place the species in *Stiriodes* where Hampson has placed conspecific forms heretofore known only from Mexico.

Last season, O. C. Poling collected a very long series of *edentata* in the Baboquivari Mts., Ariz., the specimens ranging from the normal yellow *edentata* to more heavily marked, browner and blackish specimens which seemed to agree with Druce's figures of *procida* and *umbria*. A set of specimens was sent to Mr. Schaus, who matched them with the National Museum series of *procida*, *nepotica* and *umbria*.

While all intergrades between *edentata* and the Mexican forms appear to be present in a large proportion of the material from the Baboquivari Mountains, we have not received the darker forms from other Arizona localities. This would seem to indicate that in at least part of its range *edentata* tended to produce only yellow forms, the darker forms being restricted to the region in the vicinity of the Mexican border and southward. For this reason we are listing the oldest of these darker forms as a race and the remainder of those occurring in the United States as forms of this race, although it should be borne in mind that *edentata edentata* comprises about 30% of the

specimens of this species which were sent us by Poling. In other words, *procida*, considered from normal Arizona material is a geographical race, but, considered from Pima County material is only a color form.

Nocloa alcandra Druce.

Xanthia alcandra Druce, Proc. Zool. Soc. Lond., 1890, p. 515; Biol. Centr.-Amer., Lep., Het., vol. 2, 1898, p. 485, pl. 94, fig. 12.
Nocloa alcandra Hampson, Cat. Lep. Phal. B. M., vol. 9, 1910, p. 254, text fig. 103 (type).

A series of specimens were received from the Baboquivari Mts., Pima Co., Ariz., O. C. Poling, dates 1–15 Aug. to 1–15 Sept., 1923, identified by comparison with the Biologia figure and also sent Mr. Schaus as a check for comparison with his Mexican series.

The species is closer to *pilacho* than to *cordova*. From the former it is easily differentiated because of having a distinct oblique dark shade from the costa, between the t. a. line and the orbicular, to the t. p. line at and below vein 2. *N. cordova* has the ground color paler and brighter, is less heavily powdered, and has the medial region above vein 2, except for the ordinary spots, filled with slate color.

Achaea ablunaris Guenée.

Ophisma ablunaris Guenée, Spec. Gén., Lép., vol. 7 (Noct., III), 1852, p. 237.
Achaea ablunaris Hampson, Cat. Lep. Phal. B. M., vol. 12, 1913, p. 538, text fig. 125.

Described from Columbia. Hampson is presumably correct in listing *restituta* Walker (Cat. B. M., vol. 14, p. 1366) from St. Domingo and Venezuela, *indistincta* Walker (Cat. B. M., vol. 33, p. 1009) from Bogota and *hilaris* Moeschler (Abh. Senck. Ges., vol. 16, p. 202) from Porto Rico, as synonyms.

A single specimen, identified by Schaus, from Brownsville, Texas, is in the Barnes Collection.

Ophisma tropicalis Guenée.

Ophisma tropicalis Guenée, Spec. Gén., Lép., vol. 7 (Noct., III), 1852, p. 238.—Felder, Felder and Rogenhofer, Reis. Nov., 1874, pl. 116, fig. 14.—Hampson, Cat. Lep. Phal. B. M., vol. 12, 1913, p. 544.

Described from Brazil, Cuba and Columbia. The Barnes collection contains a male from Esper Ranch, Brownsville, Tex. (probably collected by Mr. Jacob Doll) and a female from San Benito, Texas, neither specimen dated. The two specimens are quite different in superficial appearance, color, and intensity of maculation, but the course of the lines is identical

in both. Hampson lists *crocimacula* Guenée (Noct. III, p. 239), *detrahens* Walker (C. B. M., vol. 14, p. 1368), *luteiplaga* Walker (l. c., 1369), *confundens* Walker (l. c., 1372), *stigmatifera* Walker (l. c., 1387), *fugiens* Walker (l. c., 1387) and *morbillosa* Felder, Felder and Rogenhofer (Reis. Nov., pl. 116, fig. 15) in the synonymy. We do not know how many of these names can be saved as forms.

Mr. Schaus is responsible for the identification of our pair as *tropicalis*. He notes, "very variable species."

Cutina inquieticolor Dyar.

Taseopteryx inquieticolor Dyar, Ins. Insc. Menst., vol. 10, 1922, p. 169.

Described from material furnished by Mr. Fred Marloff from Stemper, Hillsboro Co., Florida. The insect is not a *Taseopteryx* (Erastriinae), differing on wing-shape, habitus and tuftings. The mid tibiae are spined, throwing the insect into the Catocalinae where it seems to fit well into the genus *Cutina* Walker (*albopunctella* Walker type and only other known species).

Thanks are due to Mr. Marloff for the donation of one of the types of *inquieticolor*. We have another specimen from Greenville, Mississippi (Geo. Dorner), so that the species will probably be found throughout the Gulf Strip division of the Lower Austral faunal zone.

Zale sabena Schaus.

Homoptera sabena Schaus, Ann. Mag. N. H. (7), vol. 8, 1901, p. 42.

A single specimen is in the Barnes Collection from Palmerlee, Cochise Co., Ariz. This has been compared with the type in the U. S. National Museum by both Schaus and Benjamin.

Panula(?) scindens Walker.

Ophiusa scindens Walker, Cat. Lep. Het. B. M., vol. 15, 1858, p. 1829.
Poaphila ordinans Walker, Cat. Lep. Het. B. M., vol. 15, 1858, p. 1837.

Scindens was described from a single male and *ordinans* from two females, all from St. Domingo (Tweedie).

Twenty-three specimens are in the Barnes Collection from Brownsville and San Benito, Texas, April, May, June and Aug., six of these being labeled "Geo. Dorner."

The identification and synonymy is the work of Mr. Schaus, who also informs us that there is a specimen in the Brooklyn Museum from Brownsville, Texas.

The insect does not fit well into the genus *Panula* (type *inconstans*). While a member of the Erebinae by the position of vein 5 of the hind wing, in habitus it is closer to *Isogona* (type *natatrix* Guenée) to which we sink *Parora* (type *texana*

Smith); and appears to be in reality a member of that intermediate group between the Erebinae and the Deltoids which Smith termed Pseudodeltoids.

Euclystis sytis Guenée.

Focilla sytis Guenée, Spec. Gén., Lép., vol. 7 (Noct., III), 1852, p. 333.

Described from Brazil. A specimen is in the Barnes Collection from Corpus Christi, Texas, identified by Mr. Schaus.

The genotype of *Euclystis* is *centurialis*.

Euclystis guerini Guenée.

Focilla guerini Guenée, Spec. Gén., Lép., vol. 7 (Noct., III), 1852, p. 334.—Boisduval and Guenée, Spec. Gen., Atlas, vol. 5–7, 1858, pl. 23, fig. 12.

Described from two males, "Campèche," collections "Guérin-Menneville and M. N." The Boisduval and Guenée figure is apparently not taken from one of the types, being that of a female.

A single specimen, Brownsville, Texas, March 11 (Geo. Dorner), is in the Barnes Collection, having been identified by Mr. Schaus.

Lois lorina Druce.

Polia lorina Druce, Proc. Zool. Soc. Lond., 1890, p. 515.
Catocala juanita Schaus, Trans. Am. Ent. Soc., vol. 21, 1894, p. 241.

One specimen labeled "K. W. Fla." is in the Barnes Collection, probably from a dealer, and may be a tropical specimen wrongly labeled. The name should not be added to our lists, but the "record" is published for what it may be worth, and the species should be looked for in Southern Florida.

For the purpose of those who persist in adding species to U. S. lists on the strength of dealers' material we might well add that we possess many which we believe to be wrongly labeled and quote as an example that there are two males of a *Hypolimnas* in the Barnes Collection labeled "Sulphur Springs, Fla., Geo. Franck" which appear to be an African species and not the same as the Formosa species heretofore distributed by dealers as *H. misippus* from Florida.

The identification of *lorina* and its synonymy is the work of Mr. William Schaus.

Bendis(?) fufius Schaus.

Bendis fufius Schaus, Trans. Am. Ent. Soc., vol. 21, 1894, p. 243.

Described from Coatepec, Mexico. Five males and three females are in the Barnes Collection from Brownsville, Texas,

March, April, November, all but two being labeled "Geo. Dorner."

Mr. Schaus has seen specimens of both sexes and compared them with the U. S. National Museum Collection and types. Our males are much more contrastingly black marked than our females, similar in this respect to *detrahens* and *griseipennis*.

Ephyrodes cacata Guenée.

Ephyrodes cacata Guenée, Spec. Gén. Lép., vol. 7 (Noct., III), 1852, p. 366—Boisduval & Guenée, Spec. Gén., Atlas, vol. 5–7, 1858, pl. 24, fig. 7.

Described from Cuba and Colombia. A single specimen is in the Barnes Collection from Bastrop Co., Texas (O. Meske), identified by Schaus, who notes that it is an extremely variable species.

Isogona natatrix Guenée.

Isogona natatrix Guenée, Spec. Gén., Lép., vol. 7 (Noct., III), 1852, p. 323.
Isogona continua Guenée, Spec. Gén., Lép., vol. 7 (Noct., III), 1852, p. 323.

I. natatrix Guenée was described from "Am. Sept.," and *continua* from Brazil, the former being a ♂ and the latter a ♀.

Two specimens are in the Barnes Collection from Brownsville, Texas, March 11 (Geo. Dorner). One of these is labeled "Probably *continua* Gn. % B. M." in Dr. McDunnough's handwriting. The other specimen was sent, with the questionable determination *continua* on it, to Mr. Schaus, who replied that it was *continua*, but that both names *natatrix* and *continua* referred to a single species.

The species was unknown to Smith (Bull. U. S. N. M., vol. 44, 1893, p. 365), and as far as we are aware, aside from the type of *natatrix*, this is the first unquestionably authentic U. S. record. Holland's figure of "*natatrix*" (Moth Book, pl. 37, fig. 18) is referable to *tenuis* Grote.

Gloveria arizonensis Packard.

Gloveria dentata Hy. Edwards, Pap., vol. 4, 1884, p. 107.—Barnes & McDunnough, Contr. N. H. Lep. N. A., vol. 1 (2), 1911, p. 17, ignot.

Dr. Dyar informed Barnes & McDunnough that *dentata* was a synonym of *arizonensis* but the name was not placed by them in their Revision (1911).

G. dentata was described from a single ♀ (W. Schaus), collection Neumoegen. This type is in the Neumoegen Collection and appears to be a straight synonym of *arizonensis*, having been matched by Benjamin with an Arizona specimen.

A NEW MELANASTUS FROM TEXAS (COLEOPTERA: ELATERIDAE).

By Frank E. Blaisdell, Sr., *San Francisco, California.*

Melanastus texanus, new species.

Form oblong-oval, parallel, about two and a half times as long as wide and quite strongly convex. Color black; under surface of body piceous; antennae, mouth-parts and legs, rufo-piceous, palpi rufo-testaceous. Luster dull, slightly shining. Dorsal surface throughout extremely finely microscopically sculptured (granulato-reticulate). Pubescence inconspicuous, pale in color, exceedingly fine and short, very sparse, scarcely projecting beyond the punctures; about twice as long on the tibiae as on the dorsum. Three or four long flying hairs arising from punctures along lateral margins of the mentum anteriorly.

Head slightly transverse, a little wider than one-half of the width of the pronotum; sides of the front scarcely as prominent as the eyes, evenly and rather strongly arcuate to the feebly defined oblique sutures where the margin is slightly notched, epistomal apex arcuate to arcuato-truncate, margin narrowly deflexed behind the labrum, frontal suture obsolete; front scarcely feebly convex, vertex moderately convex, surface densely punctate, punctures small, well defined, narrowly separated, tending to run in lines converging toward the central area behind the epistoma, the latter more densely punctured apically; a feeble carina is present above the eyes, the latter small, flat and partially divided by the obtuse sides of the front, feebly emarginate posteriorly but more strongly so anteriorly, the upper portion is a little larger than the lower, facets small. Canthi not more prominent than the corneal surface of the eye. Antennae extending to almost basal third of the pronotum, joints two to eight inclusive subcylindrical, last three slightly compressed and slightly wider forming a club, eighth joint as long as wide and subequal in size to the sixth or seventh, third twice as long as wide. Mentum slightly triangularly emarginate at apex, lateral lobes evenly rounded; medial angle of the genae subacute and slightly prominent when the mentum is flexed, or in close contact with it when extended. Mandibles bifid, upper lobe twice as large as the lower.

Pronotum a little more than twice as wide as long, marginal bead entire throughout, except at middle of apex, the latter broadly and arcuately emarginate; apical angles obtusely rounded and not prominent anteriorly; sides evenly and moderately arcuate, converging a little anteriorly, feebly and rather broadly sinuate before the basal angles; base broadly and not strongly arcuate, slightly wider than the apex and a little more widely beaded, angles obtuse and distinct; disk evenly convex, densely punctate, punctures well defined, rather small and slightly irregular, usually separated by a distance equal to about their own diameter, slightly larger laterally, not coalescent although tending to run in longitudinal lines.

Prosternum coarsely punctate, punctures discrete; propleurae coarsely and sparsely punctate but not strongly longitudinally rugulose.

Elytra about a third longer than wide, sides parallel to slightly arcuate; apex obtusely rounded, humeri feebly obtuse and very narrowly rounded, very slightly more prominent than the pronotal angles; base transverse; disk quite

evenly and strongly convex, evenly punctate, striae of punctures quite evident, strial punctures equal to those of the pronotum, interstitial series slightly irregular and smaller in the central area, smallest basally, while laterally and apically they are about the same size as the strial punctures, somewhat confused laterally and apically, separated by a distance equal to four or five times their own diameter, intervals flat. Epipleurae finely and very sparsely punctate. Scutellum small, slightly transverse and impunctate apically. Wings vestigial.

Sterna coarsely punctate. Meso-episternum with large circular and apparently entire punctures, epimera with few small punctures; meta-episternum sparsely punctate, punctures latero-apically smaller than on the meta-sternum, the latter with a pre-coxal line of punctures.

Abdomen smooth and shining, rather evenly punctured, punctures slightly larger laterally and a little denser on the fourth and fifth segments.

Legs moderate in length, femora finely and sparsely punctate. Tarsi moderate in length and stoutness, the anterior not modified in the sexes.

Male evidently smaller and more parallel; female slightly more elongate with sides more arcuate.

Measurements.—(Types) Length, male, 5 mm.; width, 2 mm.; female, 6 mm.; width, 2.5 mm.

Type locality.—Gillespie County, Texas. Collected by R. E. McDonald, June, 1925. Twelve specimens studied.

Type and *paratypes.*—Cat. No. 28850, U. S. N. M. Paratypes also in author's collection.

The species is reported as killing cotton and is therefore of economic importance.

According to Casey's table *texanus* is to be placed amongst those species which have the eyes more coarsely faceted, the pronotum finely but evidently margined at the sides, the latter arcuate and subparallel, distinctly sinuate for a short distance before the basal angles; elytral series of punctures not impressed and quite distinct throughout the width. The luster is dull and therefore falls near *crassicornis* Casey of Humboldt County, California.

By direct comparison *texanus* most closely resembles *exiguus* Casey from Colorado. In the latter the elytral punctures are smaller and more confused, the basal angles of the pronotum are rectangular to slightly acute and the terminal joint of the maxillary palpi appears to be a little more elongate and less broad at apex. A single specimen of *exiguus* Casey is at hand and collected in Colorado.

In *texanus* the elytral series of punctures, both strial and interstitial are quite distinct when viewed longitudinally, the terminal joint of the palpi is more broadly truncate at apex and less elongate and the basal angles of the pronotum are obtuse.

COCCOPHAGUS LECANII (FITCH) ERRONEOUSLY RECORDED FROM JAPAN (HYMENOPTERA).

By A. B. Gahan, *U. S. Bureau of Entomology.*

In January, 1919, a series of scale parasites were received by the Bureau of Entomology from Shonosuke Nakayama of the Imperial Plant Quarantine Service, Yokohama, Japan, which the writer identified as *Coccophagus lecanii* (Fitch). These specimens had been reared by K. Yoshida and S. Takahashi from *Ceroplastes rubens* Maskell at Yokohama, and from *Pulvinaria citricola* Kuwana and *Phenacoccus pergandei* Cockerell at Yokohama and Shidzuokaken, Japan.

A reexamination of these specimens has shown that my identification of this parasite was incorrect. Although closely resembling *C. lecanii*, the species is rather easily distinguished by the color of the legs. In *lecanii* the coxae are all black, the trochanters pallid, the femora black with their apices narrowly whitish, the tibiae mostly pale but sometimes more or less infuscated basally, and the tarsi pale with the apical joint dark. In the Japanese species the front coxae are blackish, the middle and hind coxae mostly white (sometimes slightly fuscous and occasionally mostly blackish), the front trochanters and femora usually fuscous, the middle and hind trochanters and basal one-third to one-half of their femora pallid, the apical half or two-thirds of middle and hind femora black or blackish, all tibiae and tarsi pallid with the bases of tibiae and apical joint of tarsi more or less fuscous. Otherwise the two forms seem to agree. The Japanese specimens agree in every essential with the description of *Coccophagus japonicus* Compere (Bulletin Southern California Academy of Sciences, vol. XXIII, 1924, p. 122) and are without doubt that species.

This misidentification is deeply regretted, the more so because it has apparently become the basis for at least three subsequent references in the literature. The record of *Coccophagus lecanii* from Japan by S. Nakayama (Phil. Jour. of Science, vol. 18, 1921, p. 98), and the repetition of this record by Gahan (Proc. U. S. Nat. Mus., vol. 65, 1924, p. 12) are certainly based directly upon this misidentification and it is almost equally certain that T. Ishii [Bul. 3, Dept. Agri. and Com. Imp. Plant Quar. Service (Japan), 1923, p. 86] was dealing with *C. japonicus* instead of *C. lecanii* in his excellent account of the biology and habits of the parasites of *Ceroplastes rubens*.

So far as now known *Coccophagus lecanii* (Fitch) does not occur in Japan.

Actual date of publication, January 30, 1926

In England, where the capture of a common butterfly is considered an event worthy of published record, there is great excitement among lepidopterists because their pets are getting scarce in some of their usual haunts. There has been a great demand of late for butterfly wings for jewelry and other decorative purposes. As a result collectors have been unusually active and great numbers of certain species have been shipped—or are supposed to have been shipped—from England to dealers in Canada and the United States. The British lepidopterists are greatly alarmed about the "overcollecting" which they fancy threatens the extermination of the species in question; and they have sent out an appeal to the societies of Canada and United States to use their "utmost influence to prevent the threatened extermination." Of course the fancy seems to many of us rather far fetched. We have seen how difficult it is to hold down an insect when all the forces of organized warfare are directed against it, so we are more than sceptical of the exterminating powers of net-collecting; but be that as it may. The joke is on us. We rose to the bait like hungry carp. The American Entomological Society promptly responded with the following:

"*Whereas* there is grave danger of exterminating some of the most beautiful species of insects for use in works of art and jewelry;

"*Resolved*, that The American Entomological Society strongly disapproves of such practice and herewith places itself on record as opposing the use of insects for decorative purposes."

Our British brethren have started something. Over here it is a dangerous business to suggest anything in the nature of a prohibition or regulation. Scratch an American and you find a reformer. Scratch him ever so lightly and you start a mighty regulating itch. I dread to think what shall happen if this latest call gets its due publicity. There are numbers of lady and near-male regulators out of employment. Here will be their opportunity. We may soon have a "Society for the Prevention of Cruelty to Insects," insect game wardens, protected preserves for persecuted caterpillars, arrests of small boys and amateur "bug-hunters," net laws, statutes prohibiting the cruel and promiscuous use of squirt guns,—heaven knows what! Before the thing has gone too far, and in a possibly false direction, we offer a suggestion that may turn the stream of regulation into a desirable channel.

The Japanese Beetle is a beautiful insect. It has, so far, no friends that we know of in this country. It would make a splendid ornament mounted in rings, stick pins, etc. Turn the dreaded forces of commercialism loose upon it. Perhaps they can accomplish with their nets more than we with our high power control-artillery. If so they will earn the gratitude of all who are seriously concerned with the destruction of insect pests; and if the zest of the new pursuit diverts persecution from the poor butterfly, peace will come again to sooth the troubled heart of the amateur lepidopterist.

—*Carl Heinrich.*

Animal Voices, Austin H. Clark, Scientific Monthly, Jan., 1926, pp. 40–48.—This is an extremely embarrassing paper. To review it critically would require several pages and it is hardly worth such extravagance. On the other hand one can not ignore it altogether. It is written in a popular style which makes the author's reasoning clear to all whether they be laymen or men of science. It bears the name of one justly respected for his scientific achievements. It professes to be a serious scientific explanation of certain phenomena. (The explanation is so ingeniously simple that the unthinking might be pardoned for failing to see that it is simply ingenious.) And it so challenges our common sense that we can not afford to give it even the partial consent of silence. We must protest against any method that converts half-truths into all-inclusive, all-exclusive explanations. It is undoubtedly true that certain sounds and colors may be protective. The lion's roar may frighten his enemies, or the bird's pattern hide it from unfriendly eyes; but to assume from such presumptions as these that all animal sounds and colors are nothing but protective or that they are even primarily protective in their nature is simply preposterous. There is a type of mind that rebels at any complexity in the motives or forces behind natural phenomena. It insists upon a single impulse that can be expressed in a simple formula. (The very simplicity of the formula should lead one to doubt its universal application; but this seldom happens.) Such a mind does not arrive at theories or explanations from a careful synthesis of facts. It begins with a theory acquired like faith by some process of interior illumination and thereafter sets itself to square the facts—an easy, fascinating business; but surely not sound science.

We are all too familiar these days with certain sex obsessionists who see the sexual motive as the explanation of everything from a table leg to the aurora borealis, from a baby's squalling to the B minor Mass. Now no one denies the large part that sex plays in the animate world, or that it is more or less involved in all animal and plant behavior; but our sex theory gets a hard bump when we find that it was a loose safety pin and not the Œdipus complex that set the infant yowling and that Bach wrote his music while he was fathering twenty children. So, when our esteemed fellow member tells us that, "like the various colors with which they are adorned, the similarly varied voices of the mammals, birds, and reptiles, amphibians and fishes, and the insects are primarily protective in their nature," we presume to doubt and deny. We have heard the old sow grunting in her gruel, and we have ascribed the music to no more than the expression of gastronomic emotion. And Chanticleer's morning salutation has rung in our ears with such a cocky, carefree lilt that we have heard it simply as a song—the outburst of an egotistic tenor full of the *joie de vivre* and conscious of his voice. Perhaps we were all wrong. Perhaps he was merely saying "keep away" to a chicken hawk. Perhaps the old sow was only frightening competitors from the swill. Perhaps! But it will take something much stronger than a theory to make us believe so.

—*Carl Heinrich.*

VOL. 28 FEBRUARY, 1926 No. 2

PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

CONTENTS

PUBLISHED MONTHLY EXCEPT JULY, AUGUST AND SEPTEMBER

BY THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

U. S. NATIONAL MUSEUM

WASHINGTON, D. C.

Entered as second-class matter March 10, 1919, at the Post Office at Washington, D. C., under Act of August 24, 1912.

Accepted for mailing at the special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized July 3 1918.

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON

ORGANIZED MARCH 12, 1884.

The regular meetings of the Society are held on the first Thursday of each month, from October to June, inclusive, at 8 P. M.

Annual dues for members are $3.00; initiation fee $1.00. Members are entitled to the PROCEEDINGS and any manuscript submitted by them is given precedence over any submitted by non-members.

OFFICERS FOR THE YEAR 1926.

Honorary President . . . . . E. A. SCHWARZ
President . . . . . J. M. ALDRICH
First Vice-President . . . . . J. A. HYSLOP
Second Vice-President . . . . . J. E. GRAF
Recording Secretary . . . . . C. T. GREENE
Corresponding Secretary-Treasurer . . . . . S. A. ROHWER
U. S. National Museum, Washington, D. C.
Editor . . . . . CARL HEINRICH
U. S. National Museum, Washington, D. C.
Executive Committee: THE OFFICERS and W. R. WALTON, A. N. CAUDELL, T. E. SNYDER.
Representing the Society as a Vice-President of the Washington Academy of Sciences . . . . . A. G. BÖVING

PROCEEDINGS ENTOMOLOGICAL SOCIETY OF WASHINGTON.

Published monthly, except July, August and September, by the Society at Washington, D. C. Terms of subscription: Domestic, $4.00 per annum; foreign, $4.25 per annum; recent single numbers, 50 cents, foreign postage extra. All subscriptions are payable in advance. Remittances should be made payable to the Entomological Society of Washington.

An author of a leading article in the PROCEEDINGS will be given 10 copies of the number in which his article appears. Reprints without covers will be furnished at the following rates, **provided a statement of the number desired accompanies the manuscript:**

	4 pp.	8 pp.	12 pp.	16 pp.
50 copies	2.00	4.00	6.00	8.00
100 copies	2.25	4.50	6.75	9.00

Certain charges are made for illustrations and there are available rules and suggestions governing the make-up of articles. Immediate publication in any number may be obtained at the author's expense. **All manuscripts should be sent to the Editor.**

PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 28 FEBRUARY 1926 No. 2

ADDRESS OF THE RETIRING PRESIDENT.

BY R. A. CUSHMAN.

In this heyday of the moving picture the subject that I have selected for my address might well be illustrated by that means. Unfortunately the exigencies of time and other conditions have prevented this, and I present for your approval, and I hope for your pleasure, the next related thing, a scenario illustrated by a few stills and closeups.

PARASITISM:—A SCENARIO IN THREE PARTS.

CAST OF CHARACTERS.—A galaxy of villains, no hero nor heroine, but many victims.

VILLAINS.—*Iseropus*, *Hyposoter*, *Polysphincta*, *Paniscus* } All females and each far more deadly than the male of her species.

VICTIMS.—*Hemerocampa*—a cocoon-spinning caterpillar.
Anisota—a family group of very young caterpillars.
Agrotis—a cutworm—full-grown.
Theridium—a spider.

DIRECTOR.—*Mother Nature.*

ASSISTANT DIRECTOR.—*Instinct.*

Scene.—A sunny glade at the edge of a forest. Against the background of the forest stand smaller trees and bushes. In the foreground low herbage and tall weeds.

Part 1.

Time.—Midafternoon until dusk of a summer day.

In a forked twig of an elm tree Hemerocampa, with most of the hair removed from her body, has just finished the construction of her cocoon and settled herself to a long rest.

On a low hanging leaf of one of the oak trees, the Anisotas, tiny brown creatures covered with black tubercles, and with two long black horns extending forward over the head, are feeding happily.

In her web beneath a dead weed top the small, fat Theridium is poised waiting for an unwary gnat to blunder into its meshes.

Under the edge of a fallen bit of bark the smooth gray cutworm, Agrotis, can be seen taking his afternoon nap.

Into this peaceful scene there fly three slender creatures, two black and one red and dark brown. Each has six legs, two pairs of thin transparent wings, a pair of long, slender, jointed feelers protruding from the head, and at the opposite end a slender, poisoned stiletto, concealed in a sheath. The black one with the elongate oval abdomen and two flattened tubercles on each segment is Iseropus. The other black one with slender pedicelled, somewhat club-shaped abdomen, is Hyposoter. The small one with black head and red and brown body is Polysphincta.

Iseropus flies directly to the elm tree, hovers up and down and around the tree, and finally alights near Hemerocampa's cocoon. With her feelers extended in front and tapping against the bark she moves this way and that until finally she touches the coocoon. Eagerly she tests it all over until, apparently satisfied that it suits her purpose, she takes a firm hold with her feet, arches her abdomen until the stiletto points perpendicularly toward the coocoon, then thrusts it through the meshes. The imprisoned Hemerocampa feels the prick and wages a desperate but hopeless fight. Stabbed repeatedly she sinks gradually into a coma from which she is destined never to recover. Iseropus rests for a few moments while licking up the juices that have followed her weapon from the body of the caterpillar. Again she thrusts it into the cocoon, and soon there drops from near its end an elongate white object. This is shortly followed by another, and another, and yet another until there are a dozen or more. Iseropus now withdraws her stiletto, washes her face and feelers, preens her wings and renews her search for victims.

In the meantime Hyposoter has been flitting about a small oak tree nearby, and, as our fascinated gaze leaves the Hemerocampa cocoon, she alights on the very leaf on which the little Anisotas are feeding. Quickly she discovers them with her sensitive feelers. One after another, only a few escaping, she stabs them leaving them inert and helpless, then flies away. Why this wanton destruction? But, is it destruction? Apparently not, for here one and there another of the Anisotas shows signs of life. Gradually all recover from their fearful experience and go back to eating as busily as ever. But, have they recovered? We shall see later.

In our absorption in the attack on the Anisotas we have forgotten Polysphincta. There she is flying from weed-top to weed-top, and now, just as we again catch sight of her, she comes to the one where Theridium has her home. In exploring it she touches the web. Eagerly Theridium advances to seize her expected prey, but hastily retreats. Polysphincta is all alertness. Slowly and cautiously she advances toward the now cowering spider. In desperation Theridium lunges for-

ward in an attempt to capture and destroy her enemy, but Polysphincta dodges to one side, then again advances. Again and again Theridium attacks, each time failing and each time retreating a little farther. Suddenly Polysphincta leaps, there is a brief rough and tumble fight ending in the sudden collapse of Theridium. Polysphincta crawls to the underside of the spider and stabs it repeatedly in the mouth at the same time licking up with avidity a drop of fluid that oozes from the abdomen of her victim. Her appetite satisfied, she changes her position so that her body is across that of the spider, lays the underside of her abdomen along the side of that of the spider and, after holding this position for a time moves away leaving a tiny oval whitish object glued to the spider. Hardly has she left when Theridium begins slowly and painfully to recover. Gradually she pulls herself to her feet, slowly recovers her strength and again takes up her position in the web and waits apparently as eagerly as before for the unwary gnat.

The sun has dropped below the horizon and dusk replaces the full light of day. Agrotis under the chip of bark stretches himself and, feeling the pangs of hunger, crawls from his retreat to a succulent weed standing close by, and begins his last meal before making a cozy cell in the ground in which to rest and wait for the wings that will carry him hither and yon in cool evenings to come. Suddenly there appears from under a leaf of the plant on which the cutworm is feeding a slender yellowish brown creature flying on broad wings and armed with the same sort of weapon as those of Iseropus and the others. This is Paniscus. She flies down close to the ground and in her fluttering among the plant stems soon discovers Agrotis. Now she alights on the ground and cautiously on tiptoe with her weapon thrust forward she approaches her victim. Sensing danger, Agrotis thrashes his head from side to side in a vain endeavor to frighten Paniscus away. She tiptoes around him seeking an opening and at last steps quickly in giving him a thrust. He tries to run away but the poison has its deadening effect and he soon lies helpless. Grimly Paniscus waits until he is powerless to resist, then she inserts her weapon just back of his head and stands quiet for a time. Now there appears at the base of her stiletto an oval, black, shining object attached by a short stalk to the underside of the stiletto. It slides down to the body of the cutworm. Paniscus withdraws her weapon leaving the black object fastened by its stalk to the skin of Agrotis. Two more of these she places on her victim, then preens herself for a few moments and flies away among the weed stems. Agrotis lies inert for a few moments but finally recovers strength, starts digging into the ground and gradually disappears.

Part 2.

Time.—Beginning a few days later and extending over a period of several weeks.

Hemerocampa still lies motionless in her cocoon; the Anisotas are still feeding voraciously and have grown several times larger; Theridium is still poised in her web with the remains of many gnats entangled in its meshes; and beneath the ground we can see Agrotis ensconsed in his earthen bed.

As we glance again at Hemerocampa's cocoon we detect motion in the white objects placed there by Iseropus, and we see coming from each one a tiny white maggot-like creature. These dispose themselves on the body of Hemerocampa and by looking closely we can see that they are biting at the skin with very minute pointed jaws.

Theridium is still carrying the whitish object glued to her back by Polysphincta, and as we look in her direction we see come from it another creature similar to those in the cocoons of Hemerocampa. It begins immediately to gnaw at the skin of Theridium's abdomen. She tries to dislodge it but can not reach it.

Again we look at Agrotis and find that protruding from a slit in the free end of each of the shiny black things placed on his neck by Paniscus is a brown head and part of a white body. Its jaws have already pierced the skin of the cutworm.

Slow motion camera speeds up events so that we see the maggot-like creatures on Hemerocampa, Theridium, and Agrotis, the last two still holding to their egg-shells, increase enormously in size, their victims decreasing correspondingly until all that is left of them is their dried and crumpled skins. We see the slayers crawl away; those of Hemerocampa to spin a bundle of white cocoons inside that of their victims. The devourer of Theridium, hanging to the spider web by patches of minute hooks on its back, builds a beautiful net-work bag about itself, while the cutworm's slayer makes a dense black one.

All this time the Anisotas have been feeding, but most of them have now stopped and lie listlessly on the leaf. They have not grown nearly as large as the few that are atill feeding on the edge of a nearby leaf. And now a change comes over them. They seem to be inflated while their necks appear shrivelled. Looking at them closely we see that each encloses a white cocoon, within which is a creature much like those in the cocoon of Hemerocampa. It comes to us that these Anisotas are the ones that we saw so viciously attacked by Hyposoter and that those big healthy ones on the other leaf are the ones who escaped her attention.

Part 3.

Time.—A week or ten days later.

Everything is apparently as we last saw it except that there is a hole in one end of each of the cocoons and as we watch there crawls from each not the maggot that we saw make it, but a quite different creature. Each has six legs, two pairs of thin transparent wings, on the head two long slender antennae, and at the opposite end a slender stiletto concealed in a two-parted sheath. From the cocoon of Hemerocampa come about a dozen exactly like Iseropus, from each of the Anisotas one exactly like Hyposoter; from the mesh bag in Theridium's web an exact duplicate of Polysphincta; and from the ground over the earthen cell of the cutworm the double of Paniscus.

We have witnessed the life-cycle of four species of Ichneumon-flies.

By this more or less fanciful and somewhat anachronistic scenario I have attempted to convey to you a picture of the life and habits of a few ichneumon-flies with various habits of attack, oviposition, host relations, and development. It also serves as an admittedly rather long introduction to my real subject:

SOME TYPES OF PARASITISM AMONG THE ICHNEUMONIDAE.

The origin of the parasitic habit in the hymenopterous insects is shrouded in the mists of the dim and distant past. It seems safe to assume that it did not originate on one occasion and one occasion only; the parasitic groups are too diverse to admit of a theory of common origin. It may even be that within a single group, like the Ichneumonidae as we now know it, are lesser groups which have originated at quite different periods and from quite different ancestral forms, and whose present similarity is due to convergence of development resulting from the similarity of the environment and other conditions of the parasitic life rather than from common origin.

Whatever the origin of the various groups of parasitic Hymenoptera we must assume that the carnivorous habit followed the phytophagous habit. We must also, I think, assume that when this change of habit began the Hymenoptera were already a well-defined group distinguishable from the other groups of insects by the same characteristics that distinguish them at the present time. In other words, we must look among the more primitive phytophagous Hymenoptera for clues to the immediate origin of the various groups of parasitic Hymenoptera.

The parasitic habit probably had its origin in the habit practiced by many insects of devouring their fellows. A taste

for such fare was passed on to the progeny of some of these, increasing from generation to generation, until the carnivorous or parasitic habit entirely replaced the phytophagous or plant-eating habit. With the change in method of living and nature of food came certain modifications in form and structure of the larva. Since the egg from which it hatched was placed by the parent in direct contact with the insect that was to furnish it with sustinence the larva had no need for legs with which to move from place to place, no need for strong muscles with which to operate them, and no need for other strong muscles for lengthening and shortening the body in the process of crawling, but muscles only sufficiently strong to permit it to move about in the immediate vicinity of its host and to perform such motions as were necessary in the construction of its cocoon, etc. Its food being soft or fluid and requiring no chewing, it no longer needed strong cutting and grinding jaws, but jaws only strong enough and sharp enough to pierce the skin of its host. No longer needing strong jaws it no longer needed strong muscles to operate them, nor a stiff, strongly arched and heavily braced head capsule to contain and support such muscles.

In living organisms unused or little used structures and organs become lost or atrophied or reduced to size and strength commensurate with their use. The parasitic larva, therefore, lost its legs, acquired small, acutely pointed mandibles and suffered a great reduction in the size and strength of the muscles operating these structures as well as those involved in other movements of the body. Its head lost much of its rigidity and became broad and short. With the loss of strength in the musculature of its body wall its shape was determined by the turgidity furnished by the largely fluid body content. As a natural consequence, instead of being cylindrical and of caterpillar form, it became spindle-shaped, large in the middle and small at each end, more or less curved below, with weakly constricted sutures between the segments of its body.

This, in general, is the form and structure of the full-grown larva of the parasitic hymenopteron.

In the various parasitic groups the larvae have acquired characteristics that differentiate them one group from another.

Within a group further modifications have taken place, so that within, for instance, the family Ichneumonidae are displayed great variations in both form and structure and in habits and manner of living, not only in the adult insects but in all of the preparatory stages. The sometimes very remarkable modifications of the first instar larva and egg are of this later development.

The Ichneumonidae are in very large part parasites of other insects, the comparatively few exceptions to this rule being

parasites of spiders. Some are parasites of larvae and some of pupae, some within the egg-sacs of spiders and some on the spiders themselves.

During its growth the ichneumonid larva passes through several instars, usually five in number; though Timberlake (U. S. Dept. Agr., Bur. Ent. Bull., Tech. Ser. 19, pt. V, 1912) detected only three in *Sesioplex validus* (Cresson) and Tothill (Can. Dept. Agr., Tech. Bull. 3, 1922) a like number in *Hyposoter pilosulus* (Provancher) and *Therion morio* (Fabricius). The present speaker found five in *Thersilochus conotracheli* (Riley) (Journ. Agr. Res., vol. 6, No. 22, 1916), and at least four in *Paniscus* (Proc. Ent. Soc. Wash., vol. 15, 1913, p. 156). Chewyreuv (Parasites and Hyperparasites) observed five instars in the last-named genus but only four in *Amblyteles*.

From the standpoint of position of the parasite in relation to the host the Ichneumonidae are divisible into two main groups: external and internal parasites.

The external parasite deposits its eggs on or near the host and the resulting larva feeds on the host from without by puncturing its skin and sucking its juices through the rupture.

Very little is known of the provisions for breathing on the part of the early instars of externally feeding larvae. The only positive observation that I know of is that of Chewyreuv, who studied all instars of the larva of *Paniscus* for this point. He says that the first instar has one pair of spiracles on the prothoracic segment, the second instar the prothoracic spiracles and a pair on each of the first six abdominal segments, the third instar another pair on the seventh abdominal segment, and the fourth and fifth instars the full complement of prothoracic and eight pairs of abdominal spiracles.

There is great variation among the external parasites in the habit of stinging preparatory to oviposition and in the effect of the sting on the host. Some species do not sting the host at all, others render it only temporarily comatose, while still others sting it into permanent coma or kill it outright.

The internal parasite deposits its egg within the body of the host and the larva feeds on the host from within. It lies in the body cavity of the host feeding on the fluid and semifluid body content in which it lives. It is fitted for breathing in the aqueous medium in which it finds itself, the spiracle being absent or functionless until such time as the exhaustion of the liquid body content of the host makes direct breathing necessary. In some groups the body of the larva in the early instars has a slender caudal extension of the body wall so modified as to serve as a gill. In other groups no such extension or attenuation occurs and possible a relatively large part of the necessary oxygen is obtained in the food consumed. Chewyreuv found that in *Enicospilus*, of which he knew only the first two and

last instars, the first two have no spiracles and the last the full complement of nine pairs. He says that in *Amblyteles* the first instar has no spiracles, but the second instar has the full nine pairs though these are very small. In the attack by the parent parasite the host is rendered at most temporarily comatose, recovering shortly and continuing its normal activities.

Forms of External Parasitism.

Of external parasitism among the Ichneumonidae there are known to me four types.

In the first and least highly specialized of all the types of parasitism the host is either not stung, is permanently paralyzed or is killed outright by the sting of the parent parasite.

The egg is of simple form, usually elongate oval, more or less curved with tough chorion and without pedicel or other special means of attachment to the host. Such an egg is that of *Calliephialtes* sp. (Fig. 12) and all the eggs of parasites of this group known to me are very similar in form. It is deposited on or near the host.

At the time of the attack by the parent parasite the host is enclosed within the tissue of its food-plant, a cocoon, a pupal shell or other medium, into which or through which the parasite thrusts her ovipositor for stinging the host and for deposition of the egg.

The larva of this type of parasite when first hatched is of the form shown in Fig. 11. The head is relatively large with the mouth on the lower anterior margin and a pair of small simple antennae. The body is composed of thirteen segments besides the head. The full-grown larva (Fig. 16) is fat and maggot-like in form with small head. It has spiracles on each side, the first in the intersegmental skin between the prothorax and mesothorax and one on each of the first eight abdominal segments.

Examples of this type of parasitism are the members of the tribes Rhyssini and Ichneumonini. *Megarhyssa lunator* (Fabricius) according to accounts by Lintner in The Country Gentleman, vol. 49, 1884, p. 331, and Riley in Insect Life, vol. 1, 1886, p. 171, indicate that the parent parasite does not necessarily sting (perhaps never stings) the host *Tremex* larva, but simply deposits her egg in the *Tremex* burrow, the larva searching out the *Tremex* and killing it. W. S. Fisher tells me that this coincides with his observations on *Megarhyssa* made some years ago in Pennsylvania. The species of the ichneumonine genus *Tromatobia* and many species of the cryptine genus *Gelis* (formerly *Pezomachus*), as well as certain species of the cryptine tribes Hemitelini and Cryptini, are parasitic within the egg-sacs of spiders, feeding either on the eggs or on the young spiders, which are quite obviously not

severally stung by the parent parasite. *Iseropus coelebs* (Walsh), as probably most of the other members of the tribe Ichneumonini, permanently paralyzes or kills its host preparatory to depositing its eggs. An excellent account of the habits of this species under the name of "*Pimpla inquisitor* Say" is given by Howard in Technical Bulletin 5 of the Bureau of Entomology. The present speaker's paper on "The Calliephialtes Parasite of the Codling Moth" (Journal of Agricultural Research, vol. 1, 1913, pp. 211–237) in an account of another parasite of this type.

Probably few of this type of parasite are, as appears to be the case with *Megarhyssa*, specific enemies of any particular species. The position of the prospective host individual is of nearly or quite as much importance as the systematic position of the host species. Many of the species confine their attack to members of a single insect order, but within that order may have a very wide range of hosts. Thus *Iseropus coelebs* (Walsh), referred to above, parasitizes species of such distantly related lepidopterous genera as *Malacosoma*, *Hemerocampa*, *Notolophus*, *Thyridopteryx*, *Ctenucha*, *Cecropia* and *Olene*, all medium to large Lepidoptera that construct their cocoons in exposed situations. *Epiurus alborictus* (Cresson) is parasitic upon many species of leaf-mining and leaf-folding Lepidoptera. Other species are even less particular as to the nature of their hosts, attacking almost any insect larva that occurs in a suitable place. *Epiurus pterophori* (Ashmead), for example, attacks both lepidopterous and coleopterous borers in weed stems and has also been reared and recorded by Newcomer (Bull. 265, U. S. Dept. Agr.) as a parasite of larvae of the sawfly *Ametastegia glabrata* (Fallen) that had entered the stems of weeds for pupation. Newcomer found that larvae of the sawfly that bored into apples entirely escaped parasitism by this species.

In many, but not all, of the parasites of this group the developmental period is of very short duration, especially that of the larva, there being no apparent synchronizing of the life cycle of the parasite with that of the host. They may thus pass through several generations in a year, using as host whatever suitable species is available.

In a second type of external parasitism the host is only temporarily paralyzed by the sting of the parent parasite, recovering and resuming its customary activities. The egg is fastened to the host by a secretion applied by the parent at the time of oviposition at a point where it is not likely to be knocked off. The larva hatching from this egg, uses the eggshell as a means of holding on. The host is not protected by any extraneous covering at the time of the oviposition. The only examples of this type of parasitism known to me are the members of the tribe Polysphinctini, which are parasitic upon spiders (Figs. 4, 8, 37).

The very usual host relations of the insects of this group have intrigued the interest of many observers, most of them not especially interested in parasites or even in the Hymenoptera; and short notes concerning one or another of the species have frequently appeared in entomological and other scientific periodicals. This interest is so widespread and the specialization of the insects themselves are so remarkable that a rather extensive treatment of the subject in this place is perhaps permissible.

Probably the first recorded observation on the habits of a *Polysphincta* is that of DeGeer published in 1771 (Memoirs pour servir a l'histoire des Insectes, vol. 2, 1771, pp. 863–6) and his crude figure of the cocoon in the center of the spider web probably the first illustration of any feature of the immature life of one of these insects (Fig. 1). He found a common orb-weaving spider with a parasite larva on its back and reared the parasite through to maturity. Curiously enough none of the European Ichneumonologists has since recognized the species but there can be no doubt that it was a Polysphinctine.

Apparently the first to observe the attack of the parasite on the spider was Dillwyn. (Memoranda relating to Coleopterous Insects found in the neighborhood of Swansea, 1829, p. 27.) In a footnote he says: "I have frequently observed a small black species of Ichneumon successively deposit an egg in the abdomen of two or more spiders in the sand-hills near Swansea; and I doubt whether the spider had in any case arrived at its maturity. On one of these occasions I perfectly recollect having seen a young brood of dark-coloured spiders on Crwmlyn Burrows, and that when the Ichneumon hovered over them they appeared alarmed, and instinctively endeavoured to escape." Dillwyn's observation was at fault, for he states that the egg is deposited "in the abdomen." It is interesting, however, to remark that he did note the fact that the spiders had an instinctive fear of the parasite.

Quite naturally the collectors of spiders would be expected to happen upon the immature forms of *Polysphincta* more frequently than the collectors of insects; and so we find one such, John Blackwall, a well known British arachnologist, giving us one of the earliest papers devoted to the subject in his "Account of a Species of Ichneumon whose Larva is parasitic on Spiders" (Ann. and Mag. Nat. Hist., vol. 11, 1843, pp. 1–4). He says "Immature spiders of the species *Epeira antriada* and *Epeira cucurbitina*, and adults of the species *Linyphia minuta* and *Linyphia pusilla* are frequently infested by the larva of a small *Ichneumon*, which feeds upon their juices and ultimately causes their death. This parasite is always attached to the upper part of the abdomen, near its union with the cephalothorax, generally in a transverse but occasionally in a longitudinal direction, and, though it proves a source of constant

irritation, is secured by its position from every attempt of the spider to displace it."

In 1893 McCook (Amer. Spiders, vol. 3, pp. 52–56) writes: "Mr. George Carter Bignell has favored me with an account of the manner in which Drassus lapidicolens Walckenaer was attacked by an ichneumon. While walking in the woods he noticed the spider suspended by a silken drop thread from the bough of a large oak. Looking for the cause of such a situation, he found an inchneumon fly walking cautiously down the thread towards its victim. When close to the spider she touched it with her antennae, whereat Drassus dropped a few inches lower. The fly, having apparently ascertained that she had found a suitable subject, turned round and walked backwards until close to the spider, where she paused a few moments, and then deposited her egg on its abdomen close to the cephalothorax." Practically the same account is given by Bignell himself (Trans. of the Devons. Assn., vol. 30, 1898, p. 14).

In addition to the references cited above there have been many other records published dealing with these insects. Very few of these have contributed additional facts concerning the general habits of the group, but have merely recorded the association of different species of the group with their spider hosts and their specific habits and development.

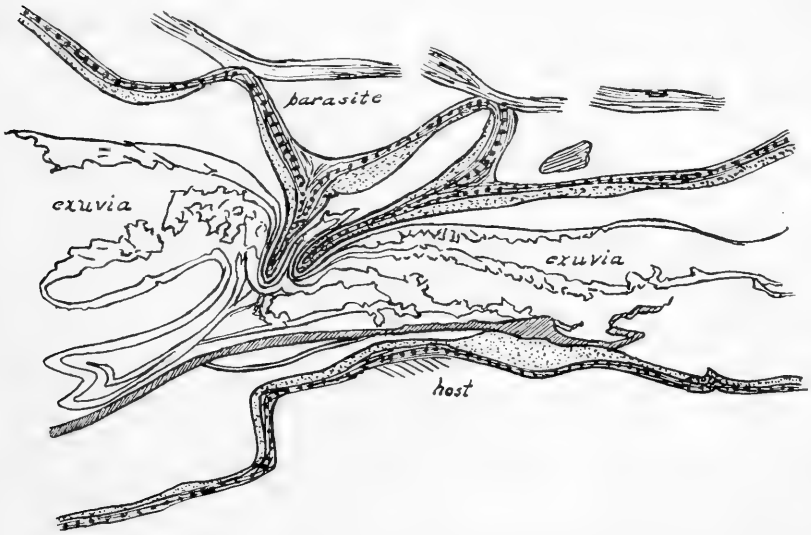
Another arachnologist, E. Nielsen of Copenhagen, produced in 1923 (Saertryk of Entomologiske Meddelelser, 14 Bind., 4–5 Haefte, pp. 137–205) the most exhaustive and best contribution to the subject of the habits of the Polysphinctinae and the modifications in structure associated with their manner of living. Nielsen had the very unusual good fortune of finding in numbers immature stages of several species and made a detailed study of their habits, structure and life history. He observed the oviposition of *Polysphincta eximia* Schmiedeknecht on *Theridium limatum* but not the attack. In oviposition the parasite took up a position with its head opposite the spinnerets of the spider and its ovipositor at the base of the abdomen on the upper side. Nielsen does not describe the egg. In less than an hour the spider had fully recovered from the effect of the sting.

Somewhat more than a year ago I received from a California lady a letter regarding some observations she had made on the habits and life-history of a *Polysphincta*. The subsequent correspondence resulted in her writing for publication a popular account of her observations, which included the complete development from oviposition to eclosion of the adult. Unfortunately this most interesting and delightfully written article has not yet been published and I am unable to quote from it. However, my correspondent sent me living material of both adult parasite, *Polysphincta* (*Zatypota*) *parva* (Cresson), and

spider, *Theridium punctipes* Emerton, and I was able on several occasions to observe the act of oviposition. My observations were made on spiders and parasites confined in test tubes. As soon as the spider became aware of the proximity of the parasite it endeavored to catch her, but on discerning the nature of the intruder retreated into its web, whence it made several vain attempts to catch or frighten away its enemy. The parasite advanced and reconnoitered and finally sprang at the spider and delivered her sting so quickly that I was unable to determine where the spider was stung. Almost immediately after the stinging the spider collapsed. The parasite then took up such a position on the under side of the spider that while she stung it repeatedly in the mouth between the chelicerae she was at the same time licking up a drop of fluid that was exuded from the base of the spider's abdomen. It seems most likely that this fluid indicated the location of the first sting Her appetite satisfied, the parasite changed her position to one across the underside of the spider at its waist and for some time apparently scratched the surface of its abdomen near the base and to one side of the middle with the tip of her ovipositor but did not thrust it through the skin. She then laid her abdomen against that of the spider so that the base of her ovipositor was over the spot where she had been scratching, remained quiescent for a short time and finally crawled away leaving her egg glued to the spot. The egg was about half a millimeter long by about a third as broad and equally rounded at both ends. It was covered with a shellac-like secretion that spread out on the surface of the host a short distance beyond the egg.

Blackwall thought that the parasite larva maintained its position on the spider by means of the mouth and "a viscid secretion emitted from its caudal extremity." This opinion was not refuted until nearly fifty years later, when Borries (Ent. Meddel., vol. 2, pp. 155–161), working with a single preserved parasitized spider discovered that this was accomplished by means of the egg-shell and the larval exuvia (Fig. 3). Nielsen found that the newly hatched larva of *Polysphincta clypeata* Holmgren remains partly enclosed in the egg-shell (Fig. 6). In *Polysphincta eximia* Schmiedeknecht he discovered that each subsequent instar maintains its hold to the exuvium of the last preceding instar by means of two pairs of fleshy projections situated on the ventral surface of the fifth and sixth abdominal segments (Figs. 2, 5) which are telescoped in the corresponding structures in the previous instar. He presents two figures of this mechanism in longitudinal section, of which I reproduce one (text fig.) showing apparently four exuvia beneath the last stage larva. I have been able to corroborate the observations of Borries and Nielsen in the case of *Polysphincta parvae* (Cresson).

In its last instar the polysphinctine larva has on the dorsum paired rounded protuberances bearing minute recurved hooks (Fig. 7 a). The larva spins its cocoon on the spider web and uses these hooks for suspending itself in the web while laying the foundations of the cocoon. Having engaged the hooks on the web the larva retracts the structure within the body, thus retaining a firm hold. The number and arrangement of these dorsal "pseudopods" varies with the species. Nielsen found that there are eight pairs in *Polysphincta eximia* (Fig. 7), *nielseni*, *tuberosa* (Fig. 36), and *clypeata* (Fig. 38), and seven



Longitudinal section of larva of *Polysphincta eximia* Schmiedeknecht showing attachment to host. (Redrawn from Nielsen.)

pairs in *pallipes*. In all of these the first pair is on the metathorax and the others on the first six or seven abdominal segments. In *Polysphincta percontatoria* var. *gracilis*, however, he found only four pairs, placed on the third to sixth abdominal segments.

A third type of external parasitism is in some respects similar to the second type in that the paralysis of the host is only temporary, the host at the time of oviposition is not enclosed in any extraneous covering, and the larva uses the egg-shell as an anchor for maintaining its position on the host, but the egg itself is entirely different, being provided with a pedicel which is thrust through the skin of the host. In the act of oviposition the egg itself is not enclosed in the ovipositor but is fastened to it by the pedicel. Representatives of this type are the Paniscini and probably the true Tryphonini. The habits of the members

of the latter group are very little known except that they are, for the most part at least, parasitic on the larvae of the sawflies, although the habit of certain of them of carrying eggs on their ovipositors is well known to every collector of Ichneumonidae. It is on this habit that the generic names *Polyblastus* and *Monoblastus* of Hartig dating from 1837 are based, *Polyblastus* including originally those species of the old genus *Tryphon* Fallen that carry several to many eggs exposed on the ovipositor and *Monoblastus* those that carry only one egg in this manner. Probably most of them attack the host as a full-grown larva, which later constructs its cocoon. Of *Paniscus*, on the other hand, much has been written and many figures have been published.

Apparently the first to record any biological observations on *Paniscus* was Goedart, who in 1700 (Metamorphoses Naturelles ou Histoire des Insects, vol. 2, p. 163) reared five specimens of what was undoubtedly *Paniscus cephalotes* Holmgren from the caterpillar of the puss moth (*Dicramura vinula*). His figure of the bundle of cocoons from which these specimens emerged is probably the earliest published figure concerning the early stages of this genus.

The next published observation was that of Bonnet in 1755. (Mémoires présentés à l'Académie des Sciences de Paris par divers Sçavans, vol. 2, pp. 281–282). In a paper on two parasites of the puss-moth, he says (I give a free translation): "The second species is the more remarkable. It lives externally on the caterpillar; it appears at first in the form of a little egg, black and brilliant as jet. This little body seems implanted in the caterpillar by a short pedicel. Little by little there emerges from under this sort of shell a soft whitish worm. The worm becomes larger and longer from day to day, but without abandoning its shell. The shell seems to diminish in size, or rather this diminution is only apparent, being due to the comparison that the eye makes between the size of the shell and the size of the worm. Finally the worm molts; then the shell drops and the worm appears much like those that one finds in fruits or in the bodies of different insects. I have not been able to find out to what class it belongs. I have sometimes seen it spin threads after the manner of caterpillars." In 1771 DeGeer (Memoires pour servir a l'histoire des Insectes, vol. 2, pt. 2, pp. 850–861) gave a remarkably accurate account of the habits and development of probably the same species as that observed by Bonnet. He reared from a cocoon of *Dicranura vinula* nine specimens of *Paniscus*. Upon opening the cocoon he found a mass of parasite cocoons and the dry and shrunken skin of the caterpillar. Remarking: "Cependant cette peau m'a fait voir une chose à quoi je ne m'attendois pas et que mérite l'attention d'un naturaliste," he proceeds to examine this cater-

pillar skin and finds several black shells each strongly attached and implanted in the skin by means of a long, slender pedicel, having near its insertion in the skin two or three thickenings suggesting articulations (Fig. 19). To each was attached a white, wrinkled pellicle which he thought was a single exuvium of the parasite larva (Fig. 23). DeGeer illustrated his observations by suprisingly good figures showing the development and anatomical details of *Paniscus*.

Newport (Trans. Linn. Soc. Lond., vol. 21, 1852, pp. 71–76, Pl. VIII, figs, 13–19) gives an extended account of the habits and biology of *Paniscus virgatus* (Fourcroy) as a parasite of *Mamestra pisi*. His principal contribution to the knowledge of the insects of this group is his discovery that the "white pellicle" of DeGeer is composed of the several exuvia of the larva, each telescoped into the preceding one and the first into the egg-shell (Fig. 9).

Many writers have recorded additional observations on the life and habits of *Paniscus*, but the latest and most detailed is a paper by Chewyreuv, "Parasites and Hyperparasites," published in Russia in 1912. A translation of this was made by Jacob Kotinsky, formerly of the Bureau of Entomology, and it is on this translation that the subsequent discussion of Chewyreuv's work is based.

The egg of *Paniscus* is comparatively large, in some species as much as a millimeter in length, broadly oval, dark brown or black depending on the species, and at the caudal end has on the ventral surface a flexible pedicel (Figs. 19, 20, 24, 28, 29, 30). On the dorsal side near the anterior end there is a small weakly chitinized depression with radiating grooves, the micropyle (Fig. 22). Chewyreuv found that the form and structure of the micropyle differs in different species.

In oviposition only the stalk of the egg is within the channel of the ovipositor, the egg itself lying along the ventral side (Fig. 25). The ovipositor is thrust a short distance into the host, serving to thread the pedicel of the egg through the skin. The twisting up of the pedicel after it leaves the ovipositor serves to hold the egg in place while the ovipositor is withdrawn, and the subsequent healing of the wound in the host fastens it still more securely.

The hatching of the larva in *Paniscus* is peculiar in that it at first only protrudes its head from a slit beginning at the micropyle and extending backward along the ventral surface of the egg. The time of hatching has no very intimate relation to the time of deposition of the egg for in some instances the egg may not hatch for several days after deposition while at other times it is already hatched when deposited as shown in Fig. 25.

Paniscus has the habit of throwing off fully developed eggs for which no host has been found, which action is, at least in

part, to avoid the disastrous results following hatching of the eggs within the body of the mother. Chewyreuv recorded one instance of the killing of a female in this manner by her own progeny.

The larva retains its hold on the egg-shell and thus to its host until practically full-grown. This is accomplished by means of a patch of minute forwardly directed spines at the apex of the last abdominal segment (Fig. 46).

The larval stage consists of five instars each telescoped within the last preceding exuvium (Figs. 9–21).

In *Paniscus* and very likely in all of the parasites of this type the attack of the parasite is made on nearly or quite full-grown, free-living host larvae, which thereafter burrow into or some other medium for pupation

The first instar larva of *Paniscus* (Figs. 26, 27) is short and fat with a relatively large and narrow, heavily chitinized head, distinctly constricted at its junction with the body. At each succeeding molt the head becomes relatively smaller and broader and less heavily chitinized. At full-growth (Fig. 13) it is broadest at its junction with the body, much shorter than broad, and hardly more heavily chitinized than the rest of the body. As stated before the first instar has only one pair of spiracles, those on the thorax. These really belong to the mesothorax, but are pushed forward into the intersegmental skin between the prothorax and mesothorax and appear to lie in the prothorax, to which segment Chewyreuv ascribed them. In the second instar six more pairs appear, one pair on each of the first six abdominal segments. The third instar adds another pair on the seventh segment, and the fourth and fifth instars have each another pair on the eighth segment.

Chewyreuv gives a very long and detailed account of the attack and oviposition of *Paniscus cristatus* (Thomson) and *Paniscus ocellaris* Thomson. The female parasite first stings the caterpillar, which attempts to escape by running and rolling but finally succumbs to the effect of the poison. When the caterpillar has been rendered helpless the parasite mounts it, inserts the ovipositor a short distance in the intersegmental skin between the thoracic segments or between thorax and abdomen, and there plants her egg (Fig. 39). Eggs that through faulty instinct are deposited elsewhere do not develop because they can be reached and destroyed by the caterpillar.

A fourth type of external parasitism is very similar to the first type discussed in that the egg is deposited externally with relation to the host. But it differs from the first type in that there is a partial return to the phytophagous habit.

The only known example of this type of parasitism is *Grotea anguina* Cresson, a parasite of the bee *Ceratina dupla* Say, and to S. Graenicher (Ent. News, 1905, pp. 44–46) is due the credit of having discovered the very peculiar habits of this species.

Graenicher says that the egg of *Grotea* is usually placed lengthwise on top of the egg of the bee. The larva of the parasite may emerge either earlier or later than the bee larva, but its first food is the contents of the egg or of the larva as the case may be. Thereafter it feeds for several days on the bee bread stored by the parent bee. This exhausted, it forces its way into the next cell in the nest, killing the bee larva. It usually enters a third cell and frequently a fourth, killing the occupant of each. At the end of about two weeks the parasite larva is full-grown and begins the construction of its cocoon. After clearing a space three or four centimeters long of pith, bee bread, etc., it builds a hard partition at each end of the burrow and lines the burrow with a thin layer of silk. In this cocoon it passes the winter emerging as an adult in time to attack the next generation of *Ceratina*. Unfortunately Graenicher describes only the egg of *Grotea* and his article is without illustrations. He says the egg is hardly half as long and a fourth as thick as that of the bee, which he describes as about two and a half mm. long and one mm. thick.

Forms of Internal Parasitism.

You will remember that in our general description of internal parasitism we stated that the egg of the parasite is deposited and the larva feeds within the body of the host, that the body of the larva in its early instars is modified for breathing in an aqueous medium and that the host is not or is only temporarily comatose after the oviposition of the parasite.

Of this general group there are at least five divisions or types among the Ichneumonidae. In the least highly specialized type the host is attacked in a late stage of its development, full-grown larva or pupa, and the development of the parasite is not closely synchronized with that of the host. The entire developmental period is passed within the host, and the parasite makes very little if any cocoon. Pupation takes place in the pupa of the host. To this class belong the members of the tribe Ephialtini and probably those of the tribe Theroniini.

The egg is practically identical in form and structure with that of the first type of external parasite.

These parasites are very catholic in their selection of hosts though normally confined to the Lepidoptera. Within this order, however, they seem to have little choice. *Itoplectis conquisitor* (Say), for example, is known to parasitize a great many species in both macrolepidoptera and microlepidoptera.

The members of the subfamily Joppinae, which includes the large genus *Amblyteles*, appear to represent a somewhat different type of parasitism from that of the Ephialtini in being more highly specialized for the internally parasitic life. As

is well known the adult parasite emerges from the chrysalis of the lepidopterous host. The only detailed observations that I know of on the life and development of a member of this group are those of Chewyreuv. He states that the host is attacked in the last larval instar by *Amblyteles* and *Ichneumon* (old sense), and he gives accounts of the attack by both *Ichneumon sarcitorius* Linné and *Amblyteles vadatorius* Illiger. The egg of each has a very thin, colorless, transparent chorion (Fig. 33). He does not give measurements of the egg, but from the small size of the newly hatched larva (Fig. 32) it is much smaller in relation to the size of the adult insect than is that of *Itoplectis*.

According to Chewyreuv the newly hatched larva of *Amblyteles vadatorius* (Fig. 35) has a relatively large, heavily chitinized yellow head with white body. The body tapers backward from the head and consists of twelve segments, of which the last has a transverse groove so that the body seems to be thirteen-jointed. There are no spiracles. The antennae are represented by hyaline circles on the upper side of the head. In the second instar, which is in general very much like the preceding, the spiracles appear to the full complement of nine pairs. The author does not say whether or not he considers them functional, merely describing them as very small and, according to Kotinsky's translation, "bung-shaped." The third instar, judging from the head shield, which was all that he knew of it, Chewyreuv says is much like the second. The fourth and, according to the author, the last instar (Fig. 31), judging by his figures is of somewhat different form with relatively smaller head and much larger spiracles.

In a third type of internal parasitism the specialization for the internally parasitic habit has gone much farther, especially in the early larval instars. Oviposition of the parasite takes place when the host is in the larval stage, frequently very young, the development of the parasite proceeds along with that of the host, the adult of the parasite emerges from a later instar of the host larva or from the host pupa. The development of the parasite is frequently so closely synchronized with that of the host that the parasite matures at the time when the host is in the proper stage of development for parasitization. Examples of this type of parasitism are to be found in the Ophionine tribes, Campoplegini and Porizonini, probably also in other tribes of this subfamily, certain Tryphoninae, and possible in the Ichneumonine tribes Lissonotini and Glyptini.

The egg is relatively small, elongately oval and more or less curved (Fig. 10).

The first instar larva is frequently very slender and has the area of the body surface further relatively increased by an extension of the last abdominal segment into a longer or shorter

tail-like appendage. The head is relatively very large and heavily chitinized, narrowly attached to the body and with the mouth on the anterior ventral surface (Figs. 17, 45, 47). Spiracles are absent. During this instar the larva increases very greatly in size with the head and sometimes the tail retaining their original size (Fig. 15). With its first molt the larva of *Thersilochus* was found by Cushman to entirely change its appearance, the head becoming broader and shorter, the mouth parts very weak, and the tail disappearing entirely (Fig. 14). The third instar larva is very similar to the second, differing practically only in size. The fourth and fifth instars (Fig. 18) are of the typical ichneumonid form, the last leaving the body of the host and spinning its cocoon in the underground cell made by the host larva.

Timberlake (Bur. Ent., Tech. Ser. Bull. 19, part V, 1912), in a study of (*Limnerium*) *Sesioplex validus* (Cresson), and Tothill (Dept. Agr. Canada Tech. Ser. Bull. 3, 1922), working with (*Campoplex*) *Hyposoter pilosulus* (Provancher), each distinguished only three larval instars. Both found the second instar to be quite similar to the first but with shorter tail (Fig. 43). Tothill states that the spiracles first appear in the third instar. Timberlake thought the caudal appendage in the first two instars to be a blood gill, but Tothill showed that the dorsal blood vessel does not enter the appendage, but that instead it is a tracheal gill, being completely filled with tracheids which are connected directly with the tracheal system (Figs. 48, 49), and each at its distal end penetrating the basement membrane of the body wall into an air chamber formed of a single very large hypodermal cell. These disappear in the third instar, when the spiracles become functional (Fig. 50).

A fourth type of internal parasitism, exemplified by *Therion morio* (Fabricius) differs from the last type discussed in that the egg, instead of being simply deposited loosely in the body cavity of the host is fastened to the inside of its body wall by a tab or cushion on one side of the egg, which differs further from that of the simpler type of internal parasites by being greatly prolonged at the caudal end (Fig. 42). Tothill thought the attachment pad to represent the micropyle, on what basis he does not state.

This type of parasitism differs from the simpler type also in that the first instar larva is enclosed within a membraneous sac (Fig. 41) which Tothill considered to be the embryonic membrane, and he therefore terms this instar "the feeding embryo." This sac also is fixed to the inside of the body wall of the host. The function of breathing is accomplished in the same manner as in *Hyposoter* (Fig. 44). The larva remains in the first instar until long after the host has pupated.

In the second instar the larva leaves the sac and thenceforth lives free in the fluid body content of the host. From this time on this type of parasitism does not differ essentially from the last type discussed. Tothill found three larval instars in *Therion*.

Of the last type of internal parasitism that I shall discuss there is so far as is at present known only one instance, *Diplazon laetatorius* (Fabricius), although it is probable that the habits throughout the tribe Diplazonini are the same. This knowledge concerning the parasitic life of *laetatorius* is very meagre. It has long been known that this species, as well as many others of the same tribe, are internal parasites of the dipterous family Syrphidae, emerging from the puparium. But in 1914 Kelly (Journ. Econ. Ent., vol. 7, pp. 294–297) brought out the fact that the parasite deposits her egg in the egg of the host, thus passing in its development through three of the stages of its host.

It is quite probable that there will be found among the Ichneumonidae other types of parasitism differing in some important particular from any of those that I have discussed; but I have summarized all those types of which I have first-hand knowledge or which I have been able to find discussed in literature. It is evident from the paucity of the published accounts of this phase of Ichneumonology that much remains to be done and should be done.

I have purposely refrained from any detailed discussion of the comparative morphology of the larvae in the various types of parasitism and also of the modifications in the adult insects associated with the different parasitic habits, partly because its inclusion in this address would have resulted in too great length and partly because such information as is available is too fragmentary and in considerable part too inaccurate to be used as a basis for conclusions.

But from what little study I have made of the immature stages of insects of this group it is evident that there is here available much of value in the determination of relationships within the group.

Explanation of Plate 2.

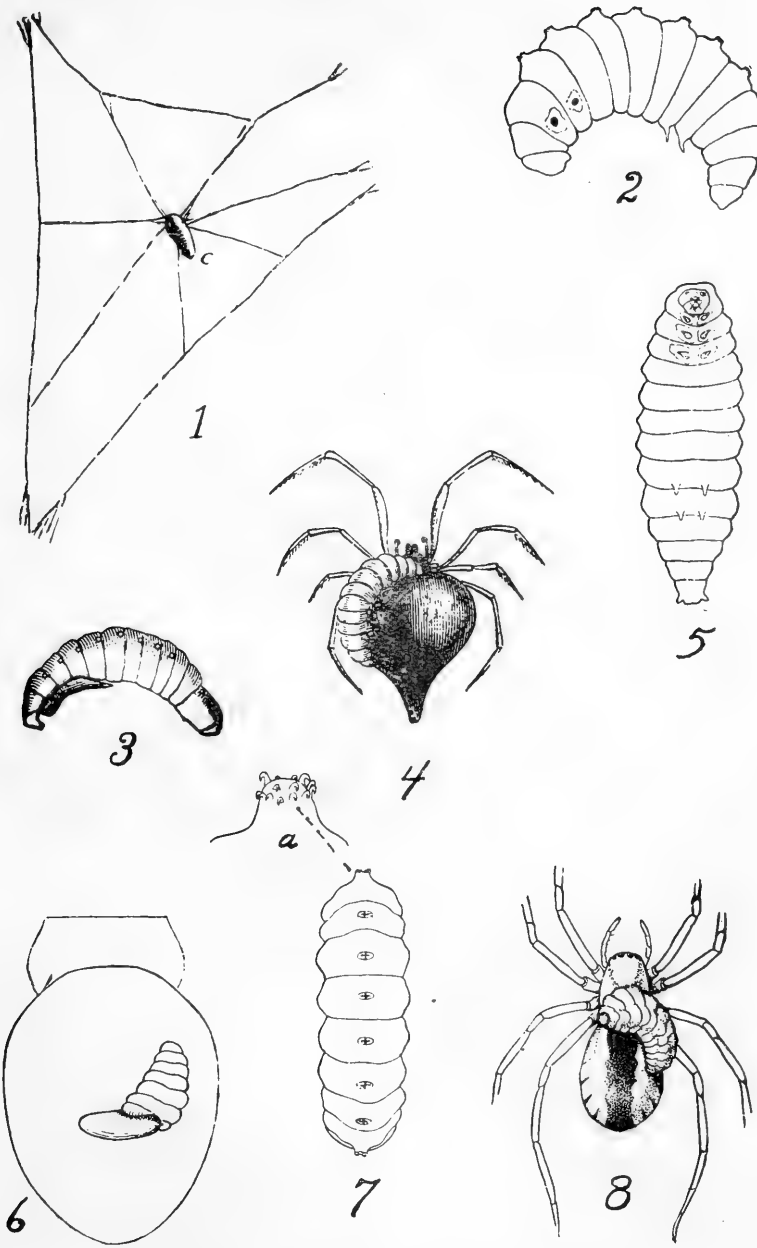
Fig. 1.—Cocoon of a polysphinctine. (After DeGeer.)

Fig. 2.—Larva of *Polysphincta eximia* Schmiedeknecht showing ventral processes for attachment to host—lateral view. (After Nielsen.)

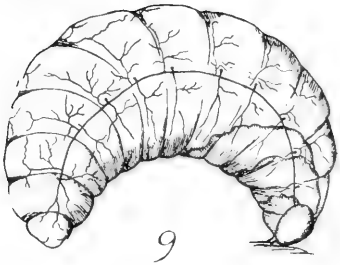
Fig. 3.—*Polysphincta* larva showing attachment to host by means of exuvia. (After Borries.)

Fig. 4.—A Ceylonese spider with its parasite. (After Green.)

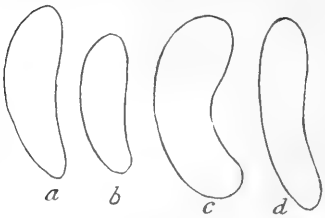
Fig. 5.—Larva of *Polysphincta eximia* Schmiedeknecht showing ventral processes for attachment to host—ventral view. (After Nielsen.)



CUSHMAN—SOME TYPES OF PARASITISM.



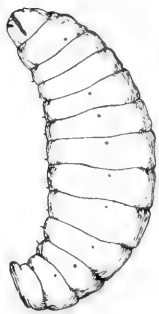
9



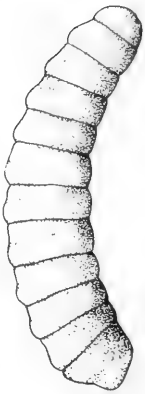
10

11

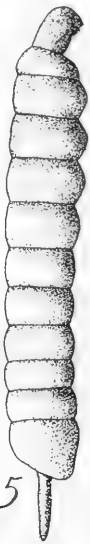
12



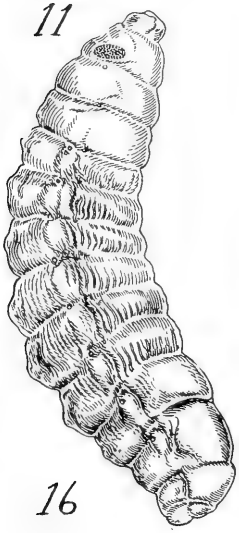
13



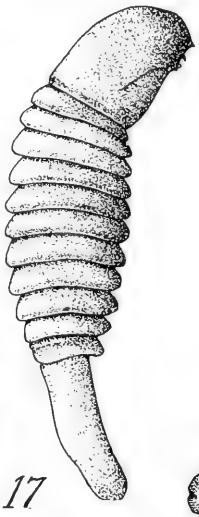
14



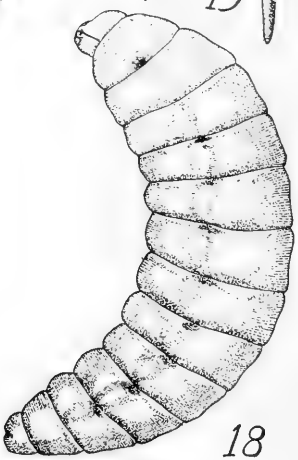
15



16



17

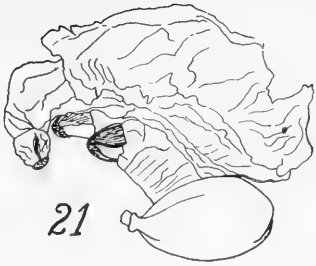


18

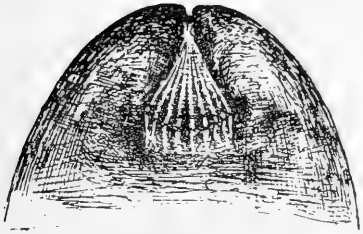
CUSHMAN—SOME TYPES OF PARASITISM.

19

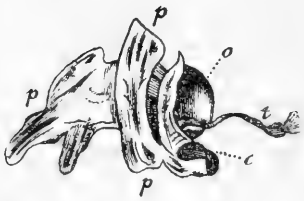
20



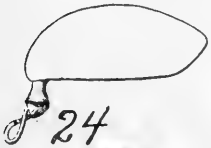
21



22



23



24

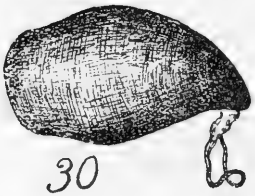
25

26

27

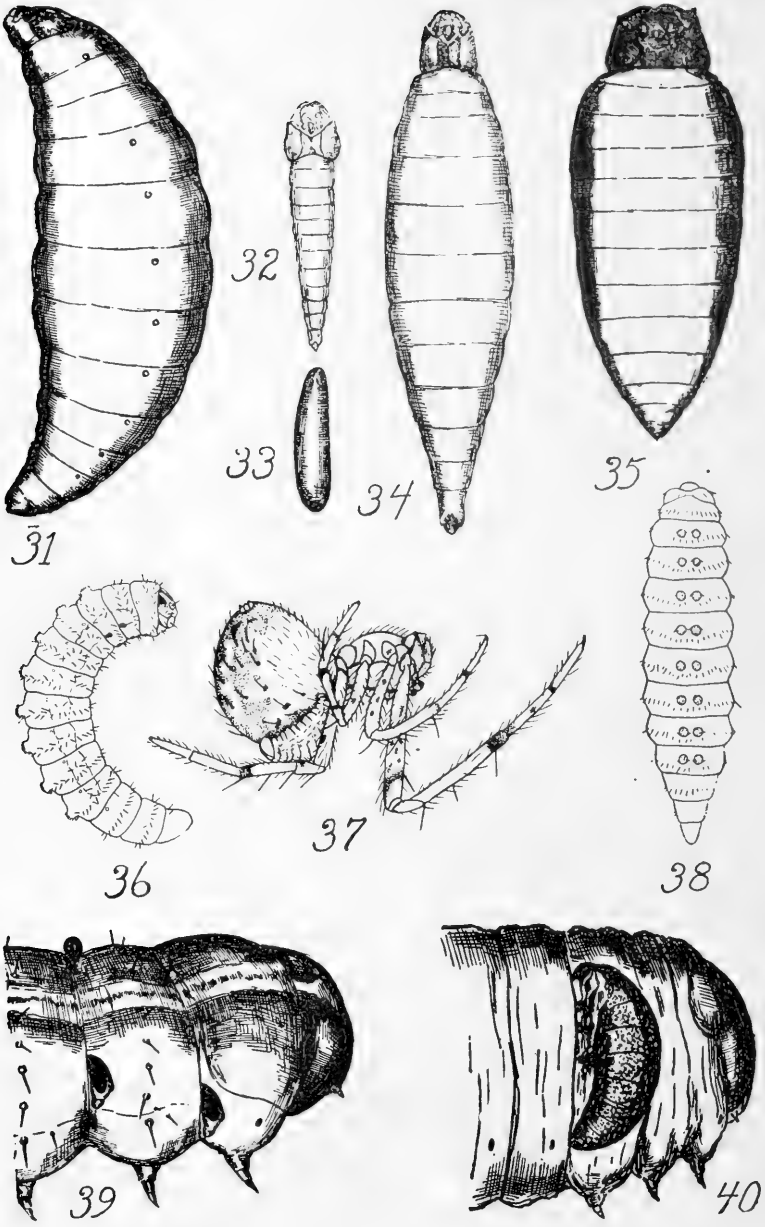
28

29

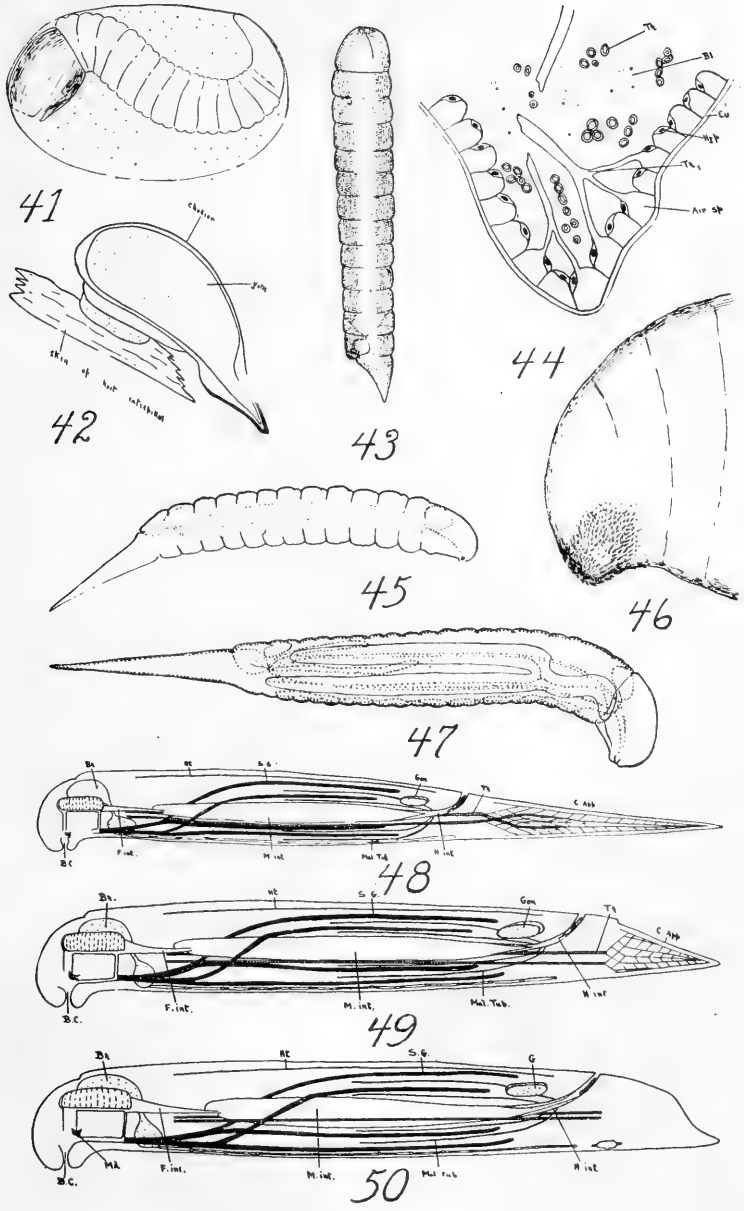


30

CUSHMAN—SOME TYPES OF PARASITISM.



CUSHMAN—SOME TYPES OF PARASITISM.



CUSHMAN—SOME TYPES OF PARASITISM.

Fig. 6.—Newly hatched larva of *Polysphincta clypeata* Holmgren showing part of body still enclosed in egg-shell. (After Nielsen.)
Fig. 7.—Larva of *Polysphincta eximia* Schmiedeknecht showing "dorsal pseudopods"; *a*—a single "pseudopod" in lateral view. (After Nielsen.)
Fig. 8.—*Linyphia communis* with larva of polysphinctine parasite. (After Howard.)

Explanation of Plate 3.

Fig. 9.—Fourth instar larva of *Paniscus virgatus* (Fourcroy) showing exuvia of three previous instars. (Redrawn from Newport.)
Fig. 10.—Forms of eggs of internal parasites: *a*—*Thersilochus conotracheli* (Riley); *b*—*Mesoleius balteatus* Cushman; *c*—*Campoplex tortricidis* Cushman; *d*—*Dioctes obliteratus* (Cresson).
Fig. 11.—Newly hatched larva of *Calliephialtes* sp. (After Cushman.)
Fig. 12.—Egg of *Calliephialtes* sp. (After Cushman.)
Fig. 13.—Full-grown larva of *Paniscus cristatus* Thomson. (Redrawn from Chewyreuv.)
Fig. 14.—Second instar larva of *Thersilochus conotracheli* (Riley). (After Cushman.)
Fig. 15.—First instar larva of *Thersilochus conotracheli* (Riley)—fully fed. (After Cushman.)
Fig. 16.—Prepupa of *Calliephialtes* sp. (After Cushman.)
Fig. 17.—Newly hatched larva of *Thersilochus conotracheli* (Riley). (After Cushman.)
Fig. 18.—Full-grown larva of *Thersilochus conotracheli* (Riley). (After Cushman.)

Explanation of Plate 4.

Fig. 19.—Egg of *Paniscus*. (After DeGeer.)
Fig. 20.—Egg of *Paniscus pallens* Cushman. (After Cushman.)
Fig. 21.—Larval exuvia of *Paniscus pallens* Cushman attached to egg-shell. (After Cushman.)
Fig. 22.—Micropyle of egg of *Paniscus ocellaris* Thomson. (After Chewyreuv.)
Fig. 23.—Egg-shell of *Paniscus* with larval exuvia attached. (After DeGeer.)
Fig. 24.—Egg of *Paniscus testaceus* Gravenhorst. (After Martelli.)
Fig. 25.—Oviposition of *Paniscus cristatus* Thomson. (After Chewyreuv.)
Fig. 26.—First instar larva of *Paniscus virgatus* (Fourcroy). (After Newport.)
Fig. 27.—First instar larva of *Paniscus ocellaris* Thomson. (After Chewyreuv.)
Fig. 28.—Egg of *Paniscus ocellaris* Thomson. (After Chewyreuv.)
Fig. 29.—Egg of *Paniscus cristatus* Thomson. (After Chewyreuv.)
Fig. 30.—Egg of *Paniscus testaceus* Gravenhorst. (After Chewyreuv.)

Explanation of Plate 5.

Fig. 31.—Full-grown larva of *Amblyteles vadatorius* (Illiger). (After Chewyreuv.)
Fig. 32.—Newly hatched larva of *Ichneumon sarcitorius* Linné. (After Chewyreuv.)
Fig. 33.—Egg of *Ichneumon sarcitorius* Linné. (After Chewyreuv.)

Fig. 34.—Fully fed first instar larva of *Ichneumon sarcitorius* Linné. (After Chewyreuv.)
Fig. 35.—First instar larva of *Amblyteles vadatorius* (Illiger). (After Chewyreuv.)
Fig. 36.—Larva of *Polysphincta tuberosa* Gravenhorst. (After Nielsen.)
Fig. 37.—*Theridium punctipes* Emerton with larva of *Polysphincta parva* (Cresson). (Drawing by Eleanor T. Armstrong.)
Fig. 38.—Larva of *Polysphincta clypeata* Holmgren. (After Nielsen.)
Fig. 39.—First instar larvae of *Paniscus cristatus* Thomson *in situ* on host. (After Chewyreuv.)
Fig. 40.—Fourth instar larva of *Paniscus in situ* on host showing exuvia of first three instars. (After Chewyreuv.)

EXPLANATION OF PLATE 6.

Fig. 41.—First instar larva of *Therion morio* (Fabricius) in its sac. (After Tothill.)
Fig. 42.—Egg of *Therion morio* (Fabricius). (After Tothill.)
Fig. 43.—Second instar larva of *Hyposoter pilosulus* (Provancher). (After Tothill.)
Fig. 44.—Diagram of tracheation of caudal appendage of young larva of *Therion morio* (Fabricius). (After Tothill.)
Fig. 45.—First instar larva of *Hyposoter pilosulus* (Provancher). (After Tothill.)
Fig. 46.—Apex of abdomen of larva of *Paniscus ocellaris* Thomson. (After Chewyreuv.)
Fig. 47.—First instar larva of *Sesioplex validus* (Cresson). (After Timberlake.)
Fig. 48.—Diagram of first instar of *Hyposoter pilosulus* (Provancher) showing tracheation of caudal appendage. (After Tothill.)
Fig. 49.—Same, second instar. (After Tothill.)
Fig. 50.—Third instar of same showing lack of tracheation. (After Tothill.)

CHANGE OF NAME IN ISOPTERA.

By THOS. E. SNYDER, *U. S. Bureau of Entomology.*

In a paper entitled "New Termites from Guatemala, Costa Rica and Colombia" (Jour. Wash. Acad. Sci., vol. 16, No. 1, pp. 16–28, Jan. 4, 1926), the writer described (p. 23) a termite from Costa Rica under the name *Kalotermes* (*Calcaritermes*) *thompsonae*. Since the name *thompsonae* is preoccupied in the genus *Kalotermes* by *K.* (*Cryptotermes*) *thompsonae* Snyder (which I have made a synonym of *K.* (*Cryptotermes*) *dudleyi* Banks), I therefore propose for *Kalotermes* (*Calcaritermes*) *thompsonae* the name—

Kalotermes (Calcaritermes) fairchildi, new name.

Dr. David Fairchild, Agricultural Explorer of the United States Department of Agriculture, has made important investigations of termites, and I take pleasure in naming this species after him.

A NEW COLEOPHORA FROM NEW YORK (LEPIDOPTERA: COLEOPHORIDAE).

By Carl Heinrich, *U. S. Bureau of Entomology.*

The following was received from Mr. E. A. Hartley of the New York State College of Forestry with request for a name.

Coleophora albovanescens, new species.

Antenna with large basal tuft; white annulated with pale drab brown; basal tuft with a slight ochreous or smoky shading beneath and sometimes above towards extremity. Palpus white with a few pale drab scales along upper edge. Face and head white. Thorax white with a fine median longitudinal line of yellow scales (in type) or a rather broad median yellow patch (in paratypes); tegula white, more or less tinged with yellow at extremity. Forewing yellow striped with white and (in paratypes) with more or less shading of fuscous toward costa and apex; white markings variable, consisting of a rather broad stripe along costa from base to end of cell, another on basal half of dorsum, a thinner and longer stripe along vein 1c, a short median stripe from middle of cell to base of vein 3, a couple of indistinct lines of white scales in apical third and a scattering of coarse white scales at base of cilia (these markings are most pronounced in the type while in one of the paratypes they are overlaid with dark scaling and nearly obsolete); cilia pale glossy brown. Upper side of hind wing and under sides of fore and hind wings a uniform dark brown. Legs white with tarsi faintly annulated; hind tibiae more or less shaded with pale ochreous drab.

Alar expanse.—13–14 mm.

Type.—Cat No. 28924, U. S. N. M.
Type locality.—Cranberry Lake, New York.
Food Plants.—Yellow Birch and Beech.

Described from male type, one male and one female paratypes all from the type locality; the type reared from yellow birch ("7–3–25" E. A. Hartley) and the two paratypes from beach ("7–12–25" and "7–21–25," E. A. Hartley).

The larvae are external feeders and the larval case is of the "pistol" type, black and similar to that of *tiliaefoliella* Clemens, with postol handle turned down abruptly (at right angle with upper edge); upper edge straight; lower edge somewhat irregular; barrel of case broadening towards handle; flaps present, small, appressed; mouth but slightly deflected; 7–8 mm. long.

An easily recognized species. As the species are arranged in Forbes' "Lepidoptera of New York and Neighboring States" (Cornell Univer. Agr. Exp. Sta. Memoir 68, 1923), it would come between *nigralineella* Chambers and *tiliaefoliella* Clemens.

Actual date of publication, February 26, 1926.

EDITORIAL.

In our modern world the soundest of principles often suffer through exaggeration and misapplication. We torture them out of shape to make them cover a host of alien things. So with Democracy. From a principle we have transformed it into a cult, a kind of universal religion that we feel obliged to profess at all times and in all places, and to whose precepts appeal for judgment and direction of our acts—at least of such acts as have any social consequence. In actual practice we do as men have ever done, live comfortably under the faith without fulfilling it any too faithfully. In one respect, however, we are consistent. Deducing, with a kind of perverse logic, from a special truth to a general application of it, we attempt to apply the democratic principle to some things to which it definitely does not apply. Science is one of these. Science is essentially aristocratic. It is something for the many but of the few and by the very few. It does not submit either its findings or its methods to the judgment of the masses or the classes or to the peculiar standards of any age. It does not even recognize the right or propriety of scientists to set up among themselves a court of demos. Its immediate appeal is to the best few, the most intelligent, the most idealistic. Its ultimate appeal is to the test of time—the ordeal of experiment. Its standard is the highest possible achievement. Its objective—truth. It reserves to itself the fullest freedom to examine all things, to revise its judgments and—if greater knowledge warrants—to completely reorder itself. It acknowledges obligation to serve the necessities of man; but it does not admit the right of these necessities either to define its liberties or to restrict its field of inquiry. It has a valid place in a democratic world, but it is not in itself democratic, nor does it admit into its constitution the fundamental principle of democracy—the rule of the many. It should not, therefore, if it is to remain true to itself, be entirely dependent for support upon the caprices of the many, upon the fees it can earn as a practical servant of public or private interest. It should have a support that will enable it always to maintain its freedom, that will allow it (whatever else it may do besides) to continue the search for truth unhampered by economic considerations of the moment or the whims of majorities. As research pure and simple it has a right of its own.

—*Carl Heinrich.*

NOTES AND NEWS ITEMS.

A List of British Aphides, J. Davidson, 1925, Longmans, Green and Co., pp. I–IX, 1–176; price, $4.50.—This is one of the Rothamsted Monographs on Agricultural Science. Section I of the book gives a list of the species, with their important synonyms, their food plants and distribution in Britain, and references to the best writings on each species. Section II contains a list of the genera used, with references to original descriptions, together with synonyms and critical notes. Section III is a list of the host plants, with the species of aphids found on each. Section IV is a rather complete bibliography of the important literature dealing with the biology and systematic study of the species concerned.

The type is pleasingly large. Valid specific names are in bold face, synonyms in italics.

To the economic entomologist this will prove to be a very valuable reference book. To the specialist on aphids it will be very useful when he is considering British and European forms, many of which are known at present only from rather poor descriptions. While the generic placing of all of the species probably could not please all taxonomists, this does not detract from the value of the work. A few typographical errors in page references are easily overlooked. It is, on the whole, a most valuable book. One can only wish that the species of the entire world could be treated in as careful a manner.

—*P. W. Mason.*

VOL. 28 MARCH, 1926 No. 3

PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

CONTENTS

PUBLISHED MONTHLY EXCEPT JULY, AUGUST AND SEPTEMBER

BY THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON
U. S. NATIONAL MUSEUM
WASHINGTON, D. C.

Entered as second-class matter March 10, 1919, at the Post Office at Washington, D. C., under Act of August 24, 1912.

Accepted for mailing at the special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized July 3 1918.

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON

ORGANIZED MARCH 12, 1884.

The regular meetings of the Society are held on the first Thursday of each month, from October to June, inclusive, at 8 P. M.

Annual dues for members are $3.00; initiation fee $1.00. Members are entitled to the PROCEEDINGS and any manuscript submitted by them is given precedence over any submitted by non-members.

OFFICERS FOR THE YEAR 1926.

Honorary President . . . . . E. A. SCHWARZ
President . . . . . J. M. ALDRICH
First Vice-President . . . . . J. A. HYSLOP
Second Vice-President . . . . . J. E. GRAF
Recording Secretary . . . . . C. T. GREENE
Corresponding Secretary-Treasurer . . . . . S. A. ROHWER
U. S. National Museum, Washington, D. C.
Editor . . . . . CARL HEINRICH
U. S. National Museum, Washington, D. C.
Executive Committee: THE OFFICERS and W. R. WALTON, A. N. CAUDELL, T. E. SNYDER.
Representing the Society as a Vice-President of the Washington Academy of Sciences . . . . . A. G. BÖVING

PROCEEDINGS ENTOMOLOGICAL SOCIETY OF WASHINGTON.

Published monthly, except July, August and September, by the Society at Washington, D. C. Terms of subscription: Domestic, $4.00 per annum; foreign, $4.25 per annum; recent single numbers, 50 cents, foreign postage extra. All subscriptions are payable in advance. Remittances should be made payable to the Entomological Society of Washington.

An author of a leading article in the PROCEEDINGS will be given 10 copies of the number in which his article appears. Reprints without covers will be furnished at the following rates, **provided a statement of the number desired accompanies the manuscript:**

	4 pp.	8 pp.	12 pp.	16 pp.
50 copies	2.00	4.00	6.00	8.00
100 copies	2.25	4.50	6.75	9.00

Certain charges are made for illustrations and there are available rules and suggestions governing the make-up of articles. Immediate publication in any number may be obtained at the author's expense. **All manuscripts should be sent to the Editor.**

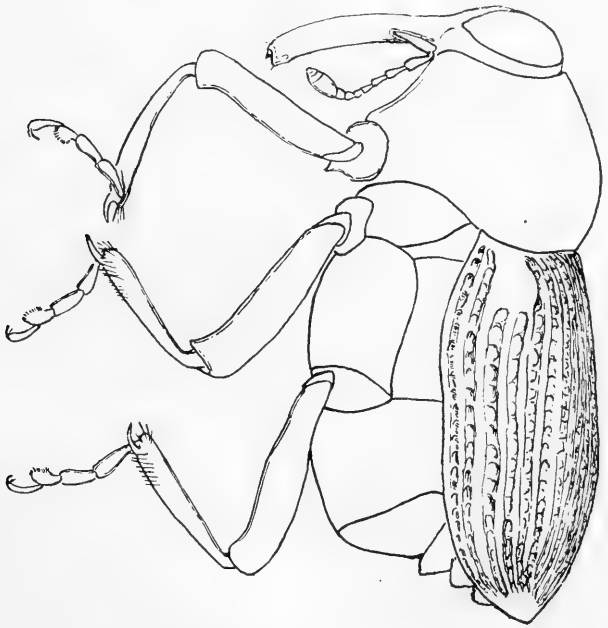
PROCEEDINGS OF THE
ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 28 MARCH 1926 No. 3

A NEW COTTON WEEVIL FROM PERU.

By H. S. Barber, *U. S. Bureau o Entomology.*

The identification of samples of a small Zygopid weevil, accompanied by larvae, pupae, and parasites, having been requested, the following description is offered to permit the correlation of the two succeeding papers. Dr. C. H. T. Townsend, who submitted the samples, states that the species breeds in cotton, attacking the stem at the surface of the ground, and that the larvae bore to the center of the stalk, causing the plant to fall over.



Eulechriops gossypii, n. sp.

The genotype of *Eulechriops* Faust, 1896, is unknown to me, but the species here described follows the characters given by

Champion, 1906 (Biol. C. A., Coleopt., vol. 6, pt. 5, pp. 109–110), to species Nos. 25–27 of his key, differing in ornamentation from the Central American species which he figures. It also differs from species of this genus known to me through specimens or figures in having the rostrum much less curved, and from the genotype of *Zygomicrus* Casey, 1897, which may not be congeneric with Faust's species, in the rostrum being parallel instead of strongly widened apically, as well as in the more shallowly concave mesosternum.

Eulechriops gossypii, new species.

Elongate-oval, black, feebly shining; feebly ornamented above with suberect, curved spathulate white hairs forming small clusters at hind angles of pronotum, before scutellum, and more prominent on elytral interstices 2 to 5 in basal fifth and on second to fourth interstices at apical third; rest of dorsal vestiture brown decumbent hairs; antennae, legs, and rostrum testaceous, elytral apices and suture faintly rufescent. Length, 2.3–2.5 mm.; width, 1.3 mm. Habitat, Peru.

Rostrum almost straight, slightly flattened, shining, impunctate except in basal fourth (♀) or with punctures decreasing apically (♂); antennae inserted at basal fifth, second funicular joint almost as long as first. Pronotum feebly gibbous posteriorly, coarsely, contiguously punctate, the white scale-like hairs extending narrowly along sides and downward behind eyes. Elytra coarsely sulcate, strial punctures elongate, intervals not wider than striae, flat, and subalutaceous; humeral umbone prominent, convex, and strongly alutaceous; apices separately rounded, slightly extended in a subhorizontal plane behind the subapical gibbosity. Legs slender, femora sulcate beneath, posterior femora not attaining tip of elytra. Mesasternum and abdomen clothed with white scales which are conspicuously smaller, narrower, and denser in a median area on first abdominal segment of the male.

Type locality.—Shomboloa, Julao, near Lamas, Peru. 2,300 feet altitude, Aug. 4, 1925, Townsend.

Type, ♀; and *allotype*, ♂.—Cat. No. 28858, U. S. N. M.

In the male the post-median elytral fascia is somewhat extended laterally by the occurrence of two or three white hairs on interstices 5 to 8. Described from two specimens believed to be ♀ ♂, although not dissected. The accompanying figure was drawn from the male.

IMMATURE STAGES OF EULECHRIOPS GOSSYPII BARBER, WITH COMMENTS ON THE CLASSIFICATION OF THE TRIBE ZYGOPSINI (COLEOPTERA: CURCULIONIDAE).

By Adam G. Böving, *U. S. Bureau of Entomology.*

INTRODUCTORY REMARKS.

The material from which the following descriptions of the larva and pupa of *Eulechriops gossypii* Barber is made was col-

lected by Dr. C. H. T. Townsend in Julao, near Lamas, Peru, 2,300 ft., August 4, 1925. It consists of three specimens of the larva and two of the pupa, preserved in alcohol, and was sent by Dr. Townsend to the U. S. Bureau of Entomology, together with imagines, for determination and figuring. Mr. H. S. Barber examined the imagines, found that they represent a new species of the genus *Eulechriops*, and has described and named this species in the article immediately preceding this (p. 53). Dr. Townsend records that the insect attacks cotton and that the larvae live in the wood of this plant and kill it.

Of the three submitted specimens of the larva, one is almost straight, but its muscle system, fat system, nerve system, and other body contents are strongly contracted and broken into two portions, which are pushed toward the front and the rear and are separated by a space almost one-fourth the length of the body which is filled only with alcohol. The straight form of this specimen is therefore presumably due to an artificial extension caused by the preservation. The second specimen, on the contrary, is much contracted as if it had been completely dried before it was placed in the alcohol, and it does not offer any suggestion as to the true shape of the larva. The third specimen is strongly curved. All its body areas are distinctly marked; it is neither excessively extended nor shriveled, and is by far the best preserved of the three specimens. Consequently, the accompanying habitus drawing is made from it. However, the larvae of the related genus *Cylindrocopturus*, which bores inside of the stems and roots of large Compositae, are only slightly curved and most likely the living larva of *Eulechriops* has the same shape.

Information about the anatomical details, especially of the head and the spiracles, is gained by dissection of the contracted specimens. Three permanent slides were made and are now in the slides collection of the National Museum.

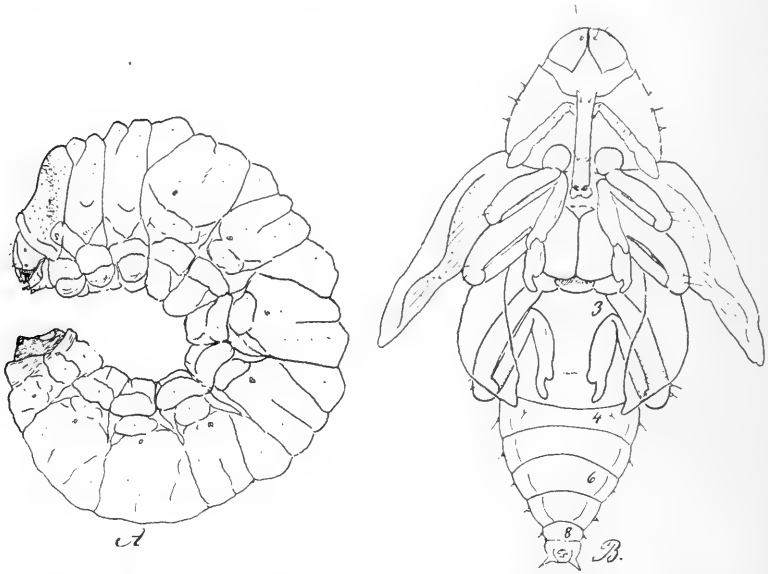
DESCRIPTION OF MATURE LARVA.

(U. S. Nat. Mus., one vial marked: Julao, near Lamas, Peru. 2,300 ft. C. H. T. Townsend, 4. VIII, 1925.)

General aspect.

The larva (text fig. A) is about 4 mm. long, cylindrical, and (probably) only slightly curved. The head is elongate-oval, but so deeply retracted into prothorax that less than half of it is exposed. Thorax and the anterior abdominal segments are somewhat larger than the rest and the pedal lobes rather protuberant. The areas of the body are arranged as in the more ordinary type of weevil larvae. The tergum of prothorax is not divided into lobes or pleads; mesothorax and metathorax have two transverse tergal lobes representing

prescutum and the fused scutal and scutellar areas; each of the first five abdominal segments has three distinct and rather protuberant transverse tergal lobes representing prescutum, scutum, and scutellum, and each of the three following segments has also three transverse tergal lobes but they are more indistinctly limited and flattened. The hypopleural lobes are simple in all the segments and there are no distinct intersegmental connecting areas.

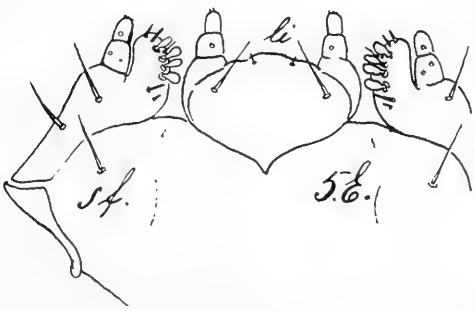


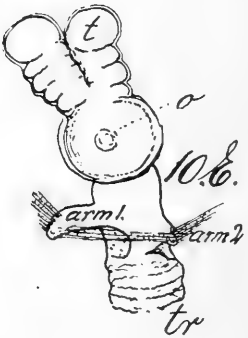
Eulechriops gossypii Barber. A: Larva. B: Pupa. (Drawings by the author.)

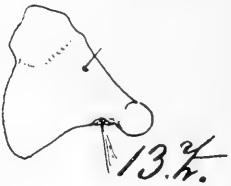
The body is mainly whitish but with a slightly yellowish, thinly chitinized, and finely asperate prothoracic shield and with a brownish, strongly chitinized, conical low process at the end of a pale yellowish, thinly chitinized, minutely granulate, and not pleaded ninth abdominal segment. The tenth abdominal segment is represented merely by a small, whitish, disk-shaped region below the conical process of the ninth.

Setae are well developed on the head capsule and the mouthparts, but are so minute as to be hardly discernible on the areas of the body and on the footwarts. The soft-skinned integument seems glabrous, but when examined with high power magnification it is shown to be finely shagreened.

The spiracles (10 E, Pl. 7) are bifore, small, all of equal size, present on mesothorax and the first eight abdominal segments and all lateral. The area in which the mesothoracic spiracle is seated is pushed into the posterior part of prothorax, but is separated by considerable distance from the anterior margin of prothorax. The two air tubes are rather short, each with from four to six incomplete annuli; spiracular opening large and circular. The closing apparatus near the spiracle proper consists of one long and one short arm, a fleshy







BÖVING—EULECHRIOPS, CYLINDROCOPTURUS, ZYGOPS.

fold, and opposite to this a crescent-shaped sharp valve, a contractor muscle between the arms, and two muscles to open the apparatus, one from each arm to the integument of the body.

Anatomical details.—(Plate 7).

Head capsule strongly retracted, but connected with the body by a large cervical collar, and on account of this membrane may be greatly protruded from prothorax when needed.

Epicranial median suture somewhat longer than half of the cranium; epicranial ridges parallel with the outlines of the head, entirely lacking.

Ocelli, two on each side, small, of equal size and both reduced to pigmented spots.

Antennae (1 E and 2 E) small, two jointed. Basal joint (b) membranous, dome-shaped, hardly twice as high as the apical joint and carrying three minute tactile hairs. Apical joint (a) minute, mamillate, somewhat pointed, proximally with ringshaped chitinization; without seta.

Clypeus (2 E) transverse, about twice as wide as long; no setae.

Labrum (2 E) transverse, anterior margin convex, medianly somewhat more than half as long as clypeus, about three times as wide as long, laterally with one well developed, slender seta and anteriorly with one or perhaps two minute setae.

Epipharynx (2 E and 3 E) on each side with (1) a lateral group of three stout, ovate, and basically suddenly constricted setae arranged in an oblique, inwardly, and posteriorly directed row, (2) near anterior labral margin, a median, transverse row of three much smaller but similarly shaped setae and (3) immediately behind the lateral group and inside of the anterior end of the epipharyngeal rod (er) two setae, one in front of the other, of the same size and shape as the lateral setae.

Mandible (4 E and 6 E) strong, subtriangular, with a broad base and heavy dorsal and ventral articulations; distally with an oblique, transverse, slightly bilobed apical edge and facing the buccal cavity with a hollow and gouge-shaped side, which, dorsally, is limited by a convex and, ventrally, by a concave longitudinal marginal edge. One minute seta on the external face.

Maxilla (5 E) with cardo and stipes having the shape, proportional size, and setal armature typical of Curculionid larvae. Maxillary lobe or mala (7 E) large, simple, reaching to the middle of the apical joint of palpus; on the dorsal ("buccal") face about ten setae, of which four are stout, shaped and sized like the large, ovate epipharyngeal setae, and the rest slender and of ordinary type. Maxillary palpus short, two jointed, with distal joint the smaller; sensory punctures present, but no setae observed.

Subfacial area (sf, Fig. 5 F) undivided, probably formed by fusion of the mental, the submental, and the maxillary articulating areas. On each side one well developed and two minute setae.

Labium (5 E) with labial palpigers distinct and chitinized. Labial stipites fused, membranous, posteriorly limited only by a thin, chitinous, biarcuate line and not by a distinct, medianly spearlike, otherwise curved bandlike sclerite as typically found in Curculionid larvae. One long seta present on each side. Ligula thick, short, and with a pair of minute setae.

Comments on the Taxonomic Position of Eulechriops Faust according to Larva.

According to characters found in the imago, the genus *Eulechriops* is placed—as listed in Leng's Catalogue of Coleoptera—in the tribe Zygopsini. To this tribe half a dozen North American genera are referred and among them *Zygops* and *Cylindrocopturus*, of which the National Museum possesses immature stages. The larvae of *Zygops* species bore in stems of *Yucca* and *Agave* and have also been found (by H. S. Barber) in the hard wood of an undetermined log in Guatemala. The much smaller larvae of *Cylindrocopturus* (*mammillatus* (Le Conte), *quercus* (Say), *adspersus* (Le Conte), *longulus* (Le Conte) and sp.) are recorded from stems of *Eupatorium*, *Xanthium*, *Ambrosia*, *Iva ciliata*, *Helianthus*, and also from the roots of *Xanthium* and *Heymenopappus flavescens*.

The characters of the larvae of these two genera differ considerably inter se and also from the larva of *Eulechriops gossypii*. There is, however, a fundamental difference between the larvae of *Zygops* and the other two genera, but differences merely of minor systematic importance between the latter. In *Zygops*, for example, the spiracles (9 Z) are bilabiate, but in *Cylindrocopturus* and *Eulechriops* (10 E) bifore and of the same type of bifore spiracles with short air tubes, few annuli, and a large circular spiracular opening. On account of the divergency in the development of this systematic character, the larvae of the three genera do not corroborate the established classification, and *Cylindrocopturus* and *Eulechriops* can not be placed in a tribe together with *Zygops*. The tribe Zygopsini must therefore be reconstructed and a new tribe will probably have to be created for the two excluded genera.

The mandibles, labium, prothoracic tergal shield, ninth abdominal segment, and several less conspicuous characters are also differently developed in *Zygops* and the other two genera, but these characters are mainly generic and no more similar in *Cylindrocopturus* and *Eulechriops*. The principal characters of the larvae of the three genera may be given as follows:

ZYGOPS Schönherr.

Spiracles (9 Z) bilabiate, of medium size, all alike and lateral. Ocellus, one.

Mandible (13 Z) with concave gouge-shaped inner face; distal part of the mandibular body somewhat constricted from the rest; apical edge triangularly bent outward.

Labium (16 Z), with stipites labii slightly chitinized, medianly separated by a longitudinal, strongly chitinized rod.

Prothoracic tergal shield bipartite; each half subtriangular with a somewhat

projecting, strongly chitinized, transverse anterior margin and an acute posterior angle.

Abdomen with three dorsal pleads representing prescutum, scutum, and scutellum well developed on most segments. Intersegmental connecting region not present.

Ninth abdominal segment (15 Z) with a remarkable large, unpaired, median, soft pad (p) situated below anus (an).

CYLINDROCOPTURUS Heller and **EULECHRIOPS** Faust.

The Principal Characters in Common for the Two Genera.

Spiracles (10 E) bifore; air tubes with about five annuli; all spiracles alike and located on the sides of the body.

Mandible (6 E) with gouge-shaped inner face and apical edge with two teeth.

Prothoracic tergal shield slightly chitinized and entire.

Abdomen with prescutum, scutum, and scutellum; no intersegmental connecting regions.

The Principal Characters Separating the Two Genera.

Ocellus in *Cylindrocopturus* one, and obliquely above it a large, disk-like, dark coloration of the otherwise light chitin of the head capsule; in *Eulechriops*, two ocelli.

The two apical teeth of mandible in *Cylindrocopturus* (11 C) more pointed than in *Eulechriops* (4 E).

Club-shaped setae of epipharynx and maxillary mala, in *Cylindrocopturus* distally pointed; in *Eulechriops* blunt.

Labium in *Cylindrocopturus* (14 C) posteriorly enforced with a biarcuate sclerite that medianly is prolonged spear-like; in *Eulechriops* (5 E) no similar chitinization.

Ninth abdominal segment in *Cylindrocopturus* (8 C) as normal in Curculionidae; in *Eulechriops* (12 E) with an entire covering of thin chitin and posteriorly above anus (an) with a low, conical, well chitinized, unpaired projection (*).

DESCRIPTION OF PUPA.

(U. S. Nat. Mus., two pupae in vial, together with three mature larvae, marked as given above for the larvae.)

The pupa (text fig. B) is about 3 mm. long.

The head comparatively small, anteriorly rounded, forming a well proportioned completion of the large, conical, strongly attenuate prothorax. The beak and the antennae reach a little behind the front margin of the mesothoracic sternum. The elytra go to the hind margin of the third abdominal sternite and the hind wings extend back to the middle of the fourth abdominal sternite. The front legs are completely exposed, the middle legs partially hidden on their inside by tibia and tarsus of the front legs, and the hind legs are covered exteriorly by the wings. The apex of the tarsus of the hind legs is almost even with the hind margin of the third abdominal segment, but does not reach it. The

abdomen as long as the entire anterior half of the body, elongate oval, with the small eighth and ninth segments somewhat contracted. Third abdominal sternite very large and as long as the following four sternites together; ninth abdominal segment armed on each side with a prominent pleural spine.

The setae are distributed as follows:

On each side of the head are (1) one long seta between the eyes, (2) one short seta near vertex, (3) one at the base of the beak, (4) two near the middle of the beak.

On each side of the pronotum are (1) one seta close to the anterior margin of pronotum and near to the longitudinal middle line, (2) one seta in the transverse middle line and between the longitudinal middle line and the lateral margin of pronotum, (3) one seta slightly in front of the transverse middle line and close to the lateral margin, (4) one seta slightly behind the transverse middle line and close to the longitudinal middle line, (5) a transverse row of three setae midway between the transverse middle line and the posterior margin of pronotum, and (6) just outside of this transverse row a longitudinal row of three setae in the lateral margin of pronotum.

On each side of the mesonotum are two setae transversely placed beside each other between the longitudinal middle line and the lateral margin of the mesonotum.

On each side of the metanotum two setae placed as are the two of the mesonotum.

On the abdominal segments are no dorsal spines or setae, one lateral seta on each pleurum of the fourth to eighth segments, and one ventral seta on each side of the sternum of the fourth.

Femur of each leg with two setae near the distal end.

Spiracles, nine, laterally placed on each side of the body.

The last cast skin of the larvae adheres to and covers the three terminal abdominal segments of the pupa.

Comments on the Taxonomic Position of Eulechriops Faust according to Pupa.

The pupa of *Cylindrocopturus* (*adspersus*) deviates somewhat from the pupa of *Eulechriops* (*gossypii*) in having rather stronger and longer setae and also in having them arranged slightly differently, but especially by possessing a transverse row of two or three distinct tergal setae on each side of the first to seventh abdominal segments and one seta on each side of the eighth tergite. All these tergal setae were lacking in *Eulechriops*, but otherwise the pupae of the two genera are very similar in the general shape of the body, the proportional size of the appendices, and all the anatomical details.

The pupa of *Zygops* differs considerably from both of these pupae. The proportionate length of the hind legs to the rest of the body in the three genera is not the same; for in *Zygops* the distal ends of the femora reach to the seventh abdominal segment and extend far behind the tips of the wings, which go

to the fourth abdominal segments as in the two other genera. The setae of *Zygops* are also stronger, spine-like, and more numerous; for instance, six on each side of the head instead of two as in *Eulechriops* and *Cylindrocopturus*, and about five on each side of most of the abdominal terga. Its seventh abdominal segment carries on each side of the body a large disk-like tergal plate with a transverse row of six strong, spine-like setae; the ninth abdominal segment is armed with a pair of large, long, and strongly chitinized pleural spines and the tenth abdominal segment has a well developed, short, blunt spine-like seta on each side.

Altogether, the development of the pupae of the three genera supports the taxonomic view gained from the comparative study of their larvae, namely, that a rather close relationship exists between *Eulechriops* and *Cylindrocopturus* but not between these and *Zygops*, and that the former two genera are wrongly placed in the tribe Zygopsini.

EXPLANATION OF PLATE 7.

(Drawings by the author.)

1. E. *Eulechriops gossypii*. Antenna: a, apical joint; b, basal joint.
2. E. *Eulechriops gossypii*. Epipharynx: er, epipharyngeal rod.
3. E. *Eulechriops gossypii*. Setae of epipharynx much enlarged; er, epipharyngeal rod.
4. E. *Eulechriops gossypii*. Mandible, dorsal face.
5. E. *Eulechriops gossypii*. Ventral mouthparts; li, ligula; sf, subfacial region.
6. E. *Eulechriops gossypii*. Mandible, exterior face.
7. E. *Eulechriops gossypii*. Maxillary mala with setae; buccal face.
8. C. *Cylindrocopturus adspersus*. End of abdomen. an, anus; (*), part of ninth abdominal tergite right above anus.
9. Z. *Zygops* sp. Spiracle.
10. E. *Eulechriops gossypii*. Spiracle; o, spiracular opening; tr, trachea.
11. C. *Cylindrocopturus adspersus*. Mandible, dorsal face.
12. E. *Eulechriops gossypii*. Distal end of abdomen; an, anus; (*), conical process of ninth abdominal tergite right above anus.
13. Z. *Zygops* sp. Mandible, ventral face.
14. C. *Cylindrocopturus adspersus*. Labium; sf, subfacial region.
15. Z. *Zygops* sp. Distal end of abdomen; an, anus; p, membranous pad of tenth abdominal segment below anus; (*), part of ninth abdominal segment above anus.
16. Z. *Zygops* sp. Labium.

A NEW UROSIGALPHUS PARASITIC ON EULECHRIOPS GOSSYPII BARBER (HYMENOPTERA: BRACONIDAE).

By R. A. Cushman *U. S. Bureau of Entomology.*

With the types of *Eulechriops gossypii* Barber from Peru received from Dr. C. H. T. Townsend were a male and a female of the following new *Urosigalphus*.

Urosigalphus eulechriopis, new species.

Female.—Length, 3 mm. Head strongly transverse; temples sloping, weakly convex, densely punctate; vertex punctate at temples, with an impunctate area posteriorly, a sharp ridge on inner side of each lateral ocellus; scrobes shallow, polished; face with small sparse punctures, medially with a small tubercle from which a shallow groove extends upward between the antennae; eye about three-fifths as long as width of face; clypeus broadly truncate at apex, the truncature about twice as long as clypeus; antennae 14-jointed, about as long as head and thorax, basal joints of flagellum more than twice as long as thick, subapical joint little longer than thick and little more than half as long as last joint. Thorax mostly coarsely irregularly rugose, only the middle of mesopleurum polished and lateral lobes of mesoscutum punctate, prescutum with a high median ridge anteriorly from which another ridge extends laterally on each side; posterior face of propodeum bounded by a very high carina, dorsal face divided medially by a short carina; stigma very broad, its anterior margin strongly curved; radius complete, radial cell barely as long on metacarpus as stigma. Abdomen coarsely longitudinally rugose, the interspaces punctate, rugae fading out posteriorly, carapace at apex with two long, slender, but not acutely pointed tubercles; ovipositor sheath about half as long as abdomen.

Black; mandibles, front and middle legs and hind trochanter testaceous, hind legs otherwise piceous; wings hyaline, venation brown, stigma pale at base.

Male.—Essentially like female but antennae longer and more slender, joints beyond middle two or more times as long as thick.

Host.—*Eulechriops gossypii* Barber.
Type locality.—Julao, near Lamas, Peru.
Type.—Cat. No. 28,865, U. S. N. M.

Described from one specimen of each sex mounted on same pin, reared by C. H. T. Townsend.

In spite of the fact that the ocellar space is not pyramidal this species is most closely related to *anthonomi* Crawford, to which it is very similar in structure and sculpture. The interocellar ridges evidently indicate the origin of the elevation characteristic of *anthonomi* and certain other species of the genus.

———————

ANTHRENUS SEMINIVEUS CASEY (COLEOPTERA).

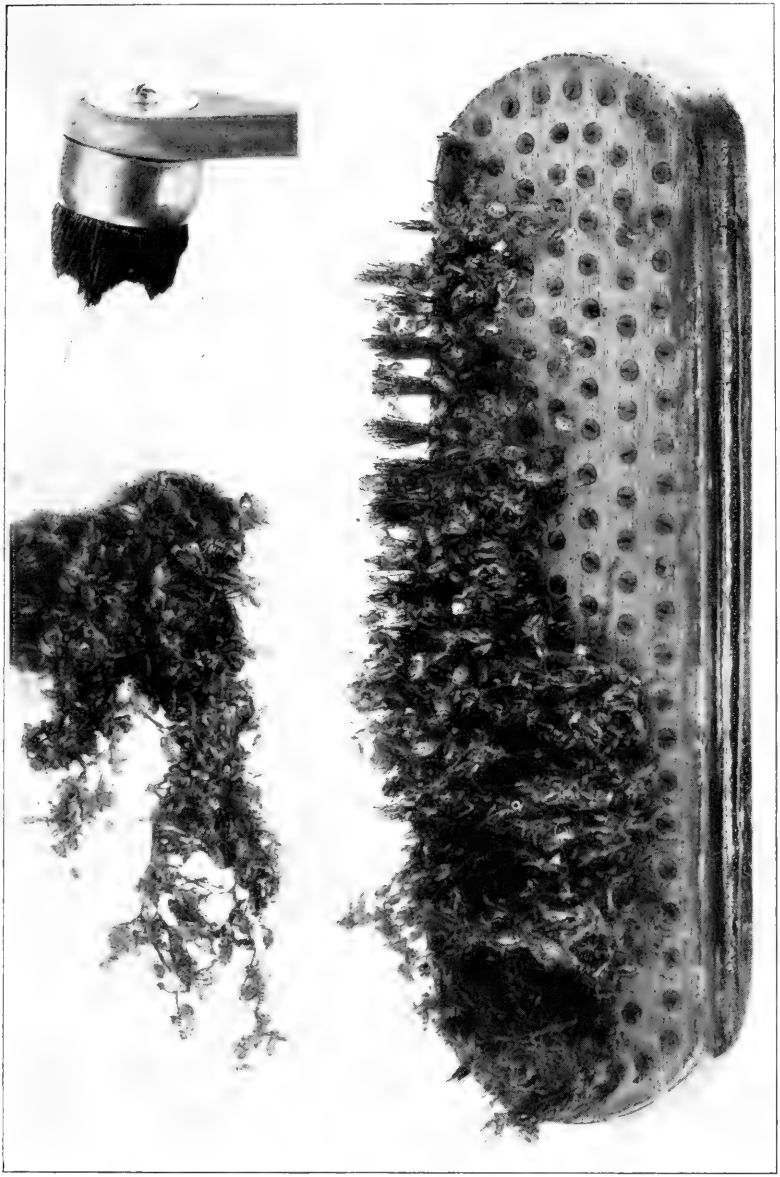
By E. A. Back and R. T. Cotton, *U. S. Bureau of Entomology.*

In 1916 the late Col. Thos. L. Casey described as new the Dermestid, *Anthrenus seminiveus*, from an adult beetle captured in his laboratory on Connecticut Avenue N. W., Washington, D. C. The new dermestid is conspicuously marked with patches of white and black scales, with yellow scales less in evidence. It closely resembles the furniture beetle, *Anthrenus fasciatus*, which is marked with patches of orange, white and black scales, among which the orange scales are very much in evidence. So far as the writers are aware, the description by Col. Casey is the only reference published regarding *seminiveus*.

It is interesting, therefore, that after about ten years two instances of destruction caused by this insect should be brought to the attention of the Department of Agriculture within a short time of each other during late 1925. In one instance the brushes of a shoe polishing outfit were ruined, as indicated by the illustrations of Plate 8. This injury was done in an apartment hotel about half a mile from the building in which Col. Casey lived. The second instance of injury occurred in the building in which he lived and took place in a divan or couch upholstered in curled hair, Spanish moss and tow. The covering of the furniture was of cotton fabric, hence the only indication of infestation was the flabbiness of the covering, coupled with the escaping adults and larvae. Through the courtesy of the apartment house management, the writers were given the privilege of pulling the furniture to pieces. This was done and it was found that the flabbiness had been caused by the fact that the hordes of larvae had almost completely eaten away the layers of curled hair. In removing the cloth cover of the back of the couch, more than 3,000 adults and 671 well-grown larvae were counted —all in a portion of the furniture where no food existed, but into which they had crawled in seeking a means of escape. In all 16,397 adult beetles and 10,002 well-grown larvae were counted in the furniture, and it was estimated that the *seminiveus* population, including the many immature larvae and eggs, was not less than 100,000.

Explanation of Plate 8.

Anthrenus seminiveus Casey. Injury by larvae to polisher (a) and applicator (b) of a shoe polishing outfit. The manner in which larvae congregate for moulting and the tendency for the cast larval skins to adhere and form festoons is shown in (c), a portion of the polishing cloth belonging to the outfit.



BACK AND COTTON — ANTHRENUS SEMINIVEUS.

A NEW EGG-PARASITE (HYMENOPTERA: SERPHOIDEA).

By A. B. Gahan, *U. S. Bureau of Entomology.*

Telenomus cosmopeplae, new species.

Extremely similar to *T. utahensis* Ashmead from which it differs only in that the first funicle joint is slightly shorter than the pedicel and the mesoscutum is very slightly less strongly sculptured, its posterior margin without any semblance of longitudinal striations along the suture separating mesoscutum and scutellum. In *utahensis* the first funicle joint is slightly longer than the pedicel, and the mesoscutum is strongly sculptured, its posterior margin along the suture being indistinctly longitudinally striated.

Female.—Length, .83 mm. Head as broad as thorax or a little broader, thin antero-posteriorly, finely reticulate-punctate or shagreened, the frons mostly polished but with its lateral margins and the lower half weakly reticulated; occiput weakly margined; head viewed from in front broader than high, subtriangular; antennae strongly clavate, 11-jointed; scape slender; pedicel not twice as long as thick; first flagellar joint very slightly narrower and a little shorter than pedicel; second joint of flagellum shorter than the first, usually about as long as thick; third flagellar joint usually a little broader than long; fourth and following joints, except the apical one, strongly transverse; apical joint conical and about as long as broad at base; thorax as broad as long, nearly circular in outline as seen from above; pronotum concealed; mesonotum broader than long, finely and uniformly reticulate-punctate, very slightly shining, and covered with short grayish pubescence; scutellum more than twice as broad as long, polished or with only very faint reticulation, pubescent like the mesoscutum, the suture at base not foveolate; postscutellum distinctly foveolate; propodeum perpendicular medially; wings a little longer than the whole insect, the signal vein about half as long as postmarginal; abdomen nearly as broad as long, rounded at apex, the second tergite much the largest, first and basal two-thirds of second tergites longitudinally striated, the apex and broad lateral margins of second polished; tergites beyond the second mostly polished. Black, wings hyaline; antennae including scape black; legs mostly black; all trochanters, front tibiae, base and apex of middle and hind tibiae, and the three basal joints of all tarsi reddish testaceous.

Male.—Length, .70 mm. Similar to the female except for the antennae. Antennae 12-jointed, not clavate; scape cylindrical; pedicel small, barely longer than thick; first flagellar joint longer and a little thicker than pedicel; second joint slightly longer than the first and of the same thickness; third joint equal to the first in length and thickness; fourth to penultimate joints moniliform, subquadrate; apical joint conical and about twice as long as broad at base.

In both sexes the middle and hind tibiae as well as the front pair are sometimes mostly brownish testaceous.

Type locality.—Urbana, Illinois.

Type.—Cat. No. 28,990, U. S. N. M.

Nine females and three males received from W. V. Balduf and said to have been reared from eggs of *Cosmopepla bimaculata* Thomas, August 8, 1925.

INSECT TAXONOMY: PRESERVING A SENSE OF PROPORTION.

By W. L. McAtee, *U. S. Biological Survey.*

Consider the *Ailanthus* tree, its sturdy though smooth trunk, its few but strong branches, and their moderate division into twigs. A simple structure, but what a glorious crown of foliage it bears—leaves relatively few in number, yet ample in size, and with their numerous leaflets rivalling the ferns in symmetry and beauty. Well named by the Chinese, Tree of Heaven.

Consider on the other hand the *Ephedra* with its insignificant trunk, and numerous slender green branches usurping the function of leaves, which in this plant are reduced to harsh scales. A complex but barren structure—such is the Syphilis Bush.

The parable[1] we would draw is the application of the contrasted plans of *Ailanthus* and *Ephedra* to the taxonomy of insects. Let the trunk of our phylogenetic tree represent the Class of Insects. Its limits in general are agreed upon and no one seriously proposes to alter it. The first divisions of the trunk like the strong limbs of *Ailanthus*, or in fact as the primary divisions of any complex should be, are relatively few in number, sturdily constituted, well rounded, and impressive. They represent the Orders of Insects. Multiplication of them weakens the structure and should not be contemplated except for the weightiest reasons. Not one entomologist in a thousand will have adequate reason for even considering the recognition of a new order of insects.

The twigs are the families and in insect taxonomy a moderate number of them provides ample attachment for a wealth of genera and species, the foliage of the tree of classification. Families, the second order of division of the Class of Insects, are in consequence groups of great importance and therefore not to be increased in number upon immature consideration. Experience proves that thoroughgoing investigation of the members of a given order over the whole world is likely to reveal intergrading forms that render the recognition of relatively few and comprehensive families not only the most convenient, but the most natural arrangement.

The genera of the tree of life on the *Ailanthus* model are petioles of generous dimensions, bearing numerous leaflets—the species. Such genera are real *groups* of species,—according with the true definition of the term, and we believe, with the manifestations of insect development in the majority of instances. While monotypic genera, in some cases, are necessary, the tendency to erect genera for single species, having peculiar adaptive characters, should be resisted. Structure, not biology,

[1]Like most parables, the present one is intended to be of broad and general, not necessarily of specific and literal, application.

is the basis of insect classification and for a long period in the future we will be ignorant of the biology of most of the forms we deal with. Therefore, let the classification be such that it will apply to all on the same terms. The use of sexual characters for defining genera also is to be deplored. It is as much as can be endured to use these characters of which we do not actually know the significance,[1] for the differentiation of what we take the liberty of calling species. Often we must put aside as an unknown mass, specimens of the sex which does not show our "characters," or if both sexes have strong "characters," likely enough we give actual mates distinct "specific" names. Such usage, we repeat, is bad enough in the case of "species," and should be entirely taboo for the much more important category of genus. If we can not place all sex forms of an insect in their proper genera on structural characters,[2] then we have too many genera. Recognition as genera, of groups of species allied in color pattern, and regardless of affinities in structure, is puerile, and all multiplication of genera for its own sake is highly undesirable. The inevitable product of such a process is mononomial nomenclature, and it is safe to say that no one is going to be hailed as a second Linnaeus for urging such a nomenclature or anything approaching it.

A phylogenetic structure on that plan, one species to a genus, one genus to a twig would resemble the *Ephedra* with its multiplied branches, subdivided into twigs which taper into separate almost thorny tips, forming a rigid, graceless, forbidding mass. How inviting by contrast is the luxuriant and well-ordered foliage of the *Ailanthus*. Here the numerous leaflets (species) arranged upon strong petioles (genera) produce those mass effects that are so agreeable in appearance and so characteristic of the most highly developed arboreal forms.

Consider the leaflets of *Ailanthus*, their number, their serried rows; they are alike in general structure, similar in appearance, and identical in color, yet each can be distinguished by details of form. What a perfect model for the structurally characterized species of a well-conceived genus. The *Ailanthus* leaflets teach us the ease of distinction regardless of color, and the entomologist needs only once to work out the classification of a group of species of uniform coloration, to realize how unnecessary it is to depend upon color for the differentiation of species. Dependence upon the more variable color characters is not only unnecessary but unsafe, and the day when simple color descriptions of species can be considered adequate has long passed.

[1]For instance, in the crayfishes the primary sexual characters, i. e. the claspers, are known to be polymorphic in a species.

[2]Not necessarily the same characters, nor does this remark apply to groups where in general only one sex is available for study.

Isolated descriptions of insect species sometimes a necessity, are regarded as an unfortunate by-product of modern insect taxonomy. As an object in themselves such descriptions are scarcely worth consideration, and if launched without keys, comparative notes, or illustrations, had better be suppressed. Revisional, constructive, in other words, genuinely useful work is the ideal of the modern taxonomist, and it is a good one to treasure, to live up to, and even to sacrifice for if need be.

To sum up: thoughtful consideration of the taxonomic sequence, species, genus, family, order, and class, should convince one that the species is a significant, and the genus an important, element in the classification of insects. To contribute to a desirable type of phylogenetic tree, what is mainly needed is exercise of a sense of proportion. Let the vital members of the structure be sound and of full value; relegate all minor, intermediate, and variable elements to the "sub" categories, where they will not necessarily claim attention. Going back to our plant simile, will the tree of life you help to build resemble the well-proportioned and admirable Tree-of-Heaven, or will it imitate the scraggly and barren Syphilis Bush?

MELANOPLUS BOREALIS IN NEW YORK STATE (ORTHOPTERA: ACRIDIDAE).

By A. N. Caudell, *U. S. Bureau of Entomology.*

During the past summer specimens of *Melanoplus borealis* Fieber were submitted to the writer for determination by Prof. J. D. Hood of Rochester, N. Y. As this species does not appear to have been reported from New York this occurrence seems worthy of record, though from the known range of this grasshopper its occurrence in that State was to be expected. These specimens were taken in a Sphagnum swamp near the Oswegatchie River in the Adirondacks and on an early date, June 17, a locality and date characteristic for this species. The collector has furnished the following note: "This species was found in some abundance along the Oswegatchie River, in the Adirondack region of New York, where the fauna and flora show decided boreal affinities. We found it very good bait for the big brown trout in the deep, quiet pools; and each cold morning a goodly number of individuals was taken for that purpose. They were just reaching maturity, and not more than half were adult by June 15. All specimens were taken from grass and other vegetation growing in the sphagnum bogs which dotted the flood-plain of the river."

Actual date of publication, March 27, 1926.

EDITORIAL.

Are scientists human? A simple question which the uncritical would probably answer offhand, the ordinary layman with a categorical no, the average man of science with an emphatic yes. We whom systematic science has taught the necessity for nice distinctions, are inclined to hedge. When we see an economic entomologist allowing clothes-moth larvae to devour his best suit of clothes, when we see a psychologist trying to open a packing case with a pair of shears, when we consult the taste in music or literature of the average scientist or his judgment on problems of public concern,—in other words when we consider only "secondary" characters, we are forced to conclude that scientists are human—very average human. But when we consider their more complex internal characters, their psychology, especially their reaction to the stimulus of criticism, we must classify them as something a little less or more than human—a different subspecies at least. They seem to lack humor. Of course the mere absence of humor is not in itself a character of any taxonomic value. Humor seems to have been acquired and lost independently by individuals in widely separated groups. Its presence is often difficult to detect and when detectible, is often so slight as to leave one in doubt whether it is coming or going. With scientists, therefore, it is not merely the absence of humor, but the way in which it has been lost, that is significant. They seem to have lost it by a process of overserious self-contemplation. As a consequence, they have come to consider themselves as peculiarly privileged persons, not to be subjected (as are other public characters) to the acid test of ridicule. One may lecture them, contradict them,—nay, even torment them with petty bureaucratic regulations; but one must not—especially if he be a scientist himself—laugh at them when they say foolish things or pronounce theories in dogmatic, pontifical fashion. It is not ethical. One must be solemn with them even when they are solemn as owls. Now this peculiar mental attitude, I contend, puts them in a class apart with priests and policemen. And I am proposing that they be recognized as a subspecies and—if future investigations substantiate my contention—that it bear the name *Homo sapiens solennis*.[1] I do this fully conscious that I may be splitting too finely; but the facts seem to warrant and, anyway, what matter it if we have one synonym more or less?

—*Carl Heinrich.*

---

[1] In making this new name I have followed the example of a well-known—I almost said notorious—cataloguer of Lepidoptera, and seized upon certain indiscreet utterances in literature. No types are cited and neither type locality nor location of types indicated. Those concerned may worry with the name as best they can.

The Ectoparasitic Orders of Insects as Represented in the United States National Museum Collections.—The ectoparasitic orders of insects, the biting lice, sucking lice and fleas, are well represented in the United States National Museum. Of the order Mallophaga there are contained 793 slides, representing 198 determined species. Type material is represented by 94 slides, which include many Kellogg cotypes, and the holotypes of Paine, McGregor and the writer. The number of valid species of Mallophaga catalogued from the world by Harrison in 1916 was 1520.

The Museum collection of sucking lice, or Anoplura, although smaller than that of the Mallophaga, is one of the most representative collections in existence. It contains 468 slides, representing 123 determined species, which is 3 more than was catalogued from the world by Ferris in 1916. Sixty-eight of these slides represent type material, many being either Ferris paratypes or holotypes of the writer. Nearly every genus of Anoplura is represented.

The collection of fleas includes 392 slides, representing 104 determined species, and including 84 representing type material. In this type material are found most of the Baker holotypes and cotypes, nearly all of the Fox type material, as well as that of the writer. Last year Dalla Torre catalogued the fleas of the world listing 586 valid, or questionably valid, species. Although less than a fourth of the species of the world are represented in the Museum collection, a very high percentage of the North American species are included, and most of these are represented by type material.

Nearly all the slides of sucking lice and of fleas are in excellent condition, and have been either cleared with caustic or cleared in potassium hydroxide and stained. Many of the older slides of biting lice, including the type specimens, were originally mounted in glycerine jelly. Such mounts showed many air spaces due to the contraction of the mounting medium. Some of these glycerine jelly slides, including the type specimens, have been made over, being treated with very dilute potassium hydroxide and mounted in balsam. It might here be added that balsam, although usually much more desirable for permanent whole mounts than glycerine jelly, has a refractive index (1.53) so near that of chitin (1.525) that minute chitinous characters soon become almost invisible. Euparal is much better in this respect than balsam. Its refractive index, 1.483, is much below that of chitin. However, it remains yet to be seen how well this medium will stand the test of time.

—*H. E. Ewing.*

VOL. 28 APRIL, 1926 No. 4

PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

CONTENTS

PUBLISHED MONTHLY EXCEPT JULY, AUGUST AND SEPTEMBER

BY THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

U. S. NATIONAL MUSEUM

WASHINGTON, D. C.

Entered as second-class matter March 10, 1919, at the Post Office at Washington, D. C., under Act of August 24, 1912.

Accepted for mailing at the special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized July 3 1918.

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON

ORGANIZED MARCH 12, 1884.

The regular meetings of the Society are held on the first Thursday of each month, from October to June, inclusive, at 8 P. M.

Annual dues for members are $3.00; initiation fee $1.00. Members are entitled to the PROCEEDINGS and any manuscript submitted by them is given precedence over any submitted by non-members.

OFFICERS FOR THE YEAR 1926.

Honorary President . . . . . E. A. SCHWARZ
President . . . . . J. M. ALDRICH
First Vice-President . . . . . J. A. HYSLOP
Second Vice-President . . . . . J. E. GRAF
Recording Secretary . . . . . C. T. GREENE
Corresponding Secretary-Treasurer . . . . . S. A. ROHWER
U. S. National Museum, Washington, D. C.
Editor . . . . . CARL HEINRICH
U. S. National Museum, Washington, D. C.
Executive Committee: THE OFFICERS and W. R. WALTON, A. N. CAUDELL, T. E. SNYDER.
Representing the Society as a Vice-President of the Washington Academy of Sciences . . . . . A. G. BÖVING

PROCEEDINGS ENTOMOLOGICAL SOCIETY OF WASHINGTON.

Published monthly, except July, August and September, by the Society at Washington, D. C. Terms of subscription: Domestic, $4.00 per annum; foreign, $4.25 per annum; recent single numbers, 50 cents, foreign postage extra. All subscriptions are payable in advance. Remittances should be made payable to the Entomological Society of Washington.

An author of a leading article in the PROCEEDINGS will be given 10 copies of the number in which his article appears. Reprints without covers will be furnished at the following rates, **provided a statement of the number desired accompanies the manuscript:**

	4 pp.	8 pp.	12 pp.	16 pp.
50 copies	2.00	4.00	6.00	8.00
100 copies	2.25	4.50	6.75	9.00

Certain charges are made for illustrations and there are available rules and suggestions governing the make-up of articles. Immediate publication in any number may be obtained at the author's expense. **All manuscripts should be sent to the Editor.**

PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 28 APRIL 1926 No. 4

CONDITION OF THE COLEOPTEROUS COLLECTION OF THE NATIONAL MUSEUM IN 1906.[1]

By E. A. Schwarz, *U. S. Bureau of Entomology, Washington, D. C.*

Shortly after the death of Mr. Martin L. Linell, Aid to the Division of Insects of the U. S. National Museum, which took place in May, 1897, Mr. E. A. Schwarz was ordered by the Honorary Curator to take charge of the collection of Coleoptera, and shortly afterwards he was appointed Custodian of Coleoptera. Since that time Mr. Schwarz has been constantly employed in the National Museum, excepting for such periods as when he was absent on official trips.

No account has ever been taken of the number of specimens, or even species of Coleoptera at the Museum. As to the number of specimens, it is quite impracticable to give even an estimate. It may be said, however, that the number of

[1]Twenty years ago the accompanying paper was submitted to Dr. Howard, Honorary Curator of Insects of the National Museum, as a basis for a report on the condition of the collection of Coleoptera in the National Museum. Because the report contains much interesting information and gives a valuable historical background showing the growth of the collection of Coleoptera of the National Museum, it does not seem to be advisable to have it remain buried in the files. It was written without any intention that it should be published and very admirably portrays the characteristics of its author. Since this report was prepared, very many changes have taken place in the collection and it has gone far beyond the expectations of Dr. Schwarz. Throughout the report there are repeated statements of the lack of sufficient boxes and drawers in which to house the collection and one would naturally expect to find such statements since the intent was to emphasize the need of more facilities for housing the rapidly growing collection. The belief is stated that it would be necessary to have 500 drawers to satisfactorily house the collection of North American Coleoptera. Of the 1722 drawers used for Coleoptera, the North American series is now stored in about 800 drawers and some large groups are still in Schmidt boxes. The collection is growing so rapidly that we can look forward to its occupying a very much larger number of cases in the near future. The arrangement of the collection has also changed somewhat since 1906, and the personnel which has been working on it has increased remarkably during this interval. All of these facts can be brought out very nicely in a supplementary report.

—*S. A. Rohwer.*

specimens of Coleoptera exceeds many times that of all other orders of insects in the Museum collections. As to the number of species, a rough, but very conservative estimate shows that there are at present about 35,000 species in the collection of which about 22,000 have been determined. The North American fauna is extremely well represented, while the faunae of foreign countries are for the present more or less poorly represented excepting the West Indian and Central American regions. The collection includes about 500 types or co-types described by various authors mostly from the North American collection.

The accessions received since 1897 have been of such magnitude that only with the utmost effort it has been possible to do the mechanical mounting and labeling of specimens—in fact the custodian would not have been able to perform this tedious work except by the assistance furnished from time to time by the Bureau of Entomology of the U. S. Department of Agriculture in placing at his disposal temporary help. It must be acknowledged that the assistance given by the present Aid to the Division of Insects, Mr. Herbert S. Barber, has been of incalculable value, Mr. Barber, besides performing his multifarious duties in other lines, spending a great deal of his free time in the working up and care-taking of the collection of Coleoptera.

Another drawback of considerable weight is the lack of proper boxes and lack of space in which to put the boxes. This condition of affairs has reached a point where it will not longer be possible to increase the collection or take care of that part which is either entirely or partially arranged.

The collection of Coleoptera of the National Museum is placed upon a basis different from the collections of other museums, from the fact that it is more frequently called upon for the determination of specimens than any other large museum either in America or in the Old World. The collection is not only called upon to furnish determinations for most of the agricultural experiment stations in the country and to the numerous correspondents of the Bureau of Entomology of the Department of Agriculture, but also for official and private entomologists in foreign countries. This work takes away such a considerable time of the Custodian that, unassisted as he is, he is unable to describe species or do original systematic work for which otherwise the large collections accumulated at the Museum furnish excellent material.

To facilitate the work of furnishing determinations for outside parties, it has been absolutely necessary to arrange the systematic collection according to geographical distribution: a collection of North American Coleoptera, the most important

and the most frequently used collection, is kept in separate series of boxes; a collection of West Indian material has been formed; also a collection of Central American species, of the Coleoptera of the Hawaiian Islands, of the Philippine Islands, and the rest of the collections from other foreign countries is also arranged according to geographical distribution.

In two families of Coleoptera an attempt has been made by the Custodian to form a general systematic collection containing the genera and species of the whole world arranged in systematic order. These are the Cicindelidae and the Lucanidae. Of the former family, the well-known authority, Dr. Walther Horn of Berlin, Germany, has donated to the Museum a large number of species from various countries, and these, together with the Museum material, were arranged according to the latest catalogue of this family. It comprises at present 30 genera with 203 exotic species, and a nearly full set of the N. A. species. Unfortunately there were no regular Museum drawers available, and the collection had to be placed in Schmidt boxes. The recent publication of a catalogue of the Lucanidae of the whole world, by Mr. van Roon, was the reason for bringing together the whole material of this family, and it was found that of 76 genera and 722 species enumerated in that catalogue the Museum possesses 36 genera and just one hundred species.

At the present time, the collection in charge of the Custodian of Coleoptera is divided into three groups: first the systematic collection; second the biologic collection, and third the microscopic collection.

SYSTEMATIC COLLECTION:

North America.

Shortly after the appointment of Mr. Schwarz as Custodian, the large Hubbard and Schwarz collection was donated to the Museum by the owners, and by its accession the Museum collection of North American Coleoptera was at once brought into the foremost rank, the number of species and the large sets of specimens in each species being unequaled by any other private or public collection here or abroad. No effort has been spared by the Custodian to maintain this position. The number of important accessions received since 1897 has fully accomplished this purpose. Following are the more important and larger accessions just referred to:

A collection made by Messrs. Hubbard and Schwarz in southern Arizona in the year 1898. This collection includes also valuable material in other orders of insects, the most complete portion, however, being the Coleoptera. The collection was mounted and labeled by the Custodian during his

private time, and has been incorporated into the systematic collection.

The Soltau collection of North American Coleoptera. Mr. Hugo Soltau, of New York, an old correspondent of Messrs. Hubbard and Schwarz and an enthusiastic collector of Coleoptera, willed his collection to the gentlemen just named, and upon his death the collection was turned over to Mr. Schwarz (Mr. Hubbard having since died) and transmitted by him at once to the National Museum. This collection has proved to be of extreme value to the Museum collection, not so much on account of the large number of species new to the Museum, but on account of large and carefully labeled series from sections of the country from which hitherto very little material was represented in the Museum, namely, the States of Alabama, Mississippi, Kentucky and Iowa. The specimens of that collection, numbering many thousands, as far as they were properly mounted and labeled, have been incorporated into the systematic collection. A large proportion of the other specimens have been mounted and labeled, and also incorporated, but a portion of the Soltau collection, mounted in a provisional manner, still required a good deal of manual labor before it can be incorporated.

The Barber and Schwarz collection, made in 1901 by Mr. H. S. Barber and E. A. Schwarz in the plateau region of Arizona and in parts of New Mexico. The cost of this expedition was partly borne by the Bureau of Entomology and partly furnished from private sources. The many thousand specimens comprising this collection and representing all orders of insects but chiefly Coleoptera, were mounted and labeled by the Custodian with the assistance of Mr. H. S. Barber, who was then in the employ of the Department of Agriculture. The specimens have most of them been named, but a small proportion only could be incorporated into the systematic collection on account of the crowded condition of the boxes.

The collection known as the Harriman Alaskan collection, made by Mr. Trevor Kincaid in various parts of Alaska, has been turned over to the Museum. It has been arranged and determined by the Custodian, and the list of species was published in the insect series of the Harriman Alaska Expedition. The collection did not add a large number of species new to the Museum, but is exceedingly valuable as illustrating the Coleoptera fauna of that region.

The Turner collection from northern Labrador. Mr. L. M. Turner, an employee of the Signal Corps of the U. S. War Department, made this collection many years ago at Ungava Bay, northern Labrador. The collection, consisting of all orders of insects, was mounted and labeled by the assistants of the Division of Entomology of the U. S. Department of Agriculture,

but Mr. Turner, on account of reasons which need not be mentioned here, failed to turn over the collection to the Museum. He died shortly afterwards and the collection, which was pinned in a number of Schmidt boxes, was lost sight of for many years. It was finally found in the cellar of the Smithsonian Institution and turned over to the Museum. The Hymenoptera of this collection had been utterly destroyed during this long interval by museum pests, and the same fate befell the Lepidoptera. The Diptera were in tolerably good condition, while the Coleoptera were found to be considerably injured by mold. On account of the extreme value of this collection, the Custodian spent considerable time in washing and cleaning the specimens and succeeded in saving all but a small portion of the smaller and more delicate specimens. The Coleoptera have been named and distributed in the systematic collection, and a list was made and preserved in the archives of the Division of Insects, but has never been published.

The Barber collection from Humboldt County, California. Taking advantage of the cheap railroad fare to California on account of the meeting of the American Ornithologists at San Francisco, Dr. L. O. Howard, Chief of the Bureau of Entomology, furnished means for Mr. H. S. Barber to proceed to northern California in order to make insect collections from a region which was not before represented in the Museum. A large number of species of all orders were brought back by Mr. Barber, mounted and labeled by himself. The Coleoptera were best represented in this collection, and were determined by the Custodian and distributed in the systematic collection. A separate list of them was made but has not yet been published.

The Plummers Island collection. This is a unique collection of great value, made by various members of the Washington Biologists' Field Club on Plummers Island, Maryland, situated in the Potomac River about ten miles west of Washington, D. C. This collection, comprising many thousand specimens and extending over the whole domain of entomology, is being constantly added to as far as the short visits of the members to the Island will allow. Most of the material was collected by the members of the Club in their free time, namely, during Sundays and other holidays and during visits in the evenings of week days, but it is fair to add that both the Bureau of Entomology and the National Museum freely granted short leaves of absence to their respective employees to continue investigation on that Island. The Coleoptera have been carefully named and listed by the Custodian, and it is the intention of the members of the Biologists' Field Club to publish shortly a full list of all the animals and plants hitherto found on that Island.

It may be added that the Hemiptera, Orthoptera, Neuroptera and Lepidoptera of this collection have also been determined and listed by the various specialists of the Bureau of Entomology attached to the Museum, the only parts that have not yet been worked up being the Hymenoptera and Diptera. The number of species in the Plummers Island collection new to the Museum as well as new to science is astonishingly large, even the Coleoptera furnishing its quota of new and undescribed species. With the exception of the Lepidoptera the collection is still kept intact, and it is the intention to make it the foundation of a local collection illustrating the insect fauna of the vicinity of Washington, D. C. In the Coleoptera the number of species hitherto found on Plummers Island is in the neighborhood of 1200 species.

The Barber collection from Brownsville, Texas. In view of the fact that the interesting region in southwestern Texas commonly called the Brownsville region, with its tropical fauna, was very little represented in the Museum collection, it has been very gratifying that Mr. H. S. Barber was sent by the Chief of the Bureau of Entomology to that region in the year 1904, under the auspices of the Carnegie fund, in order to make collections of mosquitoes and incidentally other insects. A large collection of insects of all orders, in excellent condition, was brought back by Mr. Barber, and has been mounted and labeled by him. The Coleoptera have been determined by the Custodian and a list made thereof, which probably will be published by the Brooklyn Institute of Arts and Sciences which also possesses a large collection of Brownsville Coleoptera. The number of species from Brownsville, Texas, new to our collection is surprisingly large, and it is estimated that of the total number of tropical genera and species that will ultimately be found in that region, about three-fourths are now represented at the Museum.

The Piper collection from Idaho and Washington. Professor C. V. Piper, while attached to the Agricultural Experiment Station in Idaho, made quite a collection of Coleoptera which he has kindly donated to the Museum. While not very rich in species new to the collection and not containing many small specimens, the collection is of great value on account of the locality, the fauna of the State of Idaho not previously having been well represented at the Museum.

The Keene collection from Queen Charlotte Islands, British Columbia. The Reverend Mr. Keene, who for a series of years was a missionary at Massett, Queen Charlotte Islands, donated the duplicates of his collection to the Bureau of Entomology and it was at once turned over to the Museum by the Chief of the Bureau. The collection contains a complete set of the

smaller Coleoptera found by Mr. Keene and of which he published a list in the Canadian Entomologist. The addition of the collection to the National Museum is of especial value from the fact that hitherto the Museum did not possess a single specimen from that locality. The collection consists exclusively of Coleoptera. It numbers about 4,000 specimens.

The Wickham collection of Rhyncophorus Coleoptera. This collection, made by Prof. H. F. Wickham, of Iowa City, in various parts of the United States but more especially in Iowa and in the southwestern States, was purchased by the Bureau of Entomology and turned over by Doctor Howard to the National Museum. It contains many thousand well preserved and well labeled specimens, and while the number of species new to the Museum is not very large, the collection is of great value on account of the large series of specimens illustrating very fully the geographical distribution of many species which in the Museum collection was not fully represented.

The Fresno collection, made by E. A. Schwarz. While on official duty at Fresno, California, in connection with the acclimatization of the fig insect, Mr. Schwarz made in 1900 incidentally quite a collection of insects of various orders, consisting mostly of Coleoptera and nocturnal Lepidoptera. From the fact that hitherto the Museum collection contained hardly any specimens from the San Joaquin Valley of California, this collection is of considerable interest although not a very large one.

The Key West, Florida, collection, made by Mr. E. A. Schwarz. On his return from Cuba, where he was sent by the Bureau of Entomology during the cotton boll weevil investigation, Mr. Schwarz stopped for a week at Key West in order to complete collections made by him many years ago. A large number of tropical Coleoptera not hitherto found in the Island was the result of this short stay, and it is now estimated that the tropical Coleoptera fauna of Florida represented in the Museum collection is by far the most complete one ever made in that region. A list of the strictly semi-tropical Coleoptera of southern Florida has been made by the Custodian and from this useful list it can be seen that not more than about ten species are missing in the collection. Whether we know now all the tropical insects occurring in Florida is a matter of doubt because a large proportion of the tropical region, namely, the west coast from Punta Gorda to Cape Sable and many of the Keys on the east coast as well as the largest part of the mainland from Biscayne Bay to Cape Sable have never been entomologically explored. It is estimated, however, that the total number of tropical Coleoptera in Florida does not exceed four hundred species.

Collections made in various parts of Texas by the members of the Bureau of Entomology employed in the cotton boll weevil investigation. From time to time larger and smaller sets of insects of various orders have been received from this source and turned over to the Museum by the Chief of the Bureau of Entomology. In the aggregate these specimens will number several thousand, and although the Texan fauna had been very well represented in the collection, the addition of new species received from this source is quite considerable, more especially from the collections made at Victoria, Texas. Most of the cotton boll weevil investigators in Texas did their best to make contributions to this collection.

Smaller or larger sets of Coleoptera are almost daily received for determination by Dr. L. O. Howard, partly in his capacity as Chief of the Bureau of Entomology, and partly as Honorary Curator of the Division of Insects, from numerous correspondents all over the country. The time required in the handling and determination of these sets is very great and perhaps not proportionate with the benefit derived from the increase of the collection. Still in the course of years the number of new species and rare specimens added to the Museum collection from this source is quite considerable.

The Custodian of Coleoptera is called upon to determine the Coleoptera found in the collection of bird stomachs made by the Bureau of Biological Survey of the Department of Agriculture, and while the insects thus found are mostly represented by fragments, here and there a well preserved specimen, being either new or rare, is found in the stomachs, and since large lots of these birds are shot in regions of the country which have not been visited by entomologists, the accession to the Museum derived from this peculiar source is of greater importance than we should expect. It is quite fair to state that the Chief of the Biological Survey always courteously allowed us to retain for the National Museum collection whatever of value has been found in the birds' stomachs.

A large number of exchanges were made in the course of time with most of the leading coleopterists of the country, and while the mechanical work connected with making exchanges, namely, the selecting of specimens desired by correspondents, the pinning and labeling, etc., requires an undue length of time, the result as a whole has been very satisfactory, and in the neighborhood of 200 species of North American Coleoptera have been thus added by exchange to the collection since the year 1897. The most important of these exchanges was that made with Mr. Charles Fuchs, of San Francisco, who sent to the Museum a large proportion of the Coleoptera described by the late Dr. George H. Horn from the Cape San Lucas region of Lower

California. Previous to this exchange the Museum collection did not contain more than three or four species from that region.

Finally additions of single specimens or small sets of specimens of Coleoptera are almost daily received from such of the employees of the Bureau of Entomology and National Museum who are enterprising and zealous enough to spend their free time in search of specimens. No particular accessions are made for such specimens, which in the aggregate constitute a valuable addition to the collection.

It is estimated that, when properly displayed, the collection of North American Coleoptera will require at least 500 museum drawers. At present only 80 of such drawers were available for this purpose and, as a consequence, by far the largest portion of this collection is still in the old Schmidt boxes, the constant handling of which is very detrimental to the condition of the specimens.

West Indies.

Since the establishment of the government experiment station at Porto Rico, the need for a better knowledge of the West Indian Coleopterous fauna has been seriously felt. This the more so as in the old Museum collection there was not more than about thirty species of Coleoptera from that region. As a first step to remedy this state of affairs, the Custodian prepared a card catalogue of the Coleoptera described from the West Indies. This catalogue has since proven of the greatest assistance in the determination of many species of Coleoptera sent, partly by the experiment station in Porto Rico and especially by the newly established experiment station at Santiago de las Vegas, Cuba. What is more important, a working collection of Coleoptera from the West Indies has been formed at the Museum since the year 1897, and numbers now about three thousand species. The beginning of this collection dates back to the transfer of the Hubbard and Schwarz collection, which contained a fine series of Coleoptera collected by the late H. G. Hubbard in Jamaica and the Island of Montserrat, numbering to about three hundred species. With the acquisition of Porto Rico by the United States and the military occupation of Cuba, smaller sets of Coleoptera coming from these two islands and collected by various officials of the U. S. National Museum were added to the collection, but the West Indian collections made by the employes of the Bureau of Entomology of late years outrank in importance all the collections made previously. Thus Mr. August Busck, on two trips, one to Cuba and the other to Porto Rico, brought back important collections which were mounted and labeled by himself and turned over to the National Museum by the Chief of the Bureau

of Entomology. A still larger collection of West Indian Coleoptera was made by Mr. August Busck in Santo Domingo, Trinidad, and some of the lesser Antilles, in the course of the mosquito investigations carried on by Dr. L. O. Howard under a fund provided by the Carnegie Institute. A part of this large collection was mounted and labeled by Mr. Busck himself. The other part could not be mounted until quite recently for lack of working force. Quite recently, however, Doctor Howard detailed two expert preparators for the work, and the Busck collection is now rapidly being mounted and rendered available for study.

The most important addition to the Cuban fauna of Coleoptera was acquired through the Cotton boll weevil investigation, Mr. E. A. Schwarz being sent by the Bureau of Entomology to Cayamas, Province of Santa Clara, Cuba, for the purpose of investigating the cotton boll weevil. Mr. Schwarz incidentally made a large collection of Coleoptera at that point amounting to about fifteen hundred species. This collection was mounted and labeled by the Custodian, and the whole of the West Indian material which has accumulated has been determined and arranged by him. The collection thus formed has been of the greatest assistance in the determination of insects sent on by the Agricultural Experiment Stations of Cuba and Porto Rico, and the accessions derived from the lot of insects sent from this source have been quite considerable. Prof. Carl F. Baker, the Botanist of the experiment station at Santiago de las Vegas, especially sent on large sets of Coleoptera from his private collection for determination and with permission to retain everything for the National Museum. The British agricultural experiment stations at Jamaica and Santa Lucia are also sending on Coleoptera for determination which is constantly increasing the collection at the Museum.

At present the West Indian collection is contained in twenty of the regular Museum cases. These have become so crowded that a re-arrangement of the collection in the near future will be absolutely necessary. As a matter of course among the smaller species there are a great many undescribed ones, and the collection will one day be able to furnish most valuable material to any competent Coleopterist who desires to work up the West Indian Coleopterous fauna.

Central America.

The old collection consisted of a series of species donated to the Museum by the Government of Mexico, and which was on exhibition at the Chicago Exposition. There were not more than about three hundred species. Since the year 1897 additional species from Mexico were sent from time to time for

determination by Mr. O. W. Barrett who was in charge of the entomological portion of the National Museum in Mexico.

More important additions were made by various employes of the Bureau of Entomology of the U. S. Department of Agriculture from various parts of Mexico, namely, by Prof. Herbert Osborn, Mr. Albert Koebele, and Dr. L. O. Howard, Chief of the Bureau.

Of late years Prof. A. L. Herrera is sending in for determination to the Bureau of Entomology species of economic importance, which all help to increase the collection from Mexico. A small but valuable set of species from Cuernavaca was donated by Mr. Wm. Schaus.

A valuable set of species from the territory of Tepic in the Mexican State of Sinaloa, collected by Doctor Gustav Eisen, was secured in exchange with the California Academy of Sciences through Mr. Chas. Fuchs.

As to the Central American states south of Mexico, the Museum had absolutely nothing until some years ago the Schildborgdorf collection from Costa Rica was purchased by the Museum. This collection contains about fifteen hundred species, all of them representing Coleoptera of larger size, but all new to the Museum collection.

The greatest increase to the Central American collection is of quite recent date, and consists of the following two collections: that made by Mr. Frederick Knab in 1905, mainly at various points on the west coast of Central America, on an expedition undertaken for the purpose of collecting mosquitoes under the auspices and at the expense of the Carnegie Institution; the other collection being that made the present year by Messrs. Barber and Schwarz in the eastern part of Guatemala, the expenses of the expedition being paid by the Bureau of Entomology from the cotton boll weevil fund. These two collections are just being mounted and labeled, and it is estimated that they will contain more than 2,500 species of Coleoptera new to the Museum collections.

Only forty drawers are available for the Central American collection, and it is certain, therefore, that only a small portion of the collection can be arranged unless more drawers are furnished by the Museum. As it is now, the collection is in tolerably good working order as far as the larger specimens are concerned, and by its aid specimens of most families sent in by correspondents can be determined.

Hawaiian Islands.

For practical reasons it has been found necessary to keep the material from the Hawaiian Islands separate. The foundation of this collection is a set of species (about 150 species) which

came to the Museum with the purchase by the U. S. Department of Agriculture of the Belfrage collection. Since that time it has been largely increased by a collection made by Dr. Wm. H. Ashmead on a trip to the islands at the expense of the U. S. National Museum; and further by various sendings of species, mostly of economic interest, made by the experiment station at Honolulu to the Bureau of Entomology. On the whole, this collection is still very small when compared with the number of Coleoptera collected on the islands by Mr. Perkins under the auspices of a committee of the Royal Zoological Society in England.

There are no drawers available for the proper arrangement of this collection, which has to be kept in Schmidt boxes in a very crowded condition, but all the species have been properly named.

South America.

This collection is still in very unsatisfactory condition, not only on account of the scanty material hitherto at the Museum, but also from the fact that from lack of space the material can not be spread out and thus rendered available for study and determination.

Of the old material the most valuable part is a set of Brazilian Scarabaeidae and Cerambycidae purchased by the Museum from the well-known collector, Mr. H. H. Smith, at the occasion of the Chicago Exposition in 1893. The accessions made since that time are but few, the most important being the following:

A considerable number of Brazilian Coleoptera collected by Mr. Albert Koebele at Pernambuco and Bahia during a trip undertaken many years ago at the expense of the Department of Agriculture during the cotton worm investigation. This collection was kept at the Department of Agriculture for many years until, on account of the crowded condition at the Bureau of Entomology, it was turned over to the National Museum.

Secondly, a collection of Chilean insects, which was sent by the Chilean Government to the Exposition at Buffalo in 1903, where, however, it was never unpacked and was misplaced. Through the intercession of the Chief of the Bureau of Entomology, the collection was finally recovered in 1904 and donated by the Chilean Government to the Bureau of Entomology from which it has been transferred by the Chief of the Bureau to the National Museum. The collection, containing about five hundred species, has suffered somewhat from dust, but is otherwise in good condition. The species were most of them named by Mr. Reed, who is in charge of the public insect collection at Santiago, Chile.

Valuable Venezuelan Coleoptera were donated to the Museum from time to time by Mr. Edward E. Klages. There is further some hope that a large collection of Coleoptera from the La Plata states may be purchased by the Bureau of Entomology.

EUROPE.

The old collection of European Coleoptera, consisting of those species which were in the Riley collection and those in the collections made by Dr. John B. Smith and M. L. Linell, has received hardly any additions except through exchanges with some European entomologists. These exchanges have not been sufficiently large to make this collection a really valuable one. A full collection of European Coleoptera is most desirable for the Museum, in order to make comparison with the North American fauna, but without purchasing large and well-determined collections in Europe it can not be hoped to bring together by casual exchange a collection of European insects of any great scientific value.

The European collection of the Museum contains about 4,000 species and is still kept in a very crowded condition in old Schmidt boxes. No regular Museum drawers are available to display the collection to better advantage.

AFRICA.

The old Museum collection of African Coleoptera has practically received only one important addition, namely, the collection made by Messrs. O. F. Cook and R. P. Currie in Liberia. This collection was mounted and labeled by Mr. Currie and partially determined by the present Custodian. Other additions of smaller extent came with the donation of the Hubbard and Schwarz collection which contained a small set of micro-Coleoptera from the Cape region, and from various other donations. On the whole, the African collection is in a very unsatisfactory condition, and the material can not be spread out and rendered available for study for want of space and drawers.

ASIA.

Of the North Asiatic fauna, the Museum has practically nothing in Coleoptera excepting a few small but valuable collections made by Dr. Leonhard Stejneger during the international fur-seal investigation on the Commander Islands, on Behring Island, and in parts of Kamchatka. These sets, which are still kept separate, were determined by the Custodian, and lists furnished to Doctor Stejneger, but it appears that the lists have never been published. A few small sets of Coleoptera from northern China, received as donations by correspondents

of the Museum, complete the small representation of the Coleopterous fauna of northern Asia.

From tropical Asia the only accessions of any value were through exchange with Mr. G. van Roon, of Rotterdam, Holland, and a set of Indian and Siamese Coleoptera collected by Mr. Fruhstorfer purchased and donated to the Museum by the Custodian.

The Japanese collection is gradually getting increased through the sendings for determination from Professor Nava, of Gifu, and other Japanese correspondents of the Bureau of Entomology. All Japanese insects received from this source have been properly remounted, but the original locality labels, being written in Japanese characters, are of little value. The Japanese collection is tolerably well displayed, but is still kept in the old Schmidt boxes.

It is to be greatly regretted that the Museum collection of the Philippine Islands is still in such fragmentary condition as to be practically without value for determination of Coleoptera, and what little material is at the Museum can not be spread out on account of want of space. The largest collections of Philippine Island Coleoptera were made during the first years of the military occupation by the United States, by the hospital stewards, P. Stangl and A. P. Ashly, and donated to the Museum. Another valuable set from Mindanao was donated to the Museum by Mr. E. A. Mearns. Mr. Charles S. Banks, who is Entomologist of the Bureau of Science, Department of Interior, at Manila, has sent on from time to time for determination small sets of specimens, but in the present state of our collection only a few species can be named. A set of Luzon insects made by Mr. J. L. Webb, of the Bureau of Entomology, while in the service of the Philippine forestry department, was finally secured for the Museum. This collection was unfortunately kept at Manila for about two years, and has suffered greatly from mold. The Philippine Island collection is still kept mostly unarranged in Schmidt boxes, and in the present condition of the Museum there is no chance of spreading it out or to make a serious attempt to determine the species.

From the Malayan Archipelago material of considerable value has been received, but most of it undetermined. Prof. D. G. Fairchild, of the Bureau of Plant Industry, U. S. Department of Agriculture, has donated collections of considerable extent, made by him on the islands of Java and Ceram. Another very valuable collection from Mt. Kina Balu, North Borneo, was donated to the Museum by Messrs. A. D. Dodge and A. G. Goss. This collection includes a full set of the Theodosia beetles which are peculiar to the mountain just mentioned.

This collection from the Malay Archipelago, at present still unarranged, will ultimately be incorporated into the Asiatic collection—as soon as time and space will permit.

AUSTRALIA.

The few Australian Coleoptera in the old Museum collection have received but one important addition, namely, the collection of Coccinellidae, made by Mr. Albert Koebele during his several trips to Australia undertaken partly at the expense of the Bureau of Entomology and partly at the expense of the State Board of Horticulture of California, for the purpose of introducing scale-feeding Coccinellidae into California. These Coccinellidae were partly determined by Mr. Blackburn, of Australia, and partly by the Custodian, and it is advisable to keep these Coccinellidae separate from the rest of the Australian collection to facilitate their recognition when they occur in other countries.

The New Zealand collection has been largely increased by a finely mounted and well determined set of species collected and determined by Captain Broun, the well-known authority on New Zealand Coleoptera. This set came to the Museum through the collection of Messrs. Hubbard and Schwarz, who received the specimens, through exchange, from Captain Broun.

BIOLOGIC COLLECTION.

The old collection of Coleoptera larvae was that made by the late Dr. C. V. Riley and that accumulated at the Division of Entomology, U. S. Department of Agriculture. This collection was the least important part of the biologic collections accumulated during many years by the Department of Agriculture, and unfortunately had been displayed in a way which seriously injured the specimens from the fact that the small vials were kept in a horizontal position, and in spite of the fact that every year the laborious work of refilling the vials was undertaken, a goodly proportion of the specimens have dried up. An important addition to this collection was the biologic material contained in the Hubbard and Schwarz collection. This collection is kept in vials held in vertical position in trays, and it has been found that an alcoholic collection kept in this way does not need any refilling for many years. The additions to the biologic collections are, therefore, kept in the same way.

Naturally the collection of biologic material is of slow growth, and the additions received from various sources are of small extent.

Since none of the other Custodians of the Division of Insects possess alcoholic collections, the alcoholic material of the Hubbard and Schwarz collection which represent not only Coleoptera but other orders is kept together, and occupies one of the regular Museum cases, the shelves of which have been increased to the largest possible number.

The only drawback to the arrangement of this collection in trays is the unequal size of the vials, which is necessitated by the unequal size of the specimens, and thus for larger specimens vials and trays of a larger size must be used and kept separate from those of the smaller specimens. The biologic collection contains but little exotic material.

MICROSCOPIC COLLECTION.

Upon entering his office, the present Custodian found only a small and quite worthless collection of slides representing miscellaneous European Coleoptera and a small number of slides prepared by Dr. J. B. Smith, illustrating various structures of North American beetles. A valuable addition to the collection came to the Museum through the donation of the Hubbard and Schwarz collection, which contained a number of slides made from North American Coleoptera. By far the largest and most valuable addition to the slide collection has been made, and is being made, in recent years through the zeal and skill of Mr. H. S. Barber, Aid to the Division of Entomology, who also arranged the slides in a case and prepared a catalogue of them. Proper labels put in the systematic collection facilitate the use of the microscopical collection.

At present, most of the slides represent structural details of North American Coleoptera.

A RESUMÉ OF THE WORKS OF JACOB HÜBNER IN REGARD TO THE NOMENCLATURE EMPLOYED THEREIN.

By Wm. Barnes and F. H. Benjamin, *Decatur, Illinois.*

In the Sammlung Europaischer Schmetterlinge, published in the latter part of the eighteenth and the beginning of the nineteenth centuries, Hübner used the Linnaean genera *Papilio* and *Sphinx*, and the subgenera (?) *Bombyx*, *Noctua*, *Geometra*, *Pyralis*, *Tortrix*, *Alucita*.

In the early part of the nineteenth century, probably late in the year 1805 or before November 15, 1806, although possibly of somewhat later date up to the year 1810, Hübner printed a two page tract known as the Tentamen.

This divides the order Lepidoptera into nine Phalanges, these being the well-known generic and subgeneric (?) names of

Linnaeus. Attention has been called, by prior authors, to the fact that these Phalanges are printed in the plural, but a glance into the works of Linnaeus shows that he also used all of these names in the plural when he wished to indicate that more than a single species was under consideration. In this respect, therefore, the Tentamen does not differ radically from the Systema Naturae.[1]

Each Tentamen Phalanx is divided into tribes which are indicative of groups of common structural characters, but the "names" given to the tribes are the only "names" employed in the Tentamen not starting with capital letters and printed in italic type, and since they are in adjective form, are undoubtedly intended as descriptions rather than true names. As an example Sphinges (i. e. *Sphinx* L.) is divided into three tribes,—

"*Tribus I; papilionoides.*" (viz, the butterfly-like Sphingids, rather broad winged and diurnal.)

"*Tribus II; hymenopteroides.*" (viz, the Hymenoptera-like, i. e., wasp-like, Sphingids; greatly resembling wasps and by most authors considered mimics thereof.)

"*Tribus III; legitimae.*" (viz, the legitimate or real Sphingids, true members of the present Sphingidae sorted out of the heterogenous genus *Sphinx* of Linnaeus.)

Each "tribus" is divided into a number of stirpes; each stirpe name given both in the plural and—combined with a specific name—in the singular;—examples,

" I. Nerëides—Nerëis Polymnia."

"II. Limnades—Limnas Chrysippus."

Hübner printed one hundred and seven such combinations in the Tentamen, each specific name traceable because of the quotation of the prior generic (or subgeneric) name, the whole scheme much simplified because of the descriptive characterization of the tribes corresponding to a determination "key." *Sphecomorpha*, if generic, must take as type *Sphinx incendiaria* (stated to be a wasp-like Sphingid) as sole species. As each stirps name, like *Sphecomorpha*, is in the nominative, singular, Latinized, and the first part of a binomial, then, from the standpoint of the Tentamen, 1806, they would appear to agree with all definitions of generic names.

If, however, other literature is to be taken into consideration, then the obvious course is to determine the relation between such names as *Sphecomorpha* (if generic the wasp-like *Sphinx incendiaria* sole species and therefore type), and prior literature. While *Sphecomorpha* may be determined as a new name, *Zygaena* can easily be found as having been published as a genus about

[1]Linnaeus used plurals in other orders—*Bos* vs. *Boves*, etc.

thirty-one years prior to the Tentamen. So can *Sesia*. *Pterophora* is obviously merely an emendation of *Pterophorus* Fabr., so that the original orthography of *Alucita pentadactyla* L. need not be changed to *pentadactylus*, as was done by Fabricius. *Thyris* is not new, being first printed by Laspeyres, in Illiger, Mag. Ins., II, 39 (1803). *Hepiolus* is *Hepialus* Fabr., first emended by Illiger (Mag. Ins., I, 138 (1802)), the corrected form adopted not only by Hübner, but by Ochsenheimer (Schmett. Europ., III, 103 (1810)). This case is of some interest as indicative that Hübner both knew and followed the literature of his day.

Therefore, it is to be seen, from a study of the Tentamen names on the basis of 1806 and prior dates, that Hübner elevated and divided the Linnaean genera (or in the case of the genus *Phalæna*, the large subgenera) into a series of stirpes, which have the same rank as the smaller genera of the later works of Fabricius, and of other authors of the same period.

The Sammlung exotischer Schmetterlinge presumably followed closely the Tentamen, plates I, II, V-VIII, XII, XV, XXIX, XLVII being issued before November 15, 1806 (according to Fernald, 1905).

The work was issued mainly in the form of plates appearing at different dates. The first two hundred and thirteen plates bear a nomenclature usually termed "trinomial." This seems largely due to the influence of the so-called "fac-simile" edition of Wytsman. In the original copies, the stirps name is printed in the same type as the specific name, both starting with capital letters, while between these two names a word descriptive of a mere group assigned to the stirps has been intercalated in italic and smaller type starting with a small letter. Examples: plate I, *Nerëis vitrea Doto* (the following five plates containing *Nerëis vitrea* sps.); plate VII, *Nerëis fulva Polymnia* (the two following plates containing *Nerëis fulva* sps.); plate X, *Nerëis festiva Thales* (the three following plates containing *Nerëis festiva sps.*); plate XIV, *Nerëis fulva Calliope* (will be noted as being out of place if the word *fulva* has a nomenclatorial status); plate XV, *Nerëis cærulea Thamar;* plate XVI, *Nerëis cærulea Sara;* plate XVII, *Nerëis viridis Dido*. In other words, Hübner's original plates show that the binomial is the stirps name plus the specific name, with the intercalation of a word indicative of coloration or some similar character considered in 1806 to be of minor importance; viz, the vitreous *Nerëis* sps., the fulvous *Nerëis* sps., the brightly-colored *Nerëis* sps., the green *Nerëis* sps., etc.

The so-called "fac-simile" copies have printed the names erroneously, *Nerëis* being in smaller and less heavy type than

"*Vitrea Doto*," while *vitrea* is started with a capital letter, causing what appears to be either a trinomial nomenclature or a binomial *Vitrea Doto* with the stirps name (*Nerëis*) indicating some category higher than generic.

Whether Hübner changed his system or not after plate CCXIII is a question which can scarcely be solved from a study of the Sammlung alone. He no longer used the stirps names in the singular as part of a binomial combination, nor do the "names" like *fulva* appear except as Fulvæ, but instead the binomial appears to represent the coitus of the Verzeichniss plus the specific name;—example, *Junonia Coenia*.

The Verzeichniss bekannter Schmetterlinge is a synonymic and bibliographical catalogue. Probably the first pages of this work (presumably distributed a few pages at a time) were ready for distribution in about the year 1816, although there remains some question as to the exact dates of availability.

On page 3 Hübner states he made known his Tentamen as a basis of his work. On page 7 his "Phalanx I" bears the same name, "Papiliones" used in the Tentamen (with the synonymy listed by Hübner "Papiliones Linn. Papiliones & Hesperiae Fabr." Here also appears the Tentamen "Stirps I Nerëides" (with synonymy "Heliconii Linn. & Fabr."), followed by a characterization of the name, said name appearing to be in the plural because of reference to more than a single included species (following the examples of Linnaeus, etc.). It is in the singular in the Anzeiger of the Verzeichniss in several places where uncombined with more than a single other name. Following "Stirps I" is "Familia A," "Vitreae," but this is also in the singular in the Anzeiger, "Vitrea 8. Nereis." The characters given on page 8 indicate that *Vitrea* is a mere group of *Nerëis*, based upon vitreous wings, as might also be deduced from the method employed in listing the "Familia" names in the Anzeiger, and their prior application in the Sammlung. Toward the bottom of page 8 appears "Coitus I," "Hymenites" (note the plural usage because of more than a single species being under consideration). Then appear specific names like "*Hymenitis Diaphane*" (note the singular use of *Hymenitis* because of the single species *diaphane*).

From the evidence furnished by the structure of the Verzeichniss and its Anzeiger, it would appear that Hübner elevated to Phalanges, the larger genera of the older authors, and then subdivided them into a set of tribes descriptive of great groups, being approximately equivalent to our present smaller families and larger subfamilies. That he further subdivided into a set of stirpes corresponding taxonomically in the main to the subgeneric (?) names of Linnaeus which Fabricius used as genera, i. e., *Heliconius*, *Festivus*, *Ruralis*, etc. In other words,

that his term "stirps" of the Verzeichniss seems about equal taxonomically to the smaller genera of the latter works of Fabricius. The nomenclatorial evidence that the stirpes of the Verzeichniss are the true genera is more elusive consisting mainly of the facts:—

1. They are usually described on structural characters, whereas any name assigned to the rank of "Familia" or "Coitus" is usually described upon minor superficial characters.

2. That they appear in the nominative singular in the Anzeiger, while in the text the "Coitus" name is also in the plural when combined with more than a single species.

3. That specific homonyms are sunk when appearing within the same stirps, and a new specific name proposed. Example: page 74, *gryneus* is a new name for *damon* Cram. nec *damon* Schiff. (page 67) although the quadrinomials assigned to the names, if placed in the singular following the Anzeiger, would read *Agrodiaetus Adolescens Nomiades Damon* Schiff. and *Agrodiaetus Armatus Lycus Gryneus* (*Damon* Cram.).[1]

4. That certain plates of the Sammlung bearing numbers lower than CCXIII are not listed in the Verzeichniss, indicative, with other substantiating evidence, that they appeared subsequently to at least the writing of the manuscript and probably to the publication of that part of the Verzeichniss containing their stirpes names, and that notwithstanding that the so-called "binomial" Verzeichniss was using the "coitus" name as the first part of the "binomial," these Sammlung plates possess the same type of nomenclature as plates issued before publication of any of the sheets of the Verzeichniss; example: *Limnas thalassica Limniace*. Whereas, other Sammlung plates issued either prior to the writing or publication of that part of the Verzeichniss containing their stirpes are listed in the bibliography as: example, Verz., p. 9, "I. Doto Hübn. Ner. vitr. Doto" (being Sammlung plate I). It will thus be seen that Hübner's plates of the Sammlung formerly said to be "trinomial," but which we have shown to be in reality binomial, overlapped with the so-called "binomial" Verzeichniss.

5. Little is to be gained by a study of the terms employed by Hübner in his Verzeichniss, where species are called "genera." Viewed from one angle his "Coitus" might appear generic because of the German "Verein." But, from the standpoint of Latin, "genus" might well be translated species or kind; "coitus," as a mere assembling; "familia," as a part of a gens, viz.

[1]While Hübner did not give the same name to any two stirpes, and renamed specific homonyms, he was not so careful regarding his coitus names. At least one name (*Epia*) has been used in the Verzeichniss for two distinct coiti, rather indicative that its author considered the "coitus" names of less importance than either the "stirps" or the "genera" (species) names.

of a single descendant; "stirps," as the lower part of the trunk of plants, or as a plant, shrub, stem, or stock, but conveying the meaning like English scion of offspring, progeny; "tribus," as a tribe or division of the people; "phalanx," as a host drawn up in close order. We rather wonder if Hübner could possibly have had some hazy idea of evolution in mind? His Latin terms would almost seem to indicate this.

While these terms and their translations are interesting, to our minds they show no conclusive evidence as to the nomenclatorial status of the names. "Verein," and hence "Coitus," might be translated to "genus," though in Hübner the term "genus" is used to indicate species, quite contrary to former usage. Furthermore, while the term "Stirps" was perhaps used by certain of the older authors to indicate a group higher than a genus, it was also used in the generic sense; while the term "Familia" was used as a subdivision of a genus, just as we think Hübner intended it; and Linnaeus used the term "Phalanx" to indicate a group smaller than a genus, viz, "Papiliones *dividuntur in* VI phalanges: *a.* Equites *Alis primoribus ab . . .*"

6. In attempting to determine the meaning of the terms of Hübner, rather than a mere translation of the term words, we find the system employed in the Verzeichniss directly comparable to that employed by Linnaeus. Compare, *Papilio* (or *Papiliones*) *Equites* (as *Eques* when a single species is to be considered) *Troës* (which we do not find in Linnaeus, 1758, in the singular) *Priamus*, with *Nerëides* (singular *Nerëis* given in Anzeiger) *Vitreae* (singular *Vitrea* listed in Anzeiger "Vitrea 8. Nerëis") *Hymenites* (singular *Hymenitis* in text when with but a single species) *Diaphane;* these two "quadrinomials" being respectively the first species of the Systema Naturæ and the Verzeichniss.

The Zuträge zur Sammlung exotischer Schmettlinge, in the original copies, consists of plates and text, the plates without names, but their figures numbered, and these numbers appearing both in the descriptive text and on other sheets in tabular form. Exact dates of availability of the various names are much in dispute. The "binomial" consists of the coitus plus the specific name, but in the text appears the stirps and familia name for each species, while there are also lists of the stirps names in the nominative singular. Thus while *Rusticus* of the Tentamen has been abandoned both in the Verzeichniss and the Zutrage for *Agrodiaetus* (or *Agrodiaeti*), the nominative singular form appears in places in both works.

An interesting point about the Zuträge is that in his description of new species Hübner usually calls attention to differences from known species. In those cases where he compares with

a Linnaean species he lists the full Linnaean "quadrinomial." This to our mind is quite important as a bit of evidence tending to show that Hübner recognized the Linnaean species as "quadrinomial" rather than "binomial." Hübner was not the only Lepidopterist to use Linnaean "quadrinomials." Cramer and Stoll are other well-known authors[1] who follow identically the Linnaean system. Compare, 1791, "Pap. Eq. Troes EPHESTION" Stoll, with "P. E. T. Priamus" L. (1758). An English author, Drury, as late as 1782, used "P. Eq. Tro." as "genus" for his new species "Antimachus." So that to within fifteen years or less of the dates of issue of the Tentamen and the first plates of the Sammlung, Hübner had abundant precedence for the establishment of a "quadrinomial" nomenclature which in reality is a binomial nomenclature with the second and third names added to split the large genera into groups.

In conclusion, we are forced to the belief that the "Stirps" of Hübner, at least between dates 1806 to 1816–18, is of the same nomenclatorial rank as the three genera, *Papilio*, *Sphinx*, and *Phalæna* of Linnaeus, 1758; and that about 1816–1818 he intercalated his "coitus," which while certainly comparable with "Troës," etc., of Linnaeus, differs in that it has been used in the nominative singular as part of the Verzeichniss "binomial," and would, therefore, appear available as generic in as much as it violates no characterization of a "subgeneric" name.

We are surprised to learn that while Sir George Hampson did not adopt the Tentamen, he did have much the same viewpoint regarding the rank of the Hübnerian terms. After about sixty years of the most intensive revisional work he wrote (1917, Ent. News, XXVIII, 465): "The real genera for which structural characters are given in the Verzeichniss are the Stirpes and Hübner's lower divisions Familiae and Coitus are mere form and color sections and so considered by Hübner himself, and should not, strictly speaking, be treated as generic names. In fact, Hübner's nomenclature, as also that of Linné, is only called binomial by a time-honored fiction. It is instructive to note that many of the older authors used the term Family as a subdivision of genus, as indeed is its proper meaning."

[1]For similar "quadrinomial" nomenclature in Lepidoptera consult the works of Fabricius, Sulzer, Knoch, Barbut, Esper, Borkhausen, and in part Geoffroy, Latreille (in Lamark, 1801), Abbot & Smith, etc.

REMARKS ON THE NAME OF ONE OF OUR COMMON YELLOW-JACKETS.

By S. A. Rohwer, *U. S. Bureau of Entomology.*

As early as 1785 the specific name *communis* was used for a species of the genus *Vespa*, yet in 1857 Saussure again used this name for another species, this time applying it to one of the commonest "yellow-jackets" or "hornets" in Eastern North America. Schrank (Neu. Magaz. Liebh. Entom., vol. 2, 1785, p. 328) was the first author to use the name *communis* in the genus *Vespa*, and at this time selected it for an European species from Batavia. Subsequent to the original publication Schrank (Fauna Boica, vol. 2 (2), 1802, p. 351) and C. Huber (Vollst. Naturg. d. Bau. u. Baumhölzer, vol. 2, (6), 1807, p. 302) treated this European species, but since then it has been so little understood that it is doubtfully placed in the genus *Vespa*. R. du Buysson in his monograph of the genus *Vespa* (Ann. Soc. Ent. France, vol. 73, 1904) omits all reference to Schrank's *communis* and treats only the Nearctic species described by Saussure. Dalla Torre in his Catalogus Hymenopterum (vol. 9, 1894, p. 141) gives both names, and quite contrary to his usual practice, does not propose a new name for the homonym. Again in 1904 Dalla Torre (Gen. Insectorum, fasc. 19, pp. 64 and 66) permits both names in the genus *Vespa*, but this time places the *communis* of Schrank in the genus with doubt. An examination of the description of *Vespa communis* Schrank leaves some doubt as to present systematic position of Schrank's species, but it certainly does not change the fact that *Vespa communis* Saussure is a homonym and as such should have a different name.

In his revision of the species of the genus *Vespa* R. du Buysson redescribed *communis* Saussure in all castes and in his record of material records specimens in the British Museum from Wilmington, Delaware, which bear the manuscript name label "*V. maculifrons* H." The publishing of this manuscript name in connection with this description validates the name *maculifrons* and makes it a synonym of du Buysson's interpretation of *communis* Saussure.

In tabulating the Canadian species of the genus *Vespa* Sladen (Ottawa Naturalist, vol. 32, 1918, pp. 71–72) divides *communis* into two varieties. The darker northern form he considers typical *communis*, while the paler southern form is considered as a new variety, for which he proposes the name *flavida*. These two varieties are separated on minor color differences in the female and it is doubtful if they will prove sufficiently distinct to justify names, but even if they do it seems that the restriction of the name *communis* to the darker northern variety is erroneous. This is supported by Saussure's original description and du Buysson's account which is

based partly on an examination of cotypes. If these are two varieties it is the darker northern form which would need a different name.

Dr. Bequaert has suggested (in litt. Dec. 2, 1925) that the form described by Shipp as *Vespa westwoodii* (Psyche, vol. 6, 1893, p. 450) is the same as *communis* Saussure. This may be correct, but Shipp's description is based on a discolored specimen and is so inadequate that I can not satisfactorily associate his form with any following three species as defined in du Buysson's revision: *germanica* Fabricius, *communis* Saussure or *vulgaris* Linnaeus. Assuming certain characters Shipp's description seems to agree rather satisfactorily with Sladen's darker northern form treated as *communis* var. *communis*. If this assumption is correct then the proper name of this common yellow-jacket would be *westwoodii*. Shipp's description of *westwoodii* calls for the following color markings which do not agree with the material of *maculifrons* before me: (1) supraclypeal spot apparently well separated from the marks in the emargination of the eye; (2) markings of the posterior orbits interrupted and forming two spots; (3) first tergite apparently without yellow just before the anterior declivity; (4) tibia "with a black patch in the *center* of the inner margin." With these apparent minor differences, it seems advisable to refrain from expressing a definite opinion on the form described as *westwoodii* until the type, which is in the Oxford Museum, can be studied.

The following bibliography summarizes the above discussion and gives the more important taxonomic references to this common yellow-jacket.

Vespula (Vespula) maculifrons (R. du Buysson).

? *Vespa westwoodii* SHIPP, Psyche, vol. 6, 1893, p. 450.

Vespa communis SAUSSURE, Settin. Ent. Zeit., vol. 18, 1857, p. 117 (not Schrank, Neu. Magaz. Liebh. Entom., vol. 2, 1785, p. 328); R. DU BUYSSON, Ann. Soc. Ent. France, vol. 73, 1904, p. 606; SLADEN, Ottawa Naturalist, vol. 32, 1918, p. 71.

Vespa maculifrons R. DU BUYSSON, Ann. Soc. Ent. France, vol. 73, 1904, p. 608. (Cited as a collection manuscript name for specimens from Wilmington, Delaware, in connection with du Buysson's redescription of *communis* Saussure.)

Vespa germanica Fabricius, LEWIS, Trans. Amer. Ent. Soc., vol. 24, 1897, p. 177; MARLATT, Proc. Ent. Soc. Wash., vol. 2, 1891, p. 80–83. (Last reference based on a misidentification as evidenced by specimens in U. S. National Museum.)

Vespa communis var. *flavida* SLADEN, Ottawa Naturalist, vol. 32, 1918, p. 71. (Sladen gives this as a new name for *pennsylvanica* of Authors, but I am uncertain to which authors he refers—certainly not to Saussure or du Buysson.)

Vespula (Vespula) maculifrons, variety?

? *Vespa westwoodii* SHIPP, Psyche, vol. 6, 1893, p. 450.

Vespa communis var. *communis* SLADEN, Ottawa Naturalist, vol. 32, 1918, p. 71.

Actual date of publication, April 21, 1926.

EDITORIAL.

The following "Reply" to my editorial in the December, 1925, issue was received with the request that we publish it. I do so—without comments.

—*Carl Heinrich.*

A Reply to the pseudo-critical comments which were published in the December issue of the Proceedings.—One stands aghast at the apparent colossal ignorance of this American scientist, of the evolution of species and all its attendant necessary hypotheses; ignorance (that is the *wilful* ignoring) of the wonderful sequence of undoubted, suggestive facts, which support the mighty principle. We all remember the indecency of the notorious trial of last year in the West; is it that the writer "fears for his skin" and produces this floundering torrent of abuse worthy of Caliban in Shakespeare's "Tempest," without uttering one word of disproof, one word of argument, one word of repellant fact, in anticipation of future local prejudice? Has the writer never heard of "hormones"? We pity him. 'Tis nearly thirty years ago now when we read that wonderful book by Geddes & Thompson, "The Evolution of Sex." There we found the "Contest of catabolics and anabolics" the key of much of the argument used to explain the abundance of facts and phenomena reviewed by those now illustrious teachers. Our critic (sic) does not criticise, he vituperates, he absolutely ignores the latest discoveries, which, if to become established, must be applied and stand the test of applicability in all kinds of circumstances; he even goes out of his way to sneer at eugenics, that attempt to utilize for the benefit of the future human race the experience of the past, as the "last infirmity of scientific minds." We are astonished that a worthy society allows its pages to be used to utter the low down scum of frothy journalism.

—*Hy. J. Turner,*
Editor of the "Entomologist's Record & Journal of Variation."

VOL. 28 MAY, 1926 No. 5

PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

CONTENTS

PUBLISHED MONTHLY EXCEPT JULY, AUGUST AND SEPTEMBER

BY THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON
U. S. NATIONAL MUSEUM
WASHINGTON, D. C.

Entered as second-class matter March 10, 1919, at the Post Office at Washington, D. C., under Act of August 24, 1912.

Accepted for mailing at the special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized July 3 1918.

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON

ORGANIZED MARCH 12, 1884.

The regular meetings of the Society are held on the first Thursday of each month, from October to June, inclusive, at 8 P. M.

Annual dues for members are $3.00; initiation fee $1.00. Members are entitled to the PROCEEDINGS and any manuscript submitted by them is given precedence over any submitted by non-members.

OFFICERS FOR THE YEAR 1926.

Honorary President . . . . . E. A. SCHWARZ
President . . . . . J. M. ALDRICH
First Vice-President . . . . . J. A. HYSLOP
Second Vice-President . . . . . J. E. GRAF
Recording Secretary . . . . . C. T. GREENE
Corresponding Secretary-Treasurer . . . . . S. A. ROHWER
U. S. National Museum, Washington, D. C.
Editor . . . . . CARL HEINRICH
U. S. National Museum, Washington, D. C.
Executive Committee: THE OFFICERS and W. R. WALTON, A. N. CAUDELL, T. E. SNYDER.
Representing the Society as a Vice-President of the Washington Academy of Sciences . . . . . A. G. BÖVING

PROCEEDINGS ENTOMOLOGICAL SOCIETY OF WASHINGTON.

Published monthly, except July, August and September, by the Society at Washington, D. C. Terms of subscription: Domestic, $4.00 per annum; foreign, $4.25 per annum; recent single numbers, 50 cents, foreign postage extra. All subscriptions are payable in advance. Remittances should be made payable to the Entomological Society of Washington.

An author of a leading article in the PROCEEDINGS will be given 10 copies of the number in which his article appears. Reprints without covers will be furnished at the following rates, **provided a statement of the number desired accompanies the manuscript:**

	4 pp.	8 pp.	12 pp.	16 pp.
50 copies	2.00	4.00	6.00	8.00
100 copies	2.25	4.50	6.75	9.00

Certain charges are made for illustrations and there are available rules and suggestions governing the make-up of articles. Immediate publication in any number may be obtained at the author's expense. **All manuscripts should be sent to the Editor.**

PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 28 MAY 1926 No. 5

A NEW SPECIES OF STONE CRICKET FROM ARKANSAS (ORTHOPTERA: TETTIGONIDAE; RHAPHIDOPHORINAE).

By A. N. Caudell, *U. S. Bureau of Entomology.*

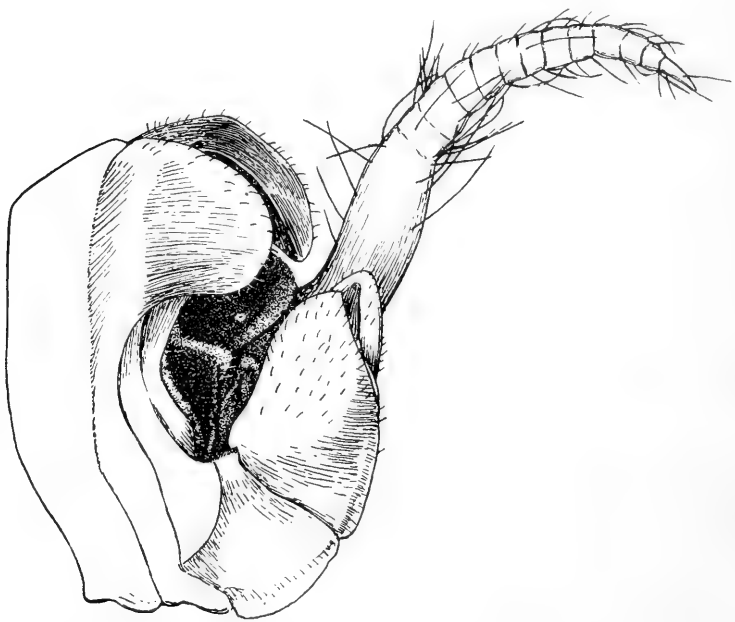
Ceuthophilus marshalli, new species.

Male.—Head yellow, smooth, the vertex very slightly tuberculously swollen; eyes black, small, about as long as broad, pointed below. Thorax smooth, yellow, with each section darker posteriorly; pronotum about as long as the meso- and metanotum together. Legs uniformly yellow, moderately slender; anterior femora a little longer than the pronotum, armed beneath on the anterior margin at about the apical fifth with a single large articulate spine; middle femora armed ventrally with three spines on the anterior margin, the largest situated about as the one on the fore femora, the other two smaller, the basal one situated a little beyond the middle, and on the posterior margin with one rather large genicular spine and one to three very small spines situated about as those on the outer margin;[1] posterior femora three times as long as the greatest width and tapering almost to the tip; ventral margins armed with short triangular teeth, those on the outer margin closer together, over thirty in number and extending to within about a fifth of the base, those of the inner margin smaller, about the same in number, situated a little further apart and extending to within a very short distance of the base; dorsal surface of these femora finely granulate, without acute points, or with one or two very minute ones; central sulcus broad for its entire length, narrowing slightly basally; anterior tibiae a little shorter than their corresponding femora, armed dorsally with sharp genicular spine on each side and beneath with three small spines on the anterior margin and two on the opposite margin, in addition to the larger apical pair; median tibiae about as long as their femora and armed as in the anterior ones with an additional pair of dorsal spines situated slightly distad of the middle; posterior tibiae subequal in length with their femora, straight, armed beneath with a pair of very minute apical spines and a subapical one situated on the median line, above with four pairs of spines, scarcely divergent, slightly slanting backwards, but little longer than

[1]In the ♂ holotype there is but one of these small spines on the left femur, situated about the middle, and two on the right femur, situated approximately opposite the one on the left side; in the adult ♂ paratype there are two on one femur and none on the other, and the allotype has this margin wholly unarmed except for the genicular spine; thus it appears rather certain that these spines when present will vary in number from one to three.

the tibial width and situated almost opposite each other and each pair separated by subequal distances, the basal pair slightly beyond the basal fifth and the apical pair at the apical fifth; in addition to the above noted spines there are the usual apical calcars, three on each side, the dorsal pair of about the same length as the adjacent pair of dorsal spines and indistinguishable from them in form; the median pair about twice as long as the upper, the inner one slightly the longer and about three fourths as long as the posterior metatarsus; the ventral calcars slightly shorter than the dorsal ones. Anterior and middle tarsi a little shorter than their tibiae and the posterior ones about one half as long as their corresponding tibiae; posterior metatarsus subequal in length with the other three combined; second segment distinctly, but less than twice, longer than deep, and fully twice as long as the third segment.

Abdomen brownish yellow, paler beneath, moderately tapering and with the dorsal surface smooth; eighth dorsal segment apically transverse, similar to the preceeding one; ninth dorsal segment projecting conspicuously beyond the eighth and apically deeply notched, the lateral angles assuming a vertical position from a lateral view appearing as in Fig. Supraanal plate almost hidden in the holotype but in the ♂ paratype it is seen to be triangular and a little longer than broad; subgenital plate apically triangularly notched, the notch apically occupying the greater part of the width of the plate; cerci simple, slender, thickest part a little basad of the middle, the length about the same as the greatest width of the posterior femora.



Ceuthophilus marshalli, end of female abdomen with one cercus removed.

Female.—Coloration and structure as in the male except in the following features: The median femora are unarmed on the posterior ventral margin except for the genicular spine, though in some specimens this margin will very surely be found armed with from one to three small spinules as in the male; posterior femora armed beneath on both margins in a little more than the apical half with many very minute teeth, more numerous on the outer margin; middle tibiae with two medio-dorsal spines on the right tibia and one on the anterior margin only of the other one; ninth segment of abdomen inconspicuous, almost hidden beneath the eighth. Subgenital plate apically rounded or, in dried specimens, mesially broadly notched; ovipositor noticeably longer than the pronotum, the outer valves smooth and apically curved upwards and very sharply pointed, the inner valves apically very sharply pointed and decurved and with four ventral teeth, sharp and, especially the distal ones, very slender.

Measurements.—Pronotum, ♂, 4.5; ♀, 3.5 mm.; anterior femora, ♂, 5, ♀, 4.25 mm.; posterior femora, ♂, 10, ♀, 8 mm.; posterior tibia, ♂, 10.5, ♀, 9 mm.; ovipositor, 5 mm.; width, posterior femora at widest point, ♂, 3.3, ♀, 2.5 mm.

Holotype ♂, allotype ♀, paratypes A, adult ♂, B, C, D, and E, adult ♀ ♀, and F to K, immature males. All taken at the type locality by B. C. Marshall. All the adult material was taken in October, 1925, except one female, paratype C, which was taken the previous February. The nymphs were taken in February, March and October, 1925. All were sent pinned except paratypes D and E which were in spirits. Paratypes B and C appear as if they also had been preserved for a time in spirits as the colors seem somewhat faded.

Types.—Holotype, allotype and paratypes A, C, E, F, G and K in the National Museum (Cat. No. 28934, U. S. N. M.); the rest of the material returned to the collector.

Type locality.—Imboden, Arkansas.

SOME NEW PORTO RICAN SCALE PARASITES (HYMENOPTERA: ENCYRTIDAE).

By H. L. Dozier,[1] *Delaware Agricultural Experiment Station.*

The writer while conducting some scale and whitefly parasite studies in Porto Rico, during 1925, reared a large number of very interesting forms, many of which proved to be new to science. Two of the species described in this paper are primary parasites of the Pustule Scale, which is a very destructive pest in the West Indies. This scale occurs in Florida, where it disfigures the oleander. It would be very interesting to determine whether or not these two parasites also occur there. Thanks are due Mr. P. H. Timberlake, who kindly confirmed the

[1]Formerly Chief Entomologist, Insular Expt. Station, Rio Piedras, Porto Rico.

validity of these species and has helped the writer in many ways in his study of these minute parasites. The new genus is named in honor of Dr. Ricardo G. Mercet, who has recently revised and done so much in this group and who has also confirmed the validity of the genus and species.

MERCETIELLA, new genus.

Female: Closest perhaps to *Metaphycus*, but with the mesonotum and scutellum very strongly reticulated, and having no trace of parapsidal furrows. Scutellum no wider than long and decidely more acute at apex than in *Aphycus* and with the setae long and bristle-like. Body rather robust and non-metallic, the abdomen rather short, rounded at the apex and with the ovipositor reaching internally nearly to the base; the tactile plates very much retracted and situated rather closer to the base than to the middle thereby differing from true *Aphycus*, which generally have the plates placed beyond the middle, at least in the female. Antennae of female are typical of Mercet's *Euaphycus* group, the funicle composed of six joints and the club three-segmented, but having the scape and pedicel microscopically reticulated. Mandibles tridentate, the three teeth being about equal in length and distinctly more acute than in the *Euaphycus* group. Maxillary palpi three-segmented, the labial palpi two-segmented. Wings *Aphycus*-like in arrangement and density of pubescence and in the shape of the submarginal vein; the marginal vein is distinctly longer than wide and the stigmal vein is comparatively short, wide at the apex and much constricted at its base.

Male: Differing from the female in having antennae with numerous long hairs which are longer and more prominent than in the species of true *Aphycus*. The hairs are about as long and prominent as in *Metaphycus melanostomatus*, but the first funicle joint is not lengthened as in that species. The reticulated scape and pedicel readily associate the male with the female even were biological data lacking.

Genotype.—Mercetiella reticulata Dozier.

Mercetiella reticulata, new species.

(Text figs. 1, 2, 3.)

Female.—Rather robust. Frontovertex over twice as long as wide, the ocelli placed in an acutely angled triangle. Eyes sparse and very finely hairy. Antennal scape cylindrical, narrow, and only slightly widened in center; pedicel almost as long as the first three funicle joints; first five funicle joints of nearly equal length, each gradually increasing in width until the sixth is almost twice as wide as the first; club elongate oval, slightly wider than the last funicle joint, slightly pointed at apex and as long as the last five funicle joints combined. Wings uniformly ciliated, the oblique hairless streak interrupted below, the cut-off portion separated from the basal hairless streak by two indistinct and faint rows of cilia. Pronotum, metanotum, and propodeum distinctly reticulated and with sparse whitish hairs.

Coloration.—Head including the eyes black, vertex yellowish with its base darker. Thorax black which becomes brownish in balsam-mounted specimens and in these a narrow, pale, median, longitudinal stripe becomes visible. Abdomen testaceous yellow, with a median irregular fuscous patch on dorsum near base; slight infuscation along the posterior margins; in balsam-mounted specimens this dorsal fuscous patch breaks up into a more irregular, less noticeable patch, distinctly reddish in color. Antennae yellowish, scape without markings, pedicel and club brown, the first five funicle joints very slightly darker than the sixth. Legs whitish except the tarsi, which are testaceous yellow, the fore-legs without markings; the middle femora with an interrupted, distally located, indistinct blackish band, the tibiae with two more or less interrupted blackish bands; the hind tibiae with two more or less distinct blackish bands.

Length (exclusive of ovipositor).—.820–.920 mm.

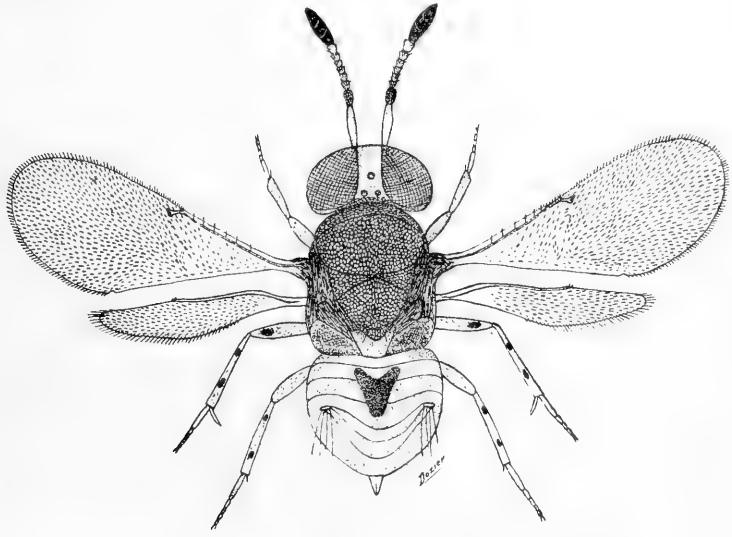


Fig. 1. *Mercetiella reticulata*, adult female, greatly enlarged.

Male.—Pubescence of the eyes sparse and very short and fine. Antennae with numerous long, conspicuous hairs; scape and pedicel reticulated; scape very slightly widened in the center where it is about as wide as the pedicel which is decidely wider than the joints of the funicle; all joints of the funicle increase in length so that the sixth is over twice as long as the first and nearly as wide as the club; the club nearly three times as long as the sixth funicle joint.

Entire body black, becoming brown in balsam mounts. Antennae entirely dusky. Fore and middle legs dusky, lightened up at the distal and proximal ends of femora and tibiae; tibiae of hind legs with two more or less distinct blackish bands.

Length.—.820 mm.

Described from a series of four females and one male reared from the Pustule Scale, *Asterolecanium pustulans*, on Balsa wood tree, Nov. 23, 1924, twelve females and two males reared from same insect on *Cassia fistula* tree during May 16–21, 1925, and a large series of males and females reared from similar material November, 1925; all reared by the writer from material collected at Rio Piedras, Porto Rico.

Holotype male, allotype and one paratype female on same slide, and two females and two males mounted on card points, deposited in the U. S. National Museum (Type Cat. No. 28982); paratypes in collections of the writer, P. H. Timberlake, R. G. Mercet, and the Porto Rican Insular Experiment Station.

Descriptions are made from slide-mounted specimens and fresh living material. This species is a primary parasite of *Asterolecanium pustulans*, and aids in checking this serious pest of the fig, *Cassia fistula*, silver oak (Grevillea sp.), oleander, mulberry, and many other trees and shrubs.

According to Mr. P. H. Timberlake, *Asterolecanium pustulans* is a common scale in Hawaii but has no parasites there except *Tomocera californica*. This latter parasite, so far, is not known to occur in Porto Rico and might prove a valuable introduction as it is also an enemy of the Black Scale, *Saissetia oleae*.

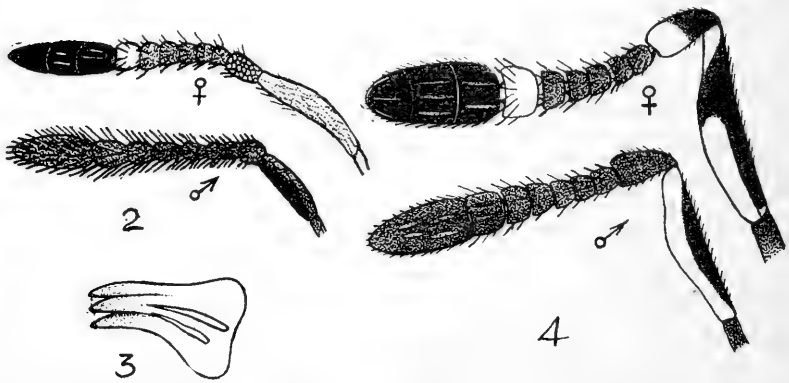


Fig. 2. *Mercetiella reticulata*, female and male antennae greatly enlarged.
Fig. 3. *Mercetiella reticulata*, mandible, greatly enlarged.
Fig. 4. *Euaphycus portoricensis*, female and male antennae, greatly enlarged.

Euaphycus portoricensis, new species.

(Text fig. 4.)

Female.—Frontovertex over twice as long as wide, the ocelli placed in an equilateral triangle. Antennal scape long, narrow, flattened but not greatly

widened; pedicel about as long as the first three funicle joints combined, the first three funicle joints are of about the same length and width, the others distinctly increasing in width; club distinctly wider than the funicle, elongate oval, obtusely rounded at apex. Maxillary palpi three-segmented, the mandibles tridentate. Wings uniformly ciliated, the oblique hairless streak of the forewing interrupted by several rows of cilia. Ovipositor protruded.

Coloration. Head and body yellow with the mesonotum and scutellum distinctly orange. Eyes with greenish bloom in life. Antennal scape pale with the outer half fuscous; basal half of pedicel blackish, the apical half whitish; first five funicle joints and club brown, the sixth funicle joint whitish. Abdomen yellow with an irregular patch of brown on dorsum. Legs whitish, middle femora with indistinct black band, the tibiae with two black annulations; two more or less distinct bands on hind tibiae and the juncture of the femora with the tibiae, blackish; tarsi yellowish.

Length (exclusive of ovipositor).—.960 mm.

Male.—Vertex, pronotum, mesonotum, and scutellum distinctly reticulated, quite similar to *Mercetiella reticulata*, the mesonotal hairs showing rather prominently on account of their dark color, abundant and bristle-like. Under high power of the microscope the hind margins of the abdominal segments are faintly reticulated. Antennae similar in shape to those of the female but the club is distinctly longer and more narrow in proportion.

General color brown with the dorsum of thorax black, the entire insect, however, lightens up when mounted in balsam on slides. Antennae entirely dusky except the scape, which is whitish with the outer margin striped with fuscous part of its length. The middle and hind tibiae with two more or less distinct black bands, and both distinctly black at the junction of the femora and tibiae.

Length.—.760 mm.

Described from two females and one male May 14, 1925, and two females and one male Nov. 14–16, 1925, all reared by the writer from *Asterolecanium pustulans* collected at Rio Piedras, Porto Rico, on *Cassia fistula* and mounted in balsam on slides. This parasite is also a primary one but much less abundant than is *Mercetiella reticulata*.

Holotype female and allotype male on slides deposited in U. S. National Museum (Cat. No. 29070); paratype female in collection of P. H. Timberlake; others in the collection of the writer.

Acerophagus nubilipennis, new species.

In Timberlake's table to members of this genus this species runs to *A. fasciipennis* Timb. but is quite distinct from that species.

Female.—Frontovertex about one half longer than wide, the ocelli placed in a triangle. Eyes not pubescent. The shorter and more basal tooth of the mandible is on the inner margin instead of the outer as in *A. fasciipennis*. Antennal scape very long and narrow, very slightly widened at middle, a little longer

than the funicle joints combined; the pedicel about as long as the first four funicle joints combined, decidedly wider than the latter but narrowed towards its base; the funicle joints successively increasing in width and slightly in length; the club is apparently solid. Mesonotum abundantly furnished with very fine light colored setae, a row of these near the hind margin much stronger and darker. Forewings uniformly ciliated except towards the base, the oblique hairless streak distinct.

General color a very pale yellow with the dorsum of a more pale orange tint, the abdomen pale with the hind margins of the two segments above the vibrissal plates brownish. Antennae dusky yellowish. Wings hyaline with the veins yellowish, the forewings with a very conspicuous smoky band extending in a somewhat triangular manner across the disk (in *A. fasciipennis* the band extends across disk in its full width); the tip of marginal vein and the stigma infuscated, forming a rather distinctive marking, and crossing the smoky band is a lighter transverse streak nearer the hind margin. Ovipositor not very much darker than the abdomen. Legs concolorous with the underpart of the body.

Length.—.76–.80 mm.

Described from two females, mounted on slides in balsam, one reared by the writer from *Pseudococcus aonidum* on Elephant Ear at Rio Piedras, Porto Rico, May 25, 1925, and the other from *Pseudococcus citri*, Rio Piedras, Porto Rico, May 26, 1925. Holotype deposited in the U. S. National Museum (Cat. No. 29071) and the paratype retained in the private collection of the writer.

TAXONOMIC STUDIES OF THE LARVAE OF THE GENERA TENEBRIO AND NEATUS LE CONTE[1] (COLEOPTERA: TENEBRIONIDAE).

By R. A. St. George, *U. S. Bureau of Entomology.*

The present paper gives a generic characterization of the larvae of *Tenebrio* Le Conte and *Neatus* Le Conte; comments on the descriptions by previous authors of larvae representing different species of these two genera, and concludes with a specific key to these larvae.

Generic Characterization of the Larvae of Tenebrio Le Conte.

Mandibles of right and left sides differing in shape; both apically bifid (Fig. 2, a^1, a^2) each with an additional tooth (t) between apex and molar part (m); tooth of right mandible (Fig. 2, t) prominent and placed near apex, that of left

[1]Characterizations both of the family Tenebrionidae and the subfamily Tenebrioninae were given by the present writer in a previous paper. (No. 20, pages 2 and 3.) The numbers in the parentheses refer to literature cited in the bibliographic list.

(Fig. 1, t) less developed and placed closer to molar part; molar part of right mandible with bituberculate crown, that of left with hollow crown; ventrally with cutting part deeply excavated; exterior surface (the back of mandible) distally (c) rounded, without margination, and bearing a single seta on dorsal surface arising from a slight depression behind the apical teeth, proximally (p) (opposite the molar part) excavated, without membranous elevation, bearing four setae, two long chitinous ones on dorsal surface above fossa and two shorter ones ventrally near condyle.

Labrum medianly without a transverse, setose elevation and with a single seta on each side (Pl. 9, 5, lab).

Maxilla with mala conical at apex (Fig. 6, ma).

Epipharynx with only two hooks (short spinelike setae) on median soft-skinned portion (Fig. 7, h.)

Legs; the first pair not much larger and stronger than the second and third pairs (Figs. 11 and 12).

Pygidium apically bicornute with cerci curved upward and more or less reflexed; on each side anterior to cerci, two short chitinous spines; surface punctate (Fig. 25).

Tenth abdominal or "anal" segment small, ventral, bearing two projecting and retractile ambulatory papillae (Fig. 22, X, ap).

Generic Characterization of the Larvae of Neatus Le Conte[1]

Mandibles as described above for the genus *Tenebrio*, except that in addition to the setae placed anteriorly and posteriorly on the back (exterior portion), other setae are placed between them along the dorsal and ventral margins (Fig. 3, p).

Labrum medianly without a transverse elevation, but with a series of long setae[2] (Fig. 4, lab).

Maxilla, epipharynx and *legs* as described in the genus *Tenebrio.*

Pygidium apically without cerci, subconically produced, not mucronate; many small spinelike setae (Fig. 26, IX), along each side, sometimes extending so far towards the center that in places they cross the tergum completely.

Tenth abdominal segment as described in the genus *Tenebrio.*

Comments on the Descriptive Literature Concerning the Larvae of Species of Tenebrio and Neatus.

The larvae representing the different species of the genus *Tenebrio* have been described previously by various authors, but for the most part the descriptions are not very complete

[1]A discussion of Le Conte's old genus *Neatus* is found on pages 9 and 10 of reference No. 20.

[2]This transverse series of setae corresponds in position to the setose elevation present in the labrum of the Blaptinae and may suggest that the genus Neatus in this respect constitutes a link between the two closely related subfamilies Blaptinae and Tenebrioninae (Comp. No. 20, pp. 3–6).

and are of too general a nature to enable a definite separation of the species. In some instances statements have been made in these descriptions which have allowed or caused misinterpretation or which have been entirely erroneous. In fact in the entire literature on the subject only two contributions are of permanent value, namely, Schiödte's description of the larva of *Tenebrio molitor* (No. 19, pages 568 to 571) and Arendsen Hein's careful work (No. 1) dealing with the following four species,—*Tenebrio molitor* Linnaeus, *Tenebrio obscurus* Fabricius, *Tenebrio picipes* Herbst and *Tebebrio opacus* Duftschmidt and some varieties and cross-varieties of *Tenebrio molitor*.

The present writer, in descriptions of *Tenebrio molitor* and *Tenebrio obscurus* (No. 5), has recently given additional morphological characters for the separation of these species and, in so far as was possible, stated which of these characters are constant and which vary and to what extent.

Even in the best descriptions slight attention has hitherto been given to occasional variations which are rather frequent in the genera in question. Thus Schiödte in his description of the number of spines on the various articles of the legs of *Tenebrio molitor* only gives a sole and definite number in each instance.

The larval characters given by Arendsen Hein are partly based upon the position of certain impressions to the light-colored segmental bands of mature specimens. The present writer has felt somewhat uncertain at times in using these characters, not only when the larvae were immature and not fully colored but also when they had been preserved in alcohol for several years as is often the case with Museum specimens. Where Arendsen Hein has counted thirteen segments in the larva of *Tenebrio*, giving the head as one (No. 1, page 127), it should read fourteen, as the tenth abdominal segment being ventral and small has been overlooked. He also describes the antennae of *Tenebrio* larvae as four jointed (No. 1, page 127), as does Mulsant (No. 14, page 10, u. 12) and Chapuis (No. 4, page 514, u. a) adding the remark that he could not verify the statement of Mulsant and Guillebeau (No. 15, page 12) that the antennae of the larvae of *Tenebrio picipes* Herbst are five jointed. The present writer, however, has found, as did Schiödte (No. 19, page 568–571) that the larvae of *Tenebrio* have only three articles (Figs. 14, 15, 16 and 17). Undoubtedly Arendsen Hein, who figures correctly the antennae (No. 1, page 129) of *Tenebrio*, has come to his number by counting the basal articulating membrane (Fig. 16, bm) as article one; his second is the true basal or first article.

Dealing with the cerci on the ninth abdominal segment, Seidlitz (No. 8, pages 632–634) and Mulsant (No. 15, page 11)

describe them as being almost horizontal in *Tenebrio opacus*. The correctness of this statement is denied by Arendsen Hein (No. 1, page 129), and in this respect the present writer agrees with Arendsen Hein.[1]

Mulsant has probably worked with a larval skin in which the cerci were out of their natural position, and Seidlitz has simply quoted Mulsant.

On the other hand the writer can not fully agree with Arendsen Hein when he remarks (No. 1, page 134) that he had not been able to confirm the observations of Mulsant (No. 15, page 11), Seidlitz (No. 8, pages 632–634) and Schiödte (No. 19, pages 571) that the cerci in *Tenebrio opacus* (Figs. 22 and 25, IX) are more slender and longer than in *Tenebrio molitor*. An examination of one of the original larvae[2] from which Schiödte's description was made shows that the cerci of this specimen were not much longer than those of *Tenebrio molitor* (Fig. 24, IX) but only about one-third as wide at base, giving to them the appearance of being long and slender (Fig. 22, IX).

The pygidial segment of the larva of *Neatus picipes* is conically produced but does not end in a single spine as described by Mulsant, whom Seidlitz quoted in this respect, and Arendsen Hein is right in correcting their statements; on the contrary it is not mucronate. Along the sides and sometimes extending so far towards the center that they, in places, cross the tergum completely, are many small spinelike setae. Occasionally one of these small spines is placed at the apical end (Fig. 26, IX), and this may have been the case in the specimen before Mulsant, but such a spine is always of the same size as the others. He compares, however, this pygidial spine with the cerci of the species of *Tenebrio* (Figs. 22, 23, and 24, IX), and if his specimen really had a spine as large as that it must have been a species of *Alphitobius* (Fig. 27, IX) rather than of *Neatus* (Fig. 26, IX).

Arendsen Hein has pointed out that the length of the longitudinal line above the abdominal spiracles (Figs. 18, ll), and

[1]Seidlitz has used this character in a key (No. 8, page 630) and this key was translated and incorporated in a previous paper by the present writer before this mistake was noticed (No. 20, page 10).

[2]This larva is now present in the National Museum, Washington, D. C. It was sent by Meinert to C. V. Riley in 1890 and was taken from the jar in the collection of the Zoological Museum in Copenhagen, Denmark, that contained the larvae from which Schiödte's description was made. In Entomologiske Meddelelser, Vol. 4, page 65, 1893–1894, we have the following record of this material: "The Museum (of Copenhagen) possesses six larvae (of *Tenebrio opacus* Duft.) presented by Mr. Lövendal, also four larval skins and one pupa (obtained) from hollow oaks at Jaegerspris. The four larval skins are from specimens reared into imagines."

the closeness of the spiracles to this line may be used as characters for the separation of the different species of *Tenebrio*. In *Tenebrio molitor* he finds that this line (Figs. 18, ll) runs to (or slightly beyond) the spiracle, but does not extend into the light colored marginal band (mb) which encircles the segment anteriorly, and the spiracles (especially the first abdominal) are close to the longitudinal line. In *Tenebrio obscurus* (Fig. 19), *Tenebrio opacus* (Fig. 21) and in *Neatus picipes* (Fig. 20), the lateral line (ll) extends deeply into the light marginal band (mb) and the spiracles are farther away from the line than in *Tenebrio molitor* (Fig. 18). In *Tenebrio opacus* the spiracle is almost circular (Fig. 21), in *Neatus picipes* (Fig. 20) and in *Tenebrio obscurus* (Fig. 19) broadly oval, that of the latter being slightly less oval than that of the former. In *Tenebrio molitor* (Fig. 18) the form of the spiracle approaches that of *Tenebrio obscurus* (Fig. 19), but is still less broadly oval and almost narrowly oval.

Key to the Described Species of Larvae of Tenebrio and Neatus.

Pygidium without cerci, not mucronate, but with many small spine-like setae along the side and sometimes extending so far towards the center that they, in places, cross the tergum completely, occasionally with one of these small spines placed at the apical end (Fig. 26, IX); labrum with a transverse series of setae placed medianly (Fig. 4, lab); mandible with many setae in an almost continuous row along exterior surface (Fig. 3)..... *Neatus picipes* Herbst = *Tenebrio picipes* Herbst.

Pygidium bicornute, on each side anterior to cerci, with two small chitinous spines (Fig. 23, IX); labrum without a transverse series of setae placed medianly (Fig. 5, lab); mandible on exterior surface (Figs. 2, 3, p), anteriorly with one seta, posteriorly with two dorsal and two ventral setae.....1.

1. Trochanter of prothoracic leg armed distally with two strong spine-like setae on the inner margin (Fig. 11, tr); longitudinal line (Fig. 18, ll) (just above the spiracle) running to or slightly beyond the spiracle, extending forward not more than the length of the diameter of the spiracle; spiracle as close to line as thickness of the thickest part of the peritremal frame (p); ventral side of labrum with a series (about 12 or 13) of irregularly placed, short, spine-like, slightly curved setae set in the anterior corners (Fig. 7)..... *Tenebrio molitor* Linnaeus.

— Trochanter of prothoracic leg armed with one strong spine-like seta (Fig. 13, tr); longitudinal line running well beyond the spiracle and extending into the light colored marginal band which encircles the segment anteriorly (Figs. 19 and 21); spiracle at a distance from the line more than the thickness of the peritremal frame; ventral side of labrum with only a few (usually not more than four) short spinelike setae set in the anterior corners (Figs. 8 and 9).....2.

2. Pygidium with longitudinal axes of cerci perpendicular to surface of tergum, cerci slender and only slightly divergent (Figs. 22, 25, IX); abdomi-

nal spiracles small, almost circular (Fig. 21); second (postapical (antennal article nearly three times as long as wide (Fig. 15)..... *Tenebrio opacus* Duftschmidt.

— Pygidium with longitudinal axes of cerci oblique to surface of tergum, cerci about the same length as in *Tenebrio opacus* but much thicker at the base and quite strongly divergent (Fig. 23, IX); abdominal spiracles large, broadly oval (Fig. 19); second antennal article four times as long as wide (Fig. 16)..... *Tenebrio obscurus* Fabricius.

BIBLIOGRAPHY.

1. Arendsen Hein, S. A.—Entomologische Mitteilungen, Berlin, Band XII, Nr. 2, 1923.
2. Blair, K. G.—Some Notes on the Insect Intermediate Hosts of Gongylonema. Jour. Trop. Med. & Hygiene, p. 76, Feb. 2, 1925.
3. Böving, Adam Giede.—The Larvae and Pupae of the Social Beetles *Coccidotrophus socialis* (Schwarz and Barber) and *Eunausibius wheeleri* (Schwarz and Barber) with Remarks on the Taxonomy of the family Cucujidae. Zoologica, New York Zool. Soc., Vol. III, No. 3, Dec. 24, 1921.
4. Chapuis, F. et Candèze, E. M.—Catalogue des Larves Coléoptères connues jusqu'à ce jour. Mem. Soc. Roy. Liége, Vol. VIII, 1853.
5. Cotton, R. T., and St. George, R. A.—The Meal Worms With Technical Descriptions of the Larvae. U. S. D. A. Bull. — —
6. Curtis, John.—British Entomology, London, Vol. VII, 1823.
7. DeGeer, C.—Mémoires à l'histoire des Insectes, T. 5, p. 35, 1775.
8. Erichson, W. F., Kiesenwetter, E. H. A. von, Seidlitz, G. von.—Naturgeschichte der Insekten Deutschlands, Vol. 5, p. 628–630, 1896.
9. Frisch, J. L.—Beschreibung von allerley Insekten in Teutschland, Berlin, 1721, t. 3, pp. 1–3, tab. lf 1–4.
10.* Goeze, J. A. E.—Belehrung, 1796, pp. 35–67.
11.* Hagen, H. A.—Stettin Ent. Zeitschr., t. 14, p. 56, 1853.
12.* Hammerschmidt, C. E.—Beitr. Ent. tab. 6, 1833.
13. Latreille, P. A.—Histoire des Insectes, Vol. 10, p. 289, 1804.
14. Mulsant, E.—Histoire Naturelle des Coléoptères de France, 1854.
15. Mulsant, E. et Guillebeau, F.—Notes pour servir à l'histoire des Tenebrions, Ann. Soc. Linn., Lyon, ser. 2, t. 2, opusc. T. 6, 1854, 1855.
16. Perris, E.—Larves de Coléoptères, Ann. Soc. Linn., Lyon T. 22, 1876.
17.* Posselt, C. Fr.—Beitr. zur Anat. d. Insekten, p. 25, tab. 3f, 1–14, 1804.
18. Rupertsberger, M.—Die Larven der Käfer in "Natur und Offenbarung," T. 21–24, 1875–1878.
19. Schiödte, J. C.—De Metamorphosi Eleutheratorum Observationes, Kjobenhavn, Pars. X, Tenebriones, Naturh. Tidsskr. 3 Ser., vol. 11, 1879, pp. 479–598.
20. St. George, R. A.—Studies on the Larvae of North American Beetles of the Subfamily Tenebrioninae with a Description of the Larva and Pupa of *Merinus laevis* (Olivier). Proc. U. S. Nat. Mus., Vol. 65, Art. 1, pp. 1–22, Pls. 1–4, 1924.

21. WADE, J. S. AND BÖVING, ADAM G. —Biology of *Embaphion muricatum* Say. Jour. Agri. Res., Vol. XXII, No. 6, Nov. 5, 1921.
22. WADE, J. S., AND ST. GEORGE, R. A.—Biology of the False Wireworm *Eleodes suturalis* Say. Jour. Agri. Res., Vol. XXVI, No. 11, Dec. 15, 1923.
23. WATERHOUSE, G. R.—Description of the Larvae and Pupae of various species of Coleopterous Insects. Trans. Ent. Soc., London, t. 1, p. 27–34, pl. 1, 1834.
24. WESTWOOD, J. O.—An Introduction to the Modern Classification of Insects, etc., I, p. 317, Fig. 38, 1839.

—* Quotations marked with (*) from other authors and not verified by the present writer.

EXPLANATION OF PLATE 9.

Figures drawn with aid of camera lucida by the author.

Fig. 1. *Tenebrio obscurus*. Dorsal side of left mandible; a^1, a^2 the bicuspidate apex; t, tooth of cutting edge; m, molar part; c, rounded surface on exterior side of cutting edge; p, excavation opposite molar part.

Fig. 2. *Tenebrio obscurus*. Ventral side of right mandible; explanation of letters as for figure 1.

Fig. 3. *Neatus picipes*. Ventral side of left mandible; explanation of letters as for figure 1.

Fig. 4. *Neatus picipes*. Anterior portion of head of larva from above, showing the clypeus (cl) and labrum (lab).

Fig. 5. *Tenebrio obscurus*. Anterior portion of head of larva from above, showing the clypeus (cl) and labrum (lab).

Fig. 6. *Tenebrio molitor*. Maxilla of larva from ventral side; mxp, maxillary palpus; ma, mala; pag, basal membrane of maxillary palpus; sti, stipes maxillaris; ca, cardo; ar, maxillary articulating area.

Fig. 7. *Tenebrio molitor*. Epipharynx and anterior margin of labrum; eph, epipharynx; so, so_1 and so_2, sensory organs; h, median hooks; tb, transverse band; t and t_1, teeth.

Fig. 8. *Tenebrio opacus*. Epipharynx and anterior margin of labrum; explanation of letters as for figure 7,

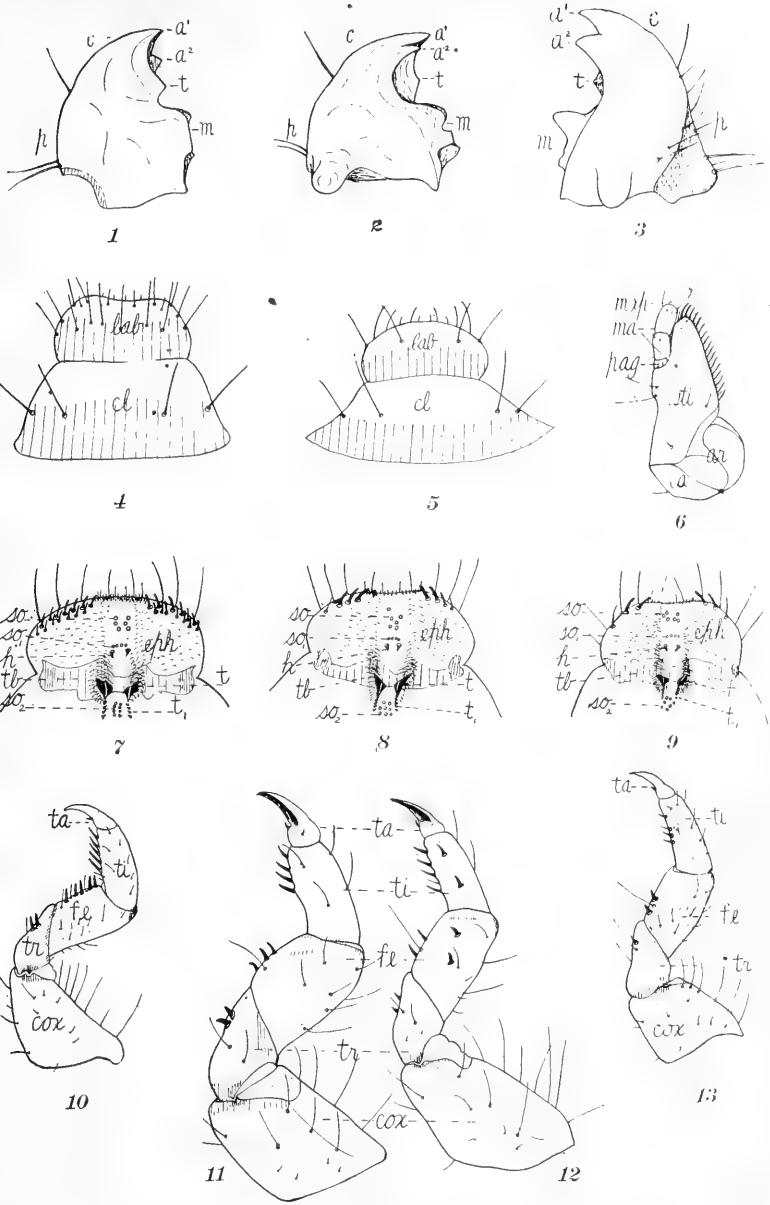
Fig. 9. *Neatus picipes*. Epipharynx and anterior margin of labrum; explanation of letters as for figure 7.

Fig. 10. *Neatus picipes*. Right prothoracic leg of larva, showing anterior view; cox, coxa; tr, trochanter; fe, femur; ti, tibia; ta, tarsus.

Fig. 11. *Tenebrio molitor*. Left prothoracic leg of larva, showing posterior face; explanation of letters as for figure 10.

Fig. 12. *Tenebrio molitor*. Left mesothoracic leg of larva, showing posterior face; explanation of letters as for figure 10.

Fig. 13. *Tenebrio obscurus*. Right prothoracic leg of larva, showing anterior face; explanation of letters as for figure 10.



1 2 3

4 5 6

7 8 9

10 11 12 13

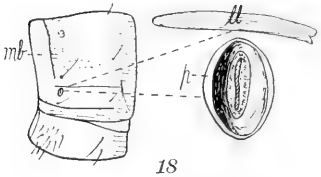
ST. GEORGE—LARVAE OF TENEBRIO AND NEATUS.

14

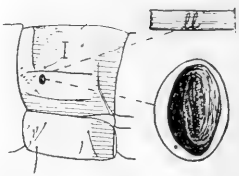
15

16

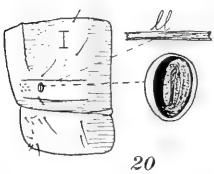
17



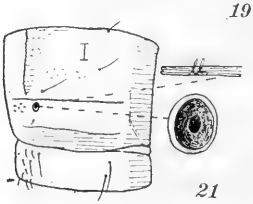
18



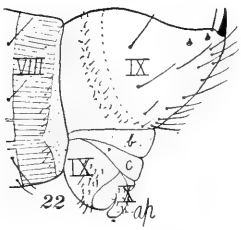
19



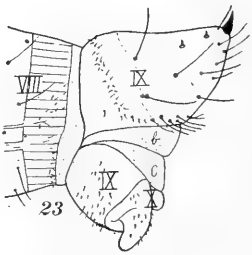
20



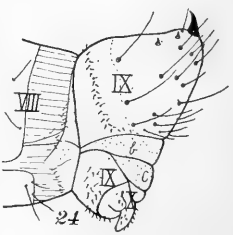
21



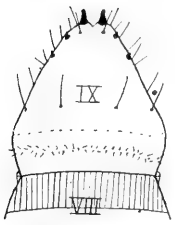
22



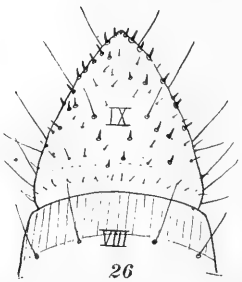
23



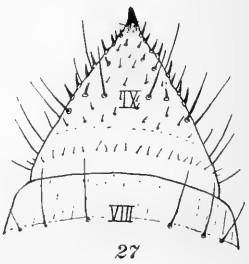
24



25



26



27

ST. GEORGE—LARVAE OF TENEBRIO AND NEATUS.

EXPLANATION OF PLATE 10.

Fig. 14. *Neatus picipes*. Antenna of larva; bm, basal articulating membrane.

Fig. 15. *Tenebrio opacus*. Antenna of larva.

Fig. 16. *Tenebrio obscurus*. Antenna of larva; bm, basal articulating membrane; 1, first or basal article; 2, second or postapical article; 3, third or apical article.

Fig. 17. *Tenebrio molitor*. Antenna of larva.

Fig. 18. *Tenebrio molitor*. Side view of first abdominal segment with spiracle and longitudinal line greatly magnified; mb, marginal band; ll, longitudinal line; p. peritremal frame.

Fig. 19. *Tenebrio obscurus*. Side view of first abdominal segment (I) with spiracle and longitudinal line greatly magnified; explanation of letters as for figure 18.

Fig. 20. *Neatus picipes*. Side view of first abdominal segment with spiracle and longitudinal line greatly magnified; explanation of letters as for figure 18.

Fig. 21. *Tenebrio opacus*. Side view of first abdominal segment with spiracle and longitudinal line greatly magnified; explanation of letters as for figure 18.

Fig. 22. *Tenebrio opacus*. Pygidium of larva; side view, showing posterior portion of eighth (VIII), ninth and tenth abdominal segments; IX, IX, ninth abdominal ("pygidial") segment, dorsal and ventral parts; X, tenth abdominal ("anal") segment, showing upper and lower lips; b and c, two-folded articulating membrane between ninth and tenth segments; ap, ambulatory papilla.

Fig. 23. *Tenebrio obscurus*. Pygidium of larva, side view; explanation of numbers and letters as for figure 22.

Fig. 24. *Tenebrio molitor*. Pygidium of larva, side view; explanation of numbers and letters as for figure 22.

Fig. 25. *Tenebrio opacus*. Pygidium of larva, dorsal view; VIII, posterior portion of eighth abdominal segment; IX, ninth abdominal segment.

Fig. 26. *Neatus picipes*. Pygidium of larva, dorsal view; explanation of numbers as for figure 25.

Fig. 27. *Alphitobius* species. Pygidium of larva, dorsal view; explanation of numbers as for figure 25.

THE OCCURRENCE OF AN AMERICAN GENUS IN EUROPE AND A EUROPEAN GENUS IN AMERICA (DIPTERA: SYRPHIDAE; SEPSIDAE).

By Raymond C. Shannon, *U. S. Bureau of Entomology.*

While I was visiting Herr Theodor Becker at his home in Leignitz, Germany, last July (1925), he gave me a male and female of a new species of *Chalcomyia*, a genus of Syrphidae hitherto known only from America, with his permission to describe and deposit the types in the U. S. National Museum. He has also determined for me specimens of a species of Sepsidae, *Amphipogon spectrum* Wahlberg, which my wife and I collected in Czecho Slovakia. A variety of the same species occurs in the northwestern part of America, but it has heretofore been known under the name of *Ambopogon hyperboreus* Greene.

The new species of *Chalcomyia* makes the sixth species for the genus and at the same time extends its range to the Old World. In a recent synopsis of the genus[1] attention was called to the fact that the subquadrate scutellum, the principal character upon which the genus was originally based, is peculiar only to the genotype *area* Loew, and in this paper other characters were used to define the genus. The present new species does not have the scutellum developed subquadrate but in all other respects it is essentially a member of *Chalcomyia*.

Since the above mentioned synopsis was published Mr. Curran has published a bulletin (Kansas Univ. Bull., vol. 15, 1925, p. 122) in which he describes and figures a new species of *Chalcomyia* from North America for which he erected a new subgenus, *Chalcosyrphus*. In the key given below all of the known species of the genus are included, as well as the new subgenus proposed by Curran.

CHALCOMYIA Williston

Third antennal joint suborbicular, with a dorsal, basal arista; mesonotal pile extending upon the humeral calli and the region between them; males with four abdominal segments; head triangular in frontal aspect; face black, usually deeply concave, tuberculate only in *cyanea;* a distinct petiole beyond the first posterior cell which is shorter than the discal crossvein; second vein distinctly curved upwards at its apical end; body pile normal; males dichoptic.

Key to Species of Chalcomyia.

A1. Mesonotum and scutellum without a flattened area; second tergite very much broader than long; hind femur but little swollen.....
Subgenus *Chalcomyia* Williston.

[1] Shannon, The Genus *Chalcomyia*, Occasional Papers, Bost. Soc. of Nat. History, vol. 5, 1925, pp. 151-153.

B1. Greenish bronze, clothed with short yellow pile; tibiae and tarsi largely yellow; scutellum subquadrate. Male: face without tubercle; eyes well separated, sides of front parallel on upper half..... *area* Loew.

B2. Not greenish bronze or with yellow pile; only bases of tibiae yellow; scutellum not markedly subquadrate.

C1. Discal crossvein joining discal cell distinctly before its middle; length of posterior crossvein much less than length of section of fourth vein above it.

D1. Mesonotal pile pale. Male: Face with a slight tubercle.... *cyanea* Smith.

D2. Mesonotal pile blackish. Male: Face evenly concave..... *beckeri*, new species.

C2. Discal crossvein joining discal cell nearly at its middle; posterior crossvein subequal to section of fourth vein above it. Male: Unknown..... *anomala* Shannon.

A2. Mesonotum flattened on apical third, scutellum flattened on disc; second tergite quadrate; hind femur much swollen..... Subgenus *Chalcosyrphus* Curran.

B1. Third antennal joint shorter than basal two combined. Male: Face without tubercle; eyes distinctly converging and rather closely approximated..... *depressa* Shannon.

B2. Third joint longer than basal two combined. Male: Unknown..... *atra* Curran.

Chalcomyia beckeri, new species.

Male.—Antennal prominence rather pronounced but less so than in other species of the genus; eyes fairly well separated; the front constricted at the middle, gradually widening above the constriction to the vertex and below widening more broadly downwards; front entirely shining black with a few hairs in ocellar region; antenna yellowish brown; arista darker, about one and one-third times the length of antenna and shorter than width of face across its middle; face black, extensively overlaid with silvery pollen; thorax black with blackish pile which is stiff and coarser along margins of mesonotum and scutellum; legs black, bases of all tibiae yellowish, lower surface of tarsi brownish, abdominal pile pale; basal corners of tergites extensively and faintly polinose; wings slightly tinged; squamae white; halteres yellow.

Female.—Front gradually widening downwards, width at vertex equal to length of antenna, width across base of antennae a little less than length of arista; face less pollinose than in male; abdomen very broad and flat, pale pilose.

Length: 8.5 mm.; wing 8 mm.

Male, type, Wölfelsfall, Germany, May 17; female, allotype, Altwater, Moravia, June (Theodor Becker). Other specimens, of type series, in collection of Theodor Becker.

Type.—Cat. No. 28727, U. S. N. M.

The general appearance of *C. beckeri* is very similar to that of

the other species of the genus, except *depressa* and *atra*. The shape of the abdomen differs in each sex (exclude *depressa*), but in each case the appearance is quite characteristic and peculiar to the genus. The males of *area*, *cyanea*, and *beckeri* have the abdomen broadening out very abruptly just beyond the base, and beyond the base of the third tergite it tapers rapidly to a rather sharp apex; the hypopygium is prominent and has a definite twist to the right.

The females of *area*, *anomala*, and *beckeri* have an unusually broad and flat abdomen.

This species is named for Theodor Becker, one of our foremost dipterologists. The writer wishes to express his appreciation to Mr. Becker for his generosity in permitting him to study this species.

Genus **AMPHIPOGON** Wahlberg.

Amphipogon Wahlberg, Ofvers. af Kongl. Ventensk. Akad. Förh., vol. 10, 1844, p. 217.

Ambopogon Greene, Proc. Ent. Soc. Washington, vol. 21, 1919, pp. 126–128, figures.—vol. 23, 1921, pp. 107–109.

Genotype.—Amphipogon spectrum Wahlberg, ibid.

Amphipogon spectrum hyperboreus (Greene).

Ambopogon hyperboreus Greene, ibid.

The occurrence of this fly in North America was first made known in 1919, when Mr. C. T. Greene published a paper entitled "A New Genus of Scatophagidae" in which he described and figured a single male specimen which had been collected on the Alaska-Yukon border, latitude 69–10 North, longitude 141 West.

A year later the writer collected several males and a female on the forested slopes of Cedar Mountain, Idaho.

While collecting with Mrs. Shannon at Mezimesti, Czecho Slovakia, August 2, 1925, to my great surprise, we found what appeared to be the same species of this very peculiar fly on a fallen fir log in one of the cultivated forests, strutting around in the same manner I had observed in the flies I collected on Cedar Mountain. Specimens were sent to Theodor Becker who determined them as *Amphipogon spectrum*. The male of the American specimens differ from the European specimens in having the hypopygial hairs consolidated into a single tuft, whereas in the European specimens of *spectrum* the hairs are divided by a well marked space making two tufts thereby.

The name *hyperboreus* is retained therefore as a varietal name for the American form, making the combination *Amphipogon spectrum hyperboreus* (Greene).

Actual date of publication, June 4, 1926.

EDITORIAL.

When we are in good humor with ourselves "We Moderns" indulge in Pollyanna rhapsodies over the magnitude of our achievements. We call ours the "Age of Science." We thrill to the paean of progress. Oh, the richness, the unity, the magic of the thing we have wrought! When the humors are reversed, pessimism intoxicates us. We see ourselves as the tragic victims of heroic vices, our civilization as a magnificent folly. In truth we are rather commonplace. What we mistake for magic is only mechanism. What we call science is frequently nothing but its application. What we see as unity is merely uniformity. What we take for richness is mostly complexity. We seem to be accomplishing more than our fathers; actually we are accomplishing less in more different ways. We seem to have a choice of many things; but we have choice only of some thousands of varieties of a few things; and all the world from Canton to Chicago has the same choice. We compete for small prizes, and specialize in restricted fields. We toil very hard over very little, and travel very fast on trifling errands. We are Lilliputians in culture. Our one real achievement is machinery,—and it is mastering us. Our one outstanding vice (it is anything but heroic) is what we call "Education," a kind of crippling process that prepares the mind for the use of crutches which the "educators" supply in the form of "short-cuts" ("mind-training" consists largely of a stuffing with "methods" and condensed, practically-applicable information). The truly scientific age (the eighteenth and nineteenth centuries) produced savants and naturalists; we make specialists. It takes leisure and long study to fashion a savant, fortunate birth and a life of devotion to produce a naturalist; specialists are turned out to order in a few years (or months) and—we are in a hurry. We want results. Other ages trained their workmen (high and low) to master a few simple tools; we set ours to serve machines, and are content if they acquire habits. Craftsmanship is at a discount. The wizard of the machine is losing—or has lost—his skill with the intimate personal tools by which alone master work is produced. Our artists (I refer chiefly to the advanced) draw badly; our thinkers and writers (I refer chiefly to the scientifically minded) fumble the most essential tools of thought, logic and language. We seem to have arrived at a confusion of minds; and sometimes it seems as if we were approaching a confusion of tongues, so difficult is it to fix meanings in words, or to catch the idiom of another's thought whenever he departs from the purely technical formulae of his specialty. We seem indeed to be building a tower of Babel upon a foundation of science.

—*Carl Heinrich.*

VOL. 28 JUNE, 1926 No. 6

PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

CONTENTS

PUBLISHED MONTHLY EXCEPT JULY, AUGUST AND SEPTEMBER

BY THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

U. S. NATIONAL MUSEUM

WASHINGTON, D. C.

Entered as second-class matter March 10, 1919, at the Post Office at Washington, D. C., under Act of August 24, 1912.

Accepted for mailing at the special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized July 3 1918.

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON

ORGANIZED MARCH 12, 1884.

The regular meetings of the Society are held on the first Thursday of each month, from October to June, inclusive, at 8 P. M.

Annual dues for members are $3.00; initiation fee $1.00. Members are entitled to the PROCEEDINGS and any manuscript submitted by them is given precedence over any submitted by non-members.

OFFICERS FOR THE YEAR 1926.

Honorary President . . . . . E. A. SCHWARZ
President . . . . . J. M. ALDRICH
First Vice-President . . . . . J. A. HYSLOP
Second Vice-President . . . . . J. E. GRAF
Recording Secretary . . . . . C. T. GREENE
Corresponding Secretary-Treasurer . . . . . S. A. ROHWER
U. S. National Museum, Washington, D. C.
Editor . . . . . CARL HEINRICH
U. S. National Museum, Washington, D. C.
Executive Committee: THE OFFICERS and W. R. WALTON, A. N. CAUDELL, T. E. SNYDER.
Representing the Society as a Vice-President of the Washington Academy of Sciences . . . . . A. G. BÖVING

PROCEEDINGS ENTOMOLOGICAL SOCIETY OF WASHINGTON.

Published monthly, except July, August and September, by the Society at Washington, D. C. Terms of subscription: Domestic, $4.00 per annum; foreign, $4.25 per annum; recent single numbers, 50 cents, foreign postage extra. All subscriptions are payable in advance. Remittances should be made payable to the Entomological Society of Washington.

An author of a leading article in the PROCEEDINGS will be given 10 copies of the number in which his article appears. Reprints without covers will be furnished at the following rates, **provided a statement of the number desired accompanies the manuscript:**

	4 pp.	8 pp.	12 pp.	16 pp.
50 copies	2.00	4.00	6.00	8.00
100 copies	2.25	4.50	6.75	9.00

Certain charges are made for illustrations and there are available rules and suggestions governing the make-up of articles. Immediate publication in any number may be obtained at the author's expense. **All manuscripts should be sent to the Editor.**

PROCEEDINGS OF THE
ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 28 JUNE 1926 No. 6

SYNOPSIS OF THE AMERICAN CALLIPHORIDAE (DIPTERA).

By Raymond C. Shannon, *U. S. Bureau of Entomology.*

A study of the American (North, Central and South America, West Indies and Galapagos Islands) Calliphoridae in the collection of the U. S. National Museum, which contains a nearly complete representation of all the species recorded from America, has permitted the writer to prepare this brief synopsis of practically all of the known American flies of the family Calliphoridae. This is the first attempt to treat all of the species occurring in this region.

In addition to studying the collection of the National Museum the writer, while in Europe (1925), had, through the courtesy of Mons. E. Segúy, the opportunity to examine the remaining types of Robineau-Desvoidy and Macquart collections in the Paris Museum, and through the courtesy of Major E. E. Austen the Walker types in the British Museum. While examining these collections a few species which were not represented in our National Collection were seen and a number of synonyms discovered.

During the last year (1925) the writer has examined several large collections of North American Calliphoridae, submitted to him for identification. Chief among these were: The collection of the Dallas, Texas, laboratory of the Bureau of Entomology (submitted by F. C. Bishopp); a collection made in Alaska by Professor J. S. Hine; material from Washington State loaned by Professor A. L. Melander; material from western Canada loaned by Owen Bryant; a collection from Canada loaned by C. Howard Curran. In addition to these collections Mr. C. W. Johnson, Dr. F. R. Cole and the University of Kansas have sent me important specimens for examination. This material has supplied several new species as well as the unknown sex of several species which had been previously described from one sex only.

To all of the above named gentlemen and also to Dr. J. M. Aldrich, Mr. J. R. Malloch, and my wife, Elnora S. Shannon (for assistance in recording data, etc.), I wish to extend my thanks for their interest and assistance in the present paper.

A short list of the more important recent papers bearing on the group is appended at the end and references to all of

the previously described species are found therein. This includes Townsend's catalogue of the South American Calyptrate Muscidae which contains the bibliography of the older papers.

Perhaps most or all of the indigenous species of North America are now known. Three genera, *Protocalliphora*, *Steringomyia* and *Melanodexia*, however, require more material and study before we can be sure of the limits and the number of their species. These are the only genera in which one or the other sex of some of the species remain unrecognized.

The number of species of Calliphoridae, aside from the genus *Mesembrinella*, inhabiting Central and South America, is apparently quite limited, although about three times the number of names have been given to them. This large number of synonyms has caused considerable confusion and made the identification of species very difficult. The papers by Dr. Aldrich (1922 and 1925) have helped considerably in stabilizing our knowledge of the two largest groups of this region, the Mesembrinellinae and Chrysomyiini, and his key to the former group is reproduced herein.

Aside from the Mesembrinellae, the Calliphorid fauna of tropical America and the regions southward appears to be a scant one, at least in collections. The number of new forms awaiting discovery may, however, be large and therefore the present paper should be considered of a provisional nature for this region and mainly applicable to the common species.

The flies of the family Calliphoridae, like the house-fly, are commonly known to every one, and some of them have well established common names such as the screw-worm flies (Chrysomyiini); green-bottle flies (Luciliini); blue-bottle flies (Calliphorini); blow-flies (Calliphorini, *Phormia* and *Protophormia*), and cluster flies (*Pollenia rudis*).

A number of them are of considerable economic importance from medical, veterinary, and sanitary standpoints. Probably all of the species in the larval stage are flesh feeders (chiefly on carrion) though some will also breed in the excrement of carnivorous and omnivorous animals, including man. Certain species attack live stock and at times cause considerable losses in cattle and sheep.

Myiasis in man, occasionally followed by death, occurs not infrequently in some regions, as a result of certain of these flies laying their eggs on wounds or diseased tissue, where the larvae upon hatching can feed on the surrounding parts.

A brief summary is here appended showing the general distribution in America and the larval habits of the groups:

Mesembrinella: Tropical America. Scavengers.
Chrysomyiini: Throughout America. Screw worm flies. All?
Phormia: North America. Carrion; sometimes producing myiasis.

Protophormia: As in *Phormia.*
Boreëllus: Subarctic. Habits unknown.
Protocalliphora: North America. Parasites of nestling birds.
Luciliini: Throughout America. Carrion; some species frequently produce myiasis; some parasitic on toads.
Calliphorini: Chiefly North America, rare in the Andes. Chiefly scavengers, sometimes produce myiasis.
Pollenia: North America. Parasites of earth worms.
Melanodexia: California, Oregon. Habits unknown.

The family Calliphoridae belongs to the higher Muscoid Diptera,[1] a group characterized by the presence of a well-defined row of hypopleural bristles. From the Tachinoidea, which have a well-developed post scutellum and the lateral margins of the tergites usually meeting on the ventral median line of the abdomen, thereby obscuring the sternites, the Sarcophagoidea may be separated by the undeveloped post scutellum (subdeveloped in *Mesembrinella*) and the side edges of the tergites usually well separated, so that sternites two to five, while reduced, usually are distinctly visible.

The Sarcophagidae and Calliphoridae are very closely allied and may eventually be considered as one family. Within the limits of our fauna the two may be differentiated as follows:

Sarcophagidae: Post humeral bristle usually present and placed mesad of the presutural; usually four notopleurals; propleura and prosternum usually bare; stem vein not ciliated; very rarely with metallic blue or green coloration; usually opaque gray and the abdomen with a checkered appearance.

Calliphoridae: Post humeral bristle rarely absent and usually placed laterad of the presutural (in Pollininae it may be laterad, in line with or mesad of presutural, or absent); usually two, rarely three (some species of *Protocalliphora*) notopleurals; propleura and prosternum pilose (bare in Polleninae); stem vein ciliated in Chrysomyiinae and *Mesembolia;* usually metallic green, blue or purplish in appearance, opaque gray in Polleninae.

Key to the Subfamilies, Tribes and Genera of American Calliphoridae.

1. Post scutellum rather well developed; bucca very narrow, about one-fifth to one-sixth height of eye; arista plumose to tip; bend of fourth vein obtuse and broadly rounded; metathoracic spiracle as broadly rounded anteriorly as it is posteriorly; disc of squamae bare; stem vein sometimes setose; female usually with a pair of decussate bristles on frontal vitta. (Tropical America).....Subfamily Mesembrinellinae.
Genus *Mesembrinella* Giglio-Tos.

[1](Superfamily Tachinoidea (including Tachinidae and Dexidae) and superfamily Sarcophagoidea (including Sarcophagidae and Calliphoridae).

Post scutellum undeveloped; bucca subquadrate, about one-half eye height; bend of fourth vein usually strongly angled; metathoracic spiracle tapering anteriorly; female rarely with decussate bristles on frontal vitta ..... 2.

2. Stem vein on upper side and subcostal sclerite setose ..... 3.
Subfamily Phorminae.

Stem vein bare; subcostal sclerite setose only in *Lucilia caesar* and *Pollenia* ..... 17.

3. Arista bare. (Chile) ..... Tribe Trixoneurini.
Trixoneura, new genus.

Arista distinctly plumose ..... 4.

4. Stem vein setose below as well as above. (South American, chiefly in the Andes) ..... Tribe Toxotarsini ..... 5.

Stem vein bare below ..... 9.

5. Hind basitarsus arcuated ..... *Toxotarsus* Macquart.

Hind basitarsus straight ..... 6.

6. One sublateral; no posterior acrostichals ..... *Sarconesia* Bigot.

Two to three sublaterals; two to three posterior acrostichals ..... 7.

7. Arista plumose less than half its length; two posterior acrostichals (middle pair absent) ..... *Chlorobrachycoma* Townsend.

Arista plumose a little more than half its length; three posterior acrostichals ..... 8.

8. Large robust flies, 12–18 mm. Male: Eyes widely separated, legs conspicuously hairy; mid-basitarsus enlarged at apex; forceps consolidated into a single style. Female: Front much broader than length of third antennal joint ..... *Neta*, new genus.

Moderate size, 7–10 mm. Male: Eyes closely approximated; legs not hairy; mid-basitarsus not swollen at apex; two well-developed pairs of forceps. Female: Front narrower than length of third antennal joint ..... *Sarconesiopsis* Townsend.

9. Face yellow with mostly yellow pile; one post humeral bristle (throughout America) ..... Tribe Chrysomyiini ..... 10.

Face black with black hairs; lower squama bare; usually two post humerals ..... Tribe Phormini ..... 14.

10. Lower squama partly pilose on outer as well as basal half. (Chiefly eastern hemisphere, one species in America) ..... *Chrysomyia* R.-Desvoidy.

Lower squama bare on outer half ..... 11.

11. Lower squama with distinct hairs on basal portion; mesonotum strongly vittate; dorsocentrals 0:1 or 0:2; disc of upper squama in female with distinct hairs ..... 12.

Lower squama bare or faintly pubescent on basal portion; mesonotum without distinct vittae; dorsocentrals 2:4; disc of upper squama of female bare ..... 13.

12. Palpi short and slender ..... *Cochliomyia* Townsend.

Palpi normal, clavate ..... *Paralucilia* Brauer and Bergenstamm.

13. Vibrissae at oral margin, hardly approximated ..... *Hemilucilia* Brauer.

Vibrissae at least length of second antannal joint above oral margin ..... *Chloroprocta* Van der Wulp.

14. Anterior acrostichals not distinct from surrounding hairs; squamae darkened; outer portion of disc of upper squama thinly haired.....15.
Anterior acrostichals well differentiated from surrounding hairs; squamae rarely darkened.....16.
15. Head strongly triangular in frontal aspect; arista thickened and with short appressed rays; prothoracic spiracle much larger than third antennal joint.....*Boreëllus* Aldrich and Shannon.
Head very obtusely triangular; arista and aristal rays normal; prothoracic spiracle about size of third joint.....*Protophormia* Townsend.
16. Four anterior dorsocentrals; prothoracic spiracle distinctly light orange; opaque area (outer portion) of upper squama thinly haired.....*Phormia* R.-Desvoidy.
Three anterior dorsocentrals; prothoracic spiracle dark orange to black; upper squama without hairs on upper surface.....*Protocalliphora* Hough.
17. Prosternum and propleura pilose; more or less metallic green to blue to purple; pilosity of parafacials not extending down as far as lowermost margin of eye.....Subfamily Calliphorinae.....18.
Prosternum and propleura bare; without evident blue, green or purple reflections, abdomen usually tessellated in appearance; parafacials pilose as far down as lowermost eye margin. (North America). Subfamily Polleniinae.....22.
18. Parasquamal tuft present; lower squama bare. (Throughout America). Tribe Luciliini.....19.
Without a parasquamal patch of hairs; lower squama with distinct hairs. (Chiefly North America, rare in Andes).....Tribe Calliphorini.....20.
19. Very large robust species, 18–20 mm.; no anterior acrostichals; one sublateral.....*Blepharicnema* Macquart.
Moderate in size, 6–12 mm.....*Lucilia* R.-Desvoidy.
20. One sublateral; two bristles near middle on exterior surface of fore tibia; two post acrostichals.....*Cynomyia* R.-Desvoidy.
Two or three sublaterals; usually one bristle on[1] exterior surface of fore tibia; three post acrostichals.....21.
21. Antenna of normal size, third joint longer than length of dorsal bristle on second joint; section of costa between auxiliary and first veins longer than section between tips of second and fourth veins; last section of fourth vein (apical crossvein) usually with a decided bend..... *Steringomyia* Pokorny and *Calliphora* R.-Desvoidy.
Antenna black, small, third joint only as long as dorsal bristle on second joint; section of costa between auxiliary and first veins distinctly shorter than section between second and fourth veins; last section of fourth vein straight or but gently curved.....*Onesia* R.-Desvoidy.
22. Lower squama broader than long, the mesal margin in contact with metanotum; anterior mesonotal bristles: 2 acrostichals; 2 dorsocentrals; 2 sublaterals; one post humeral; one presutural; thorax, in fresh condition, clothed with deciduous yellow pile.....*Pollenia* R.-Desvoidy.

[1]The European genus *Melinda* R.-Desvoidy, which may eventually be reported from America, has the squamae bare.

Lower squama a little longer than broad, the mesal margin well separated from thorax; presutural bristles: 2 acrostichals; 2 dorsocentrals; 1 sublateral; no post humeral; 1 presutural; thorax without yellow pile *Melanodexia* Williston.

Key to species of Mesembrinella (from Aldrich, 1925).

1. Stem vein bare (subgenus *Mesembrinella*)....2.
   Stem vein ciliated (subgenus *Mesembolia* Aldrich)....20.
2. Two presutural bristles....3.
   One presutural....7.
3. Legs almost black, but middle and hind femora yellow on apical half....4.
   Femora and tibia yellow....5.
4. Wing with heavy subcostal black stripe not reaching third vein, posterior portion paler; three posterior acrostichals (Bolivia, Surinam).... *brunnipes* Surcouf.
   Wing deep brown, the second fourth, except behind yellow (Bolivia).... *pictipennis* Aldrich.
5. Apical cell very wide open, the included costal section more than half as long as preceding one (Costa Rica, Ecuador).....*umbrosa* Aldrich.
   Apical cell less widely opened, included costal section less than half the preceding one....6.
6. Wing with diffuse and not very strong infuscation (wide spread Neotropical)....*bicolor* (Fabricius).
   Wing with heavy subcostal stripe, beyond middle, before third vein (Brazil)....*batesi* Aldrich.
7. Fourth abdominal segment with discal row of bristles....8.
   Fourth segment without discals....13.
8. Femora, pleurae and abdomen blue-green or blackish; 2 pairs of acrostichals before suture....9.
   Femora, pleurae and base of abdomen yellow....10.
9. Discal scutellar bristles small, almost in line with the much larger basal lateral pair; female with but one pair of proclinate orbitals, which are almost in the frontal row (Costa Rica)....*uniseta* Aldrich.
   Discal scutellars but little smaller than lateral basal pair, and forming with them a strong curve; female with two pairs of orbitals, just outside frontal row, which is here very hairlike (Peru)....*cruciata* (Townsend).
10. One pair anterior acrostichals....11.
    No anterior acrostichals....12.
11. One post humeral (Panama)....*tibialis* Aldrich.
    Two post humerals (South America)....*aeneiventris* (Wiedemann).
12. Mesonotum, rear view, showing three dark stripes, separating four pollinose ones (Brazil)....*purpurata* Aldrich.
    Viewed from behind, the pollen is not distinctly divided into four stripes (Costa Rica)....*semiflava* Aldrich.
13. Facial ridges high and sharp, hairy to middle; middle and hind tibiae not infuscated; sternopleruals 2:1....*facialis* Aldrich.
    Facial ridges lower, not hairy except close to vibrissae....14.

14. With one or 2 pairs anterior acrostichals.....15.
Without anterior acrostichals.....17.
15. Legs, pleurae and base of abdomen largely yellow.....16.
Legs, thorax and abdomen blue-green or blackish; fifth sternite of male produced into two shining black styles (Costa Rica).....
spicata Aldrich.
16. Second to fourth abdominal segments with posterior sharply defined violet band; third segment without marginal bristles (Brazil).....
cyaneicincta Surcouf.
Second to fourth segments not banded with violet; third segment with row of marginals (Costa Rica).....*flavicrura* Aldrich.
17. One intra-alar (posterior); abdominal segments 2–4 with sharply defined posterior violet bands (Brazil).....*pauciseta* Aldrich.
Two intra-alars; abdomen not violet banded.....18.
18. Second abdominal segment with weak hairs along hind margin (South America).....*randa* (Walker).
Second segment with distinct row of marginals.....19.
19. Mid and hind tibiae black, in male the middle ones elongated and with minute bristles (South America).....*quadrilineata* (Fabricius).
Mid and hind tibiae not or hardly infuscated; male with the usual bristles or mid tibia (Brazil).....*dorsimacula* Aldrich.
20. Greatest width of apical cell exceeding length of hind crossvein.....21.
Greatest width of apical cell less than hind crossvein (Brazil).....
peregina Aldrich.
21. Apical cell moderately wide open, the included costal segment not more than half of preceding one; no acrostichals immediately behind suture (Mexico to Paraguay).....*bellardiana* Aldrich.
Apical cell very wide open, included costal section more than half of preceding (Brazil).....*fulvipes* Aldrich.

Tribe TRIXONEURINI.

Genus **TRIXONEURA,** new genus.

Genotype.—Agria fuscipennis Macquart.

Trixoneura fuscipennis (Macquart).

Agria fuscipennis Macquart, Dipt. Exot., vol. 2, pt. 3, 1841, p. 109.

This tribe, genus and species constitute a very aberrant one for the Calliphoridae. The species, presumably the type specimen (female), was examined by the writer in the Paris Museum, and was found to have the following characters: Arista bare; hairs on upper part of head very stiff and bristly; no sublaterals; one post humeral; post alar declivity with few setae; metasternum with strong hairs; stem vein coarse setose; subcostal sclerite with few setae; first posterior cell closed; no post scutellum. In general appearance the fly is rather small, with something of a Sarcophagid aspect.

Another specimen, also female, was found in the same collection placed with *Toxotarsus rufipalpus* Macquart.

Distribution.—Chile (type locality).

Tribe TOXOTARSINI.

The Toxotarsini appear to be peculiar to South America and are largely restricted to the Andean region. Several genera are known, but in each case they are monotypic. The tribe is characterized by the stem vein being setose above and below; subcostal sclerite setose; squamae bare; a tuft of hairs present in the interior angle of the squamae; parafacials setose; macrochaetae strongly developed on head and thorax; sternopleurals 1:1. In general appearance they resemble the genera *Cynomyia* and *Calliphora*. The group heretofore has been considered under the Sarcophagidae as certain members have the arista plumose only half way. A number of characters such as the presence of only two notopleurals, the post humeral being placed laterad of the presutural and the setose stem vein definitely allies the tribe to the Calliphoridae.

The genus and species, *Chloronesia andina* Townsend,[1] which has also been associated with the genera of this tribe, proves to be a true Sarcophagid.

Toxotarsus rufipalpis Macquart.

Toxotarsus rufipalpis Macquart, Dipt. Exot. Supp., vol. 4, 1851, p. 238, pl. 22, fig. 3.

This genus and species was described by Macquart as having the hind basitarsus arcuated. The writer saw the type in the Paris Museum, but not knowing the character of the hind basitarsus failed to look for it, and took it to be *Sarconesia chlorogaster*. Specimens of *S. chlorogaster*, now before me, males and females, have the hind metatarsus straight. Due to this difference, it seems advisable to consider the two as separate genera and species.

Distribution.—Chile (type locality).

Sarconesia chlorogaster (Wiedemann).

Sarconesia Bigot, An. Soc. Ent. France, ser. 3, vol. 5, 1857, p. 301.

Genotype.—Sarcophaga chlorogaster Wiedemann, Aus. Zweifl., vol. 1830, p. 359.

This species bears a strong superficial resemblance to the genus *Sarcophaga* except for its metallic blue abdomen.

Distribution.—Peru, Chile, Argentina, Paraguay.

[1]Townsend, Proc. U. S. Nat. Museum, vol. 43, 1912, pp. 360–361.

Chlorobrachycoma splendida Townsend.

Chlorobrachycoma Townsend, Ins. Ins. Mens., vol. 6, 1918, p. 155.

Genotype.—splendida Townsend, ibid.

Only a single specimen, a female, is known of this genus and species. It is about the size and appearance of *S. chilensis*, but the pollinose mesonotal stripes are less distinct and the metallic greenish blue color is very pronounced.

Distribution.—Oroya, Peru, 12,000 feet (May 8, 1914, C. H. Townsend).

Genus **SARCONESIOPSIS** Townsend.

Sarconesiopsis Townsend, Ins. Ins. Mens., vol. 6, 1918, p. 156.

Genotype.—Calliphora chilensis Macquart.

Sarconesiopsis chilensis (Macquart).

Calliphora chilensis Macquart, Dipt. Exot., vol. 2, 1841, p. 131.
? Cynomyia fuscipennis Macquart, ibid., p. 110.
Musca incerta Walker, Dipt. Saunders, 1856, p. 334.
Sarconesiopsis caerulea Townsend, Ins. Ins. Mens., vol. 6, 1918, p. 156.

Appears to be a common species in Peru and Chile, forty-six specimens at hand. The male has unusually dark wings, while in the female the wings are clear.

Distribution.—Chile (type locality), Peru, Colombia.

NETA, new genus.

Genotype.—Phryssopoda splendens Macquart.

Neta splendens (Macquart).

Phryssopoda splendens Macquart, Dipt. Exot., vol. 4, 1851, p. 204.
Calliphora peruviana Macquart, ibid, p. 243.
Calliphora magellanica Macquart, Dipt. Exot., vol. 2, 1841, p. 131.
Sarcophaga ortogesa Walker, List, 1849, p. 834.
Musca chilensis Walker, *Nomen nuda?*
Calliphora paytensis Townsend, Ann. New York Acad. Sci., vol. 7, 1892, p. 36.

The types of all the above (Townsend's name was proposed for *peruviana* as it was preoccupied) have been examined by the writer, who found that they constitute but one species.

A very large and striking species, presenting several peculiar characters in the male; that of the single style in place of the four which are usually present, is particularly remarkable.

Distribution.—Bolivia (type locality), Peru, Chile.

Tribe CHRYSOMYIINI.

Genus **COCHLIOMYIA** Townsend.

This genus, at first monotypic (type, *macellaria* Fabricius), had a second species, namely, *Musca laniaria* Wiedmann, assigned to it by Aldrich (1925). A third species, new, has been found in the National Museum collection and is here added.

Key to species of Cochliomyia Townsend.

1. No upper frontal bristles present in male.....2.
   A distinct pair of upper frontal bristles present in male; tip of abdomen coppery, the first three tergites very dark green; thorax dark, the four pale stripes more slender than in *macellaria* or *laniaria*, the inner ones scarcely continued onto scutellum (St. Domingo).....*minima*, new species.
2. Tip of abdomen colored the same as the preceding part; thorax evidently metallic blue or green, with four white pollinose stripes, the inner not continued onto scutellum (wide spread throughout warmer parts of America).....*macellaria* (Fabricius).
   Tip of abdomen coppery or with violet reflections, in strong contrast to the rather dark preceding portion; thorax black with only slight traces of metallic color, the four white pollinose stripes distinct and the inner pair continued onto scutellum. (Florida, West Indies).....*laniaria* (Wiedemann).

Cochliomyia minima, new species.

Male.—Differs from *macellaria* and *laniaria* by the smaller size; broader front which is one and one-half times the width of parafacial; presence of a distinct pair of upper frontal bristles; the deeply set facial plate which rather sharply rises to the frontal oral margin; the oral vibrissae nearer to the oral margin, being scarcely the length of the second antennal joint above the margin; palpus nearly the length of third antennal joint; the narrower mesonotal stripes (legs very dark brown); dorsum of tergites one, two, three and most of fourth very dark and nearly opaque, the sides of the third and fourth segments with a pollinose spot, on the latter a faint transverse pollinose stripe connects the spots; fifth tergite a fiery copper color; hypopygium and forceps yellowish, the forceps much shorter and stouter and the penis very much longer, its length nearly equal to length of hind tibia; wings subhyaline, darker basally; squamae darkened; halteres brownish yellow.

Female.—Agrees with the male externally except in the front, which is, however, normal for the sex and shows very little difference from the front of the other two species.

Described from two males and one female.

Type locality.—San Francisco Mountains, St. Domingo, West Indies (September 15, A. Busck).

Type.—Cat. No. 28,886, U. S. N. M.

Genus **HEMILUCILIA** Brauer.

Table of Species.

1. Anterior part of thorax more or less yellow; base of abdomen, dorsal view, partly yellow ..... 2.

   Thorax entirely metallic green or blue; dorsum of abdomen entirely dark. Male: Eyes contiguous, no fronto-orbital bristles. Female: Front less than twice as long as wide, black on upper two-thirds. (Brazil, Panama, Costa Rica, Mexico) ..... *fuscanipennis* (Macquart)

2. Second tergite entirely dark. Male: Eyes contiguous, no fronto-orbital bristles. Female: Front more than twice as long as wide, dark only above. (Costa Rica, Panama, Brazil, Paraguay) ..... *segmentaria* (Fabricius).

   Second tergite largely yellow ..... 3.

3. Male: Eyes separated by width greater than parafacial; upper pair of fronto-orbitals present. Female: Length of front less than twice the width, shining black on upper two-thirds; length 6.5 mm. (Venezuela, Brazil) ..... *parva*, new species.

   Male: Unknown. Female: Length of front nearly three times its width, black only on vertex; length 8 mm. (Peru) ..... *townsendia*, new species.

Hemilucilia segmentaria (Fabricius).

A moderate sized species, dark blue, with anterior part of thorax and abdomen yellowish.

Distribution.—Apparently widespread in tropical America. South America (type locality), Brazil, Venezuela, Panama, Costa Rica.

Hemilucilia townsendi, new species.

Less robust than *segmentaria;* thorax metallic green, yellowish anteriorly, with faint pollinose stripes on mesonotum; first and second tergites yellow, the latter with a hind border of dark blue which extends forward as a median stripe to the anterior margin of the tergite; apical half of wing smoky, especially on anterior border.

One female.

Type locality.—Yahuarmayo, Peru (February 11, 1910, C. H. T. Townsend).

Type.—Cat. No. 28,887, U. S. N. M.

Named in honor of Dr. C. H. Tyler Townsend.

Hemilucilia parva, new species.

Noticeably smaller than its congeners, thorax light metallic green, the anterior portion yellowish; first tergite yellow, second yellow anteriorly, darkened on hind border with a median anteriorly directed projection from the darkened portion. Eyes well separated in the male, the upper pair of fronto-orbitals present.

One male, one female.
Type locality.—"Amazon," Brazil (H. W. Bates).
Allotype locality.—Quebrada Secca, Venezuela.
Type.—In British Museum.
Allotype.—Cat. No. 28,888, U. S. N. M.

Hemilucilia fuscanipennis (Macquart).

Similar to *segmentaria* but entirely bluish black and lacking the yellow on the thorax and the base of the abdomen dorsally, which, however, may be very obscurely yellow.
Distribution.—Tropical America. Bahia, Brazil (type locality); Panama, Costa Rica, Mexico.

Genus **CHRYSOMYIA** Robineau-Desvoidy.

Chrysomyia desvoidyi Hough.

Only one species, *C. desvoidyi* Hough, is known for this genus in the Western Hemisphere. The genus is essentially an Old World group and is characterized by having the lower squama pilose on the outer half as well as in the basal hollow. *C. desvoidyi* has only the mesal portion of the outer half of the lower squama pilose.
Distribution.—Mexico, Venezuela, Panama, Costa Rica.

Genus **CHLOROPROCTA** Van der Wulp.

Table of Species.

Thorax, except dorsum, and abdomen more or less yellowish; eyes of male with conspicuously enlarged facets above.....*semiviridis* Van der Wulp.
Thorax, etc., entirely dark metallic bluish green; eye facets of male nearly uniform throughout.....*idioidea* R.-Desvoidy.

Chloroprocta semiviridis Van der Wulp.

The two species given in the above key belong to the genus *Chloroprocta* as defined by Aldrich. The yellowish color in *semiviridis* is variable, a female from Costa Rica shows very little trace of yellow.
Distribution.—Yucatan (type locality); Costa Rica; Mexico; Texas.

Chloroprocta idioidea (Robineau-Desvoidy).

Chrysomyia idioidea Robineau-Desvoidy, Myodaires, 1830, p. 445 (type examined).
Musca purpureae Walker, Dipt. Saund., 1856, p. 337 (type examined).

One female from Para, Brazil, and three from Bartica, British Guiana, agree with the types of both *idioidea* and *purpureae*.

Type locality.—South America (for both *idioidea* and *purpureae*).

Genus **PARALUCILIA** Brauer and Bergenstamm.

Table of Species.

Length of antenna much less than height of bucca, or, in female, than width of front. (Southern United States to Argentina and Chile)..... *affinis* R.-Desvoidy.

Length of antenna slightly longer than height of bucca and distinctly longer than width of front of female. (Brazil).....*viridula* R.-Desvoidy.

Paralucilia viridula (Robineau-Desvoidy.)

Chrysomyia viridula Robineau-Desvoidy, Myodaires, 1830, p. 445.

Type not seen in the Paris Museum.

One female at hand, which is apparently very distinct from the following species, agrees very closely with the description of *viridula* and is therefore considered to be conspecific with it. In addition to the much narrower front, larger antennae and smaller bucca it possesses the following mesonotal bristles which are absent in *affinis*. Three anterior dorsocentrals (sometimes one in *affinis*); two sublaterals; four posterior dorsocentrals (two in *affinis*).

Distribution.—Brazil (type locality); Sao Paulo, Brazil (A. Lutz).

Paralucilia affinis (Robineau-Desvoidy).

Chrysomyia affinis Robineau-Desvoidy, Myodaires, 1830, p. 445.
Chrysomyia fulvicrura R.-D., ibid, p. 446 (type examined).
Calliphora peruviana R.-D., ibid, p. 438.
Calliphora fulvipes Macquart,[1] Diptera Exotique, vol. 2, pt. 3, 1843, p. 132 (type? examined).
Lucilia durvillei Macquart, ibid, p. 142 (type examined).
Calliphora annulipes Philippi, Zeitschr. Ges. Naturw., vol. 17, 1865, p. 514.

The above list of synonyms is quite sure to be only an incomplete one as it contains only those of which the writer is reasonably certain. Many of the names listed under *Lucilia, Chrysomyia* and *Somomyia* in Townsend's catalogue of South American Muscidae will very likely prove to be synonyms of either this species or *Cochliomyia macellaria.*

[1]A specimen in the Paris Museum is presumably the type of this species, as it bears a label, "en Cat. du Mus. Gayi." This same specimen, however, bears the name label "*C. rufipes*" which Macquart had previously used for a species he described from Java.

It may be assumed that Macquart at the time of describing it noticed that the name *rufipes* was preoccupied and changed the name to *fulvipes* in the description but did not change the name label on the specimen.

Distribution.—Brazil (type locality) and throughout South America in general and extending into the southern United States.

Tribe PHORMIINI.

Phormia regina (Meigen).

Distribution.—Mexico, throughout United States, rather rare in Canada and Alaska.

Protophormia terraenovae (Robineau-Desvoidy).

Distribution.—About the same range as above but more abundant in the North and less numerous southward.

Boreellus atriceps (Zetterstedt).

Boreëllus aristatus Aldrich and Shannon, Ins. Ins. Mens., vol. 11; 1923, p. 107.

Distribution.—Boreal America and Europe.

Genus **PROTOCALLIPHORA** Hough.

Key to Males of Protocalliphora.

1. Narrowest width of front equal to length of third antennal joint; outer forceps subquadrate, less than twice as long as broad (*avium*, sens. lat.)....2.
   Narrowest width of front distinctly less than length of third antennal joint; outer forceps elongate, three to four times as long as broad.....3.
2. Hairs on mesonotum one-fourth length of bristles; basicosta black (New York).....variety *avium* S. & D.
   Hairs on mesonotum nearly half as long as bristles; basicosta orange (Washington).....variety *asiovora* S. & D.
3. Parafrontals contiguous (always?).....(*hirudo*, sens lat.).....4.
   Parafrontals well separated.....(*splendida*, sens. lat.).....5.
4. Three notopleurals (Colorado).....variety *hirudo* S. & D.
   Two notopleurals (Kansas).....variety *parva* S. & D.
5. Dark metallic blue; pollinose stripes on mesonotal disc faint.....6.
   Body with a grayish tinge; pollinose stripes evident on disc of mesonotum (Washington).....subspecies *hirundo* S. & D.
6. Squamae white (throughout U. S.).....variety *splendida* Macquart.
   Squamae darkened (Washington, British Columbia).....variety *hesperia* S. & D.

Key to Females of Protocalliphora.

1. Large species (11 mm.); parafacials broad, opposite second antennal joint equal in width to distance between oral vibrissae; basicosta dark brown .....(*avium*, sens. lat.) .....2.
   Smaller (9 mm. or less); parafacials usually narrower, opposite second antennal joint equal to one-half distance between oral vibrissae; if as broad as in *avium* then basicosta orange.....3.

2. Abdomen slightly pruinose.....variety *avium* S. & D.
   Abdomen with ashy tinge.....variety *asiovora* S. & D.
3. Front unusually narrow; upper fronto-orbital absent; three notopleurals.... (*hirudo*, sens. lat.).....4.
   Front normal, upper fronto-orbital present; two notopleurals..... (*splendida*, sens. lat.).....6.
4. General color dark, with rather heavy pruinosity.....5.
   General color bronze (Washington).....variety *cuprea* S. & D.
5. Squamae darkened.....variety *hirudo* S. & D.
   Squamae white.....variety *parva* S. & D.
6. Abdomen entirely dark blue.....7.
   Abdomen more or less coppery.....8.
7. Squamae white.....varieties *sialia* S. & D. and *hirunda* S. & D.
   Squamae darkened.....variety *hesperia* S. & D.
8. Body entirely coppery (New Hampshire, Ontario).....variety *aenea* S. & D.
   Last abdominal segment only, coppery.....variety *splendida* Macquart.

Tribe LUCILIINI.

Blepharicnema splendens Macquart.

Synonym.—*Cynomyia auriceps* Walker (type examined).

As far as known, this species has only been taken in Ecuador and Peru.

Genus **LUCILIA** R.-Desvoidy.

Table of Subgenera and Species of Lucilia, Males.

1. Lower face greatly produced forward; mesonotum with unusually stiff bristles (Galapagos Islands)..... (*Viridinsula*, new subgenus) *Lucilia* (*Viridinsula*) *pionia* (Walker).
   Lower face not produced forward.....2.
2. Two sublaterals; arista unusually thick basally and short plumose, the second aristal joint twice as long as broad (Alaska)..... (Subgenus *Francilia* Shannon) *Lucilia* (*Francilia*) *alaskensis* Shannon.
   Three sublaterals; arista normal and long plumose, the second joint as broad as long.....(Subgenus *Lucilia*) R.-Desvoidy).....3.
3. Three posterior acrostichals; propleura black setose; occiput partly black setose.....4.
   Two posterior acrostichals.....7.
4. Palpi and basicosta yellow.....5.
   Palpi blackish; basicosta black (North America, Europe)..... *sylvarum* (Meigen).
5. Parafrontals contiguous; pruinosity of body scarcely perceptible (Idaho) *thatuna*, new species.
   Parafrontals well separated; body with distinct pruinosity.....6.
6. Body usually more evidently green; metasternum pilose; lobes of fifth sternite inconspicuous, appressed, with short stiff hairs. (Cosmopolitan).....*sericata* (Meigen).

Body usually more evidently coppery; metasternum bare; lobes of fifth sternite prominent with dense long hairs. (Cosmopolitan.) (*argyricephala* Macquart; *pallescens* Shannon) ..... *cuprina* (Wiedemann).

7. Subcostal sclerite setose; back of head mostly black setose; basicosta black; propleura black setose (North America, i. e., boreal and transitional zones and high altitudes in southern states) ..... *caesar* (Linnaeus).

Subcostal sclerite faintly pubescent ..... 8.

8. Hind margin of second and third and entire surface of fourth tergites with long, erect bristles; back of head entirely with stiff black setae; propleural pile and basicosta black; lobes of fifth sternite conspicuous (Washington) ..... *elongata* Shannon.

Abdomen not conspicuously bristly; back of head with pale soft pile ..... 9.

9. Parafrontals bristly only on lower half, contiguous and of less width than parafacial; propleura pale pilose; basicosta dark brown ..... 10.

Parafrontals bristly on more than lower half ..... 11.

10. Eye facets, on large front area, greatly enlarged; parafrontals reduced to slender line of less width than one of adjoining facets; pro- and metathoracic spiracles greatly enlarged; general body color purplish; squamae darkened. (Costa Rica, Mexico) ..... *ocularis*, new species.

Eye facets moderately enlarged; parafrontals distinctly broader than width of facet; thoracic spiracles moderately enlarged; general body color dark bluish green; squamae moderately infuscated ..... *rica*, new species.

11. Propleura black pilose; parafrontals contiguous, bristly on entire length, a pair of upper frontal bristles present; basicosta dark brown; forceps with short, sparse pile. (Texas, New Mexico, Arizona) ..... *unicolor* Townsend.

Propleura pale pilose ..... 12.

12. Parafrontals bristly on lower three-fourths, no upper frontals present; basicosta dark brown; forceps with rather dense long pile ..... 13.

Parafrontals with a pair of upper frontal bristles; inner forceps not distinctly hairy ..... 14.

13. Face very sparsely pilose; general color strongly purple. (Peru) ..... *ibis*, new species.

Face normally pilose; general color strongly green. (Texas, Mexico, Costa Rica, Panama) ..... *hirtiforceps*, new species.

14. Parafrontals contiguous; beard black; basicosta more or less yellow. (Southeastern United States) ..... *australis* Townsend.

Parafrontals distinctly separated; beard largely yellowish; basicosta yellow. (Southeastern United States and West Indies) ..... *cluvia* (Walker).

Table of Females of Lucilia.

1. Two sublaterals; two exterior bristles on fore tibia. (Subgenus *Francilia*) ..... *alaskensis* Shannon.

Three sublaterals; one exterior bristle. (Subgenus *Lucilia*) ..... 2.

2. Three posterior acrostichals ..... 3.

Two posterior acrostichals.....6.
3. Basicosta black; palpi brownish.....*sylvarum* (Meigen).
Basicosta and palpi yellow.....4.
4. Body without evident pruinosity; third antennal joint broader than width of parafacial.....*thatuna*, new species.
Body with distinct pruinosity; parafacial broader than width of third antennal joint.....5.
5. Body more evidently green; metasternum pilose.....*sericata* (Meigen).
Body more evidently coppery; metasternum bare.....*cuprina* (Weidemann).
6. Subcostal sclerite setose; basicosta black.....*caesar* (Linnaeus).
Subcostal sclerite faintly pubescent.....7.
7. Tergites three, four and five with strong, erect bristles; basicosta black; back of head entirely black setose.....*elongata* Shannon.
8. Tergites three, four and five not conspicuously bristly.....9.
9. Propleura black pilose; basicosta dark brown; front and face dark.....*unicolor* Townsend.
Propleura pale pilose.....10.
10. Antennae bright reddish yellow (Santa Marta, Colombia).....*ruficornis* Macquart.
Antennae not bright reddish yellow.....11.
11. Bases of wings strongly darkened; body color purplish.....*ocularis*, new species.
Bases of wings not strongly darkened.....12.
12. Beard largely pale.....13.
Beard entirely black.....14.
13. Front as broad as length of third antennal joint.....*cluvia* (Walker).
Front not as broad as length of third joint.....*rica*, new species.
14. Basicosta more or less yellow.....*australis* Townsend.
Basicosta dark brown (Face yellowish. Contrast with face dark in *unicolor*).....*hirtiforceps*, new species.

VIRIDINSULA, new subgenus.

Genotype.—Lucilia pionia Walker.

This new subgenus is known only in the male and the genotype has only been recorded from the Galapagos Islands.

Subgenus **LUCILIA** R.-Desvoidy.

Lucilia cuprina (Wiedemann).

This species has been recorded from America under the names *Lucilia pallescens* Shannon and *Lucilia argyricephala* Macquart (Shannon, Proc. Ent. Soc. Washington, 1925). Recently Patton (Bull. Ent. Research, 1925) has shown that *argyricephala* Macquart is synonymous with *cuprina* (Wiedemann).

Evidently *L. cuprina* is well established as a cosmopolitan species. It is apparently indigenous to Southern Asia and

parts of Africa. Specimens in the National Collection are from Michigan, District of Columbia, North Carolina, Texas, Brazil, Hawaii, Australia, Asia and Africa.

Lucilia thatuna, new species.

Male and female.—Parafrontals of male contiguous; front of female of moderate width; three posterior acrostichals; back of head partly black setose; propleura black setose; palpi and basicosta yellow; pruinosity of body barely perceptible.

Two males, three females.

Type locality.—Moscow Mountains, Idaho (July 20, 1924, J. M. Aldrich).

Type.—Male, Cat. No. 28,889, U. S. N. M.

Lucilia oculatis, new species.

Male and female.—Fairly large species of a deep purplish color and characterized by an area of very large facets, particularly in the male, on a large frontal portion of the eye. Parafrontals of male contiguous and greatly reduced so that at their narrowest portion the two together appear to be a slender line of less width than one of the adjoining facets and setose only on lower half; propleura pale pilose; two posterior acrostichals; pro- and metathoracic spiracles greatly enlarged; bases of wings and squamae darkened.

Three males, two females.

Type locality.—Higuito, San Mateo, Costa Rica (Pablo Schild).

Allotype locality.—Juan Vinas, Costa Rica (Pablo Schild); also from Mexico (J. R. Inda).

Type.—Cat. No. 28,890, U. S. N. M.

Lucilia rica, new species.

Male and *female.*—Rather small species with eyes facets and thoracic spiracles moderately enlarged, general body color bluish green; parafrontals of male bristly only on lower half and their combined width at the narrowest portion distinctly broader than width of adjoining eye facet; hind region of lower surface of head pale pilose; two posterior acrostichals; squamae moderately infuscated. Front of female not as broad as length of third antennal joint.

Two males, three females.

Type and allotype localities.—Antigua, West Indies (1924, H. Goodwin); also one paratype from Mayaguez, Porto Rico (March 14, 1914, R. H. Van Zwalenburg).

Type.—Cat. No. 29,145, U. S. N. M.

Lucilia ibis, new species.

Male.—Rather small species of a deep purplish color. The very sparsely pilose face and the rather densely and long haired forceps serve to identify it.

Two males.

Type locality.—Huadquina, 5,000 feet, Peru (August, 1911, Yale Peruvian Expedition).

Type.—Cat. No. 28,891, U. S. N. M.

Lucilia hirtiforceps, new species.

Male and female.—Closely allied to *L. australis* and *unicolor*. A moderate sized species of a deep green coloration; parafrontals of male subcontiguous, setose on lower three-fourths and without a pair of upper frontal bristles; face yellowish; two posterior acrostichals; propleura pale pilose; basicosta dark brown.

Five males, six females. Type male and allotype female taken in copula.

Type locality.—Ancon, Canal Zone (June 1, 1921, J. Zetek); also from Taboga Island, Panama; Costa Rica; San Salvador; Colina, Mexico; Victoria, Texas.

Type.—Cat. No. 28,892, U. S. N. M.

Lucilia cluvia (Walker).

Synonym.—*Lucilia pilatei* Hough.

The synonymy is based upon an examination of the type made by the writer in the British Museum. A fairly common species in the West Indies and southeastern United States.

Lucilia unicolor Townsend.

Synonym.—*Lucilia infuscata* Townsend.

In the writer's previous treatment of the Luciliini (1924) this species was stated to be possibly distinct from *auctralis* Townsend. Additional material now shows it to be a different species.

Table of Species of Cynomyia.

Head as high as broad and mostly bright orange yellow (east and west coasts of northern North America).....*mortuorum* (Linnaeus).

Head broader than high, largely blackish, lower portion partly reddish brown (throughout North America).....*cadaverina* R.-Desvoidy.

Cynomyia flavipalpis Macquart.

This species was described from America and reported from New Hampshire by Johnson (determination by Coquillett). It may prove to be a species of *Steringomyia*. Species not seen.

Table of Species of Steringomyia and Calliphora.

1. Two sublaterals; two intra-laterals; males with lobes of fifth sternite prominent, obtusely rounded apically. (See note below on *S. montana*) ..... 2.
   Three sublaterals ..... 4.
2. Squamae white ..... 3.
   Squamae darkened (Colorado, 10,240 feet altitude; Alaska) ..... *S. aldrichi* Shannon.
3. Arista short plumose (Alaska) ..... *S. popoffana* (Townsend).
   Arista with normal plumosity (Colorado, 10,240 feet altitude; Alaska) ..... *S. alpina* (Zetterstedt).
4. Front of head largely bright golden; squamae white; basicosta yellow; two costal spines; front of male broad with pair of upper frontals (plains region of western North America) ..... *C. elongata* (Hough).
   Front of head not conspicuously bright yellow; squamae darkened ..... 5.
5. A strongly differentiated pair of secondary ocellars placed immediately behind ocelli; bristles on facial ridges well developed; front of male broad, the parafrontals with strong, long bristles on entire length. (Western North America) ..... *latifrons* Hough.
   Secondary ocellars hardly differentiated from surrounding hairs; facial ridge bristles much smaller ..... 6.
6. Two intra-alars ..... 7.
   Three intra-alars ..... 13.
7. Bucca red; basicosta yellow, or yellowish-brown. (Very wide spread in North America) ..... *C. erythrocephala* (Meigen).
   Bucca black; basicosta black ..... 8.
8. Head as broad as high; gena (below parafacial) normally black ..... 9.
   Head broader than high; gena reddish brown ..... 10.
9. Distance between wing margin and angle of fourth vein less than preangular section of fourth vein; forceps of male very similar to those of *C. viridescens* (Alaska) ..... *C. morticia* Shannon.
   Distance between wing margin and angle of fourth vein greater than preangular section of fourth vein ..... 9a.
9a. Forceps of male broadly pear-shaped in outline ..... *S. alaskensis* Shannon.
   Forceps of male distinctly more slender, similar to those of *S. aldrichi* ..... *Steringomyia montana*, new species.
10. Bases of wings blackish ..... 11.
    Bases of wings not strongly darkened ..... 12.
11. Male: Narrowest width of front equal to distance between hind ocelli. Female: Width of parafacial about equal to length of aristal rays (Mexico, Colombia?) (Synonym.—*C. irazuana* Townsend) ..... *C. nigribasis* Macquart.
    Male: Narrowest width of front distinctly wider than distance between hind ocelli. Female: Width of parafacial much greater than length of aristal rays (Peru) ..... *C. peruviana* R.-Desvoidy.
12. Beard reddish (North America) ..... *vomitoria vomitoria* (Linnaeus).
    Beard black (northern North America) ..... *vomitoria nigribarba* Shannon.

13. Bucca red; third antennal joint of female rather small, the length equal to distance between rows of frontal bristles (western United States)..... *coloradensis* Hough.

Bucca black; third antennal joint of female rather large, the length greater than distance between rows of frontals (eastern and northern North America) ..... *viridescens* R.-Desvoidy.

Steringomyia montana, new species.

Male and *female*.—This species is intermediate between the genera *Calliphora* and *Steringomyia*. It seems to be closely related to *C. morticia* on the one hand and to *S. alaskensis* (also an intermediate form between the two genera) and *S. aldrichi* on the other. The genitalia of the males of *montana* and *alaskensis*, including the prominent lobes of the fifth tergite, are more typically those of *Steringomyia* and the difference in the wing venation, as stated in the key and which appears to be characteristic of *Steringomyia*, is shared by both. For these reasons *montana* and *alaskensis* are retained in *Steringomyia*, even though they possess three sublaterals. The differences between the species are very slight especially in the females. Two females at hand from the same locality as the male of *montana* are here considered to belong to the same species as the male, but one female from Alaska and two from Mount Ranier, Washington, may be either *montana* or *alaskensis* and for the time being are not assigned to either species. The forceps of the male show distinct differences. In *alaskensis* the four together present a broad pear-shaped outline. In *montana* they are much slenderer and very similar to those of *aldrichi* (see figures in Shannon's paper, 1923).

One male, two females.

Type and allotype locality.—Edmonton, Alberta (August 19, 1923, E. H. Strickland).

Type.—Cat. No. 28,895, U. S. N. M.

Tribe Polleniini.

Two North American genera are included in the Pollenini: *Pollenia* Desvoidy and *Melanodexia* Williston.

The tribe Polleniini differs considerably from the other North American Calliphoridae. The species are without metallic blue or green coloration, but usually have a dull grayish or blackish appearance, the abdomen sometimes is shining black but usually has a pollinose checkered pattern similar to that of the Sarcophagidae. Facial carina usually present; antennae rather small; facialae distinctly convergent below; oral vibrissae approximated and situated well above oral margin; posthumeral bristle variable, may be absent (*Melanodexia*) or present and placed laterad, in line with or mesad of the presutural; sternopleurals 1:1; metasternum, prosternum and propleurae bare; parafacials hairy down to lowermost margin of eye; squamal disc bare; tympanic membrane bare.

Two genera of the Sarcophagidae, *Morinia* Desvoidy (European) and *Neophyto* Townsend (North American) seem to possess considerable in common with the Polleniini.

Genus **POLLENIA** Desvoidy.

Four species of *Pollenia* (including *Nitellia*) have been reported from North America. Of these, only *P. rudis* (Fabricius) seems to be well known and established in this country. *Pollenia* (*Nitellia*) *glabricula* (Bigot), described from California, has not been recorded since it was first described. An examination of the type may show it to belong to the genus *Melanodexia*. *Pollenia obscura* Bigot, described from North America, likewise has not been recorded since its original discovery.

Pollenia vespillo Fabricius.

Pollenia (*Nitellia*) *vespillo* (Fabricius), a well-known European species, has been reported from Nova Scotia by Walker and its occurrence in North America was confirmed by Hough. Aside from these records nothing is known of this species in America. It may be immediately distinguished from *P. rudis* by the almost entirely shining black abdomen, only a very faint and uniform pollinosity being present.

Pollenia rudis (Fabricius).

P. rudis (Fabricius), commonly called the cluster fly because of its habit of congregating in attics during the winter, may be easily recognized in its fresh condition by the presence of the loose yellow pile on the sides and dorsum of the thorax. This pile is deciduous and in a rubbed condition the species may be mistaken for a Sarcophagid. However, the family and tribal characters noted above serve to separate it from the Sarcophagidae.

A very common species in eastern North America. Specimens in the National Collection are also from Colorado, Nevada, Utah and California.

Genus **MELANODEXIA** Williston.

Three species of *Melanodexia* are recognized in the present paper based on a study of twenty males and six females. The differences between the species are rather slight and, moreover, the specimens show some individual variation which further complicates their separation. All of the material is from California and Oregon. Nothing is known of their biology.

The species described by Bigot as *Nitellia glabricula* from California may well prove to be a species of this genus.

Key to Species of Melanodexia.

A1. Males.

B1. Forceps small, length of outside forcep equal to combined width of the four; third antennal joint distinctly narrower than second; size moderate.....*satanica*, new species.

B2. Forceps elongate, length of outside forceps distinctly longer than combined width of the four; third antennal joint about as broad as second.

C1. Palpus not longer than antenna; size moderate, 8 to 9 mm..... *tristis* Williston.

C2. Palpus distinctly longer than antenna; larger species, 11 mm..... *grandis*, new species.

A2. Females.

B1. Frontal vitta parallel sided; palpus not longer than proboscis..... *tristis* Williston.

B2. Frontal vitta diverging downwards; palpus distinctly longer than antenna.....*grandis*, new species.

Melanodexia tristis Williston.

Description based on type male.

Male.—Head nearly hemispherical, a little broader than high; front black, at narrowest width a little broader than length of third antennal joint, widening out considerably above antennae, swollen in appearance; frontal and ocellar bristles long and slender, about length of arista; first and second joints shining brown; second enlarged and with a long dorsal bristle equal to length of antenna; third joint dark brown, twice as long as wide; arista longer than antenna, with two irregular dorsal rows of rays and a lower row, the outer fourth bare; face large, swollen; facial ridges converging below; vibrissae long, placed well above oral margin; facial carina distinct; distance between lower margin of eye and oral margin equal to width of eye; palpi slender, brownish, with scattered long setae. Thorax shining black, bristles long slender, with fairly long black hairs interspersed (the type specimen has a single pair of anterior acrostichals; two pairs are normal number). Legs not elongate, the bristles rather long, pulvilli and claws of rather large size (said to be small in original description). Abdomen short-conical, with distinct bristles only on distal part, anteriorly with abundant erect hairs. Third longitudinal vein strongly convex in front, terminating very near tip of wing; antepenultimate section of fourth vein fully twice length of penultimate section, the latter joining the ultimate section at an angle. Wings and squamae smoky. Length, 6 mm.

This was very kindly loaned me by the University of Kansas.

Female.[1]—Description based on specimens at hand.

[1]The female described as allotype by Williston can not be found in the Kansas University collection. From the description it appears to belong to the species described below as *grandis*.

More shining black than the male but still with a decided pollinose cast; the thoracic and abdominal hairs less developed, rather short on the abdomen; front rather broad; frontal vitta with parallel sides; facial carina scarcely perceptible, the antennae consequently nearly touching basally; palpus shorter than proboscis; length equal to that of the male.

Type locality.—Death Valley, California (Baron, collector).
Type.—In Kansas University collection.

Specimens in the National Museum from San Bernardino County (May, D. W. Coquillett); San Diego (March 27, 1915, April 20, 1921, W. S. Wright); Claremont (C. F. Baker; Metz).

There are also three males and one female from Oregon in the collection which may be referable to this species, but some variation is present in these and they have been kept apart for the time being. They appear to be intermediate between *tristis* and *grandis*.

Melanodexia grandis, new species.

Male and *female*.—This species may be separated from *tristis* by its larger size; head higher than broad; palpus longer than antenna; the longer forceps of the male and broader front of the female in which the frontal vitta widens downwards. Length, 11 mm.; wing, 8.5 mm.

Four males, two females. All from California.
Type locality.—Monterey County, California (July 5, 1896, collector ?).
Other localities.—Pacific Grove (May 9, 1906, J. M. Aldrich); Pleyto, Monterey County (May 22, 1920, E. P. Van Duzee).
Type.—Cat. No. 28,894, U. S. N. M.

Melanodexia satanica, new species.

Male.—About the size of *tristis;* the wings a little more smoky; second antennal joint enlarged and perceptibly broader than third joint; palpus longer than antenna; forceps short, outer forceps only as long as combined width of the four and rather strongly contracted beyond middle but moderately expanded at apex to form a blunt point (sharp-pointed in *tristis* and *grandis*). Length, 9–10 mm.; wing, 8–8.5 mm.

Eight males.
Type locality.—Los Gatos Canyon Divide to mouth of Mount Diablo Ridge, Fresno County, California (June 6–8, 1907, J. C. Bradley).
Type.—Cat. No. 28,893, U. S. N. M.

Two females are at hand from Bairs Ranch, Humboldt County, California (June 9, H. S. Barber) which may prove to belong to this species. They differ from the females of *tristis* and *grandis* principally by their striking shining black coloration. There is also a possibility that they represent

the species described as *Nitellia glabricula* Bigot from a single female from California. This species was described as being shining black.

BIBLIOGRAPHY.

ALDRICH, J. M.—Catalogue of North American Diptera. Smithsonian Miscellaneous Collections, Vol. 46, 1905.

ALDRICH, J. M.—Neotropical Muscoid Genus *Mesembrinella* Giglio-Tos and other Testaceous Muscoid Flies. Proc. U. S. Nat. Museum, Vol. 62, 1922, Art. 11, pp. 1–24.

ALDRICH, J. M.—New Diptera or Two-winged Flies in the United States National Museum. Proc. U. S. Nat. Museum, Vol. 66, 1925, Art. 18, pp. 1–36.

SHANNON, R. C.—Genera of Nearctic Calliphoridae, Blow-flies, with Revision of the Calliphorini. Ins. Ins. Mens., Vol. 11, 1923, pp. 101–118.

SHANNON, R. C.—Nearctic Calliphoridae, Luciliini. Ins. Ins. Mens., Vol. 12, 1924, pp. 67–81.

SHANNON AND DOBROSCKY.—The North American bird parasites of the genus Protocalliphora. Journ. Wash. Acad. Sci., Vol. 14, 1924, pp. 247–253.

TOWNSEND, C. H. T.—Catalogue of the Described South American species of Calyptrate Muscidae. Ann. New York Acad. Sci., Vol. 7, 1892, pp. 1–44.

A FOREIGN CABBAGE FLEA-BEETLE IN THE UNITED STATES.

BY F. H. CHITTENDEN, *U. S. Bureau of Entomology.*

March 7, 1921, Mr. R. L. Michaud, Rochester, N. Y., wrote for information as to how to dispose of what he termed a "black flea" which was destroying seedling radish. May 7, specimens were furnished which proved to be a *Phyllotreta* not hitherto known as occurring in this country. In regard to the habits of the species, he wrote: "The beetles work hardest when the sun is hot and just as soon as the seed comes through the ground they eat it. All my cabbage is ruined and completely gone. They hide in the ground at night and on cold days. They are attacking not only radish and cabbage but turnip and everything of the cabbage family and last summer when there was nothing like that to feed on they attacked wax beans." Our correspondent found it necessary to dig up his beds for replanting. He stated that the insects did not appear to injure plantings after the middle of August and that this was the third season that they had "cleaned up" in his vicinity. Others who grew radish in the neighborhood experienced the same trouble.

The specimens of the seedling radish plants received showed that the insects at first attacked the cotyledons, pitting them with holes in the customary manner of flea-beetles, and afterward attacked the smaller first leaves as they developed. Injury of this character showed practically complete destruction of the plants attacked. Later in the same year Dr. D. E. Fink visited the infested region and obtained additional specimens of the beetles and their work and made observations on local conditions. The species at that time appeared to be confined to within a few miles of Rochester.

Recently, specimens of this *Phyllotreta* were forwarded to Mr. F. Heikertinger, specialist on the *Halticini* of Europe, who prepared specimens of the male genitalia for positive identification. Under date of January 4, 1926, he wrote that the species is surely the European *Phyllotreta aera* Allard, a form which inhabits southern Europe and the southern portions of middle Europe and which is now and then destructive to cruciferous crop plants, such as cabbage, although it is not a common species like *atra* and *cruciferae*. Specimens have also been taken in Europe on a hedge mustard, *Sisymbrium altissimum*.

Ph. aerea belongs to a unicolorous group in which the antennal joints are alike in the sexes. Since this adds another species introduced from abroad, the others being *armoraciae* and *vittata*, it is pertinent to remark that it is quite possible that any or all of the Eurasian Phyllotretas might be introduced and become more or less injurious in the course of years. Of the related species there are the following:

Ph. nigripes Fab., larger and distinctly green in color. The commonest of the dark species occurring on cultivated and wild Cruciferae in Germany and Austria.

Ph. cruciferae Goeze, not quite so large as the preceding, metallic blue-green or less distinctly dark green. Very common, widely distributed and destructive to cruciferous crops in Europe.

Ph. atra Fab., a little larger than *aerea* but quite similar, also very common, injurious and widely known in Europe.

Ph. diademata Foudr., of similar size to *aerea*, occurring on *Radicula silvestris* and *Neslia paniculata*, both naturalized from Europe. Apparently not injurious.

Ph. austriaca Hktgr., a comparatively rare species occurring on *Sisymbrium strictitissimum* in Austria.

Ph. consobrina Curt., an inhabitant of western Europe, is similar to *aerea* only in the female, the male being easily separated by the fourth and fifth antennal joints being equally dilated. This species is also destructive to cole crops.

Mr. H. S. Barber has called the writer's attention to the receipt of a specimen of *Ph. nemorum* L. taken at Chicago, Ill., in a package from Germany, November 27, 1925. This is

one of the best known of the destructive European species and might in all probability be introduced here as easily as was the case of the injurious *Ph. armoraciae* Koch, which is practically and fortunately restricted in its food habits, injuring so far as known only horse-radish.

The following is a technical description of *Ph. aerea:*

Phyllotreta aerea Allard.

Phyllotreta aerea Allard, Ann. Soc. Ent. France, 1859, Bul. p. C. Heikertinger, Halticinae, Käfer d. Deutsch. Reiches, IV, 1913, p. 177.

Phyllotreta punctulata Foudras, Ann. Soc. Linn. Lyon, ser. 2, 1859–1860, pp. 255–257.

Elongate oval, not more than twice as wide as long, moderately convex, rather feebly polished black, with rather faint metallic, more or less aeneous, lustre. Antennae very slender, slightly more than half as long as the body, first three basal joints as viewed from lower surface light yellowish red. Head narrow, surface distinctly, very finely, and somewhat densely punctulate; eyes rather large and prominent. Prothorax moderately convex, long, nearly one-third wider than long, feebly narrowed, a little wider at the apex than the head, moderately arcuate at the sides, widest near the middle, feebly narrowed at the base; surface finely, regularly, and sparsely punctate. Elytra wide, distinctly wider at the base than the prothorax, humeri abruptly rounded, umbone not prominent, sides moderately and evenly arcuate, punctation about as on the prothorax, finer at the apex. Ventral segments shining black, finely, rather densely punctulate, punctules with very fine, sparse gray hairs only. Femora black, faintly pilose with gray; tibiae piceous, brown at articulations; tarsi pale fuscous.

Male.—Antennal joints 2, 3, 4 subequal in length; 2 slightly wider than 3; 3 slightly shorter; 5 about one-fourth longer than 4 or 6; 7 scarcely wider; 8–11 a little wider than preceding, scarcely more than twice as wide as 2, 3, 4; subequal in length, 11 a little longer. Fifth ventral segment subtruncate, transversely concave across the middle, not flat but with a ridge at the apex, tubercles wanting or rather indefinitely indicated.

Female.—Antennae about as in the male. Fifth ventral segment feebly concave at sides, apex conical without tubercles.

Length 1.4–2.2 mm.; width 0.7–1.1 mm.

Habitat.—Rochester, N. Y. (R. L. Michaud, D. E. Fink); Southern and South-central Europe.

Ph. aerea is not closely related to any described native form. From any other species with which it might be confused, it may be distinguished by its more perfectly oval and by the distinctive last ventral segment of the male. Compared with our common *pusilla*, the prothorax is wider and the color is not distinctly cupreous or aeneous as in that species. The eyes are prominent, the humeri abruptly rounded, and the ventral punctules bear fine gray hairs.

A FOSSIL ORTHOPTEROUS INSECT FORMERLY REFERRED TO MECOPTERA.

By T. D. A. Cockerell.

Taphacris bittaciformis (Cockerell).

Eobanksia bittaciformis Cockerell, Amer. Journ. Science, XXVII (1909), p. 384.

When Dr. R. J. Tillyard recently visited me in Boulder, we had a very enjoyable session going over some of the fossil insects from Florissant, and among others, the type of *Eobanksia* came up for review. I had not studied it since 1909, but on taking it up again it at once occurred to me that it was Orthopterous. Dr. Tillyard, from his intimate knowledge of insect pterology, at once confirmed this suspicion, and made the suggestion that it represented a single hind wing, instead of a pair of wings as supposed. He also declared it Acridiid, and considered it referable to *Taphacris* of Scudder, the type of which (*T. reliquata* Scudder) is almost twice as large. I had specimens of *Taphacris* in the collection, and we proceeded to make comparisons, at once finding a close similarity. Since Dr. Tillyard left, I have minutely examined the specimens, and can confirm his opinions. The attempted restoration originally offered (l. c. fig. 9, A) is of course radically wrong, yet it shows the essential features of the venation and can be understood if, instead of making the outline of two wings, the apparent upper wing is connected with the supposed lower, and it is understood that the broad fan-like lower portion has been lost. The notations Sc, R, Rs, M and Cu stand; Cu runs into the first anal as Snodgrass figures for *Dissosteira carolina*, but very much nearer the base of the wing. The parallel veins marked R in the supposed hind wing are A3 and A4. The costal vein begins below the costal margin, but soon attains it as can be seen in recent species. The obliquity of the cross-veins above A3 and below A4 is a striking feature.

The second specimen referred to (l. c. fig. 8 and fig. 9B) shows a hind wing completely folded, the first fold at the beginning of the anals, as in Martynov's recent figure of *Locusta* (*Pacyhtylus*) *migratoria*. The veins are darker than in the type; the two branches of the radial sector are about 1.7 mm. apart (3.4 apart in the type), and the distal branch is again forked (simple in the type). Dr. Tillyard thinks this is a distinct species, and I was inclined to agree; but in view of the great variation shown in the venation of Orthoptera (even on the two sides of the same specimen) I will merely designate it as a new variery, **T. bittaciformis tillyardi.** The type is at the University of Colorado; the reverse at Yale. So far, I have not found any closely related recent genus.

NOTES ON HYPOCHAETA AND RELATED GENERA OF MUSCOID FLIES (DIPTERA).

By J. M. Aldrich.

Since I discussed *Hypochaeta longicornis* of Coquillett 1897 (these Proceedings, vol. 25, 1923, 161, 162) I have been permitted to examine the type of *Frivaldskia longicornis* Schiner, the European species which Coquillett believed he had recognized from North America. In the article cited I assumed that our species is different from that of Schiner, but later I had some misgivings on the point. Through the liberality of the authorities of the Vienna Natural History Museum in allowing me to borrow Schiner's type, I am able to clear up some relations, and the discoveries should be put on record.

First a few words on the nomenclatural confusion about this European species, which has been increased by the publication of Stein's fine posthumous work on European Tachinidae.

Schiner proposed the genus *Frivaldskia* to replace *Fallenia* Meigen, preoccupied (1861, 142); in a list of Tachinidae he merely wrote, "*Frivaldskia* (Fallenia Mg.)," but later (1862, 527) he gave characters for the genus. Now *Fallenia* Meigen (1838, 265) was based on two species, *Tachina longicornis* Fallen and *Tachina coracina* Meigen. Coquillett (1910, 544) designated the former as type, and it automatically becomes the type of *Frivaldskia* also.

Brauer and Bergenstamm (1889, 93), recognizing the fact that Schiner's *longicornis* was not the same as Fallen's established the genus *Hypochaeta*, with the sole species "*longicornis* Schiner (non Fall.)."

Thus *Tachina longicornis* Fallen became the type of *Frivaldskia*, and *Frivaldskia longicornis* Schiner became the type of *Hypochaeta*. Stein (1900, 135) ascertained from Meigen's type that Schiner's species is a synonym of *Tachina distincta* Meigen (1824, 302), which becomes the prior name for the type of *Hypochaeta*.

Bezzi (1907, 305) places under the name *Frivaldskia* (used as a subgenus of *Campylochaeta*), only the two species *longicornis* Fallen and *distincta* Meigen (syn. *longicornis* Schiner); he makes *Hypochaeta* a synonym of *Frivaldskia*.

Stein (1924, 104) puts under *Frivaldskia* only the one species *distincta* Meigen, with *longicornis* Schiner as synonym; and believing *longicornis* Fallen to be distinct generically he erects for it the new genus Latigena. Here are evidently two errors, as he should have used *Frivaldskia* for the latter and *Hypochaeta* for the former—assuming that the two species are generically distinct, which seems probable (I have not seen *longicornis* Fallen, but it has proclinate ocellars).

Hypochaeta distincta Meigen, as represented by Schiner's type of *longicornis*, shows the following characters of special interest besides those mentioned by Brauer and Bergenstamm:

Female.—Back of head with white hair except the orbital row, which is double above, and a group of black hairs at lower part of cheek; the bristle of the cheek is smaller than figured by Brauer, who overestimated its taxonomic value. It is the same as in our *tarsalis*. Palpi yellow.

Acrostichal 3, 2(?); dorsocentral 2, 3; humeral 4; posthumeral 1; presutural 2 (inner small); notopleural 2; supraalar 3 (only the middle one large); intraalar 3; postalar 2; sternopleural 2, 1 (lower anterior hairlike); pteropleural 0; infrasquamal hairs absent; scutellum with 2 lateral, 1 good sized decussate apical, 1 small discal. Squamae white, of ordinary form. Hypopleural bristles well developed, 5 or 6.

First posterior cell ending a little farther before the tip of the wing than in our *tarsalis;* the distance from tip of fourth vein to apex is very little less than from auxiliary to first on costa. Last section of fifth vein to preceding as 20 to 24 by micrometer. Third vein at base with half a dozen hairs, two or three of which are of very unusual size.

Front tarsi not at all notched underneath. Front tibia with two outer bristles and row of large on front (extensor); middle tibia with 3 bristles and some hairs on outer front side; hind tibia with 8 very uneven short and long bristles on outer hind side; hind trochanter with a medium sized bristle.

There are four genera which form a very compact group, hardly more than a genus in fact, characterized by having hairy eyes; bristly facial ridges; receding face; third antennal joint several times the second; ocellars large, erect, the tips reclinate and diverging; first posterior cell ending near tip of wing; smallish size and general gray color. Three are American, only *Hypochaeta* being European. Only five species are included. They may all be readily tabulated as follows:

Key to Hypochaeta and Allied Genera.

1. First vein hairy ..... 2.
   First vein bare ..... 3.
2. Hind crossvein retracted, so that the last section of the fifth vein is considerably more than half the preceding (North America) ..... *Chaetophlepsis* Townsend.
   Hind crossvein not retracted, hence the last section of fifth vein is much less than half the preceding (North America) ..... *Parahypochaeta* Brauer and Bergenstamm.
3. Hind crossvein retracted (Europe) ..... *Hypochaeta* Brauer and Bergenstamm.
   Hind crossvein not retracted (Peru) ..... *Hypochaetopsis* Townsend.

Parahypochaeta Brauer and Bergenstamm (1891, 337) has only the one species *heteroneura*. I have reported on the type (1924, 215), and no other specimens are yet known.

Chaetophlepsis Townsend (1915, 422) has two species; *tarsalis* Townsend (ibid.) from North and South America, is gray, while *townsendi* Smith (1916, 94) has red legs and abdomen.

Hypochaetopsis Townsend (1915, 422) has only one species, *chaetosa* Townsend (ibid.).

BIBLIOGRAPHY.

Aldrich, J. M.—1923. Proc. Ent. Soc. Wash., vol. 25.—1924. Annals Ent. Soc. Amer., vol. 17.

Bezzi, M.—1907. Katalog der Palaärktischen Dipteren, vol. 3.

Brauer, F. and Bergenstamm, J. E.—1889. Zweifl. Kais. Mus. Wien, part 4.—1891. Op. cit., part 5.

Coquillett, D. W.—1910. The Type-Species of N. A. Genera of Diptera. Proc. U. S. N. M., vol. 37.

Meigen, J. W.—1824. Syst. Beschreib. Eur. Zweifl. Ins., vol. 4.—1838. Op. cit., vol. 7.

Schiner, J. R.—1861. Wiener Ent. Monatsch., vol. 5.—1862. Fauna Austriaca, Diptera, vol. 1.

Smith, Harrison E.—1916. Proc. Ent. Soc. Wash., vol. 18.

Stein, Paul.—1900. Entom. Nachricht., vol. 26.—1924. Die Verbreitetsten Tachiniden Mitteleuropas. Arch. f. Naturgesch., vol. 90.

Townsend, C. H. T.—1915. Proc. U. S. N. M., vol. 49.

SOME RECENT GENERIC DERIVATIVES OF THE MALLOPHAGAN GENUS PHILOPTERUS NITZSCH (PHILOPTERIDAE).

By H. E. Ewing, *U. S. Bureau of Entomology.*

The genus *Philopterus* Nitzsch, like a few other genera of the order Mallophaga, has long included a vast assemblage of species that infest hosts of almost all the larger bird groups. In recent years various genera have been split off from the old cosmopolitan group, and in 1916 Cummings established at one time four new genera for certain of its components. But even with these various subtractions the genus yet includes upward of two hundred valid species.

The Philopteri of Owls.

Osborn (1896) pointed out that his *Philopterus bubonis* of the great horned owl, *Bubo virgininianus virginianus*, showed "decided affinities to *ceblebrachys*" and approached *Nirmus*, particularly in the form of the head and in the rigidity of the trabeculae. Mjöberg (1910) was the first to separate any of the owl-infesting species into a separate taxonomic group. In this year he established his subgenus *Strigiphilus*, which has been rightly raised to a genus by Harrison (1916), for the peculiar owl-infesting species, *Philopterus heterocerus*

Nitzsch. Into this genus Harrison (1916) places two other owl-infesting species, *Philopterus hexopthalmus* Nitzsch and *Philopterus remotus* Kellogg and Chapman. That this genus is very distinctive in that the males have appendiculate antennae and that the genital armature is peculiar is at once admitted. In the shape of the head *Strigiphilus* species approach *Philopterus ceblebrachys* Nitzcsh, to be further considered.

Kellogg (1913) pointed out that the owl-infesting Philopteri group themselves about three well differentiated types represented by Nitzsch's three species, *P. rostratus*, *P. cursor* and *P. ceblebrachys*. If Mjöberg's subgenus is excluded from consideration this undoubtedly is the case as far as our present knowledge of the different species goes. Cummings (1916) followed Kellogg in recognizing the latter's three types of owl-infesting Philopteri, and gave us for the first time a detailed account of the genital armature of the species typifying the three groups.

Kellogg believed that much of the variation found among the owl Philopteri was of the individual type brought about "probably through the unusual isolation of the separate groups of individuals that compose the species."

Cummings (1916) admitted the distinctness of the three types of owl Philopteri, but believed a close relationship existed between these types and the hawk-infesting Philopteri in their male copulatory apparatus.

Up to the present only nineteen species of Philopteri (exclusive of the three species of *Strigiphilus*) have been described from owls as type hosts, and of these Harrison (1916) recognizes as valid only thirteen. These thirteen species are represented by only eight type host species, which fall into as many genera.

Thus out of about a hundred owl species known from the entire world, representing about a fourth as many genera, only a small percentage of their lice has been studied and described. Because of this paucity of knowledge concerning the Mallophaga of owls as a group much hesitation is felt in making generalizations of any kind. However, the writer would like to summarize what is known regarding the distinctness of the three types of owl-infesting Philopteri mentioned by Kellogg and by Cummings, and also give a suggestion or two in regard to the possible significance of the group differentiation observed.

The most distinctive group of the three is the *ceblebrachys* group. In *ceblebrachys* itself the forehead is greatly shortened, the sides being rounded; the trabeculae are short and immovable, and do not reach the tip of segment one of the antenna; the eyes are reduced and the cornea lacks the uniform curve found in typical Philopteri; the male genital armature shows a long slender basal plate, fused endomeres and short, stubby, free parameres.

P. cursor, typifying the *cursor* group of owl-infesting Philopteri, has the forehead more or less quadrangular, of medium length, with the sides broadly incurved (concave); the trabeculae are of medium size, longer than segment one of antenna, and movable; the eyes are normal with evenly rounded corners; the male reproductive organs are similar to those of *ceblebrachys* except, as pointed out by Cummings, the vesicula seminalis is very large and rather peculiarly shaped.

P. rostratus, representing the *rostratus* group of owl-infesting Philopteri, is similar to *cursor* except that the forehead is much longer and the vesicula seminalis is much smaller and differently shaped.

In regard to the significance of these different types a note should be given. After studying many species of Philopteri infesting birds other than owls, it appears to the writer that in two of the three mentioned groups, the *cursor* group and the *rostratus* group, there are no characters that would differentiate these from the great body of Philopteri left in Nitzcsh's old genus after subtracting Cumming's genera, *Anatoecus*, *Ibidoecus*, *Neophilopterus* and *Dollabella*. More than this, these two groups run together completely in the shape of the head; and even in the types of male genital armature we have an intermediate type in *P. syrnii* Packard.

In the *ceblebrachys* group conditions are different. In the shape of the head, the reduction in size of the trabeculae and their fusion with the head and in the reduction of the eyes there exists a combination of characters that sets apart these species from all other Philopteri.

The writer believes that in the *ceblebrachys* group there has been a parallel phylogenetic development of the parasites with their hosts. It is probable that the members of this group have been longest isolated on the owls, hence have to a much greater degree adapted themselves in response to the environment imposed upon them by their owl hosts. Could not the degeneration of the eyes, most noted in *bubonis* Osborn, be explained through adaptive responsiveness to the nocturnal habits of the host in conjunction with their avoidance of bright light in the daytime? The eyes being practically useless in the night or in the dark places during the daytime, may have degenerated just as they have in many cave-dwelling insects. However, with their hosts, the owls, that are compelled to seek out free-living prey widely scattered over the landside the eyes have become acutely sharpened in their function. Do we not have here, therefore, a remarkable case of a physical element of an environment (darkness) working in opposite directions in its modification effect upon a specialized organ of similar function common to both host and parasite,—a subtle difference caused by the diversity of the food and other habits of the two?

Because of the viewpoint of the present writer in regard to the *ceblebrachys* group the liberty is here taken of establishing a new genus for it.

EUSTRIGIPHILUS, new genus.

Forehead irregularly rounded, broader than long and with sides outwardly rounded; signatural plate undivided and extending forward almost to the front margin of head; clypeal bands well pigmented and extending to the margin of head. Trabeculae reduced and immovable, not reaching the tip of the first segment of antenna. Eyes small and with distorted corneas. Antennae the same in the two sexes; short; segments one and two of about the same length. Abdomen broad, stout. Male genital armature with long basal plate, fused endomeres, and short, stubby, free parameres; a true penis wanting.

Genotype.—Philopterus ceblebrachys (Nitzsch).

Contained species.—In addition to the type species, *Philopterus bubonis* (Osborn) and *Philopterus clypeatus* (Mjöberg).

The type species shows the extreme diversification from the typical Philopteri. In *P. bubonis* the forehead is not so well rounded. The same is even more true of *P. clypeatus*. In addition, the last mentioned species has much larger trabeculae than those of the type species. Doubtless other species will be added to this genus in the future.

The Philopteri of Cuckoos.

Four species of cuckoo-infesting Philopteri contained in the National Museum Collection have been studied. All of these show a clypeal region which is characteristic, having an expanded hyaline margin with the front part incurved and a tuft of three or more long setae on top of each clypeal band. Among the bird hosts cuckoos are held to occupy a rather isolated and primitive position. It is interesting to note, therefore, that some of their Philopteri have a distinctive appearance. A new genus is here established for certain cuckoo-infesting species.

CUCULOECUS, new genus.

Clypeal region with a hyaline margin throughout, which in front is incurved or concave; signatural plate entire; clypeal bands not reaching the lateral margins of the head and each bearing dorsally at its anterior end a tuft of three or more long setae. Trabeculae very large and movable. Antennae medium and similar in the two sexes. Eyes normal with evenly rounded corneas. Abdomen broad and stout; tergites of female interrupted in the middle. Genital armature of male with slender basal plate; parameres stout, free, incurved; endomeres fused into an endomeral plate which usually protrudes beyond the parameres; penis present, but small and not well developed.

Genotype.—Philopterus coccygi (Osborn).

Contained species.—In addition to the type species, *P. latifrons* (Nitzsch), and two other undescribed species, one from a Cuban cuckoo and one from a Chinese cuckoo.

Cumming's Genera.

The genera established by Cummings (1916) are quite distinctive. These four genera, the two new ones established in this paper and Mjöberg's owl-infesting genus are separated from each other in the following key.

Key to Seven of the Generic Derivatives of Philopterus Nitzcsh.

1. Clypeal region expanded, with free margin hyaline throughout, in front incurved, or emarginate, and bearing above on each lateral chitinization (clypeal band) a tuft of three or more long setae. Parasitic on cuckoos. *Cuculoecus*, new genus.

   Clypeal region without such characters ..... 2.

2. Clypeal region expanded and with hyaline free margin throughout but rounded and not emarginate in front; antennae very short. Parasitic on geese, ducks and swans ..... *Anatoecus* Cummings.

   Clypeal region but little if at all expanded, not evenly rounded and not bounded throughout by a hyaline margin ..... 3.

3. Antennae of males appendiculate, or having a lateral process; forehead short; broader than long. Parasitic on owls ..... *Strigiphilus* Mjöberg.

   Antennae of males not appendiculate, but the same as those of females ..... 4.

4. Forehead irregularly rounded, much broader than long and with sides outcurved; trabeculae reduced, immovable, and not reaching the distal end of first antennal segment; eyes reduced. Only found on owls ..... *Eustrigiphilus*, new genus.

   Forehead more or less rectangular with sides broadly emarginate (concave); trabeculae larger and usually movable; eyes with rounded hyaline corneas ..... 5.

5. Signatural plate divided; antennae long, with segment two distinctly longer than any of the others. Parasitic on ibises ..... *Ibidoecus* Cummings.

   Signatural plate not divided; antennae shorter ..... 6.

6. Tergites of females interrupted dorsally. Parasitic on storks ..... *Neophilopterus* Cummings.

   Tergites of females extending across the abdomen and uniting the pleurites of the two sides. Parasitic on *Numenius* species ..... *Dollabella* Cummings.

The Philopteri of Birds of Prey.

Cummings (1916) calls attention to the similarity of the male genital armature of the Philopteri of owls to those of the birds of prey. Undoubtedly there is a rather marked similarity between the two. It should be noted, however, that whereas the genital armature of the owl-infesting species shows the penis either vestigial or wanting, it is present, though small, in the birds-of-prey type. Also in the Philopteri of birds of prey the

endomeres are not united distally, hence a true endomeral plate is wanting.

BIBLIOGRAPHY.

CUMMINGS, B. F.—1916. Studies on the Anoplura and Mallophaga, etc., Pt. II. Proc. Zool. Soc. Lond., 1916, pp. 643–693, figs. 1–36.

HARRISON, L.—1916. The Genera and Species of Mallophaga. Parasitology, Vol. IX, No. 1, pp. 1–156.

KELLOGG, V. L.—1913. The Docophori of Owls. Science, Vol. XXXVII, No. 943, pp. 154–155.

MJÖBERG, E.—1910. Studien über Mallophagen und Anopluren. Ark. f. Zool., Bd. VI, n. 13, pp. 1–296, figs. 1–156, Taf. I–V.

OSBORN, H.—1896. Insects Affecting Domestic Animals. U. S. Dept. Agr., Div. Ent., Bul. No. 5 (new series).

DIESTRAMMENA OCCURRING IN WELLS (ORTHOPTERA: TETTIGONIDAE).

BY A. N. CAUDELL, *U. S. Bureau of Entomology.*

In December, 1923, a letter was received from Mr. W. M. Wallace of Carterville, Illinois, saying his well was infested with crickets. These insects had first been noted by him the previous spring when numbers of them were seen to jump down into the water when the lid of the well was raised. Little was thought of the matter until they began to multiply in numbers. It was then decided to draw all the water out of the well, which was done twice during the summer and again in the fall, each time the walls of brick being washed. "And now," the letter states, "we have a well full of water and bugs." As many as five young ones are sometimes drawn up in one bucket of water; and he surmised that the eggs of the crickets must have been deposited in the crevices of the bricks. A specimen was sent for determination and proved to be *Diestrammena japanica* Blatchley. This insect has hitherto been found only in green houses, except for a single specimen taken in Kansas under a sidewalk and near a green house. Thus this occurrence in such numbers in a well, especially in the winter, is of decided interest.

Actual date of publication, June 28, 1926.

EDITORIAL.

Every now and then I am rebuked by my betters for using the word "scientist." They would have me use instead, "man of science." I wonder why? "Man of science" is admittedly a felicitous phrase; it fills the mouth comfortably; it is rhythmical; it has a certain romantic, high-quality ring reminding of such similar phrases as "man of destiny," "man of mystery," "man of war." Ordinarily it serves very well as a substitute for the simpler term; it serves nicely, when we are discriminating among men, to distinguish some as "men of science." It gives relief to sentences that otherwise would be burdened with too many repetitions of the same word. It is a fitting phrase; but it is not strictly synonymous with "scientist," nor can it always serve so well. It would be rather awkward to speak of Mme. Curie as a "man of science." She might be called a "woman of science"; but such a designation would hint too strongly of feminist discrimination. ("scientific woman," "scientific lady" are of course out of the question; they are ambiguous; besides, they suggest such other monstrous combinations as "scientific poet," "scientific barber.") No! There are times when only the word "scientist" will do. What is the objection to it anyway? It is a good word,—a little harsh perhaps (all words ending in *ist* are), but a word of character. Like "chemist," "organist," "theosophist" it means something definite. (It does at least to those who respect words.) The cat-like hiss at the end, while not beautiful is decidedly appropriate. It has an arresting quality. It reminds us that we are faced by a definitive word, one that we should handle with care. Perhaps we have handled it too carelessly. Perhaps by abuse, by applying the term "scientist" indiscriminately to men (and women) of science, inventors, medical practitioners, compilers of statistics, Viennese pseudo-philosophers, squirt-gun experts, devotees of Christian Science and dispensers of Popular-Science we have somewhat degraded it. But is that sufficient reason for abandoning it altogether? I think not. If we are to abandon all abused words we might as well throw our dictionaries away and let emotion have complete mastery over language. Rather let us abandon the abuse. Let us revive the ancient and honorable habit of defining terms as we use them. Let us define—or redefine—"scientist," and, having defined it, let us use it strictly in accordance with the definition.

—*Carl Heinrich.*

NOTES AND NEWS ITEMS.

Applied Entomology, An Introductory Text Book of Insects and Their Relation to Man, 2d Edition, H. T. Fernald, McGraw Hill Book Company, Inc., 1926.—The second edition of this book indicates that it is meeting the expectations of its author in filling a want for a class-room text book to be used as an introductory course in entomology.

The book work is good, but it is to be regretted that many of the orders are only illustrated with half tone plates which show no anatomical structures so useful to the student in identifying insects. The pen and ink plates are much more satisfactory.

The arrangement of the book for class-room work is excellent; the first four chapters introducing the student to entomology, orienting in his mind the relative position of insects among other animals, familiarizing him with the rudiments of external and internal anatomy and the general scheme of insect development. The next five chapters cover the economic significance of insects from a human viewpoint and give a brief outline of control practices. These first nine chapters admirably cover the work that should be required of all students undertaking undergraduate courses on agricultural subjects. From chapter 10 on the book is a popularized and simplified taxonomically-arranged treatise, only adequate for undergraduate students specializing in economic entomology.

A striking weakness is the lack of any bibliographical references to help broaden the necessarily brief treatment of the several orders; and the chapters on anatomy are too elementary for Junior and Senior work.

The biological notes accompanying the taxonomic diagnosis of each order make the book very readable.

—*J. A. Hyslop.*

VOL. 28 OCTOBER, 1926 No. 7

PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

CONTENTS

PUBLISHED MONTHLY EXCEPT JULY, AUGUST AND SEPTEMBER

BY THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

U. S. NATIONAL MUSEUM

WASHINGTON, D. C.

Entered as second-class matter March 10, 1919, at the Post Office at Washington, D. C., under Act of August 24, 1912.

Accepted for mailing at the special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized July 3 1918.

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON

ORGANIZED MARCH 12, 1884.

The regular meetings of the Society are held on the first Thursday of each month, from October to June, inclusive, at 8 P. M.

Annual dues for members are $3.00; initiation fee $1.00. Members are entitled to the PROCEEDINGS and any manuscript submitted by them is given precedence over any submitted by non-members.

OFFICERS FOR THE YEAR 1926.

Honorary President . . . . . E. A. SCHWARZ
President . . . . . J. M. ALDRICH
First Vice-President . . . . . J. A. HYSLOP
Second Vice-President . . . . . J. E. GRAF
Recording Secretary . . . . . C. T. GREENE
Corresponding Secretary-Treasurer . . . . . S. A. ROHWER
U. S. National Museum, Washington, D. C.
Editor . . . . . CARL HEINRICH
U. S. National Museum, Washington, D. C.
Executive Committee: THE OFFICERS and W. R. WALTON, A. N. CAUDELL, T. E. SNYDER.
Representing the Society as a Vice-President of the Washington Academy of Sciences . . . . . A. G. BÖVING

PROCEEDINGS ENTOMOLOGICAL SOCIETY OF WASHINGTON.

Published monthly, except July, August and September, by the Society at Washington, D. C. Terms of subscription: Domestic, $4.00 per annum; foreign, $4.25 per annum; recent single numbers, 50 cents, foreign postage extra. All subscriptions are payable in advance. Remittances should be made payable to the Entomological Society of Washington.

An author of a leading article in the PROCEEDINGS will be given 10 copies of the number in which his article appears. Reprints without covers will be furnished at the following rates, **provided a statement of the number desired accompanies the manuscript:**

	4 pp.	8 pp.	12 pp.	16 pp.
50 copies	2.00	4.00	6.00	8.00
100 copies	2.25	4.50	6.75	9.00

Certain charges are made for illustrations and there are available rules and suggestions governing the make-up of articles. Immediate publication in any number may be obtained at the author's expense. **All manuscripts should be sent to the Editor.**

PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 28 OCTOBER 1926 No. 7

THREE NEW TERMITOPHILOUS BEETLES FROM BRITISH GUIANA.

By W. M. Mann, *U. S. National Museum, Washington, D. C.*

A number of years ago Dr. Alfred Emerson sent me a large series of termitophiles which he collected in British Guiana. Only a small portion of these interesting beetles have been worked up. The following paper deals with descriptions of three of the new forms.

PODUROIDES, new genus.

Small, tapering little depressed species, with the pronotum and elytra somewhat expanded and thin at sides. Head nearly as broad as anterior border of pronotum, transversely oval, occipital angles rounded; in front of eyes obliquely receding. Eyes well developed, moderately convex. Clypeus transverse, straight at anterior border. Labrum transverse, feebly emarginate at middle of front, rounded at sides. Maxillae with outer lobe long and slender, inner lobe shorter and strongly setose on inner border. Maxillary palpi 4-jointed; second joint nearly as long as the third, slender basally and clavate at apex, third joint strongly enlarged, terminal joint slender, acuminate. Ligula elongate, excised apically to form two conical lobes. Labial palpi 3-jointed, first joint elongate, second transverse, third a little longer than the second and half as thick. Mandibles stout, acuminate, finely toothed near middle, prostheca elongate, well developed. Antennae 11-jointed, stout, basal joint broad and concave above, second joint broader than the third. Pronotum convex. Elytra moderately convex, strongly transverse. Abdomen evenly tapering, seven segments visible from above. Legs short, femora and tibiae rather strongly compressed, coxae contiguous, tarsi 4–4–4 jointed.

Genotype.—Poduroides bövingi, new species.

Poduroides bövingi, new species.

Length 1.25 mm.

Reddish brown, elytra, and antennae except the terminal joint, a little darker than the rest, terminal and penultimate joints of antennae yellow. Head and body finely punctate and covered with moderately abundant yellow pile which is exceedingly fine and short on the dorsum and longer on ventral surface of abdomen; brown, rather stiff, though fine, erect hairs sparse on head, thorax and elytra, more abundant on gaster where there are also sparse, fine, long, suberect yellow hairs; legs pilose; antennae very finely setose.

Head nearly twice as broad as long, vertex transversely convex, front flat,

clypeal region flat. Diameter of eyes greater than their distance to posterior border of head. Antennae about as long as head and thorax together, basal joint broader than the others, strongly depressed, with the upper surface distinctly concave; second joint transverse, the remainder forming a club, tapering at apex, joints 3–9 strongly transverse, 10 less than twice as broad as long, 11 connate, longer than broad but shorter than 9 and 10 together.

Pronotum convex, a little broader than long and a little broader behind than in front, anterior angles broadly and posterior more narrowly rounded, sides feebly arcuate, anterior border straight, posterior border arcuate at middle, concealing the scutellum. Elytra a little broader than pronotum and together more than twice as broad as long, broadest in front of middle, behind which the sides are nearly straight, anterior corners rounded, posterior corners subangulate, posterior margin nearly straight. Abdomen tapering, a little longer than head, thorax and elytra together.

Type locality.—Kartabo Point, British Guiana.

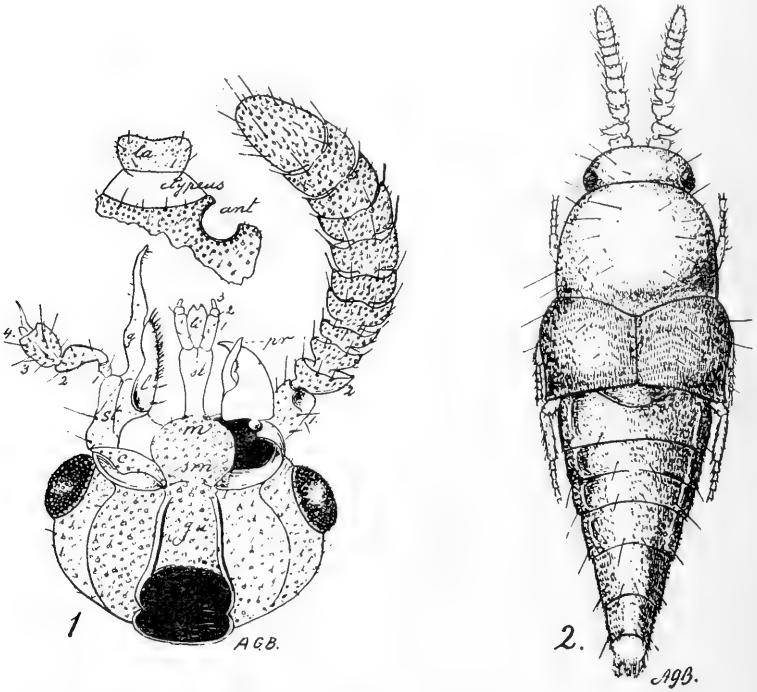


Fig. 1. *Poduroides bövingi* Mann. Head of adult, ventra view (ant. = antennal ring; c = cardo; g = galea; gu = gula; l = lacinia; la = labrum; li = ligula; m = mentum; pr = prostheca; sl = stipes labii; sm = submentum; st = stipes.

Fig. 2. *P. bövingi* Mann. Adult, dorsal view.

Host.—*Nasutitermes* (*Nasutitermes*) *gaigei* Emerson.

Type and paratype.—Cat. No. 29061 U. S. N. M.

Described from three specimens under Emerson number 163j; the type on a tag, one paratype on a slide, the other paratype in alcohol.

This genus from tarsal formula and structure of trophi belongs near the Corotocini, but is very distinct from the genera in that group in the structure of the antennae. The strongly sloping front of head, concealed by the broad, basal antennal joints makes it necessary to dissect the specimen to see even the form of the clypeus.

The habitus sketch and that of the details of the head were kindly drawn by Dr. Böving, to whom, in recognition of his studies in beetle anatomy, I dedicate the species.

Subfamily TACHYPORINAE.

TERMITONICUS new genus.

Body depressed, broadest at elytra and base of abdomen, tapering behind. Head small, not concealed, much narrower than pronotum, subovate, surface flattened in front, convex behind, posterior border biconcave. Labrum transverse, convex, rounded at anterior border. Maxillary palpi small, second and third joints subequal in length and thickness, the second clavate and curved, the third subcylindrical, terminal joint thick and very short. Mandible stout basally, slender and acuminate at tip. Labial palpi 3-jointed, basal joint thick, second and third joints subequal. Ligula long, slender, bifid, the tips conical. Antennae 11-jointed, slender, only slightly thickened toward apex, longer than head and thorax, not geniculate, all joints longer than broad. Eyes well developed. Pronotum broad, convex, the sides arcuately expanded as thin lamellae. Elytra very broad, with median portion convex and sides broadly expanded. Abdomen broad basally, evenly narrowed behind, in profile thickest in front of middle, more convex above than beneath; sides broadly margined, the marginal line distinctly impressed but very narrow; 7 segments visible. Legs short, femora flattened, tibiae slender, tarsi 4–4–4 jointed, basitarsi not longer than second joint; coxae approximate.

Genotype.—*Termitonicus mahout*, new species.

Termitonicus mahout, new species.

Length 1.75 mm.

Dark reddish brown, shining; sparsely, finelyand shallowly punctate. Brownish erect hairs sparse on thorax, elytra and antennae, absent on head, except labrum, and on legs except a pair on anterior trochanters; abdomen with exceedingly fine, short, recumbent yellow pubescence.

Head a little longer than broad, front flat, vertex convex, sides behind eyes evenly arcuate to posterior border; clypeus short, truncate anteriorly. Eyes moderately convex, shorter than their distance to occipital angles. First antennal joint about as long as second and third joints together, rather slender, its apex twice as broad as the base, second joint two-thirds as long as the third,

remaining joints longer than broad, decreasing in length toward apex, terminal joint conical, shorter than the two preceding together.

Pronotum more than two times as broad as head, anterior border emarginate; sides, anterior and posterior angles strongly arcuate, posterior border at middle broadly rounded. Elytra individually much broader than long, together nearly twice as broad as pronotum, sides arcuate, posterior corners subangulate, border broadly emarginate. Abdomen at base nearly as wide as elytra, sides convergent, nearly straight.

Type locality.—Kartabo, British Guiana (Emerson).
Host.—*Nasutitermes* (*Velocitermes*) *beebei* Emerson.
Type and paratypes.—Cat. No. 29062 U. S. N. M.

Described from four tag-mounted specimens (one type) and one slide-mounted specimen taken by Dr. Emerson, and bearing his number 389. Dr. Emerson has prepared a figure of the species to publish with notes on its biology.

Termitonicus, from the position of the antennal insertions, the structure of the thorax, with the spiracles exposed, and the arrangement of the coxae, comes in the Tachyporinae, but can be assigned to none of the known groups, the 4-jointed tarsi not conforming to those characters of other groups than the Hypocypti and the 11-jointed antennae separating it from that group.

The depressed and broad triangular abdomen, the form of the expanded pronotum and elytra are distinctive.

Tribe BOLITOCHARINI.

Group *Leptusae.*

TERMITOSPECTRUM, new genus.

Small, robust species, somewhat resembling *Philotermes*, with pronotum expanded laterally and moderately physogastric. Head depressed, excluding labrum, transverse, broad posteriorly, the front and vertex shallowly concave. Labrum longer than broad and narrowly rounded at anterior margin, surface convex. Mentum quadrangular, submentum long and narrow. Ligula projecting as an elongate, simple, subcylindrical process. Labial palpi 3-jointed, second joint shorter and very slightly broader than the third, which is about two times as long as broad.

Mandibles slender, arcuate, simple. Maxillae with outer lobe very long and slender, slightly thickened apically.

Maxillary palpi 4-jointed, first joint very small, second slender at basal half, clavate anteriorly, about half as thick as the third which is elongate-oval and a little longer than the second, fourth small, subulate. Antennal fossae small. Antennae 11-jointed, basal joint thickly ovate, shorter than second and third joints together, second joint distinctly longer than broad, constricted at base, joints 3–10 submoniliform, those on the basal half less rounded than those apically, terminal joint ovate, shorter than joints 9–10 together.

Eyes large, convex.

Pronotum transverse, sides produced laterally as broad, very thin lamellae, robust and strongly convex above and concave beneath, separated from the discal portion by heavy diagonal furrows, posterior border narrowly lamellate. Elytra distinctly narrower than thorax, together much broader than long, humeri subgibbous, sides feebly arcuate, posterior angles narrowly rounded, posterior border strongly emarginate. Scutellum short and broad. Abdomen a little wider than pronotum, broadest basally, narrowed and rounded apically, sides arcuate, convex above and strongly convex beneath, roundly margined at sides, carried elevated. Mesosternum finely carinate between coxae, posterior margin projecting and rounded between metasternal coxae.

Legs rather stout, femora and middle and posterior tibiae moderately compressed. Tarsi 4–4–5 jointed, basitarsi shorter than the other joints together.

Genotype.—Termitospectrum thoracicum, new species.

Termitospectrum thoracicum, new species.

Length 1.60 mm.

Pale reddish brown, front of head, margins of pronotum, tips of elytra and the appendages yellow-brown. Head, thorax and elytra shallowly cribrate-punctate. Hairs yellow in color, on dorsal surface sparse, on front of head more abundant, fine and erect, on ventral surface and appendages abundant, longer and coarser.

Head broadly rounded at sides posterior to eyes, the hind border fitting the deeply emarginate anterior border of pronotum. Pronotum about twice as broad as head, excluding eyes, anterior angles of margin produced as rounded lobes and separated from the remainder of margin by a shallow, oblique impression.

Type locality.—Kartabo Point, Kartabo, British Guiana.

Type.—Cat. No. 29063 U. S. N. M.

Host.—Nasutitermes (Nasutitermes) gaigei Emerson.

There is some superficial resemblance to the genus *Philotermes*, but *Termitospectrum* is distinct from this genus in the structure of the pronotum, the greatly elongate labrum, its moniliform antennae and tapering abdomen.

Described from two specimens, the type bearing A. Emerson number 163j and definitely associated with the above host; the paratype under Emerson number 390 and believed to be associated with the same host but found in a nest which was secondarily used by *Nasutitermes gaigei* and *Nasutitermes beebei* Emerson.

NOTES ON CERATOPOGONINAE (DIPTERA).

By Wm. A. Hoffman.[1]

Taxonomists interested in the Chironomidae have never been certain as to what the genus *Ceratopogon* actually represented. Edwards (1) (Ann. and Mag. Nat. Hist., Ser. 9, Vol. VI: 127, 1920) has outlined the various concepts held by investigators in this field. Through inquiry Edwards established the fact that Meigen's type *C. communis* possessed affinities with both *Atrichopogon* and *Stilobezzia*. He later informed me that a personal examination demonstrated that a microscopical pubescence was present on the eyes, and therefore *Psilohelea* Kieffer was synonymous with *Ceratopogon*. Among a number of Ceratopogoninae sent me by Dr. Felt of Albany, New York, was included a series, the characters of whose members coincided in the main with descriptions of Edwards (1), Winnertz (2), Kieffer (3) and Goetghebuer (4), the species concerned having been placed under *Ceratopogon* (*Psilohelea*). Since no American ceratopogonine has as yet been definitely classed as a species of *Ceratopogon* as limited by Edwards and the above-mentioned workers, this form, apparently new, is described in order that it may serve as a basis for comparison.

Ceratopogon culicoidithorax, new species.

Length of body (dry specimen) approximately 2 mm.; length of wing 1.32 mm.; width of wing .69 mm.

Occiput black, surface dull, covered with a fine gray pruinescence; frons hour glass shaped, decidedly narrowed between the bases of the antennae; clypeus slightly shiny, proboscis much more so, and slightly shorter. Palpi five segmented, the apical one longest, third proportionately shorter than in *Culicoides* and *Leptoconops*. The distance between the inner margins of the eyes is about one-seventh the head width. The antennae are short, dark yellowish brown, segments four to ten inclusive approximately spherical, the apical five becoming progressively longer, though the length of the terminal member does not exceed its width by more than a third. Surface of thorax brownish black, shiny, with fine grayish pruinescence; hairs few in number, black and coarse, restricted chiefly to the areas near the wing bases and the margins of the prescutellar depression. Ovate sensory organs on the fore part of the mesonotum are a prominent feature as with *Culicoides*, though possibly more shallow. Surface of scutellum and metanotum similar to that of mesonotum, the former with two pairs of coarse black hairs, one median, the other lateral, also several minute ones, all arranged in a transverse row. Greater portion of haltere pale except the light brown base. Legs well developed, tibiae especially so, of a medium brown shade, tarsi lighter; the tibiae tend to be more heavily clothed with long coarse hairs; the second and third

[1]From the Department of Medical Zoology, School of Hygiene and Public Health of the Johns Hopkins University, Baltimore, Maryland.

tibiae lack spines, the first terminated by a spur; the last has the usual apical row of spinulae; metatarsus not quite equal to combined length of following two segments, fourth very small, obcordate; metatarsus with four pairs of small spines ventrally, first two of these heavier, second segment with a terminal pair, posterior metatarsus with a number of ventral spinulae; claws dark, strong, almost as long as fifth tarsal segment, each with an inconspicuous tooth about midway from the base; an extremely minute empodium may be seen under favorable conditions. Wing practically devoid of macrotrichiae; veins R_{1+2+3} and R_{4+5} (first and second longitudinal) are exceptionally well developed, rising above the surface; radial cells approximately equal in length, the second considerably wider, its distal end not quite attaining a point two-thirds of the wing length from the base; Cu forks directly below the median end of the radio-median crossvein. Abdomen dull brown, with few brown hairs, chiefly situated laterally.

Male similar to the female except in regard to the usual secondary sexual characters; in the female the radial cells are practically contiguous while in the male they are separated by a distance almost equal to the length of each, this result apparently having been brought about by coalescence of the radial veins in the apical portion of the first cell and the basal part of the second; these cells are therefore shorter than the same structures in the female. The claw of the male is shorter and lacks the median tooth.

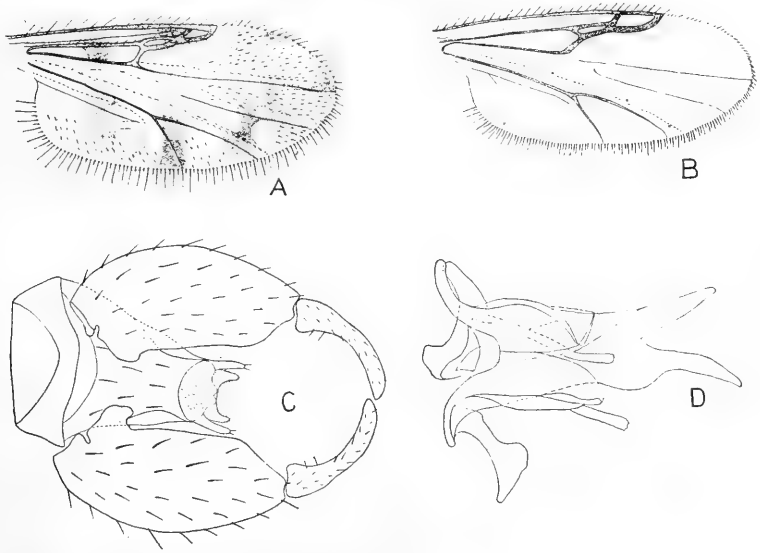


Fig. A. *Culicoides mississippiensis.* Wing.
Fig. B. *Ceratopogon culicoidithorax.* Wing.
Fig. C. *Ceratopogon culicoidithorax.* Male hypopygium; side pieces, claspers, and ninth tergite: ventral view.
Fig. D. *C. culicoidithorax.* Male hypopygium, harpes and aedoeagus: ventral view.

Karner, N. Y., May 14, 1906. Eight cotypes, 6 ♀ ♀. 1 ♂ in the New York State Museum at Albany, 1 ♀ in the U. S. National Museum. Cat. No. 29423.

The presence of prominent sensory thoracic organs suggests that *Ceratopogon* may be closely allied to *Culicoides*, while the radial cells markedly resemble those of *Stilobezzia*. The larva of *Stilobezzia coquilleti* Kief (*picta* Coq.) can not be distinguished from *Culicoides*, at least under the lower powers of a binocular. The larva of this species, however, is quiescent, while those species of *Culicoides* in which the larvae have an aquatic existence, move in an active vibratory manner.

Culicoides mississippiensis, new species.

Length (dry specimen) approximately 1.5 mm.; length of wing 1.4 mm.; width of wing .62 mm.

Frons, clypeus and antennae light brown, palpi darker, third segment long gradually widening up to three-fourths its length; proboscis blackish brown, shiny; fourth segment of antennae slightly shorter than fifth; occiput brown, densely covered with gray pruinescence, with a number of short brown hairs. Inner margins of eyes almost contiguous at vertex. Thorax brown, densely covered with gray pruinescence, with a number of short hairs,—those in and bounding the prescutellar depression and at the wing bases considerably longer. Sensory organs crescent shaped, inner end wider. Scutellum similar to mesonotum except for a darker median patch. Stem of haltere yellowish, button chiefly brown. Legs long, yellowish brown, first tarsal segment more than twice the length of second. Wings white, with a tendency toward the formation of three brownish bands, the first midway between the radio-median crossvein and the base, disappearing at vein M, visible again below Cu, then gradually becoming fainter. The second crosses the middle of the wing in a similar manner; the third begins beyond the second radial cell, irregularly across the wing, giving off branches to the tip along veins M1, M2 and the first branch of Cu and along the anterior margin. These surround three large apical white spots. Microtrichiae occur on the distal half and the anal portion. Abdomen dull brown, covered with fine gray pruinescence, with a few long hairs; the second to seventh segments inclusive are lighter along the posterior margin. The sensory organs in these segments are very prominent; they consist of a basal anterior pair widely separated and a posterior pair located medially.

Pass Christian, Miss., April, 1925 (Mrs. J. Michels): "troublesome." Eight female cotypes in the collection of the U. S. National Museum. Cat. No. 29206.

Attention is called to a typographical error occurring in the synoptic key of the American species of *Culicoides* (Amer. Journ. Hygiene, 5:278, 1925). The first portion of couplet 16

should refer to *C. stellifer*, the second to couplet 17 instead of the reverse. Since the appearance of this paper some additional distributional records have been obtained. *C. venustus* Hoff. known heretofore only from Baltimore was taken at Nassau, N. Y., June 22, 1907. A specimen of *C. stellifer* Coq. from Speculator, June 8, 1911, also represents a new record from New York. Occurrence of an individual of *C. melleus* Coq. collected with the type series of *C. mississippiensis* at Pass Christian, Miss., indicates that like *C. furens* Poey this form is apparently restricted to coasts and inlets. Other localities for this species are Lake Worth, Florida (type), and South River, Maryland, June 2, 1923.

LITERATURE CITED.

(1) EDWARDS, H. F.—On the Use of the Generic Name *Ceratopogon*, Meigen. Ann. & Mag. Nat. Hist. Ser. 9, VI; 127–130. 1920.
(2) WINNERTZ.—Linnea Ent., 6:57. 1851.
(3) KIEFFER, J. J.—Chironomides d'Europe. Ann. Mus. Nat. Hung., 17:66–69. 1919.
(4) GAETGHEBUER, M.—Ceratopogoninae de Belgique. Mem. du Mus. Royal d'Hist. Nat. de Belgique VIII, Fasc 3, 66–69. 1920.

THE APHIDS OF MYZOCALLIS INFESTING THE BAMBOO.

BY ROYICHI TAKAHASHI, *Department of Agriculture, Research Institute, Taihoku, Formosa, Japan.*

At present seven species of *Myzocallis* are known to occur on the bamboo (*Bambusa*, *Arundinaria*, *Dendrocalamus* and *Sasa*).

Myzocallis arundinariae Essig.

Univ. Calif. Publ. Entom., 1, p. 302 (1917).

Host.—Bambusa, *Arundinaria*.
Distribution.—Japan, North America.

Myzocallis arundicolens Clarke.

Canad. Entom., xxxv, p. 249 (1903).
Synonym.—Takecallis bambusae Matsumura, Jl. Coll. Agr. Sapporo, vii, p. 373 (1917).

Host.—Bambusa, *Arundinaria*, *Sasa*.
Distribution.—Japan, North America, England.

Myzocallis bambusifoliae Takah.

Aphididae of Formosa, part 1, p. 73 (1921), part 2, p. 123, pl. II, B, fig. 6 (1923) and part 3, p. 63 (1924).

Host.—Bambusa.
Distribution.—Formosa.

Myzocallis formosanus Takah.

Aphididae of Formosa, part 3, p. 64 (1924).

Host.—Arundinaria.
Distribution.—Formosa: Arisan (altitude about 8,000 feet).

Myzocallis sasae Mats.

Jl. Coll. Agr. Sapporo, VII, p. 372 (1917).

Host.—Sasa, Bambusa.
Distribution.—Japan.

Myzocallis taiwanus, new species.

The aphid recorded as *Myzocallis sasae* Mats.? in my paper (Aphididae of Formosa, part 4, p. 46) is not true *sasae* Mats., but is hitherto undescribed.

Winged viviparous female.—Green, without stripes and patches on the dorsum. Head and thorax slightly brownish. The 3d antennal joint black on the apical part and slightly dusky on the basal part; the 4th black on the distal half; the 5th and 6th black. Cornicles somewhat dusky. Body oblong. Head a little protruding at the middle of the front above the front ocellus, between the antennae (near the front) with a pair of very small tubercles each bearing a fine hair which is much shorter than the 2d antennal joint, wanting hairs on the dorsal side. Eyes large, with moderate ocular tubercles. Frontal tubercles absent. Antennae slender, provided with a few very short setae; the 3d joint somewhat imbricated on the distal portion, provided with 4–7 oval sensoria of medium size arranged in a single row on the basal one-third which is somewhat dilated and almost as stout as the front tibia; the 4th imbricated, lacking sensoria; the relative length of joints about as follows: III—122, IV—80, V—70, VI—80 (42+38). Rostrum short, reaching a little beyond the front coxae. The 1st oblique on the front wing slightly curved; the 2d distinctly curved at the middle; the 3d twice branched, the upper branch extending to the apex of the wing; stigmatic vein faint, moderately curved; hind wings with 2 somewhat divergent obliques; hooklets 2. Thorax and abdomen almost lacking hairs. Abdomen at the middle of the basal part of the dorsum with 2 pairs of blunt tubercles which are larger than the cornicle, conical in shape, almost as long as wide at midlength and each bearing a short bristle at the apex; a few similar, but smaller tubercles present near the side. Cornicles small, constricted at the middle, expanded at the base, wider than long, much smaller than the cauda. Cauda a little shorter than the distal part of the 6th antennal joint, wider than the lobe of the anal plate, constricted, with many long bristles of which one pair is longer and stouter. Anal plate deeply bilobed, provided with some very long bristles. Legs slender; tibiae

provided with numerous rather long setae; front tibiae almost as long as the 3d antennal joint; hind tarsi somewhat shorter than the cauda.

Length of body—about 2.0 mm. Antenna—about 1.8 mm. Fore wing—about 2.5 mm.

Host.—*Bambusa*, attacking the young leaf and shoot.
Distribution.—Formosa (Taiwan): Taihoku, Karenko.
Type.—In Research Institute collection, Taihoku, Formosa.

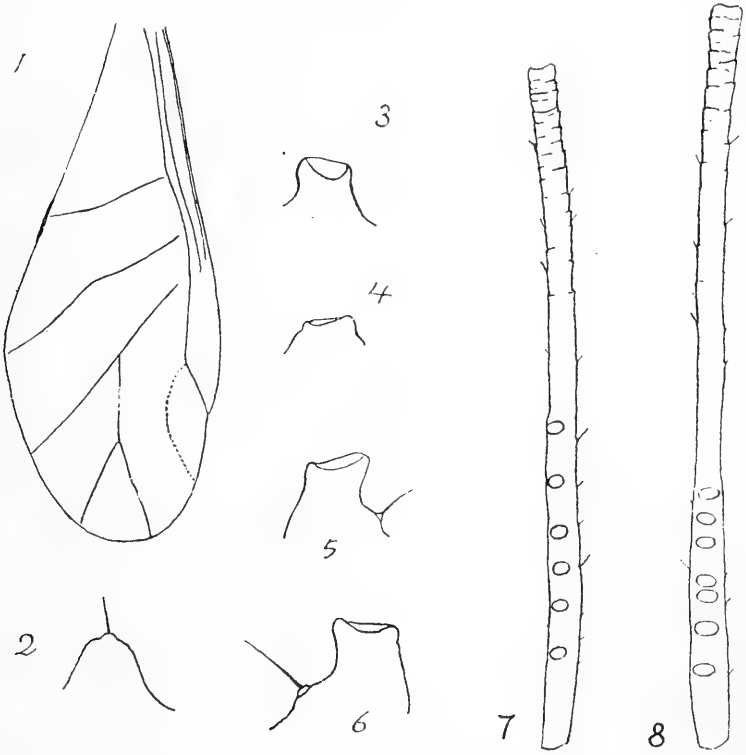


Fig. 1. Fore wing of *M. taiwanus* Takah.
Fig. 2. Tubercle on the abdomen of *M. taiwanus* Takah.
Fig. 3. Cornicle of *M. taiwanus* Takah.
Fig. 4. Cornicle of *M. formosanus* Takah.
Fig. 5. Cornicle of *M. bambusifoliae* Takah.
Fig. 6. Cornicle of *M. bambusicola* Takah.
Fig. 7. 3d antennal joint of *M. sasae* Mats.
Fig. 8. 3d antennal joint of *M. taiwanus* Takah.

This species is very closely allied to *M. sasae* Mats., but is different from it in the shape and distribution of the sensoria on

the 3d antennal joint, as well as in the more distinct tubercles on the basal part of the abdomen. In *sasae* Mats., the sensoria are almost circular in shape and arranged on the basal half of the joint, while in *M. taiwanus* they are oval and on the basal one-third.

Myzocallis bambusicola Takah.

Aphididae of Formosa, part 1, p. 70 (1921).

Host.—*Dendrocalamus*, *Bambusa*.
Distribution.—Formosa.

Key to the Species of Myzocallis on the Bamboo.
(Winged viviparous female.)

1. White, green or yellow, without large tubercles.....2
— Purplish black, with very large tubercles.....*M. bambusicola* Takah.
2. Abdomen with markings.....3.
— Abdomen without markings.....5.
3. Cornicles much shorter than wide, legs black throughout.....*M. formosanus* Takah.
— Cornicles not much shorter than wide, legs not black throughout.....4.
4. The 3d antennal joint black on the basal and apical parts.....*M. bambusifoliae* Takah.
— The 3d antennal joint black throughout.....*M. arundinariae* Essig.
5. The 3d antennal joint black on the distal part, with a black band near the base.....*M. arundicolens* Clarke.
— The 3d antennal joint black on the distal part and somewhat dusky on the basal part.....6.
6. The 3d antennal joint with sensoria on the basal half.....*M. sasae* Mats.
— The 3d antennal joint with sensoria on the basal one-third.....*M. taiwanus* Takah.

TWO NEW SPECIES OF ATTELABUS WITH NOTES (COLEOPTERA).

By F. H. Chittenden, *U. S. Bureau of Entomology.*

Through the kindness of Mr. D. K. Duncan, the writer has received a species of *Attelabus* new to science, and the present opportunity is taken to describe not only this species but also another related to *rhois* but distinct as shown by the characters mentioned. Both species are from Arizona, and it should be added that *rhois* also occurs in that State. Remarks are made on some neglected and little understood sexual characters of the species occurring in America north of Mexico. The two species in question fall into the genus *Himatolabus* Jekel which, for convenience if for no other reason, we may consider a subgenus, like *Homaeolabus* Jek. and *Synolabus* Jek.

Attelabus (Himatolabus) constrictipennis, new species.

Shining black throughout, glabrous on dorsum, convex, about one-fourth longer than wide; elytra strongly constricted behind the base. Rostrum as long as the head, moderately widened at the apex, subcylindrical; surface distinctly, somewhat sparsely punctate. Eyes circular in outline, somewhat closely placed together, strongly carinate between, with a corresponding deep sulcus each side. Head with an impressed line in posterior half; surface feebly and very sparsely punctulate. Antennal joints 1 to 4 subequal in length; 1 and 2 very thick, subequal in width, 2 arcuate on one side; 3 and 4 very slender; 7 and 8 subequal in length and width; club a little longer than preceding four joints, first joint of club only a little wider than long. Prothorax about as long as wide, a little wider at apex than the head, sides feebly arcuate, gradually widened to base, which is sinuate; disc moderately constricted at apex, strongly transversely foveate at base, fovea transversely rugose; surface uneven, with a circular depression near the middle of the disc on each side, feebly, finely, and very sparsely punctate, densely in the fovea. Scutellum large, almost one-third wider than long, nearly impunctate. Elytra about as wide as long, much wider at base than prothorax, strongly sinuate, humeri slightly produced, gradually rounded and, with the umbone, elevated, laterally compressed and very prominent, sides nearly straight, apex narrower, subtruncate; strongly constricted about one-third behind the base, constriction not reaching the umbone; surface strongly and coarsely striate-punctate at base, very feebly punctate a little behind the constriction, with the exception of the sutural and second striae, which are distinctly, finely, and rather closely punctate, third to fifth striae with much finer and remotely placed punctules. Pygidium feebly and sparsely punctate, punctures bearing short erect gray pile. Ventral segments feebly and sparsely punctate, punctures forming one or two rows. Anterior femora long, moderately clavate, mutic; anterior tibiae about as long as the femora, very slender, moderately arcuate, inner surface finely serrate, villous, bimucronate at apex.

♂.—Anterior femora about three-fifths as long as the body; tibiae about four-fifths as long as the femora, very slender and very strongly arcuate, unimucronate at apex.

Length 3.5 to 4.5 mm.; width 2.2 to 3. 5 mm.

Type locality.—Sierra Ancha Mts., Ariz., October 1, 1925 (D. K. Duncan).

Type ♀.—Cat. No. 28830, United States National Museum.

This species belongs in Sharp's group I, C: "Anterior femora without teeth or spines; eyes but little separated, the space between them sulcate or carinate; surface without pubescence" (*Xestolabus* Jekel), and appears to be nearly related to *callosus* Sharp,[1] as described and figured, agreeing in the prominent elytral humeri. The latter species, however, evidently lacks the conspicuous constriction behind them. In one specimen examined the depression on the right side of the thoracic disc is

[1]Biol. Centr.-Amer., vol. IV, pt. 3, 1889, p. 7, Tab. I, fig. 6.

rather deeply concave but is lacking on the left side. Compared with *corvinus* Gyll., specimens of which are in the U. S. National collection, the present form is smaller and more distinctly black. The eyes are more prominent, as are also the elytral humeri, and the pronotum is much smaller, and both narrower and shorter.

Of this species Mr. Duncan writes that it occurred in abundance in September, 1924, on Workman Creek in the Sierra Ancha Mountains, Gila County, Ariz., at an elevation of between 4,000 and 5,000 feet in a somewhat inaccessible box canyon. The beetles were not found in any other locality either in that region or elsewhere in Arizona visited that season, and they were apparently feeding on wild grapevine and a low-growing bushy vine resembling, Mr. Duncan says, poison ivy, presumably a plant related to Virginia creeper.

Attelabus (Himatolabus) disparipes, new species.

Of similar form to *rhois*, robust, opaque, rufous, clothed with fine golden pubescence. Head fully one-third longer than wide. Rostrum as wide as long, strongly dilated at apex, coarsely, rather deeply and irregularly punctate, punctures of irregular size. Antennal joint 1 not greatly longer than 2; 3 long and narrow; 4 and 5 subequal, nearly as long as wide; 6, 7, and 8 subequal in width; 8 short, nearly twice as wide as long. Prothorax slightly wider than long, narrowed at apex, sides subparallel in basal half; punctation of surface much obscured by pubscence, punctures irregular in size, rather deep, and closely set, no median smooth line or other bare areas; base with a wide transverse sulcus. Elytra nearly as wide as long, subquadrate, humeri moderately prominent, abruptly rounded; surface coarsely, irregularly punctate, striae feebly defined. Pygidium feebly and sparsely punctate. Ventral segments more finely punctate than on pygidium.

♂.—Anterior femora long, strongly dilated, fully one-half as wide as long, much more strongly dilated and arcuate on posterior surface. Anterior tibiae fully as long as femora, very slender, strongly arcuate, moderately and acutely serrate on inner surface, bearing a single acute mucro.

♀.—Anterior femora much shorter, strongly clavate. Anterior tibiae as long as femora, very stout, outer edge nearly straight, apex strongly bimucronate.

Length 3.8 to 5.2 mm.; width 2.2 to 3.0 mm.

Type locality.—Arizona.

Type ♂.—Cat. No. 28824, U. S. National Museum.

This species may be separated from *rhois* by its brighter red color, finer and sparser golden pubescence, the absence of a smooth median thoracic line, much deeper transverse antebasal sulcus of the thorax, and feebly defined elytral striae. In the male the anterior tibiae are somewhat more strongly arcuate and in the female they are distinctly shorter and thicker than in *rhois*. The species is also a little larger and more robust.

In studying the above mentioned two species in comparison with other species of *Attelabus*, some observations were made which may be of interest as bearing on the secondary sexual characters. Neither Leconte nor Sharp treated of these characters as of generic or subgeneric value.

Of the sexual structure of *analis*, Leconte wrote (Rhynch. Am. No. Mex., 1876, p. 10) " ♂. Ventral segments with two rows of acute tubercles," " ♀. under surface of mouth with two small acute teeth projecting downwards." Primarily, the sexes may be identified by the larger size of the body, especially of the abdomen, in the female; second, by the shorter head and less prominent eyes than in the male; and third, by the straight tibiae armed at the apex with two strong hooks. In the male of *analis*, as also of *rhois*, the tibiae are longer, slenderer, and distinctly arcuate and bear at the apex a single hook, on the inner side. Such being the case, Leconte's definition of the sexes should be reversed. In the female of *analis* there are six abdominal tubercles proceeding in pairs from the first three segments and the teeth projecting backward from the mouth-parts of the male are smaller, but otherwise similar to these tubercles.

In the male of *nigripes* the tibiae are similar to those of *analis* but in the female they are moderately arcuate. In that of *bipustulatus* the tibiae are comparatively stout and much less distinctly curved, being less strongly differentiated from the female. In both of these species the femur is armed with an acute tooth, in the latter situated a little nearer the apex.

To summarize, in the case of our species of *Attelabus:* The tibiae ♂ are armed with only one hook at the apex and they are slenderer and more or less strongly arcuate, except in *nigripes* and *bipustulatus*, in which the males are distinguished by acutely toothed femora. In the females the tibiae bear two teeth at the apex, and they are usually stouter and shorter, and straight or feebly arcuate.

Since the above observations were written, the writer's attention has been called to the work of E. Voss (Stett. Ent. Zeitg., 1925) who has monographed this genus and made use of the characters which have just been mentioned. Voss adds two new species to our fauna, *Attelabus* (*Pilolabus*) *californicus* and *A.* (*Homoelolabus*) *coloradensis*.

THE GENUS DIXA IN COLORADO (DIPTERA: DIXIDAE).

By T. D. A. Cockerell.

On September 27, 1926, the Entomology class of the University of Colorado went out on the campus to secure material on which to begin the year's work. Sweeping just below the lake, Mr. Scott Gale was so fortunate as to find a female *Dixa*, the genus being new to this part of the country. Apparently the species is undescribed, and it may be made known as follows:

Dixa universitatis, new species.

Length about 4 mm.; head black, shining; palpi black; proboscis yellow; antennae dark; thorax pale straw yellow, dorsally with a very broad median black band on anterior two-thirds or rather less, abruptly truncate posteriorly; lateral bands broad and black on posterior half of thorax, but on anterior half reduced to a cloud, evanescent anteriorly; wings clear; halteres yellow; abdomen dusky yellow; legs dark greyish, pallid at base; femora black at extreme tip; hind tibiae enlarged and black at end. End of Sc a little before fork of R; fork of R_2–R_3 about one-fourth longer than the strongly arched stem; R–M cross-vein just before stem of R_2–R_3 and just beyond M–Cu cross-vein; fork of M about as long as its stem; anal arched at end.

A species of *Dixa* s. str. of Dyar and Shannon, and in Johannsen's (1923) key runs to *D. clavata* Lw., differing by the unclouded wing-veins, light proboscis and scutellum. Overlooking the tibial character, it might run to "*D. calvula* Williston," from St. Vincent, but the R–M cross-vein is so slightly before the stem of R_{4+5} that it partly intersects it. On looking up Williston's account we find that the species is really *Dixa clavulus* (clavulus, a little nail, not an adjective), and has the cross-vein much more basad, and the stem of R_{4+5} much shorter and less arched. Run on in the key, the species goes to *D. venosa* Lw., but differs at once in color of scutellum and halteres. It is quite different from the various Dyar and Shannon species. In Johannsen's earlier (1903) table it runs to *D. terna* Lw., but the venation is quite different.

Type.—Cat. No. 29540, U. S. N. M.

Actual date of publication, October 12, 1926.

EDITORIAL.

When an old, experienced entomologist dies, the world often loses a great store of very useful knowledge simply because he has not put it on record. He may have published many large monographs or other papers, but he must have made many interesting observations never recorded which would have helped to fill chinks in our biological or ecological knowledge or which would have attracted the attention of other observers, perhaps in other countries, and have induced them to try to make parallel observations on the same or related forms.

The dislike to "rush into print" is pronounced with many able men and many close observers. Many make careful notes which never reach the display of type and are lost to the world.

Progress towards a complete understanding of the so-called "works of nature" is made perhaps no more by the publication of great monographs than by a recording in print from time to time of isolated observations which will incite the publication of parallel or confirmatory observations elsewhere and which will subsequently be worked into a logical and understandable whole.

My belief in the importance of prompt publication of short notes is growing stronger. It has happened several times in the last dozen years that such publication of an isolated observation has brought forth others from different parts of the world with the result that, when correlated, we have found ourselves in possession of important biological data and in position to use them in generalizations.

A short note is read at once; a long paper is laid aside for future study and all too often is never digested.

—*L. O. Howard.*

VOL. 28 NOVEMBER, 1926 No. 8

PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

CONTENTS

PUBLISHED MONTHLY EXCEPT JULY, AUGUST AND SEPTEMBER

BY THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

U. S. NATIONAL MUSEUM

WASHINGTON, D. C.

Entered as second-class matter March 10, 1919, at the Post Office at Washington, D. C., under Act of August 24, 1912.

Accepted for mailing at the special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized July 3 1918.

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON

ORGANIZED MARCH 12, 1884.

The regular meetings of the Society are held on the first Thursday of each month, from October to June, inclusive, at 8 P. M.

Annual dues for members are $3.00; initiation fee $1.00. Members are entitled to the PROCEEDINGS and any manuscript submitted by them is given precedence over any submitted by non-members.

OFFICERS FOR THE YEAR 1926.

Honorary President . . . . . E. A. SCHWARZ
President . . . . . J. M. ALDRICH
First Vice-President . . . . . J. A. HYSLOP
Second Vice-President . . . . . J. E. GRAF
Recording Secretary . . . . . C. T. GREENE
Corresponding Secretary-Treasurer . . . . . S. A. ROHWER
U. S. National Museum, Washington, D. C.
Editor . . . . . CARL HEINRICH
U. S. National Museum, Washington, D. C.
Executive Committee: THE OFFICERS and W. R. WALTON, A. N. CAUDELL, T. E. SNYDER.
Representing the Society as a Vice-President of the Washington Academy of Sciences . . . . . A. G. BÖVING

PROCEEDINGS ENTOMOLOGICAL SOCIETY OF WASHINGTON.

Published monthly, except July, August and September, by the Society at Washington, D. C. Terms of subscription: Domestic, $4.00 per annum; foreign, $4.25 per annum; recent single numbers, 50 cents, foreign postage extra. All subscriptions are payable in advance. Remittances should be made payable to the Entomological Society of Washington.

An author of a leading article in the PROCEEDINGS will be given 10 copies of the number in which his article appears. Reprints without covers will be furnished at the following rates, **provided a statement of the number desired accompanies the manuscript:**

	4 pp.	8 pp.	12 pp.	16 pp.
50 copies	2.00	4.00	6.00	8.00
100 copies	2.25	4.50	6.75	9.00

Certain charges are made for illustrations and there are available rules and suggestions governing the make-up of articles. Immediate publication in any number may be obtained at the author's expense. **All manuscripts should be sent to the Editor.**

PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 28 NOVEMBER 1926 No. 8

NOTES ON SERPHOIDEA WITH DESCRIPTIONS OF NEW SPECIES (HYMENOPTERA).

By Robert M. Fouts, *Washington, D. C.*

This paper contains descriptions of fourteen new species belonging to the families Bethylidae, Calliceratidae, Diapriidae, and Scelionidae. All the species except one are from North America.

Family BETHYLIDAE.

Goniozus euliae, new species.

Female.—Length, 2.00 mm. Head a little longer than wide, slightly wider than the thorax; frons finely reticulate with small scattered punctures; carina on clypeus extending to lower third of eye; head above eye about two-thirds as long as eye; scape shorter than the three following joints united, less than three times as long as wide; third joint shorter and narrower than the second, one and one-half times as long as wide, as long as four; all flagellar joints somewhat longer than wide; thorax twice as long as wide; notauli absent; propodeum margined only laterally, without a median longitudinal carina, more or less elevated and polished down the median line; pronotum and mesonotum finely reticulate with scattered punctures; pronotum longer than the mesonotum, rounded anteriorly; wings hyaline, with short marginal cilia; branch of basal nervure nearly straight, about as long as the prostigma; abdomen somewhat less than one and one-third times as long as wide. Black; scape yellow, darker above; antennal joints two to seven yellow; terminal joints brown; legs black to very dark brown; anterior tibiae yellowish-brown; middle and posterior tibiae yellowish at extreme apices; tarsi yellow.

Male.—Length, 1.80 mm. Scape shorter than the two following joints united, about twice as long as wide; second and third joints subequal, about one and one-half times as long as wide; following five joints a little wider, nearly as wide as long; terminal joints somewhat narrower, longer than wide; abdomen a little more than twice as long as wide; pedicel yellow, darker above; antennal joints two to seven yellow; following joints light brown.

Type locality.—Winchester, Virginia.
Type.—Cat. No. 28770, U. S. Nat. Mus.
Host.—Larvae of *Eulia velutinana*, Walker.

Description based on three females and one male reared by Mr. W. S. Hough. Two specimens were reared on August 1, 1925. The other two are labelled "August, 1925."

Family CALLICERATIDAE.

Conostigmus ater, new species.

Female.—Length, 2.30 mm. Head one and three-fourths times as wide as long, one and one-eighth times as wide as the thorax; frons very finely and deliately reticulate, sparsely covered with small punctures; cheeks and vertex sculptured like the frons but without punctures; vertex bordered behind by a high and sharp carina; from this carina to the anterior ocellus extends a moderately deep crenulate furrow; head arcuately excavated posteriorly; scape about as long as the following four joints united; joint two twice as long as wide, as long as four, two-thirds as long as three; joint three a little wider at apex than two, somewhat narrower than four; joints four to eleven about seven-tenths as wide as long, cylindrical; joint eleven obconical, acute at apex, as long as three, about twice as long as wide; thorax one and one-third times as long as wide, about five-sixths as wide as the abdomen; upper surface of the thorax finely scaly reticulate, sparsely covered with small punctures; propleura wrinkled anteriorly, reticulate above and behind; abdomen one and two-thirds times as long as wide; second tergite as wide as long, strongly longitudinally striate on anterior one-third; wings whitish, pubescent, shortly ciliate on distal margin. Black; antennae piceous; legs pale brown, the coxae, all femora outwardly, and the posterior tibiae outwardly, darker; venation dark brown.

Type locality.—Milpitas, California.

Type.—Cat. No. 28771, U. S. Nat. Mus.; Paratype in Coll. Fouts.

Host.—Syrphid puparium.

Three females reared May 13, 1925, by Mr. R. F. Campbell.

This species differs from *nevadensis* in having the third antennal joint longer than the second.

Family DIAPRIIDAE.

Spilomicrus virginicus, new species.

(Fig. 1).

Female.—Length, 3.02 mm. Closely related to *keifferi* Fouts but differs as follows: Head seen from the side distinctly higher than long, the angle formed at the antennal prominence obtuse; third antennal joint nearly three times as long as wide; fourth joint twice as long as wide, a little longer than the fifth, two-thirds the length of the third; second tergite one and one-third times as long as wide; pubescence on first abdominal segment long and dense; color as in *kiefferi*.

Type locality.—Falls Church, Virginia.

Type and paratype.—Cat. No. 28772, U. S. Nat. Mus. Paratype in Collection of Fouts.

Host.—Puparium of *Xylota bicolor* Loew on *Liriodendron tulipifera* Linn.

Aparamesius nigriclavis, new species.

Female.—Length, 2.10 mm. Head as wide as long, a little narrower than the thorax; antennal prominence forming the apex of an angle of about 90 degrees; scape six times as long as wide; pedicel twice as long as wide, as long as joint three, as wide as six; joint three two and one-half times as long as wide, as wide as four or five; joints four to thirteen subequal in length, becoming gradually wider toward apex; terminal six joints forming a club which is not sharply differentiated, joint eight being but very little wider than seven; club joints, except the last, about as wide as long; joint thirteen twice as long as wide, as long as

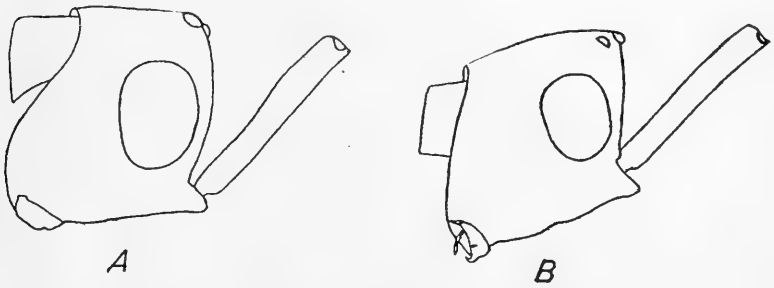


Fig. 1. A Head of *Spilomicrus kiefferi* Fouts (Lateral view).
B. Head of *Spilomicrus virginicus* Fouts (Lateral view).

eleven and twelve united, as wide as twelve, acute at apex; thorax approximately one and three-fifths times as long as wide, narrower than the abdomen; mesopleuron separated from the mesosternum by two parallel carinae; basal prominence on propodeum short, subacute; basal vein absent; first tergite one and three-fifths times as long as wide, smooth, with several longitudinal ridges; second tergite one and one-half times as long as wide, with a very small median indentation at base; segments three to six united one-fourth as long as the second; fifth tergite a little longer than the sixth, longer than the third and fourth united. Black; scape rufous; antennal joints two to nine rufous, fuscous at their extreme apices; legs rufous, the femora darker above; wings with a brownish tinge.

Type locality.—McLean Bogs, New York.
Paratype locality.—Toronto, Canada.
Paratype in Coll. U. S. Nat. Mus., Cat. No. 28773.
The type was collected by Mr. M. D. Leonard at McLean Bogs on May 16, 1925. Mr. Herbert S. Parish collected the paratype on May 10, 1921.

Doliopria americana, new species.

Female.—Length, 1.02 mm. Head as wide as long, as wide as the thorax; scape as long as the following six antennal joints united; joint two as wide as seven, less than twice as long as wide; joint three shorter and narrower than two, a little longer than wide, as long as eight; joint four as wide as long, as wide as

three; joints five, six, and seven somewhat wider than long, widening slightly in the order named; eight transverse, button-shaped, wider than seven, narrower than nine; nine as wide as the scape, transverse, narrower than ten; ten about as wide as long, twice as long as nine; eleven as long as nine and ten united, indistinctly wider than ten, conical, blunt at apex; all antennal joints covered with short white hairs; thorax one and one-half times as long as wide, slightly narrower than the abdomen; thorax truncate anteriorly, the angles of the pronotum more or less prominent; notauli absent; mesonotum and scutellum flattened, the latter with a broad, shallow, immargined fovea at base; propodeum with a rounded polished elevation medially; first segment of the abdomen cylindrical, about as wide as long, covered with long white hair; second tergite a little more than one and three-eighths times as long as wide, pubescent at extreme base on the sides, with a very short median carina basally, and with a shallow immargined fovea on either side partially covered with short white hairs; abdomen truncate at apex, the terminal segments very short, together about as long as the first tergite. Black; scape rufous; pedicel brown; antennal joints three to eight reddish-brown; metapleurum and propodeum laterally rufous; legs yellow, wings hyaline.

Type locality.—Mount Holly Springs, Pennsylvania.
Paratype locality.—Carlisle, Pennsylvania.
Paratype.—Cat. No. 28774, U. S. Nat. Mus.
Type.—In Coll. Fouts.
Described from two specimens collected by the author. The type was swept from wheat on July 16, 1920. The paratype was swept from lawn grass on July 15, 1918.

Galesus punctiger, new species.

Female.—Length, 2.60 mm. Head distinctly longer than wide; body entirely polished and shining; frons just above the base of the eye with a fairly large triangular projection; upper part of head behind eyes nearly as long as eyes; dorsal surface of head behind the ocelli with four moderately large pits arranged in a quadrangle, the area thus enclosed wider than long; on each side of this quandrangle is another large puncture; vertex along the posterior carina with several punctures; cheeks with a few smaller punctures; second antennal joint about as long as three, a little wider; three slightly longer and wider than four, a little less than twice as long as wide; joints four to twelve subequal in length; joints four to seven increasing gradually in width, the seventh as wide as the eighth; following joints to the twelfth transverse; twelve obconical, a little longer than two, rather blunt at apex; thorax one and one-half times as long as wide, one and one-ninth times as wide as the head; pronotum with a row of punctures across its posterior margin; pronotum pubescent, the hairs long, white; notauli complete, converging but not meeting posteriorly; median lobe of mesonotum near apex with two adjacent setigerous punctures; scutellum sub-convex, with two large, more or less circular, foveae at base and with a broad groove on each side; at the apex of the scutellum are two small pits; first abdominal segment 1 35 times as long as wide, cylindrical, with three longitudi-

nal ridges above; second tergite 1.72 times as long as wide, wider than the thorax, with a median sulcus extending nearly to its middle and with an inconspicuous basal impression on either side at base; segments following the second extremely short, not visible from above; anterior wing veinless, pubescent, ciliate, with a more or less distinct fold, with its distal margin cleft, the incision long; body black; flagellum piceous, the short white hairs causing it to appear grayish; legs reddish-brown, the tarsi yellow, coxae black.

Male.—Length, 2.80 mm. Head distinctly wider than long, sculptured as in the female but the pits on its upper surface larger and deeper; second antennal joint shorter and narrower than the third, scarcely longer than wide; joints three to fourteen subequal in width; three a trifle longer than four, a little less than twice as long as wide, widest in the middle; joints four to fourteen subequal in length, very little longer than wide; fourteen obconical, as long as three, acute at apex; flagellar joints pubescent, the length of the hairs on any segment about one-third its width; thorax a little less than one and one-half times as long as wide, one and one-seventh times as wide as the head, four-fifths as long as the second tergite; first tergite one and one-half times as long as wide, one-fifth as long as the second; second tergite about three-fifths as wide as long, one and one-fourth times as wide as the head; wings as in the female but the distal margin not cleft. The parts not described above are as in the female.

Type locality.—Uvalde, Texas.
Type.—Cat. No. 28775, U. S. Nat. Mus.
Host.—? *Drosophila* sp.

One female and four males reared, August, 1925, by Mr. Alan P. Dodd.

This is the first indication known to me that the emargination of the wings may be a secondary sexual character. Kieffer in his monograph of the Diapriidae (Das Tierreich, Lief. 44, 1916, pp. 200–235) cites no instance in which the sexes differ in wing structure.

The female of *punctiger* runs to *politus* in Kieffer's key (ibid., p. 204) and differs in the shape of the head and in the structure of the antennae. The male runs in the same key to *clarimontis* Kieffer and differs in the structure of the antennae.

Trichopria (Planopria) cubensis, new species.

Male.—Length, 1.26 mm. Runs to *melanopleura* Ashmead in Kieffer's key (das Tierreich, Lief. 44, 1916, p. 108). The first segment of the abdomen in *cubensis* is about one and one-half times as long as wide. Head as long as wide, narrower than the thorax; antennae a little longer than the entire body; scape cylindrical, five times as long as wide, as long as joints three and four united; pedicel oval, a little longer than wide, three-fourths the length of the third joint; third joint two and one-half times as long as wide, a little shorter and narrower than the fourth; fourth joint as wide as the scape, somewhat over twice as long as wide, shallowly emarginate on basal two-thirds; joints five to fourteen subequal,

narrowed proximally, about twice as long as wide; last joint as long as the fourth, about three times as long as wide, acute apically; flagellar joints with whorls of long hairs, the hairs about as long as the joints; thorax about one and four-fifths times as long as wide, narrower than the abdomen; mesonotum subconvex, without a trace of notauli; scutellum with a shallow circular fovea at base, the depression more than half as wide as the scutellum; scutellum subconvex, about as wide as long, truncate posteriorly, without a trace of a ridge or carina posteriorly; propodeum with three longitudinal carinae, the middle one not elevated at base, larger than the others; propodeum thickly covered with rather short white hairs laterally; medially, between the smaller carinae, it is bare and shining; abdomen one and two-fifths times as long as the thorax; petiole dorsally densely covered with moderately long white hairs; second tergite one and one-fourth times as long as wide; wings hyaline, long, extending two-thirds the length of the abdomen past the latter's apex; scape and pedicel yellow; flagellum brown; head black; thorax and petiole yellow, tinged with reddish; abdomen black, yellowish basally on the sides; legs bright straw-colored.

Female.—Length, 1.49 mm. Runs to *mellea* Ashm. in Kieffer's key (ibid. p. 82) and differs in having the antennal club black. Head a little longer than wide, indistinctly narrower than the thorax; scape four times as long as wide, as long as the following four joints united; pedicel a little narrower than the scape, not much longer than wide, as long as the third joint; third joint twice as long as wide, narrower than the second, a little narrower but distinctly longer than the fourth; joints four to eight subequal, about three-fourths as wide as long; joint eight as wide as long, as wide as seven, considerably narrower than nine; joint nine as long as ten, a little longer than wide; joints ten and eleven equal, as wide as long, twice as wide as eight, as wide as twelve at base; last joint about three-fifths as wide as long, blunt at apex; pubescence on joints three to nine longer than the joints are wide; thorax about one and four-fifths times as long as wide, five sevenths as wide as the abdomen; abdomen one and two-thirds times as long as the thorax, about twice as long as wide; petiole about as wide as long; second tergite one and three-sevenths times as long as wide; wings hyaline, extending one-third the length of the abdomen past the latter's apex; scape and funicular joints light brown; club joints black; head reddish brown, rufous behind the ocelli; thorax brownish yellow; mesonotum and scutellum bright yellow; abdomen dark brown; second tergite basally on the sides and tergites five and six entirely brownish-yellow.

Type locality.—Colon, Cuba.

Type, *allotype* and three *paratypes* in Coll. U. S. N. M., Cat. No. 28776.

Host.—*Lixophaga diatreae* Towns. (puparia).

Described from four males and three females collected in 1920 by Mr. T. E. Holloway.

Trichopria (Trichopria) popenoei Ashmead.

Trichopria popenoei Ashmead, Bull. 45, U. S. Nat. Mus., 1893, p. 435.

Trichopria (*Trichopria*) *popenoei* Ashmead, Kieffer, Das Tierreich, Lief. 44, 1916, p. 95.

Female.—Length, 1.50 mm. Head a little wider than long, narrower than the thorax; antennae distinctly longer than the head and thorax united, gradually thickened toward tip, without a distinct club; pedicel about as long as the third joint, a little wider than the third; following five joints subequal in length, becoming gradually thicker distally; ninth joint spherical; joints ten and eleven slightly wider than long, the latter a trifle wider and longer than the former; twelfth joint nearly as long as the two preceding united, not quite twice as long as wide, not very sharp at apex; thorax one and one-half times as long as wide, narrower than the abdomen; scutellum quadrate, with a short indistinct median ridge posteriorly; propodeum with a high median longitudinal ridge; this ridge curving abruptly downward at the middle of the propodeum; second tergite one and three-eighths times as long as wide; sides of abdomen slightly curved, more strongly so anteriorly.

Type locality.—Riley County, Kansas.
Type.—Cat. No. 24478, U. S. Nat. Mus.
Description based on the type. The male described by Ashmead is a different species.

Trichopria (Trichopria) illinoiensis Girault.

Trichopria popenoei illinoiensis Girault, Proc. U. S. Nat. Mus., Vol. 58, 1920, p. 178.

Female.—Length, 1.77 mm. Head a little wider than long, slightly wider than the thorax; antennae with a distinct four-jointed club, joint eight being much narrower than nine; pedicel a little longer and thicker than the third joints; joints four to eight subequal in length, the eighth a little thicker; joints nine to twelve equally wide, twice as wide as eight; joints nine and ten subequal, slightly wider than long; eleven quadrate; joint twelve longer than eleven but *distinctly* shorter than ten and eleven united, conical, sharply pointed apically, a little less than twice as long as wide; antennae somewhat longer than the head and thorax united; thorax one and six-sevenths times as long as wide, three-fourths as wide as the abdomen; fovea of scutellum as in *popenoei;* scutellum quadrate as in *popenoei* but with posterior elevation scarcely noticeable; propodeum not so elevated as in *popenoei*, the median ridge seen laterally not much curved; abdomen about one and one-sixth times as long as the thorax; sides of abdomen more curved than in *popenoei;* anteriorly the abdomen is strongly narrowed; second tergite one and one-fourth times as long as wide.

The paratype seems to belong to a different species. The abdomen is one and one-sixth times as long as the thorax, and the second tergite is nearly one and one-half times as long as wide. The paratype is, moreover, somewhat larger, being 2.02 mm. long.

Type locality.—Urbana, Illinois.

Type.—Cat. No. 20842, U. S. Nat. Mus.
Description based on the type and paratype.

Trichopria (Trichopria) abdominalis, new species.

Female.—Length, 1.48 mm. Differs from the type of *illinoiensis* in having the second tergite one and two-thirds times as long as wide. Head very little wider than long, a trifle narrower than the thorax; antennae essentially as in *illinoiensis*, with a four-jointed club; eighth joint spherical, distinctly more than half as wide and very little shorter than the ninth; last four joints as in *illinoiensis;* thorax one and two-thirds times as long as wide, wider than high; fovea at base of scutellum as in *popenoei;* scutellum as in *illinoiensis*, without a median posterior elevation; the propodeum is different from that found in either of the two species just mentioned; the median ridge is not present behind the anterior one-fourth, this latter part forming a square plateau as high as the posterior edge of the scutellum; abdomen one and three-tenths times as long as the thorax, one and one-sixth times as wide as the thorax; sides of the second tergite straight and nearly parallel, curving inwardly anteriorly. Body shining black; funicle reddish-brown; femora and tibiae brown; tarsi lighter.

One paratype has the head as long as wide.

Type locality.—Riverton, New Jersey.
Type.—Cat. No. 28777, U. S. Nat. Mus. Two paratypes in Coll. Fouts.
Host.—Dipterous puparium.
Description based on four females reared, August 1, 1922, by Mr. T. H. Frison.

Belyta longicollis, new species.

Female.—Length, 4.00 mm. Body elongate; head seen from above two-thirds as wide as long, seen from the side five-sixths as high as long; pedicel as long as the third joint, as wide as the latter at apex; following joints moniliform; last joint conical, as long as the pedicel; thorax about twice as long as wide, one and two-fifths times as wide as the head, slightly wider than the second tergite; pronotum narrowed necklike anteriorly, bulging out in front of the tegulae; median carina on propodeum diverging at apical one-third; apical angles of propodeum distinctly projecting but not prominently so; first abdominal segment a little over twice as long as wide, more or less rugose, with two slightly diverging carinae down the middle, the area between these carinae smooth, with a few transverse wrinkles; second tergite a little over twice as long as wide; median sulcus on second tergite extending distally one-third the length of the segment; second tergite basally with two short depressions on either side of the larger one; legs and antennae rufous, the antennae darker distally; wings brown; radial cell closed, about six times as long as the punctiform marginal vein.

Type locality.—Mount Holly Springs, Pennsylvania.
One specimen collected by the author on July 7, 1918.

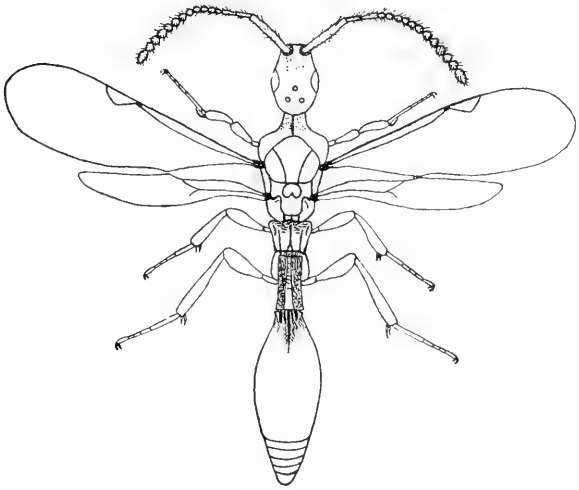


Fig. 2. *Belyta longicollis* Fouts. Female

Family SCELIONIDAE.

Platygaster exiguae, new species.

Female.—Length, 1.30 mm. Runs to *marylandica* Fouts in the author's key (Proc. U. S. Nat. Mus., vol. 63, 1924, p. 28) and differs in the structure of the scutellum. In *marylandica* the scutellum is polished and evenly convex above.

In *exiguae*, on the contrary, its dorsal surface is roughened and covered closely with short white hairs. These hairs are so fine and small as to be scarcely visible. In this species, moreover, the superior face of the scutellum encroaches upon the posterior face producing a sort of low crest or ridge. Head twice as wide as long, a little wider than the thorax; all antennal joints, except the third, longer than wide; pedicel as long as the ninth joint, twice as long as wide; joint ten twice as long as wide, longer than nine, blunt at apex; thorax a little more than one and one-third times as long as wide, higher than wide, slightly narrower than the abdomen; second tergite indistinctly longer than wide; striae on second tergite numerous, extending a little past the middle of the segment; body and appendages entirely black.

Type locality.—Oxford, Colorado.
Paratype.—Cat. No. 28778, U. S. N. M.
Type.—In Coll. Fouts.

Described from two specimens reared, June 13, 1921, from a gall of *Rhabdophaga coloradensis* Felt on *Salix exigua.* These specimens were sent to me for identification by Dr. E. P. Felt and are recorded under his number A–3198.

Platygaster distincta, new species.

Male.—Length, 1.62 mm. Runs direct to *lupinicola* in the author's key (Proc. U. S. Nat. Mus., vol. 63, 1924, p. 29) and differs principally in having the flagellar joints more elongate. Head twice as wide as long, a little wider than the thorax, slightly excavated behind; pedicel twice as long as wide, one and one-third times as long as the third joint and distinctly wider than the third; joint three one and one-half times as long as wide, half as long as four; joint four slightly longer than two, as long as five, narrowed at both ends, angulate just before the middle where it is widest, half as wide as long; joint four not emarginate proximally, joints five–ten subequal, cylindrical, nearly three times as long as wide; ten about as long as three and four united, three times as long as wide, acute at apex; flagellum densely covered with erect white hairs, these hairs longer than the joints are wide; thorax two-thirds as wide as long, eight-ninths as wide as high, six-sevenths as long as the abdomen, strongly convex dorsally; notauli indicated posteriorly, the median lobe of the mesonotum touching the scutellum, narrowly truncate at apex; scutellum highly convex, polished, sparsely pubescent; wings hyaline, pubescent, extending half the length of the abdomen past the latter's apex; abdomen about as wide as the thorax, a little less than twice as long as wide; second tergite a trifle longer than wide; basal foveae on second tergite striate, the striae not quite attaining the middle of the segment; each of the tergites following the second with a transverse row of setigerous punctures; tergites three to seven together more than half as long as the second; black; anterior tibiae at base and apex yellowish-brown; tarsi dark brown.

Type locality.—San Francisco, Calif.
Type.—Cat. No. 28872, U. S. Nat. Mus.
Three paratypes in Collection Fouts.
Description based on six specimens collected by Mr. E. Walther and recorded as being probably parasitic on *Thecocdiplosis.*

Platygaster flavitarsis, new species.

Female.—Length, 1.19 mm. Runs direct to *marylandica* Fouts in the author's key (Proc. U. S. Nat. Mus., Vol. 63, 1924, p. 28). It differs in having the median lobe of the mesonotum truncate and half as wide at the apex as the scutellum. Head twice as wide as long, wider than the thorax, not emarginate posteriorly; frons finely diagonally aciculate; pedicel twice as long as wide, nearly as long as the following two joints united; third joint half as long as the pedicel, longer than wide, a little narrower than four; joint four as long as six, as wide as five, slightly less than twice as long as wide; joint six as long as seven, as wide at apex as seven, narrowed proximally; joints seven, eight, and nine subequal, distinctly, but only slightly, longer than wide; joint ten as long as two, a little longer than nine, one and one-half times as long as wide, subacute at apex; pubescence on antennal joints very short; thorax one and one-third times as long as wide; notauli distinct on posterior half of mesonotum, nearly parallel;

median lobe of mesonotum truncate posteriorly, touching the scutellum; scutellum transverse, highly convex, polished, higher than the mesonotum at base, with numerous long white hairs laterally; first tergite evenly rounded above, the median area not defined; striae on second tergite extending to the middle of the segment; second tergite one and one-ninth times as long as wide, narrower than the thorax; tergites three, four and five equally long, a little shorter than the sixth, without distinct sculpture; last four tergites together two-thirds the length of the second; first joint of middle tarsi about seven times as long as wide; wings extending the length of the last three segments past the apex of the abdomen; black; legs dark brown; anterior femora at extreme apex, anterior tibiae on apical half, and anterior tarsi, yellowish; middle and posterior tarsi light brown; wings hyaline.

Type locality.—Glen Echo, Maryland.
Two paratypes in Coll. U. S. Nat. Mus., Cat. No. 28779.
Described from six specimens collected by the author, May, 1925, on the leaves of Elder.

Leptacis polita, new species.

Female.—Length, 1.19 mm. Head one and one-half times as wide as long, one and one-sixth times as wide as the thorax; frons shining, faintly shagreened; lateral ocelli less than their diameter from the eye margin, a little more than their diameter from the anterior ocellus; cheeks subconvex; occiput flattened, separated from the vertex by a low but sharp carina; seen from above the head is as long behind this carina as the distance from the carina anteriorly to the lateral ocelli; scape about as long as the last four antennal joints, rather slender, a little over five times as long as wide, widest in the middle; pedicel about twice as long as wide, three times as wide as the third joint, one and two-fifths times as long as the third joint; fourth joint twice as long as the third, about five times as long as wide, as wide at base as the third, slightly thickened toward apex; fifth and sixth joints subequal, a little longer than wide, distinctly wider than the fourth; seventh joint as long as the fourth, slightly wider than the pedicel, two and one-third times as long as wide, one and two-fifths times as long as the eighth; eighth and ninth joints subequal, distinctly wider than the seventh, a little longer than wide; last joint as long and as wide as the seventh, conical, acute at apex; pubescence on flagellar joints short and inconspicuous; thorax twice as long as wide, as wide as the abdomen, one and one-fourth times as high as wide; pronotum with two sharp vertical carinae enclosing an anterior triangular space, this area delicately shagreened; mesonotum shagreened, convex, without a trace of notauli; apical margin of mesonotum entire, the median lobe not distinguishable; scutellum highly elevated, hump-like anteriorly, compressed, shagreened, prolonged into a long sharp spine posteriorly, the spine extending as far backward as the apex of the first abdominal segment; abdomen scarcely longer than the thorax; first tergite two-thirds the length of the second, with the pubescence very sparse and short; second tergite one and one-fourth times as long as wide, strongly convex, without pubescence basally; at the base of the second tergite are two small indentations homologous to the

foveae in *Platygaster* and allied genera; wings subhyaline, rather narrow, the anterior pair without marginal cilia, extending half the length of the abdomen past the latter's apex; pubescence on front wings sparse, arranged in rows; tibiae strongly clavate; upper half of head dark brown, lower half yellowish-brown; scape and legs, except the swollen parts of the femora and tibiae which are darker, yellowish-brown; flagellum and club black; pronotum, pleurae, propodeum, and first abdominal segment rufous; thorax and abdomen, except as indicated, black.

Type locality.—Hamburg Farm in Santa Clara Province, Costa Rica.

Type.—Cat. No. 28780, U. S. Nat. Mus.

One specimen collected, May 28, 1925, by Mr. F. Nevermann.

Anteris reticulata, new species.

Female.—Length, 1.73 mm. Head, except as noted below, dorsal surface of thorax, and the last four abdominal tergites, finely shagreened; head as wide as the thorax, 1.69 times as wide as long, emarginate posteriorly; head below compound eyes strongly carinate, the carinae converging at the mandibles; lateral ocelli touching the eye margin; scape 2.38 times as long as the pedicel, a little wider than the pedicel; pedicel twice as long as wide, nearly as long as the three following joints together; third joint a little longer than wide, narrower than the pedicel; joints three to seven equally wide; joints four to seven equally long; last six joints forming a closely articulate club, all the joints except the last of which are transverse; joints 9–12 about twice as wide as long; twelfth joint conical, as long as wide, a little longer than the eighth; thorax 1.11 times as long as wide, indistinctly narrower than the abdomen, broadly rounded anteriorly, narrowed posteriorly, widest across the tegulae; notauli distinct on posterior two-thirds of the mesonotum; scutellum subconvex, unarmed, separated from the mesonotum by a row of deep punctures; scutellum traversed by a row of smaller punctures near the apex, the narrower band posterior to this row polished; metanotum armed with a short erect spine; propodeum unarmed; abdomen 1.80 times as long as wide, 1.65 times as long as the thorax, broadly elliptical, more or less pointed at apex; first tergite three times as wide (at apex) as long, traversed by about a dozen longitudinal carinae, second tergite twice as long as the first, 2.63 times as wide (at apex) as long, carinate like the first but the carinae not present on the posterior third of the segment; third tergite 1.95 times as long as the second, 1.69 times as wide as long, as wide at base as at apex, the sides nearly straight; fourth tergite one-fourth the length of the third, 1.57 times as long as the fifth, 1.83 times as long as the sixth; wings pubescent and ciliate; marginal vein short, thickened, not as long as the radius; radius straight, without a knob at tip; basal vein and metacarpa wanting; shining black; antennae dark brown, the scape at base yellowish; legs light brown; wings hyaline.

Male.—Length, 1.62 mm. Except in the following particulars this sex agrees with the description given above; scape about as long as the following 5 antennal

joints united, scarcely as wide as the eighth joint; pedicel very little longer than wide, as long as three but somewhat wider than third, as wide as five; four and five as long as wide, narrower than six; six to ten subequal in width, broadly transverse; ten indistinctly narrower than nine, wider than long, a trifle wider than eleven; eleventh a little wider than long, wider than twelve; twelve twice as long as wide, twice as long as eleven, conical, subacute at apex; second tergite 2.47 times as wide (at apex) as long; third tergite 1.86 times as long as the second, 1.54 times as wide as long; fourth tergite more than one-third the length of the third, twice as long as the fifth; fifth tergite as long as the sixth and seventh together; antennae and legs light brown.

Type locality.—Washington, D. C.

Two specimens collected in grass by the author on July 14, 1917. They were copulating when collected.

This is the only species of *Anteris* known to inhabit North America. It agrees with Kieffer's description of the genus. (Gen. Ins., Fasc. 80B, 1910, p. 80.)

A NEW OTIORHYNCHID WITH SINGLE TARSAL CLAWS (COLEOPTERA.)

By L. L. Buchanan, *U. S. Biological Survey*.

Single tarsal claws are found among the Curculionidae of this region in the genera Brachybamus, Barilepton, Eisonyx, and Mononychus, but are not known to occur in any North American Otiorhynchid with the exception of the remarkable species described below. This unique weevil belongs to the Simoini of the Leng catalog (Periteli of Horn), and by Horn's classification (1876, p. 66), falls in the group having the articular surface of the hind tibiae scaly, along with Eucyllus, Thinoxenus, etc.

EUCILINUS, new genus.

Body small and stout; vestiture consisting of scales, setae, and hairs; prothorax very broad; articular surface of all the tibiae scaly; claws single; mentum small and deeply sunk in its cavity; mandibular scar on face of mandible itself; gular region with a pair of short, deep grooves convergent forward.

Sides of beak strongly convergent from eyes forward; alae not dilated. Scrobes in apical half somewhat more broadly visible from above than from the side, moderately arcuate and directed toward eyes. Scape biarcuate, reaching slightly past anterior margin of prothorax, the funicle a little shorter. Eyes rounded, partially grooved, and laterally placed though not at all concealed from above. Elytra broad, with rows of punctures, the 10th or outer row uniformly distinct to apex, sides deeply embracing abdomen. Scutellum minute. Mid-coxae narrowly separated, side pieces of mesosternum unequal, metepisternal suture not visible. Rear coxae separated by their own width, inter-

coxal process broad and subtruncate. Metasternum nearly as long as 2d ventral segment at middle. First abdominal suture arcuate at middle, 1st segment a little shorter than 2d + 3d, 2d at middle about as long as 3d + 4th, 5th slightly shorter than 2d. Legs moderately stout, the tibiae flattened, strongly dilated at outer apical angle, and with the apical spinules broad and blunt; anterior and middle tibiae mucronate; tarsi rather narrow, 3d segment bilobed.

Genotype.—Eucilinus mononychus, new species.

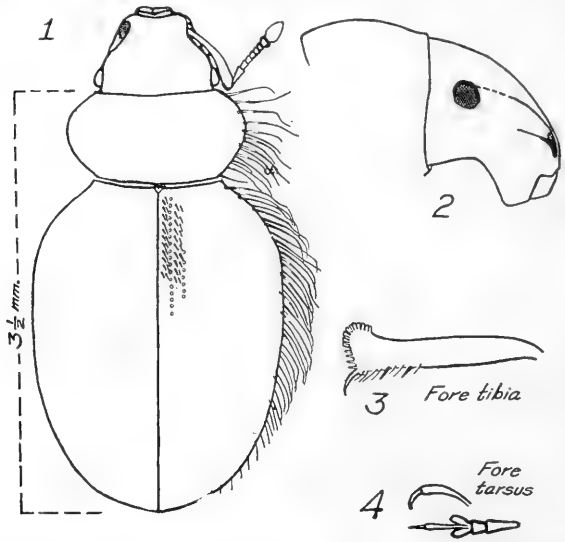


Fig. 1, *Eucilinus mononychus*, dorsal view; fig. 2, side view of head and prothorax; fig. 3, fore tibia; fig. 4, fore tarsus, and claw segment from side.

Eucilinus mononychus, new species.

Length, 3.5–3.8 mm. (thorax and elytra). Uniform pale grey to white. Body and appendages setose and densely scaly. Chitin of an obscure reddish color. Beak feebly concave along middle, continuous with head in profile; setae closer laterally. Nasal plate with high rim, lunate, twice as broad as long. Eyes rather small, rounded, moderately convex. Prothorax transversely oval (60 to 31), its side margins with long, soft, laterally projecting hairs, some of which are at least ½ length of scape. Elytra suboval (21 long to 17 broad), with rows of small punctures which are slightly larger on sides and on declivity, but in general separated by from once to twice their own diameter; intervals setose; lateral margins of elytra with long hair as on prothorax. The single tarsal claw moderately long and arcuate.

Head and beak much longer than prothorax (50 to 31). Width of head across eyes ¼ greater than length of prothorax (40 to 31). First funicular segment stouter and longer than 2d + 3d, 2d longer than 3d, 3d to 7th from moderately to strongly transverse. Diameter of eye nearly equal to that of pos-

terior portion of scrobe; margin of eye grooved except for posterior-ventral arc. Vertex convex, evenly, sparsely punctate and setose. Prothorax with setae and punctuation as on vertex, convex transversely and longitudinally, sides very strongly divergent, apex broadly emarginate, base truncate, scales dense and a little larger and more distinctly striate than on beak. Margin of sternum behind fore coxae with a dense fringe of matted down hair. Elytra with the intervals broad, flat and equal, each rather closely set with a confused double, or partly triple, row of fine erect setae which are short along suture but become progressively a little longer toward sides, those on 7th interval abruptly much longer and softer. Declivity about perpendicular. Legs scaly and setose and with long sparse hair. Fore tibia with its anterior face convex, the posterior flat, outer edge sharp, articular surface in same plane with posterior face and not set off from it by spinules; hind tibiae longest, fore tibiae next in length, middle pair shortest. Tarsi rather narrow, hind pair with 1st segment longer than 2d + 3d, 4th as long as 1st; front tarsi shorter, claw segment longer than 1st.

Type locality.—Utah (Type and 3 paratypes).
Other locality.—Arizona (1 paratype).
Type.—Cat. No. 28911, U. S. N. M.

All 5 specimens seem to be ♀♀. The tibial structure in general indicates burrowing habits, though the long soft hair would not seem to support this idea.

NEW SPECIES OF BOLOSCHESIS (=CHLAMYS) WITH NOTES ON KNOWN SPECIES (COLEOPTERA; CHRYSOMELIDAE; FULCIDACINAE).

By Chas. Schaeffer, *Brooklyn Museum, Brooklyn, N. Y.*

The change of familiar and time-honored names and their replacement with modern inventions is always unpleasant, but Jacobson, 1924 (Rev. Russe d'Ent., Vol. 18, p. 239) recognizing the prior use of *Chlamys* by Bolton for a genus of Mollusca, and of *Diaspis* by Bremi for our familiar scale insects, has proposed the names *Boloschesis* and *Diplacaspis* to replace these homonyms. At present we have no recourse but to adopt them. The latter genus will probably be suppressed, however, under the former since the chief distinguishing character, the failure of the elytra to meet continuously behind the scutellum and the consequent development of the metanotum into a so-called second scutellum, is a variable character and the very small bifid instead of dentate claws are not likely to be satisfactory for generic definition. The new subfamily name is based upon the gigantic Brazilian forms to which the genonym *Fulcidax* was applied by Voet 1806.[1]

[1]Mr. H. S. Barber has called my attention to the change of names, which I had overlooked, and has kindly added this introductory paragraph.

Our indigenous species formerly known as *Chlamys* are rather difficult to identify from descriptions. *Memnonia* Lac. has hitherto been easily determined, but when two additional species were distinguished, these being similar to *memnonia* and *confusa* in the display of the "second scutellum" and, in some lights, of a darker colored discal velvety spot on each elyton, the identity of the true *memnonia* became very doubtful. Moreover California was mentioned in addition to the type locality, Mexico, in the original description of *moestifica* and the exact identity of the latter species which has never been included in our lists became of great interest, especially since the descriptions of both offer scarcely any satisfactory means of distinction because of the variability of the characters mentioned. The species identified at present as *memnonia* differs from the rest of the related species, with the exception of *prosternalis*, by the absence of a yellow spot within the emargination of each eye and rather larger, more prominent elytral tubercles, while the rest of the species have a distinct yellow eye spot and the elytral tubercles less prominent. Types or cotypes of *memnonia* and *moestifica* are in the British Museum as stated by Mr. Jacoby in the "Biologia" and at my request Mr. Arrow kindly sent me Mexican specimens of both species compared and labelled by Mr. Jacoby, also some unidentified Mexican and North American species. Unfortunately the specimens sent as *memnonia* and *moestifica* belonged to one species differing only in size, and were of no assistance. On further inquiry, also regarding the presence or absence of a yellow eye spot of both species, Mr. Bryant, to whom my questions were referred by Mr. Arrow, wrote me that *moestifica* has a yellow eye spot but *memnonia* has no spot; and he further writes that the specimens I returned and labelled *confusa* are apparently the same as *moestifica*. According to this information, *memnonia* was correctly identified and my *confusa* becomes a synonym of *moestifica*.

For the privilege of studying the material in the National Museum I am indebted to Messrs. Schwarz and Barber and to Dr. Henry Skinner for the loan of specimens from the collections of Dr. Horn.

The following key for the determination of the North American species of *Boloschesis* (= *Chlamys*) is a modification of the one published in 1907 with the new species added.

Key to the North American Species of Boloschesis.

1. Body beneath uniformly metallic or black ..... 2.
   Body beneath pale or bicolored ..... 11.
2. Legs entirely black or metallic ..... 3.
   Legs more or less pale ..... 10.

3. Metascutellum visible ..... 4.
   Metascutellum covered ..... 8.
4. Prosternum between the coxae wide with sides broadly emarginate, widening behind the coxae and obliquely narrowing to apex at about apical fourth; color cupreous ..... *prosternalis Schffr.*
— Prosternum narrow between and behind the coxae, gradually narrowing to apex ..... 5.
5. A yellow spot within the emargination of each eye ..... 6.
   Emargination of eye without a yellow spot ..... *memnonia* Lac.
6. Longitudinal median impressed line dividing the prothoracic tuberosity into two lobes very distant and deep ..... 7.
— Longitudinal median impressed line of prothorax indistinct and feeble; color cupreous, elytral sculpture coarsely punctate-rugose ..... *subelata*, n. sp.
7. Elytral punctuation relatively fine or moderate, the punctures generally well separated; color usually dark cupreous ..... *moestifica* Lac.
— Elytral punctuation relatively large and more or less confluent, producing a rather coarse, punctate-rugose sculpture; color bright cupreous ..... *scabripennis*, n. sp.
8. Small species, about 2.5 mm. long, reddish cupreous, sides of prothorax obsoletely strigate, elytra generally distinctly punctate ..... *tuberculata* Klug.
   Larger species, about 3.4 mm. long, cupreous to almost black ..... 9.
9. Elytra generally finely and sparsely punctate, punctures occasionally very feeble or absent or quite distinct; prothorax rather finely strigate-rugose, tuberosity moderately deeply divided into two lobes ..... *gibbosa* Fab.
— Elytra distinctly and rather coarsely punctate; prothorax more coarsely and more evenly strigate-rugose, tuberosity less deeply divided and surface generally more shining than in *gibbosa* ..... *cribripennis* Lac.
10. Oblong, black, opaque, front of head, antennae and legs more or less reddish; prothorax coarsely strigate on disk of front, above at middle of tuberosity moderately broadly canaliculate ..... *foveolata* Knoch.
— Short, rather robust, dark cupreous, antennae, labrum, tarsi and tibiae in about apical half reddish; prothorax uneven in front, sparsely but coarsely punctate, intervals between the punctures finely strigate, tuberosity broadly divided into two lobes, next to each lobe a moderate tubercle and near the base of the tuberosity at middle two rather prominent tubercles when viewed laterally or posteriorly ..... *quadrilobata*, n. sp.
11. Body above obscure-metallic, finely pubescent; head, antennae, apical and side margins of prothorax, legs, underside of body and pygidium pale, coarsely and densely punctured and with two shining, black spots on the anterior face of the gibbosity; elytra with about nine black or aeneous tubercles, surface cribrately punctured ..... *maculipes* Chev.
— Body above yellowish or ferrugineous, more or less varied with darker markings ..... 12.
12. Prothorax distinctly and rather coarsely punctate ..... 13.
— Prothorax not punctate, sculpture indistinctly reticulate, color yellowish green, with two darker spots on each side of basal lobe; elytra ferruginous with a darker postscutellar spot ..... *texana* Schffr.

13. All the antennal joints pale, color ferruginous with darker markings on prothorax and elytra; punctuation of elytra confused and tubercles moderately distinct ..... *huachucae* Schffr.
— Last four or five joints of antennae black, color usually yellowish-testaceous with ferruginous or black markings; punctuation of elytra on the disk forming more or less regular rows, tubercles absent or feeble ..... *arizonensis* Linell.

Boloschesis subelata, new species.

Form of *gibbosa*, Fab. but elytra coarsely punctate-rugose and with a very distinct metascutellum. Cupreous more or less shining, antennae, labrum and a spot within the emargination of each eye, yellowish. Head very finely strigate-rugose with a few moderate punctures anteriorly; antennae pale, third joint a little longer than fourth, fifth triangular but narrower than the sixth joint. Prothorax with a rather feebly canaliculate tuberosity, surface finely strigate-rugose, sparsely punctate, punctures moderate, but a little larger at sides of apex of tuberosity where the surface is less even. Elytra with the usual tubercles, which are, however, rather feebly distinct and more or less confluent anteriorly from the humeral to the median tubercle near suture and then to the sub-median basal tubercle; near lateral margin an arcuate elevated line from about middle to not quite to apex; intervals, especially between the confluent tubercles, coarsely and densely punctate-rugose; metascutellum narrow, carina-like. Prosternum finely rugose and as usual narrow between the coxae. Pygidium finely strigate-rugose with the usual median carina and more or less distinct ocellate punctures. Body beneath with large punctures; claws broadly appendiculate. Length 3.75 mm.

Tucson, Arizona (Hubbard), Goffs, California (Rehn and Hebard).

Type and *paratype* (Tucson, Arizona).—Cat. No. 29463, U. S. National Museum; paratypes in collection, American Entomological Society, Philadelphia, and one paratype in collection, Brooklyn Museum.

This species, the type and paratype of which were reared from larval cases on *Larrea tridentata* (*Covillea glutinosa*) will be readily known from those having a visible metascutellum and a yellow eye spot by the very coarse punctate-rugose elytra and the form of prothorax, which is slightly lower and the summit of tuberosity is more regularly arcuate and at middle more feebly canalicate than in the other species. The elevated sinuous ridges of the elytra, caused by the confluence of the tubercles, are less distinct.

Boloschesis scabripennis, new species.

Form of the smaller specimens of *gibbosa* Fab. but elytra coarsely punctate-rugose and with distinct metascutellum. Color cupreous, antennae, labrum and

a small spot within the emargination of each eye reddish. Head very finely strigate-rugose with a few moderate punctures anteriorly and posteriorly. Prothorax with distinct and moderately deeply canaliculate tuberosity; surface finely strigate-rugose, scarcely punctate in front but more distinctly at sides and anteriorly near the summit of the tuberosity where the surface is rather subrugose and more uneven than below. Elytra with the usual tubercles, which are more or less confluent but not as clearly defined as mostly in *memnonia* and *moestifica;* near lateral margin an arcuate, elevated line running parallel with the margin from about middle to not quite to apex; surface, especially between the confluent tubercles, coarsely and densely punctate-rugose, between the punctures when visible moderately finely rugose; metascutellum distinct but narrow. Prosternum finely rugose, narrow between the anterior coxae. Pygidium finely rugose with the usual median carina and occasionally a few smooth spaces. Body beneath with large punctures; claws broadly appendiculate at base. Length 3.5 mm.

Texas, Marathon, June (Mitchell and Cushman), El Paso (ex+Love, Brooklyn Museum); New Mexico, close to N. M. Agr. College, May (Cockerell, U. S. Nat. Mus.); California, Riverside, April (coll. O. Dietz); Arizona (coll. Riley, U. S. Nat. Mus. and Brooklyn Mus.).

Type (Marathon, Texas).—Cat. No. 29464, U. S. National Museum; paratypes in Nat. Museum and Brooklyn Museum. The paratype from New Mexico is labelled "on Larrea."

This species differs from the above described *subelata* in having a more suddenly declivous and more deeply canaliculate prothoracic tuberosity. From *moestifica* it differs in having a much coarser elytral sculpture and the prothorax smoother anteriorly. It is more closely related to the latter than to the other species.

Boloschesis moestifica (Lac.)

Chlamys moestifica Lacord. 1848.
Chlamys confusa Schaeffer 1920

This species was described from Mexico and California by Lacordaire but has never been recognized here in North America. Lacordaire's specimens came from Dupont and were, like other species from the same source, not collected in California but in Arizona.

Of the North American species displaying the metascutellum and a yellow spot within the emargination of each eye this species has a much less rugose elytral sculpture but a rather more coarse sculpture anteriorly of each lobe of the prothoracic tuberosity which Lacordaire describes as follows: "Chacun des lobes * * * est creusé en avant d'une assez grand fossette et le reste est convert de petites crètes formant une sorte de

reseau irregulier a mailles incompletes." This is of course variable but of none of the species have I seen specimens which so perfectly agree in this respect except those I described as *confusa*. The punctuation of elytra is in some specimens very fine or almost absent, in others it is more distinct. The metascutellum is in a few specimens faint or invisible.

It is found in several localities in southern Arizona and Mexico.

Boloschesis prosternalis (Schaeffer).

This species was originally described from Brownsville, Texas, but occurs also at Catalina Springs, Arizona (Hubbard and Schwarz in coll. U. S. N. M.) and at Acapulco, Mexico (Hoege in coll. Brit. Mus.). It is the smallest of the species having a metascutellum and readily known by the different form of prosternum. There is also no yellow spot within the emargination of each eye and the black velvety space on each elytron usually seen in a certain light in the species with a metascutellum is absent in this species.

Boloschesis insularis, new species.

Form of *gibbosa* Fab., color above and below and legs cupreous, labrum, a spot within the emargination of each eye and the first five antennal joints reddish, the last six joints black. Head very finely rugose, posteriorly punctate; antennae with fourth joint triangular, much narrower than the fifth joint. Prothorax similar to *gibbosa* but tuberosity more obliquely and less suddenly declivous; surface finely strigate-rugose, moderately coarsely punctate at sides; tuberosity divided into two sub-acute lobes, each lobe rather coarsely sub-rugose anteriorly. Elytra with tubercles as in *gibbosa;* surface rather coarsely punctate, intervals between the punctures convex, producing a somewhat sub-rugose appearance, surface otherwise, when visible between the punctures, finely rugose; metascutellum absent. Body below with large punctures. Prosternum narrow between the coxae, finely rugose and coarsely punctate. Claws broadly appendiculate Length, 3.75 mm.

Wilson City, Abaco, Bahama, June (Engelhardt).

Type.—Cat. No. 29465 U. S. National Museum.

This species is very similar to *gibbosa* but the prothoracic tuberosity is different, anteriorly more oblique and not as suddenly declivous and the two lobes are rather more acute, the outer six antennal joints are black and the elytral sculpture is rougher.

Boloschesis quadrilobata, new species.

Small, similar to *tuberculata*, color dark cupreous, antennae, labrum, tarsi and tibiae in about apical half reddish. Head finely rugose, closely punctate

with moderately large punctures; between the eyes a fovea-like impression. Prothorax with a rather strong and sudden tuberosity, which latter is broadly canaliculate at its summit, dividing it into two lobes, at sides of each of the latter is a tubercle-like prominence and in front near the base of the tuberosity another rather prominent tubercle on each side of middle,[1] also a relatively large tubercle at sides equidistant from lateral margin and base; surface rather uneven, moderately finely strigate-rugose with relatively very large punctures, more numerous at sides than front. Elytra with the usual tubercles but the large median ones near suture nearer to the scutellum than in the other species, tubercles more or less confluent, the large median tubercle more or less distinctly connected with the smaller one below by a coarsely sculptured and moderately broad elevation, near the side margin, from about middle but not reaching to apex, a more or less distinct arcuate ridge; surface between the tubercles rather coarsely and sparsely punctuate; intervals between the punctures finely rugose; metascutellum absent. Prosternum rather finely rugose with moderate punctures which are well separated; narrow between the coxae. Pygidium with a fine, distinct longitudinal median carina; surface finely rugose with a few, more or less distinct tubercles and moderately large punctures. Body beneath with large punctures. Length, 3 mm.

San Antonio, Texas (Hubbard and Schwarz coll.).

Type and *paratype*.—Cat. No. 29466, U. S. National Museum.

This small species will be readily known from the other cupreous North American Boloschesis by the coloration of the tibiae and tarsi and the different sculpture of prothorax.

Boloschesis gibbosus (Fab.)

Bruchus gibbosus Fab. 1777, 1781, 1787, 1792 and 1801.
Clythra plicata Fab, 1801.
Chlamys tuberosa Knoch, 1801.
Chlamys plicata (=gibbosa) Oliv. 1808.

The names *affinis* Klug, *assimilis* Klug and *polycocca* Lac, are wrongly placed as synonyms of *foveolata* Knoch in Mr. Leng's catalogue. They belong under *gibbosa* Fab.

B. gibbosa Fab. is a very variable insect in regard to the sculpture of prothorax and elytra. The strigation of the prothorax is in some specimens as coarse as in *cribripennis* Lac. and the sculpture of the elytra in certain specimens of *cribripennis* is very nearly as occasionally occurs in *gibbosa*. Some of these varieties are possibly referable to one or the other synonyms but I found it impossible to determine any of these with certainty from the descriptions.

[1]These two frontal tubercles are scarcely visible from a frontal view, but are very distinct and rather prominent from a lateral or posterior view.

DESCRIPTION OF A NEW BRACONID PARASITE OF ARTONA CATOXANTHA (HYMENOPTERA).

By S. A. Rohwer, *U. S. Bureau of Entomology.*

The description of the following new parasite is presented at this time so its name will be available to economic workers who are studying the life history, habits and control of the coconut pest, *Artona catoxantha* Hampson. The material from which this new species is described was forwarded by B. A. R. Gater, of the Department of Agriculture of Straits Settlements and Federated Malay States, accompanied by a letter stating that it is an important parasite of the early instars of its host and that efforts are being made to introduce it into Fiji to control *Levuana iridescens*.

Apanteles artonae, new species.

Ovipositor short, hind legs except base of tibiae black, second tergite with oblique furrows, hind coxae opaque, granular.

Female.—Length 2 mm. Eyes very slightly converging towards the clypeus; face rather coarsely punctured, with a tendency to transverse striations, with rather distinct ridge below the bases of the antennae; vertex shining but with small punctures; antenna distinctly tapering apically, 18-jointed in type, the basal joints fully four times as long as their greatest width; mesoscutum with distinct, close, well-defined punctures; parapsides indicated posteriorly; suture in front of the scutellum broad, with four transverse rugae at the bottom; scutellum convex, with large punctures on the disk, the lateral face granular followed posteriorly by a somewhat polished area; propodeum with indistinct punctures medianly, with well-defined carina laterally, otherwise without carinae; mesepisternum shining, with distinct setigerous punctures; posterior coxae long, cylindrical, opaque, granular and with a few well-defined punctures interspersed; posterior tibiae longer than their femora and trochanters combined; first tergite slightly longer than its greatest apical width, indistinctly sculptured laterally, medianly smooth and shining; second tergite with two oblique furrows, the lateral area subopaque, the median area smooth and polished; following tergites polished; ovipositor short, about half as long as the first tergite; nervulus postfurcal by a distance somewhat greater than its length. Black; head and thorax covered with sparse white hair; sides of the first and second tergites ferrugineous; anterior legs, below the bases of the femora, ferrugineous but with the tarsi paler than the femora; base of posterior tibia ferrugineous; palpi sordid white; wings hyaline, distinctly iridescent, venation pale brown, costa and stigma dark brown.

Male.—Length 1.75 mm. Antenna not so distinctly tapering as in female; intermediate femora distinctly infuscate basally; first and second tergites very narrowly ferrugineous laterally; otherwise agrees with above characterization of the female.

Type locality.—Kuala Lumpur, Federated Malay States.

Type.—Cat. No. 40097, U. S. N. M.

Described from six females (one type) and nine males (one allotype) received from B. A. R. Gater, and said to be a parasite of the early stages of *Artona catoxantha*. Specimens recorded under his number 2603.

NOMINA CONSERVANDA FROM THE STANDPOINT OF THE TAXONOMIST.

By W. L. McAtee, *U. S. Biological Survey.*

Nomina conservanda have been adopted for the chief purpose of preserving familiar names. The action is equivalent to a ruling in the field of language that we shall continue to use the terms horseless carriage or flying machine and never change to such modern ones as automobile or airplane. Why do scientists, most of whom presumably are evolutionists, attempt to block development in taxonomy while constantly accepting change in other fields both within and without the domain of science?

Getting at the root of the thing, what virtue is there in familiarity? Certainly there is no real value in preserving a familiar name unless it embodies a definite concept. Proponents of nomina conservanda assume that these names do embody such concepts but this is a fallacy. In fact the longer a name has been in use the more we may be assured that authors have applied it to diverse organisms. The history of old names is very likely to be a chronicle of misidentifications.

Any one who has revised a taxonomic group knows this is true. He finds the same name label on different species, sometimes on several of them, and he finds different species (including undescribed ones) standing under a single name. If these things are true of collections, they are true also of literature which is based on collections. The plea that nomina conservanda preserve definite concepts, for the field of entomology at least, is ridiculous.

The definite concept idea is not retroactive; we can not consult the older writings and assume without great risk of error, when we find one of the conserved "familiar names" that it applies to the same organism assigned to it at present. Furthermore the definite concept idea has no anticipatory value, for we can not be insured against future change. Progress in taxonomy will not stop. Every successive reviser finds characters overlooked by his predecessors and refines the classification. Taxonomy is dynamic not static and its development demands never-ceasing perfecting of analysis and definition. Setting

up nomina conservanda is attempting to establish fixed entities in a field where change, where progress, necessarily has been the rule. It amounts to fixing limits to the search for knowledge—a wholly unscientific endeavor.

Nomina conservanda (in entomology at least) are the most tinsel of idols, and setting them up involves sacrifice of scientific ideals of evolution in methods and of progress in knowledge. Furthermore they can be established only by nullification of the fundamental principle of nomenclature, priority. Under the methods by which nomina conservanda are selected any name may be adopted or rejected by fiat.

This is anarchy which the taxonomist can not safely tolerate. To put the thing on the most selfish basis, taxonomists as a rule have as one of their chief objects building for themselves a monument from their works. When the names of the older systematists are handled with slight consideration by the commissions which promulgate nomina conservanda, how can the modern taxonomist expect better treatment for his names? It seems to the present writer that entomological taxonomists almost to a man will oppose nomina conservanda not only because of their futility but also because of their unfairness. Taxonomists originate the names, work with them more than other scientists, and in all ways have greater interests in them, and rights over them. Why, therefore, should taxonomists accept fiat names?

There would seem to be no compelling reason why fiat names should pretend to be terms recognized in technical taxonomy. Why will not standardized vernacular names serve every need of fiat nomenclature? Using vernaculars would certainly obviate otherwise inevitable conflict between believers and non-believers in nomina conservanda. If the proponents, however, will have pseudo-technical names, let them go their gait. Taxonomists can develop their own field according to their own best judgment, ignoring nomina conservanda which in consequence will eventually pass into the realm of forgotten things.

Actual date of publication, December 15, 1926.

EDITORIAL.

When a taxonomist is asked to determine material of an entire order of insects from all parts of the world, a high percentage of accuracy must not be expected. Insect orders are vast, and at any given time only minor subdivisions of them are covered by thorough-going revisions of fairly recent dates. It is only with such revisions in hand that the taxonomist can make determinations that he is confident reflect the most advanced and accurate classification. Requesting positive identifications of miscellaneous specimens, therefore, may be asking the impossible. The taxonomist feels most confident when dealing with groups he has personally revised; working with others he uses in the order of preference, (a) revisions by others if fortunately such exist, (b) descriptions and illustrations, or (c) comparisons with previously named material. Descriptions may not fit exactly, illustrations may differ in detail, and previous identifications may be faulty. Often a specific name can be given only with the reservation that it be understood as conventional, and only taken for what it is worth considering the existing state of the classification and literature,—in other words, as something likely to be changed by advance in knowledge.

Economic entomologists and others on the consuming end of insect determinations, therefore, should bear in mind that when identifications can not be revisional, in many cases they are necessarily more or less provisional.

—*W. L. McAtee.*

NOTES AND NEWS ITEMS.

Insects of Western North America, E. O. Essig, 1926, The MacMillan Company, New York.—This handsome and valuable contribution to American Entomology is a credit to both the author and the publishers. It is a handbook on insects, which will be useful not merely to the students, the agriculturists, and the general public in the West, but to professional entomologists all over the world, due to the scholarly arrangement of the subject, the large amount of biological data, much of which is new or at least hitherto unpublished, and to the numerous excellent illustrations, most of them original; the photographs are particularly good, instructive and well reproduced.

The volume contains more than a thousand pages, with 766 text figures and text in clear type on fine paper, substantially bound in cloth.

The subject is treated according to the orders, necessarily concisely, but with a surprising amount of interesting details, which makes the volume far more readable than the ordinary textbook. Analytical keys to the orders and families are given, and careful separate indexes to both insects and foodplants enable easy cross-references to any subject treated. Control measures against injurious insects are indicated and very full references to the more important economic and systematic literature are given in footnotes.

It is an excellent textbook and reference book and Mr. Essig is to be congratulated on this important and altogether praiseworthy work.

—*August Busck.*

VOL. 28 DECEMBER, 1926 No. 9

PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

CONTENTS

PUBLISHED MONTHLY EXCEPT JULY, AUGUST AND SEPTEMBER

BY THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

U. S. NATIONAL MUSEUM

WASHINGTON, D. C.

Entered as second-class matter March 10, 1919, at the Post Office at Washington, D. C., under Act of August 24, 1912.

Accepted for mailing at the special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized July 3, 1918.

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON

ORGANIZED MARCH 12, 1884.

The regular meetings of the Society are held on the first Thursday of each month, from October to June, inclusive, at 8 P. M.

Annual dues for members are $3.00; initiation fee $1.00. Members are entitled to the PROCEEDINGS and any manuscript submitted by them is given precedence over any submitted by non-members.

OFFICERS FOR THE YEAR 1926.

Honorary President . . . . . E. A. SCHWARZ
President . . . . . J. M. ALDRICH
First Vice-President . . . . . J. A. HYSLOP
Second Vice-President . . . . . J. E. GRAF
Recording Secretary . . . . . C. T. GREENE
Corresponding Secretary-Treasurer . . . . . S. A. ROHWER
U. S. National Museum, Washington, D. C.
Editor . . . . . CARL HEINRICH
U. S. National Museum, Washington, D. C.
Executive Committee: THE OFFICERS and W. R. WALTON, A. N. CAUDELL, T. E. SNYDER.
Representing the Society as a Vice-President of the Washington Academy of Sciences . . . . . A. G. BÖVING

PROCEEDINGS ENTOMOLOGICAL SOCIETY OF WASHINGTON.

Published monthly, except July, August and September, by the Society at Washington, D. C. Terms of subscription: Domestic, $4.00 per annum; foreign, $4.25 per annum; recent single numbers, 50 cents, foreign postage extra. All subscriptions are payable in advance. Remittances should be made payable to the Entomological Society of Washington.

An author of a leading article in the PROCEEDINGS will be given 10 copies of the number in which his article appears. Reprints without covers will be furnished at the following rates, **provided a statement of the number desired accompanies the manuscript:**

	4 pp.	8 pp.	12 pp.	16 pp.
50 copies	2.00	4.00	6.00	8.00
100 copies	2.25	4.50	6.75	9.00

Certain charges are made for illustrations and there are available rules and suggestions governing the make-up of articles. Immediate publication in any number may be obtained at the author's expense. **All manuscripts should be sent to the Editor.**

PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 28 DECEMBER 1926 No. 9

THE SPECIES OF HÜBNER'S TENTAMEN.

By Wm. T. M. Forbes, *Ithaca, New York.*

Recent notices by the Commission of Zoological Nomenclature have called for an agreed bibliography of the specific names cited in Hübner's *Tentamen*. The following is presented to the public interested in that work, in the hope that it may serve this purpose.

Of the 107 names presented in the Tentamen, one is based on a species then unpublished, and so doubtless invalid; 74 are from Linnaeus, 64 first appearing in the tenth edition (or earlier as polynomials), 2 in the Museum of Louisa Ulrica, and four each in the Fauna Suecica and the 12th edition of the Systema. Four names are from Clerck's Icones (also appearing in Linnaeus), 7 are described in the Vienna Catalogue, usually credited to Denis and Schiffermüller, and one each from Cramer and Scopoli. Of names sometimes credited to the Vienna Catalogue, but which appear there as *nomina nuda*, one each appear to have been validated by description by Borkhausen and Hübner himself, and the twelve remaining are all described in Fabricius' "Mantissa" published in 1787. For some of these there may have been earlier references which have escaped me, but the Fabrician descriptions validate them in any case. Five names appear to have been first published by Hübner himself in the "Sammlung Europ. Schm."

ORIGINAL REFERENCES FOR GENOTYPES PROPOSED IN THE TENTAMEN.

I. Papiliones I. *nymphales* (Verz No.)

Nerëis Polymnia (Papilio Polymnia) Linn. 28
1764 Museum Ludovicae Ulricae, 224
1767 Linn. Syst. Nat., ed. xii, Papilio No. 58[1] (*P. Heliconius*)
(Preoccupied by Linnaeus, Syst. Nat., ed. x, 654, 1758.)

Limnas Chrysippus (Papilio Chrysippus Linn.) 78
1764 Linn. Mus. Ludov. Ulr., 263
1767 Linn. Syst. Nat., Ed. xii, Pap. 119 (P. Danaus)

[1]The Verzeichniss cites this as equal to Heliconii Linn. Does this automatically fix the type of both? We have been using Heliconius of another subfamily, but there seems to be evidence that this was the group L. especially intended.

Lemonias Maturna (Papilio Nymphalis[1] Maturna Linn.) 223
1758 Linn. Syst. Nat., Ed. x, Pap. 136
1767 Linn. Syst. Nat., Ed. xii, Pap. 204
There are early references to Lemonias Illiger, but I can not find it was published before 1818.

Dryas Paphia (Papilio Nymphalis Paphia Linn.) 266
1758 Linn. Syst. Nat., Ed. x, Pap. 138
1768 Linn. Syst. Nat., Ed. xii, Pap. 209

Hamadryas Jo (sic) (Papilio Nymphalis Io Linn.) 322
1758 Linn. Syst. Nat., Ed. x, Pap. 88
1767 Linn. Syst. Nat., Ed. xii, Pap. 131

Najas Populi (Papilio Nymphalis Populi Linn.) 404
1758 Linn. Syst. Nat., Ed. x, Pap. 111
1767 Linn. Syst. Nat., Ed. xii, 162

Potamis Iris (Papilio Nymphalis Iris Linn.) 460
1758 Linn. Syst. Nat., Ed. x, Pap. 110
1767 Linn. Syst. Nat., Ed. xii, 161

Oreas Proserpina (Papilio Proserpina Schiff.) 459
1776 Denis and Schiffermüller Syst. Verz. der Schmetterlinge der Wiener Gegend, Plates la, lb, Figs. 9a, b (*circe* Fabr. Syst. Ent., Pap. no. 226).

II. *gentiles*

Rusticus Argus (Papilio Plebejus Argus Linn.) 670
1758 Linn. Syst. Nat., Ed. x, Pap. 152
1767 Linn. Syst. Nat., Ed. xii, Pap. 232[2]

Princeps Machaon (Papilio Eques Machaon Linn.) 844
1758 Linn. Syst. Nat., Ed. x, Pap. 27
1767 Linn. Syst. Nat., Ed. xii, Pap. 33

Mancipium Brassicae (Papilio Danaus Brassicae Linn.) 983
1758 Linn. Syst. Nat., Ed. x, Pap. 58
1767 Linn. Syst. Nat., Ed. xii, Pap. 75

Consul Fabius (Papilio Eques Achivus Fabius Cr.) 1058
1775 Cramer Papillons Exotiques I Pl. 90, C., D.[3]

Urbanus Malvae (Papilio Plebeius Malvae Linn.) 1191
1758 Linn Syst. Nat., Ed. x, Pap. 167
1767 Linn Syst. Nat., Ed. xii, 267

II. Sphinges I. *papilionoides*

Zygaena Filipendulae (Sphinx Filipendulae Linn.) 1273

[1]In each case I cite Linnean genus and subgenus from the Systema Naturae. His numbering is continuous in each genus.

[2]There is apparently a little question which of two closely related species is the true *argus* L., but they are strictly congeneric and both were included in Linnaeus' conception.

[3]*Protogonius* Hbn. Verz. is monotypical and would be a strict synonym.

1758 Linn. Syst. Nat., Ed. x, Sph. 32
1767 Linn. Syst. Nat., Ed. xii, Sph. 34[1]

Chrysaor Statices (Sphinx Statices Linn.) 1293
1758 Linn. Syst. Nat., Ed. x, Sph. 38
1767 Linn. Syst. Nat., Ed. xii, Sph. 47

Glaucopis Phegea (Sphinx Phegea Linn.)[2] 1318 n. b. l.
1758 Linn. Syst. Nat., Ed. x, Sph. 33
1767 Linn. Syst. Nat., Ed. xii, Sph. 35
(Preoccupied by Gmelin in Linn. Syst. Nat., ed. XIII, 363, 1788.)

II. *hymenopteroides*

Sphecomorpha Incendiaria (*nomen nudum*)[3]

Sesia Culiciformis (Sphinx culiciformis Linn.)
1758 Linn. Syst. Nat. Ed. x, p. 493, Sph. 29
1767 Linn. Syst. Nat. Ed. xii, Sph. 30[4]

Thyris Pyralidiformis (Sphinx Pyralidiformis Hbn.) 1399
date uncertain (1793- —[5]). Hübner, Sammlung Europäische Schmetterlinge, Sphinges p. 86, Pl. III, fig. 16.
(synonym of *fenestrella* Scop.; *fenestrina* Den. and Schiff.)

III. *legitimae*

Bombylia Stellatarum (Sphinx stellatarum Linn.) 1409
1758 Linn. Syst. Nat., Ed. x, Sph. 26
1767 Linn. Syst. Nat., Ed. xii, Sph. 27

Eumorpha Elpenor (Sphinx Elpenor Linn.) 1463
1758 Linn. Syst. Nat., Ed. x, Sph. 15
1767 Linn. Syst. Nat., Ed. xii, Sph. 17

Manduca Atropos (Sphinx Atropos Linn.) 1494
1758 Linn. Syst. Nat., Ed. x, Sph. 8
1767 Linn. Syst. Nat., Ed. xii, Sph. 9

Amorpha Populi (Sphinx Populi Linn.) 1517
1758 Linn. Syst. Nat., Ed. x, Sph. 2
1767 Linn. Syst. Nat., Ed. xii, Sph. 2

[1]Fixes type of *Zygaena* Fabr. Syst. Ent. p. 550. 1775.

[2]Has priority over *Amata* Fabr. Illiger's Mag. vi, 289. The types though congeneric are wholly distinct. *Glaucopis* was taken up by F. in the same place, but without listing Hübner's type. (He also shifted the meaning of "*Pyralis*" in a similar way.)

[3]*Glaucopis Incendiaria* Hbn. was published 1827 according to Hampson, cat. Lep. Phal. i

[4]Fixes type of *Sesia* Fabr. Syst. Ent. p. 547, 1775.

[5]The text is dated 1796. This is *Thyris* Laspeyres, whose type (sole species) is the same species, cited by Laspeyres as *fenestrina*.

III. Bombyces I. *sphingoides*

Dimorpha Versicolora (Phal. Bombyx versicolora Linn.) 1526
1758 Linn. Syst. Nat., Ed. x, P. Bomb. 17[1]
1767 Linn. Syst. Nat., Ed. xii, P. Bomb. 32[1]
Ptilodon Camelina (P. B. camelina Linn.) 1542
1758 Linn. Syst. Nat., Ed. x, P. B. 56
1767 Linn. Syst. Nat., Ed. xii, P. B. 80
Andria Vinula (P. B. Vinula Linn.) 1559
1758 Linn. Syst. Nat., Ed. x, P. B. 16
1767 Linn. Syst. Nat., Ed. xii, P. B. 29
Platypteryx Hamula (Bombyx Hamula Schiffermüller)[2] 1570
(Prelinnean) Réaum. vol. ii Mem. vi Pl. 22, figs. 407 (le cheval marin)
1776 Den. and Schiff. Syst. Verz. Bombyx T. 4. proposes *Bombyx Hamula* for "le cheval marin" of Réaumur.
1790 Borkhausen Naturg. d. Eur. Schmett. III, p. 57 no. 11 (also in Esper)
1796 (?) Hübner Samml. Eur. Schm. II, Bombyces p. 114, figs. 46, 47
Echidna Tau (P. Bombyx Tau Linn.) 1592
1758 Linn. Syst. Nat., Ed. x, P. B. 7
1767 Linn. Syst. Nat., Ed. xii, P. B. 8
(Preoccupied in the fishes by Forster 1778, and also in the Mammalia by Cuvier, 1797.)

II. *veras*

Heraea Carpini (Bombyx Carpini Schiff.) 1638
(Prelinnean) Réaum. vol. 1, pl. 49, figs. 1–10. (le petit paon)
(1758 Linn. Syst. Nat. P. B. 6 pavonia, α minor) (No. 7α of Ed. xii)
1776 Den. and Schiff. Syst. Verz. Bombyx B. 3. proposes *Bombyx carpini*[3] for "le petit paon" of Réamur.
1796 (?) Hübner Samml. Eur. Schm. Pl. 14 figs. 53–54 (*carpini*)
Hipogymna (sic) *Morio* (P. Bombyx Morio Linn.) 1644
1767 Linn. Syst. Nat., Ed. xii, P. B. 66
Leucoma Auriflua (Bombyx Auriflua Fabr.) 1660
(1776 Den. and Schiff. Verz. Bombyx D. 4.—undescribed)[4]
1787 Fabr. Mantissa Insectorum ii, Bombyx No. 145
Dasychira Pudibunda (P. Bombyx pudibunda Linn.)
1758 Linn. Syst. Nat., Ed. x, P. B. 35
1767 Linn. Syst. Nat., Ed. xii, P. B. 54
Melalopha Curtula (P. Bombyx curtula Linn.) 1684
1758 Linn. Syst. Nat., Ed. x, P. B. 34

[1]All the species of *Phalaena* are numbered consecutively.

[2]Fixes type of *Playtypteryx* Laspeyres. Is a synonym of *Drepana* Schranck.

[3]Ph. (for the Linnean *Phalaena*) appears in the center-heads; but the formal citation of the name is merely "B. Carpini," and so everywhere.

[4]Name used by Stephens in another sense.

1767 Linn. Syst. Nat., Ed. xii, P. B. 52
Hipocrita (sic) *Jacobaeae* (P. Noctua Jacobaeae Linn.) 1717
1758 Linn. Syst. Nat., Ed. x, P. N. 81
1767 Linn. Syst. Nat., Ed. xii, P. N. 111
Hypercompe Caja (P. Bombyx Caja Linn.) 1868
1758 Linn. Syst. Nat., Ed. x, P. B. 22
1767 Linn. Syst. Nat., Ed. xii, P. B. 38
Lachneis Catax (P. Bombyx Catax) 1909
1758 Linn. Syst. Nat., Ed. x, Appendix, p. 822
1767 Linn. Syst. Nat., Ed. xii, P. B. 27
Trichoda Neustria (P. Bombyx Neustria) 1974
1758 Linn. Syst. Nat., Ed. x, P. B. 19
1767 Linn. Syst. Nat., Ed. xii, P. B .35
(preoccupied by Trichoda Müller, 1773)
Eutricha Quercifolia (P. Bombyx quercifolia) 1951
1758 Linn. Syst. Nat. Ed. x, P. B. 8
1767 Linn. Syst. Nat., Ed. xii, P. B. 18
Heteromorpha Caeruleocephala (P. Bombyx caeruleocephala Linn.) 1989
1758 Linn. Syst. Nat., Ed. x, P. B. 38
1767 Linn. Syst. Nat., Ed. xii, P. B. 59

III. *fodicantes*

Teredo Cossus (P. Bombyx Cossus Linn.)[1] 1995
1758 Linn. Syst. Nat., Ed. x, P. B. 40
1767 Linn. Syst. Nat., Ed. xii, P. B. 63
Hepiolus Humuli (P. Noctua Humuli Linn.)[2] 2017
1758 Linn. Syst. Nat., Ed. x, P. N. 62
1767 Linn. Syst. Nat., Ed. xii, P. N. 84

IV. Noctuae I. *bombycoides*

Apatele (sic) *Aceris* (P. Noctua Aceris Linn.) 2041
1758 Linn. Syst. Nat. Ed. x, P. N. 98
1767 Linn. Syst. Nat., Ed. xii, P. N. 137
Diphthera Aprilina (P. Noctua aprilina Linn.)[3] 2050
1758 Linn. Syst. Nat., Ed. x, P. N. 99
1767 Linn. Syst. Nat., Ed. xii, P. N. 138

---

[1]Preoccupied; Linn. Syst. Nat., Ed. x, p. 651.

[2]Fixes type of *Hepialus* Fabr. Syst. Ent. p. 589, 1775. Kirby also marks *humuli* as type of *Hepialus*, but Packard chose the blunt-winged species. Illiger also spells it "*Hepiolus*."

[3]This genus name has been in more or less continuous use, credited to Hübner. If the Tentamen is rejected, I do not know what will be its first valid use; perhaps Sammlung Exot. Schmett., Pl. 193, for *Noropsis hieroglyphica*, a South American form of an entirely different group.

Jaspidia Spoliatricula (P. Noctua Spoliatricula Hübner) 2061
1799 Hübn. Samml. Eur. Schmett. Noctua 26.[1]

II. *genuinae*

Miselia Oxyacanthae (P. Noctua Oxyacanthae Linn.) 2069[2]
1758 Linn. Syst. Nat., Ed. x, P. N. 113
1767 Linn. Syst. Nat., Ed. xii, P. N. 165
Pyrophyla (sic) *Pyramidea* (P. Noctua pyramidea Linn.) 2081
1758 Linn. Syst. Nat., Ed. x, P. N. 119
1767 Linn. Syst. Nat., Ed. xii, P. N. 181
Polia Flavicincta (Noctua flavicincta Fabr.)[3] 2107
1776 Den. and Schiff. Syst. Verz. Noct. H. 2.—(undescribed)
1787 Fabr. Mantissa Insect., Noctua 277
Achatia Atriplicis (P. Noctua Atriplicis Linn.) 2203
1758 Linn. Syst. Nat., Ed. x, P. N. 116
1767 Linn. Syst. Nat., Ed. xii, P. N. 173
Graphiphora Gothica (P. Noctua gothica Linn.) 2248
1758 Linn. Syst. Nat., Ed. x, P. N. 107
1767 Linn. Syst. Nat., Ed. xii, P. N. 159
Agrotis Segetis (P. Noctua Segetum Schiff.)[4] 2280
1775 Schiff. Syst. Verz. Noctua N. 12, Pl. 1a, 1b, fig. 3.
Glaee (sic) *Vaccinii* (Ph. Noctua Vaccinii Linn.) 2318
1761 Linn. Fauna Suecica No. 1212
1767 Linn. Syst. Nat. Ed. xii, P. N. 166
Xanthia Fulvago (Ph. Noctua Fulvago Linn.) 2344
1761 Linn. Fauna Suecica no. 1173
1767 Linn. Syst. Nat., Ed. xii, P. N. 190
Cosmia Affinis (P. Noctua affinis Linn.)[5] 2351
1767 Linn. Syst. Nat., Ed. xii, P. N. 144
Bombycia Or (Noctua or Fabr.) 2358
(1776 Den. and Schiff. Syst. Verz. Noctua T. 5.—undescribed)
1787 Fabricius Mantissa Insect. N. 202

---

[1]Is *Bryophila algae* of later authors according to Staudinger and Rebel. The name appears in the Wiener Verzeichniss, but without description.

[2]In the text of the Verzeichniss it is misprinted "Oxiocanthae," but is correct in Geyer's index.

[3]This name was taken up by Ochsenheimer and Treitschke and has been in continuous use. If the Tentamen is not accepted it may be a very difficult matter to determine the type of later uses. Tr. included *flavicincta*, Hampson chose *cappa*, a member of another subfamily.

[4]This name was taken up by Ochsenheimer, and it is frequently credited to him.

[5]This name was taken up by Ochsenheimer, and is frequently credited to him, but with a different type (*paleacea*, I think).

Heliophila Pallens (P. Noctua pallens Linn.) 2390
1758 Linn. Syst. Nat. Ed. x, P. N. 77
1759 (so given in Fauna Suecica) Clerck Icones Pl. 4, fig. 6
1767 Linn. Syst. Nat. Ed. xii, P. N. 107

Xylena (sic) *Lythoxylea* (P. Noctua lithoxylaea Fabr.) 2416
(1776 Den. and Schiff. Syst. Verz. Noct. K. 2.—undescribed)
1787 Fabr. Mantissa Insect. P. N. *lithoxylaea* no. 299[1]

Tribonophora (sic) *Umbratica* (P. Noctua umbratica Linn.) 2445
1758 Linn. Syst. Nat., Ed. x, P. N. 103
1767 Linn. Syst. Nat., Ed. xii, P. N. 150[2]

Plusia Chrysitis (P. Noctua Chrysitis Linn.) 2496
1758 Linn. Syst. Nat., Ed. x, P. N. 90
1767 Linn. Syst. Nat., Ed. xii, P. N. 126

Erotyla Sulphurea (P. Noctua Sulphurea Schiff.) 2509
1767 Linn. Syst. Nat., Ed. xii, P. Pyralis Sulphuralis No. 333
1775 Schiff. Syst. Verz. Noc. Z. 6. proposes *sulphurea* as a substitute name for *sulphuralis*, under the custom of the time, as the ending —alis was restricted to the Pyralides, and Schiff. transfers it to the Noctuidae.[3]

Antophila (sic, but *Anthophilae*) *Purpurina* (N. purpurina Fabr.) 2527
(1776 Den. and Schiff. Syst. Verz. Noc. T. 9.—undescribed)
1787 Fabr. Mantissa Insect. N. 215

Heliothis Dipsacea (P. Noctua dipsacea Linn.) 2578
1767 Linn. Syst. Nat., Ed. xii, P. N. 185[4]

Ascalapha Lunaria (P. Noctua lunaris Fabr.) 2621
(1776 Den. and Schiff. Syst. Verz. Noc. Aa. 1.—undescribed)
1787 Fabr. Mantissa Insect. P. Noctua 135

Lemur Maura (P. Noctua maura Linn.) 2711
1758 Linn. Syst. Nat., Ed. x, P. N. 88
1767 Linn. Syst. Nat., Ed. xii, P. N. 124
(preoccupied by *Lemur* Linnaeus, Syst. Nat., Ed. x, 1758)

Blepharum Sponsa (P. Noctua sponsa Linn.) 2726
1767 Linn. Syst. Nat., Ed. xii, P. N. 118

Brephos Parthenias (P. Noctua Parthenias) 2745
1761 Linn. Fauna Suecica No. 1160
1767 Linn. Syst. Nat., Ed. xii, P. N. 94

---

[1]Was taken up by Ochsenheimer. Later it was emended to Xylina, and has been constantly used with this spelling.

[2]The spelling is an obvious misprint, and is corrected in the Verzeichniss Bek. Schm. to Tribunophorae. It should not be confused with the Trigonophorae of the Wiener Verz.

[3]A synonym of *Emmelia trabealis* (Scop.)

[4]This name was taken up by Ochsenheimer and has been in continuous use to include *dipsacea*, save for Hampson, who ignores the Tentamen and uses the "first species rule" in selecting types.

Euclidia Glyphica (P. Noctua glyphica) 2752
1758 Linn. Syst. Nat., Ed. x, P. N. 76
1767 Linn. Syst. Nat., Ed. xii, P. N. 105[1]

V. GEOMETRAE I. *amplae*

Hylaea Fasciaria (P. Geometra fasciaria) 2766
1758 Linn. Syst. Nat., Ed. x, P. G. 142
1759 (?) Clerck Icones Pl. 5, fig. 6 (?) (so cited in L. Ed. xii)
1767 Linn. Syst. Nat., Ed. xii, P. G. 216

Terpne Papilionaria (P. Geometra papilionaria Linn.) 2779
1758 Linn. Syst. Nat., Ed. x, P. G. 151
1767 Linn. Syst. Nat., Ed. xii, P. G. 225

Eusarca Elinguaria (P. Geometra elinguaria Linn.) 2802
1758 Linn. Syst. Nat., Ed. x, P. G. 137
1767 Linn. Syst. Nat., Ed. xii, P. G. 211

Lars Sambucaria (P. Geometra Sambucaria Linn.) 2820
1758 Linn. Syst. Nat., Ed. x, P. G. 129
1767 Linn. Syst. Nat., Ed. xii, P. G. 203

Eutrapela Lunaria (P. Geometra Lunaria Schiff.) 2836
1776 Den. and Schiff. Syst. Verz. Geo. F. 7, Pl. 1a, 1b, fig. 4

Erastria Amataria (P. Geometra amataria Linn.) 2904
1758 Linn. Syst. Nat., Ed. x, P. G. 158 (amata).
1767 Linn. Syst. Nat., Ed. xii, P. G. 201 (amataria)
(the name was first changed in the Fauna Suecica no. 1223)

II. *tenues*

Cyclophora Pendularia (Phalaena pendularia (Clerck?)) 2915
1759 (?) Clerck Icones Pl. 7, fig. 5
1761 Linn. Fauna Suecica No. 1244 (cites "Icones")

Spilote Grossulariata (P. Geometra Grossulariata Linn.) (-aria) 2937
1758 Linn. Syst. Nat., Ed. x, P. G. 167
1767 Linn. Syst. Nat., Ed. xii, P. G. 242

Sphecodes Pusaria (P. Geometra pusaria Linn.) 2982
1758 Linn. Syst. Nat., Ed. x, P. G. 150
1767 Linn. Syst. Nat., Ed. xii, P. G. 223

Chleuastes Piniaria (P. Geometra Piniaria Linn.) 2878
1758 Linn. Syst. Nat., Ed. x, P. G. 134
176– Clerck Icones Pl. 1, fig. 10
1767 Linn. Syst. Nat., Ed. xii, P. G. 210

Sciadion Furvata (Phalaena furuata Fabr.)[2] 3019
(1776 Den. and Schiff. Syst. Verz. Geo. I. 1.—undescribed)
1787 Fabr. Mantissa Insect. Phalaena No. 120

Cymatophora Roboraria (Phalaena roboraria Fabr.) 3043
(1776 Den. and Schiff. Syst. Verz. Geo. D. 1.—undescribed)
1787 Fabr. Mantissa Insect. Phal. No. 23

---

[1]Taken up by Ochsenheimer and in continuous use.

[2]Fabr. prints with a *u*, but also in "Laru*a*e liu*i*dae." He uses *v* in "vndata."

III. *aequivocae*

Pachys Prodromaria (Phal. prodromaria Fabr.) 3072
(1776 Den. and Schiff. Syst. Verz. Geo. C. 1.: name proposed for "la printanière" of Geoffroy. I can find no such name in Geoffroy, and suppose it must have been unpublished)
1787 Fabr. Mantissa Insect. Phal. 87[1]

Epirrita Dilutata (Geometra Dilutata Borkhausen) 3100
1794 Borkh. Naturgesch. vol. 5, p. 290, 564
(date?) Hübner Samml. Eur. Schm. Geometrae Pl. 36. fig. 188

Rheumaptera Hastata (P. Geometra hastata Linn.) 3169
1758 Linn. Syst. Nat., Ed. x, P. G. 180
1759 (?) Clerck Icones Pl. 1, fig. 9
1767 Linn. Syst. Nat., Ed. xii, P. G. 254

Hydria Undulata (P. Geometra undulata Linn.) 3182
1758 Linn. Syst. Nat., Ed. x, P. G. 164
1759 (?) Clerck Icones Pl. 6, fig. 3
1767 Linn. Syst. Nat., Ed. xii, P. G. 239

Petrophora Moeniata (Phalaena Moeniata Scop.) ——
1763 Scopoli Ent. Carn. 226, No. 561 (Moeniata)
1776 Den. and Schiff. Syst. Verz. Geo. M. 1. (Moeniaria)

VI. PYRALIDES I. *geometriformes*

Erpyzon Barbalis (P. Pyralis Barbalis Cl.) 3295
1759 (?) Clerck Icones Pl. 5. fig. 3
1767 Linn. Syst. Nat., Ed. xii, Phal. 329 (small *b*)

Salia Salicalis (Pyralis Salicalis Schiff.) 3293
1776 Den. and Schiff. Syst. Verz. Pls. la, lb, fig. 5.

II. *vulgares*

Helia Purpuralis (P. P. purpuralis Linn.) 3344
1758 Linn. Syst. Nat., Ed. x, P. P. 233
1759? Clerck Icones Pl. 9, fig. 10
1767 Linn. Syst. Nat., Ed. xii, P. P. 342

Elophila Limnalis (P. Geometra Lemnata Linn.) 3468
1758 Linn Syst. Nat., Ed. x, P. G. 199 (Lemnata)
1767 Linn. Syst. Nat., Ed. xii, P. G. 278 (Lemnata)
1776 Den. and Schiff. Syst. Verz. Pyr. B. 30. (Lemnalis)[2]

Palpita Urticalis (P. Geometra urticata Linn.) 3451
1758 Linn. Syst. Nat., Ed. x, P. Geometra 195 (Hortulata)[3]
1761 Linn Fauna Suecica no. 1297 (urticata)[3]
1767 Linn Syst. Nat., Ed. xii, P. G. 272 (urticata)

[1]According to Staudinger and Rebel is a synonym of *strataria* Hufnagel.

[2]*Limnalis* was an obvious misprint. The change from *lemnata* to *lemnalis* was in accordance with the custom of the time.

[3]The two citations have identical bibliographic references.

III. *difformes*

Idia Bombycalis (Phalaena bombycalis Fabr.) 3321
(1776 Den. and Schiff. Syst. Verz. Pyr. A. 6.—undescribed)
1787 Fabr. Mantissa Insect. Phal. 268
Chlamiphora Palliola (P. palliolalis Hbn.) 3845
(1776 Den. and Schiff. Syst. Verz. Noct. D. 1.—undescribed)
17— Hübner Samml. Eur. Schmett. pyral. f. 149[1] (palliolalis)

VII. Tortrices I. *lascivae*

Hemerophila Pariana (P. Tortrix pariana Clerck) 3575
17— Clerck Icones Pl. 10, fig. 9
1767 Linn. Syst. Nat. Ed. xii, P. Tortrix 320
Olethreutes Arcuana (P. Tinea Arcuella Clerck) 3586
17— Clerck Icones Pl. 10, fig. 8
1767 Linn. Syst. Nat., Ed. xii, Phal. 296
Archips Oporana (P. Tortrix oporana Linn.) 3775
1758 Linn. Syst. Nat., Ed. x, P. T. 207
1767 Linn. Syst. Nat., Ed. xii, P. T. 292

II. *pigrae*

Nycteola Degenerana (P. Tortrix Degenerana Hbn.) 3837
1793–1827 Hübner Samml. Eur. Schmett. Tortrix 8
Pseudoips Quercana (x. Tortrix Quercana Schiff.) 3843
(Prelinnean) Geoffroy Histoire Abreges des Insectes vol. 2, p. 172 no. 124 "la chappe verte a bande."
1776 Den. and Schiff. Syst. Verz. Tor. A. 1. proposes the name *quercana* for "la Chappe verte a bande" of Geoffroy.
Cochlidion Testudo (Bombyx Testudo Fabr.) 3850
(1776 Den. and Schiff. Syst. Verz. Bom. V. 1.—undescribed)
1787 Fabr. Mantissa Insect., Bombyx no. 116

VIII. Tineae I. *certae*

Canephora Graminella (Tinea Graminella Schiff.) 3854
1764 Geoff. Hist. abr. des Insectes ii, 203 no. 51; "la teigne à fourreau de paille composé."
1776 Den. and Schiff. Syst. Verz. p. 133, 291, proposes the name Graminella for "la teigne à fourreau de paille composé."
1793–1827 Hübner Samml. Eur. Schm. Tin. 1[2]
Enyphantes Gelatella (P. Tinea Gelatella Linn.)
1761 Linn. Fauna Suecica no. 1450

[1]I think there is no doubt in fact of this equation; Hübner having changed the name of the species on transferring it to the Pyralids, in accordance with the rule of the time. It is a synonym of *culculatella* Linn. Tinea no. 258 (ed. xii, no. 376), and has also been placed in the old genus Tortrix.

[2]Listed as a synonym of *vestitella* (*vestita* esp.) in the Verzeichniss. Given as a synonym of *unicolor* Hufn. by Staud. and Rebel.

176– Clerck Icones Pl. 8, fig. 5 (congelatella)
1767 Linn. Syst. Nat., Ed. xii, P. T. 344

Brosis Granella (P. Tinea granella Linn.) 3890
1758 Linn. Syst. Nat., Ed. x, P. T. 259
1767 Linn. Syst. Nat., Ed. xii, P. T. 377

Ses Pellionella (P. Tinea pellionella Linn.) 3869
1758 Linn. Syst. Nat., Ed. x, P. T. 254
1767 Linn. Syst. Nat., Ed. xii, P. T. 372

II. *incertae*

Tetrachila Conchella (Tinea Conchella Fabr.) 3489?
(1775 Schiff. Syst. Verz. Tinea B. 6.—undescribed)
1787 Fabr. Mantissa Insect. Tinea 30[1]

Hyphantes Evonymella (P. Tinea Evonymella Linn.) 3984
1758 Linn. Syst. Nat., Ed. x, P. T. 239
1767 Linn. Syst. Nat., Ed. xii, P. T. 350

III. *mirabiles*

Elasmion Geerella (P. Tinea DeGeerella L.) 4031
1758 Linn. Syst. Nat., Ed. x, P. T. 286
176– Clerck Icones Pl. 12, fig. 3 (degeerella)
1767 Linn. Syst. Nat., Ed. xii, P. T. 426 (DeGeerella)

Coleophora Anatipennella (P. T. Anatipennella Hübn.) 4175
1796 (?) Hübner Samml. Eur. Schmett. Tinea 186

Phyllonorycter Rajella (P. Tinea Rajella Linn.) 4118
1758 Linn. Syst. Nat., Ed. x, P. T. 298
1767 Linn. Syst. Nat., Ed. xii, P. T. 447

IX. Alucitae I. *indubidatae* (sic)

Pterophora Pentadactyla (P. A. pentadactyla Linn.) 4194
1758 Linn. Syst. Nat., Ed. x, P. A. 304
1767 Linn. Syst. Nat., Ed. xii, P. A. 459[2]

Ripidophora Hexadactyla (P. Alucita hexadactyla Linn.) 4196
1758 Linn. Syst. Nat., Ed. x, P. A. 305
1767 Linn. Syst. Nat., Ed. xii, P. A. 460

THE BRONZED CUTWORM (NEPHELODES EMMEDONIA CRAMER) (LEPIDOPTERA).

By S. E. Crumb, *U. S. Bureau of Entomology.*

The mature larva of the bronzed cutworm is described rather fully in the following pages as a contribution toward a classifi-

[1]It is uncertain apparently to which of two closely related species this name belongs.

[2]Fixes type of *Pterophorus* Geoffroy, of which it is an obvious emendation.

cation of noctuid larvae, since this is the only representative of the genus reported from the United States. The other early stages of this common species apparently have not been previously described.

LARVA.

Sixth Instar (Mature) Larva.

In this larva the body is dark brown with a bronzy sheen; there are 3 broad, sharply defined, dorsal pale lines; and the head is concolorous with the dorsum. A remarkable anatomical feature is the absence of seta IIc on the prothorax. This is present a little posterior to seta Ic in all other noctuid larvae which the writer has examined.

Head 4.2 to 4.5 mm. broad. Body about 35 to 45 mm. long and 9 mm. broad; broadening gradually posteriorly to the seventh abdominal segment; skin set closely with small, dark, isolated, round, nearly flat, shining granules; general color dark brown with a distinct bronzy sheen, distinctly paler ventrally. A broad sharply defined but subdued middorsal pale line. Similar broader subdorsal lines. An ill-defined pale line including setigerous tubercle III. A broad waxy white band below the spiracles. Spiracles black. Setigerous tubercles minute, their arrangement as in figure 1. Claw of leg with the base broadly rounded, not at all angulate. Each anterior proleg with about 10 stout crochets. Head concolorous with the dorsum with faint darker reticulation, the ocelli unusually small, III and IV widely separated. Cervical shield black, shining, with 3 equal pale lines. Anal shield black with 3 pale lines.

Mouth Parts.—Spinneret scarcely twice as long as broad, the lateral margins nearly parallel, the apical margin simple, convex (fig. 3). Labial palpus with the segments in the proportionate length of 22 (basal), 4.5, and 16.5. The apical papilla on the basal segment twice as long as the second segment (fig. 5). Mandible large, heavy, with 5 rather ill-defined teeth (fig. 2). Hypopharynx with the fore part densely clothed with spines, much coarser laterally. Lobes of the maxillulae and gorge set sparsely throughout with rather coarse spines. Free margin of the blade of the maxillulae with about 13 coarse, rather short, flat, triangular, toothlike processes. Two of the three setae on the first segment of the maxillary palpus strap-shaped with pointed tips.

Head Setae and Punctures (figs. 4, 6, 7).—A^2 approximately equidistant from A^1 and A^3; A^2 somewhat nearer to A^a than to A^1; A^2 decidedly nearer to A^1 than to P^a; A^a apparently normally about equidistant from A^2 and A^3; A^a nearer to A^2 than to P^a; A^3 slightly less than the ocellar width from ocellus II; line joining the bases of A^3 and O^2 passes through ocellus I; interspace A^2–A^a somewhat less than P^1–P^a; P^a, A^a and A^2 (also A^3) not approximately in a straight line; P^2 decidedly nearer to Adf^2 than to Adf^1 and distinctly above the level of Adf^2; Adf^2 twice as near to P^1 as to P^2; P^b twice as near to P^2 as to P^1; Adf^a about twice as near to Adf^2 as to Adf^1; Adf^2 far above the apex of the front; F^a on the line of F^1; O^1 on the line connecting the centres of ocelli IV and VI; O^2 slightly nearer to A^3 than to O^1; O^2 decidedly nearer to A^3 than to L^1; O^a less than the ocellar width from ocellus VI and nearer to VI than to O^3; ocellus VI slightly nearer to O^1 than to O^3—sometimes equidistant; L^1

about 3 times as near to L^a as to O^2; SO^a distinctly anterior to SO^3, and 3 or more times as near to SO^3 as to SO^2; SO^3 slightly nearer to G^1 than to O^3; G^1 distinctly nearer to O^3 than to SO^3; G^a approximately equidistant from G^1 and O^3; G^1 distinctly nearer to G^a than to O^3; G^1 minute.

Fifth Instar Larva.

Head 3 mm. broad. Body about 27 mm. long and 5 mm. broad, gradually enlarging posteriorly. Coloration as in the mature larva with the pale stripes somewhat more prominent.

Fourth Instar Larva.

Head 2.1 mm. broad. Body about 16 mm. long and 3.5 mm. broad, tapering gradually from the metathorax posteriorly; skin set with minute slightly isolated granules; general color green, finely obscurely flecked with pale, including the venter. With narrow subdued middorsal, subdorsal and subspiracular pale bands, the band below the spiracles suffused with purplish. A deeper green in a band above the spiracles. Head greenish flecked with pale fuscous. Cervical and anal shields concolorous with adjacent parts. Spiracles black. Tubercles and their setae inconspicuous.

Third Instar Larva.

Head 1.2 mm. broad. Body about 13 mm. long and 1.5 mm. broad, tapering from the mesothorax to the blunt posterior extremity; skin set with inconspicuous small, rounded, fuscous granules; general color bright green with subdued white middorsal, subdorsal and subspiracular bands, the latter including a band of purplish. Head white flecked with fuscous. Cervical and anal shields concolorous with adjacent parts.

Second Instar Larva.

Head 0.81 mm. broad. Body about 5 mm. long and 1 mm. broad, tapering gradually to the blunt posterior extremity; skin set very closely with fine longitudinal granules having fuscous borders and somewhat more closely massed along the white markings, upon which they are obsolete; general color pale olivaceous with prominent middorsal, subdorsal, and subspiracular stripes and a pair of lines above the spiracles, white. Spiracles black. Setigerous tubercles of body small, fuscous, their setae brown, about one-ninth the length of an abdominal segment, very slightly enlarged apically. Head white, very conspicuously closely freckled with dark fuscous. Cervical and anal shields nearly concolorous with adjacent parts, flecked with dark fuscous.

First Instar Larva.

Head 0.51 mm. broad. Body about 3 to 5 mm. long and 0.5 mm. broad, gradually tapering from the prothorax posteriorly; skin set dorsally and ventrally with conspicuous, coarse, isolated, rounded, brown, granules; general color whitish to pale olivaceous with middorsal, subdorsal and a pair of supraspiracular lines white, distinct, and a broad white band below the spiracles.

Spiracle dark. Setigerous tubercles all of about equal size, small, dark, their setae heavy, clavate, brown, about one-fifteenth the length of an abdominal segment. Legs pale, the apical segment infuscated. Functional prolegs on abdominal segments 3, 4, 5, 6 and 10. Head pale brown with slightly darker close-set freckles. Cervical shield distinct, brownish with dark margins. Anal shield distinct, large semicircular.

PUPA.

Pupa about 23 mm. long and 8 mm. broad, wing cases and appendage cases coarsely rugulose, spiracles narrow, somewhat oblique, anterior third of movable abdominal segments finely, closely punctured, cremaster a cylindrical process longitudinally rugulose, bearing apically two rather short stout spines.

EGG.

Egg round in outline, broadly elliptical in profile, 0.93 mm. broad and 0.77 mm. high, with about 250 minute ribs which bear very minute isolated papillae, transverse lines not noticeable. A few days after deposition the upper half of the egg becomes more or less marked with pale pink which changes shortly to plumbeous. Eggs deposited October 3 were dissected December 11 and contained fully developed but nearly motionless larvae.

Eggs deposited in September and October do not hatch until January or February, and hatching may continue over a considerable period in eggs which were deposited on the same night. Three larvae hatched on January 20, 1917, from a lot of eggs deposited September 28, 1916, which had been kept outdoors in a moist sunny place. Much snow was on the ground at this time at Clarksville, Tennessee, where these observations were made, and the weather had only just begun to moderate after a protracted cold spell during which the temperature fell to near zero on several occasions. Larvae which hatched on January 31 when the mercury stood at 70° Fahrenheit were subjected almost at once to a falling temperature and on the night of February 2, the temperature fell to 5° Fahrenheit. Although these larvae had had no food since hatching they were still alive on February 8.

It is difficult to conceive of any great advantage the species gains by subjecting this grass-feeding larva to the hardships which its hatching period impose upon it, but it is evident that these larvae possess remarkable qualifications for meeting these difficulties.

DISTRIBUTION.

This species has been reported in some cases as occurring throughout the United States east of the Rocky Mountains, but the records available to the writer indicate that it is limited to the northern portion of this region, with Colorado, Kansas,

Missouri, Tennessee and Virginia marking the approximate southern limit of its range.

FOOD PLANTS.

The larva has a marked preference for grasses and cereal plants as food, but it has been reported as feeding on the buds and leaves of fruit trees.

SEASONAL HISTORY.

The following observations on the seasonal history of the bronzed cutworm are based on conditions at Clarksville, Tennessee. This is a one-brooded species. Larvae begin to mature and enter the soil early in April, and most of them have ceased their activity by early in May, although some are occasionally found until the latter part of May. These larvae, after a long resting period, begin pupating in July, and moths begin to make their appearance about the middle of September and continue on the wing until about the middle of October. Eggs deposited in September and October hatch in January and February.

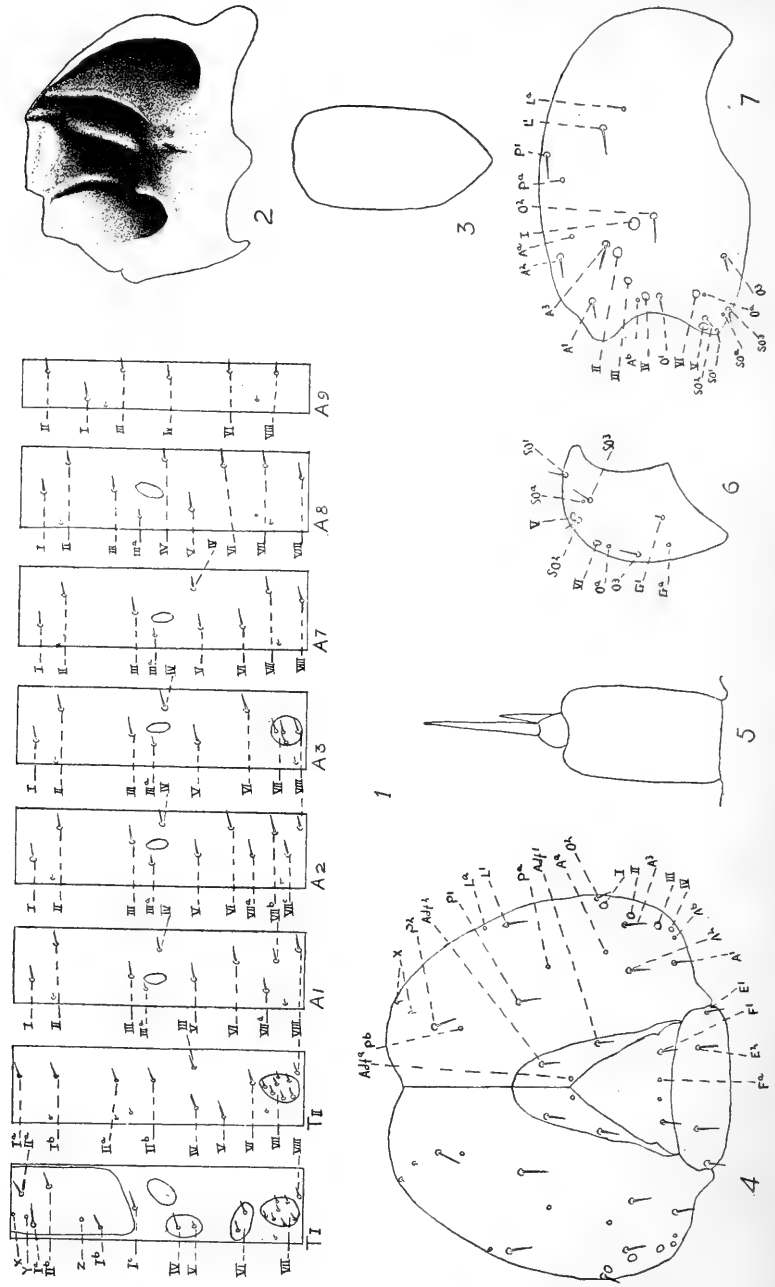
In common with a large group of single-brooded species of the cutworm type, the bronzed cutworm has a period of retarded development in its seasonal history. These species tend to be of northern distribution, and the higher average temperature encountered as they advance into more southern latitudes tends to shorten the time necessary for the completion of the cycle of development. In order that the various features of the seasonal history may be fixed as to seasonal occurrence, the life cycle must be made to occupy a full year. This is accomplished, in the group under consideration, by prolonging the period of retarded development as the species advances southward to compensate for the tendency toward acceleration in development.

This retardation rarely occurs in the adult, but all of the other stages of the insect are utilized commonly in one or another of the species. In the case of the bronzed cutworm, retardation occurs in both the larval and egg stages, about six months of the year being spent in a quiescent state in northern Tennessee.

One surprising result of this slowing-up of the activities of the insect as it advances southward is that the moths emerge in northern Tennessee distinctly later than they do in Canada[1] or Illinois.[2] It will be readily seen that there must be a definite

[1]Gibson, A.—1915. "Cutworms and Their Control," Bulletin No. 10, Entomological Branch, Dept. of Agriculture, Canada, p. 29.

[2]Forbes, S. A.—1904. "The More Important Insect Injuries to Indian Corn," Bull. No. 95, Univ. Illinois Ag. Ex. Sta., p. 360.



CRUMB—THE BRONZED CUTWORM.

limit to the period which the species can occupy in a quiescent state, and therefore there may be a definite southern limit beyond which the species can not maintain itself owing to this fact and owing possibly to abnormalities in the period of emergence as indicated above.

EXPLANATION OF PLATE 2.

Fig. 1.—*Nephelodes emmedonia:* Setal maps of first and second thoracic and first, second, third, seventh, eighth and ninth abdominal segments of larva.
Fig. 2.—*Nephelodes emmedonia:* Mandible of larva.
Fig. 3.—*Nephelodes emmedonia:* Spinneret of larva.
Fig. 4.—*Nephelodes emmedonia:* Head capsule of larva, dorsal view showing arrangement of setae and punctures.
Fig. 5.—*Nephelodes emmedonia:* Labial palpus of larva.
Fig. 6.—*Nephelodes emmedonia:* Head capsule of larva, ventral view of right side, showing arrangement of setae and punctures.
Fig. 7.—*Nephelodes emmedonia:* Head capsule of larva, lateral view, showing arrangement of setae and punctures.

Explanation of Symbols applied to Larva.

A^1, A^2, A^3, A^a, A^b = anterior setae and punctures of epicranium.
Adf^1, Adf^2, Adf^a = adfrontal setae and punctures of epicranium.
E^1, E^2 = epistomal setae.
F^1, F^a = frontal seta and puncture.
G^1, G^a = genal seta and puncture of epicranium.
L^1, L^a = lateral seta and puncture of epicranium.
O^1, O^2, O^3, O^a = ocellar setae and puncture of epicranium.
P^1, P^2, P^a, P^b = posterior setae and punctures of epicranium.
SO^1, SO^2, SO^3, SO^a = subocellar setae and puncture of epicranium.
X = ultraposterior setae of epicranium.
I, II, III, IV, V, VI = ocelli.

NORTH AMERICAN BEES OF THE GENUS PANURGINUS.

BY J. C. CRAWFORD, *North Carolina Department of Agriculture.*

Work of this group of bees was begun several years ago in Washington and is based on the collection of the U. S. National Museum, where the types of the species described in this paper as new are deposited. To this material there is added a species taken during work on the project of a Biological survey of North Carolina.

The key to species includes all those known to the author which are described in the male sex, but two varieties of *P. clypeatus* based on antennal and venational characters are not included.

Genus **PANURGINUS** Nylander.

Synonym.—*Greeleyella* Cockerell,
Birkmania (sic) Viereck.

Although the genotype of *Panurginus* is not well known, in Europe many species have been assigned to this genus. Apparently they are correctly placed and if so, the American species formerly put in the genus *Greeleyella* must be transferred to *Panurginus*. The European subgenus *Epimethia* and also *P. hispanicus* will, I think, have to be excluded. The American species formerly referred to the genus must, as stated by Mr. Charles Robertson, be placed in *Pseudopanurgus*.

Panurginus Nyl. Auct. is easily recognized by the first recurrent vein being either subinterstitial or received by the first cell near apex or by the second cell almost at base. In *Pseudopanurgus* the first recurrent is received by the second cell far from base. In the males of *Panurginus* the eighth sternite is expanded apically and the sixth, which is heavily chitinized has an apical cavity usually bounded by a carina for the reception of the expanded portion of the eighth sternite; in *Pseudopanurgus* the sixth sternite is thin, almost membraneous and medially deeply emarginate or cleft almost to base.

The following key is based on pinned specimens and it should be noted, regarding the process on the sixth sternite, that, in *morrisoni*, it appears much more preapical than when mounted in balsam; also that in *nigrellus* it seems much more deeply emarginate. As the sixth, seventh and eighth sternites show good specific characters, they are illustrated for all the species known to me.

Key to the Males.

1. Face entirely black.....2.
   Clypeus, at least in part, light color.....4.
2. Mesoscutum dull, strongly reticulately lineolated practically all over; process on 6th sternite partly preapical, strongly elevated, slightly emarginate apically, sides strongly reflexed.....*morrisoni*, n. sp.
   Mesoscutum weakly reticulately lineolated only anteriorly, rest smooth and shiny; process of 6th sternite caudad of posterior margin and appearing deeply emarginate apically, sides not strongly reflexed.....3.
3. Process of 6th sternite deeply emarginate, the prongs subparallel thickened and truncate apically.....*nigrellus*, n. sp.
   Process not deeply emarginate (though appearing so in dry specimens), prongs widely divergent and rounded apically.....*atriceps* Cress.
4. All tibiae yellow.....*beardsleyi* Ckll.
   Tibiae dark, at most a yellow stripe on front and hind pair.....5.
5. Mesonotum strongly lineolate, almost impunctate.....*potentillae* Cwfd.
   Mesonotum not distinctly lineolate, distinctly punctured.....6.
6. Mark on clypeus not reaching upper margin and usually confined to a transverse band near apical margin.....*atramontensis*, n. sp.

Clypeus all light except lateral angles ..... 7.

7. Abdomen strongly lineolate, with very weak scattered punctures; lineolation distinct on 2d segment; propodeum mostly covered with fine crowded punctures, at extreme base weakly rugulose ..... 8.
   Abdomen smooth or partly weakly lineolate, with distinct though small punctures, especially on 2d segment where lineolation is not apparent; base of propodeum rugose almost to apex ..... 9.
8. Antennae short, reaching tegulae; 2d joint of funicle wider than long; following joints subquadrate ..... *polytricha* Ckll.
   Antennae reaching beyond tegulae; joints of funicle longer than wide ..... *occidentalis* Cwfd.
9. Process on 6th ventral segment strongly bearded, hind tibiae with a yellow mark beneath basally ..... *bakeri*, n. sp.
   Process on 6th ventral segment not bearded ..... *clypeatus* Cress.

Panurginus morrisoni, new species (Fig. 4).

Male.—Length, 7 mm. Black, with no light markings on face or legs; head and thorax with long dirty whitish pubescence and dull from minute reticulate sculpture that on head above antennae resembles small thimble-like punctures or with less magnification granulations; face sparsely punctured with small shallow punctures which are hardly discernable in the coarse ground roughening; tips of mandibles reddish, crossing over each other only slightly; third joint of antennae slightly longer than fourth, no longer than fifth; mesonotum more shiny than head, sparsely and finely punctured; propodeum dull, dorsal surface with strong granular or fine thimble-like sculpture, truncation with similar but finer and shallower sculpture; wings slightly yellowish, stigma and veins light brown; legs dark brown; abdomen brownish black, shiny, reticulately lineolated.

Type and three paratypes with the record, Stanford University, March, 24, 1910; two paratypes from Strawberry Bend, Corte Madre Creek, near Stanford Univ., Apr. 4, 1915 (Harold Morrison coll.); three paratypes, swept from *Ranunculus* beyond Felt Lake, Stanford Univ., March 4, 1915 (H. Morrison coll.); all from the collection of H. Morrison.

Panurginus atriceps (Cresson) (Fig. 9).

Synonym.—Calliopsis atriceps Cresson.

The U. S. National Museum contains one male from Olympia, Wash., from the Ashmead collection.

This species is very similar to *morrisoni* but is distinguished by the characters given in the key. The third antennal joint is distinctly longer than 4th or 5th, and the mandibles cross each other markedly, reaching over half way from point of crossing to base of opposing mandible; the face is more shiny than *morrisoni*.

Panurginus nigrellus, new species (Fig. 7).

Male.—Length, 6 mm. Similar to the two preceding species but differentiated as indicated in the key; third antennal joint no longer than fifth; mandibles about as in *atriceps*.

Type and 5 paratypes with the record, near Stanford University, California, Strawberry Bend, Corte Madero Creek, April 11, 1915, Harold Morrison, Collector.

Additional specimens as follows:

Near Stanford University, California, Corte Madero Creek, April 4, 1915, Harold Morrison, Collector, 5 specimens; near Stanford University, California, Corte Madero Creek, April 11, 1915, Harold Morrison, Collector, 2 specimens; Corte Madero Creek, May 12, 1915, R. Stinchfield, Collector, on flowers of *Arbutus menzusii;* 1 specimen; near Stanford University, California, Canyon, lower end, April 4, 1915, Harold Morrison, Collector, 1 specimen.

Panurginus beardsleyi (Cockerell) (Fig. 10).

Synonymy.—Greeleyella beardsleyi Cockerell.
Panurginus malvastri Cockerell and Swenk.

This is a species in which the sternites are modified to a remarkable degree.

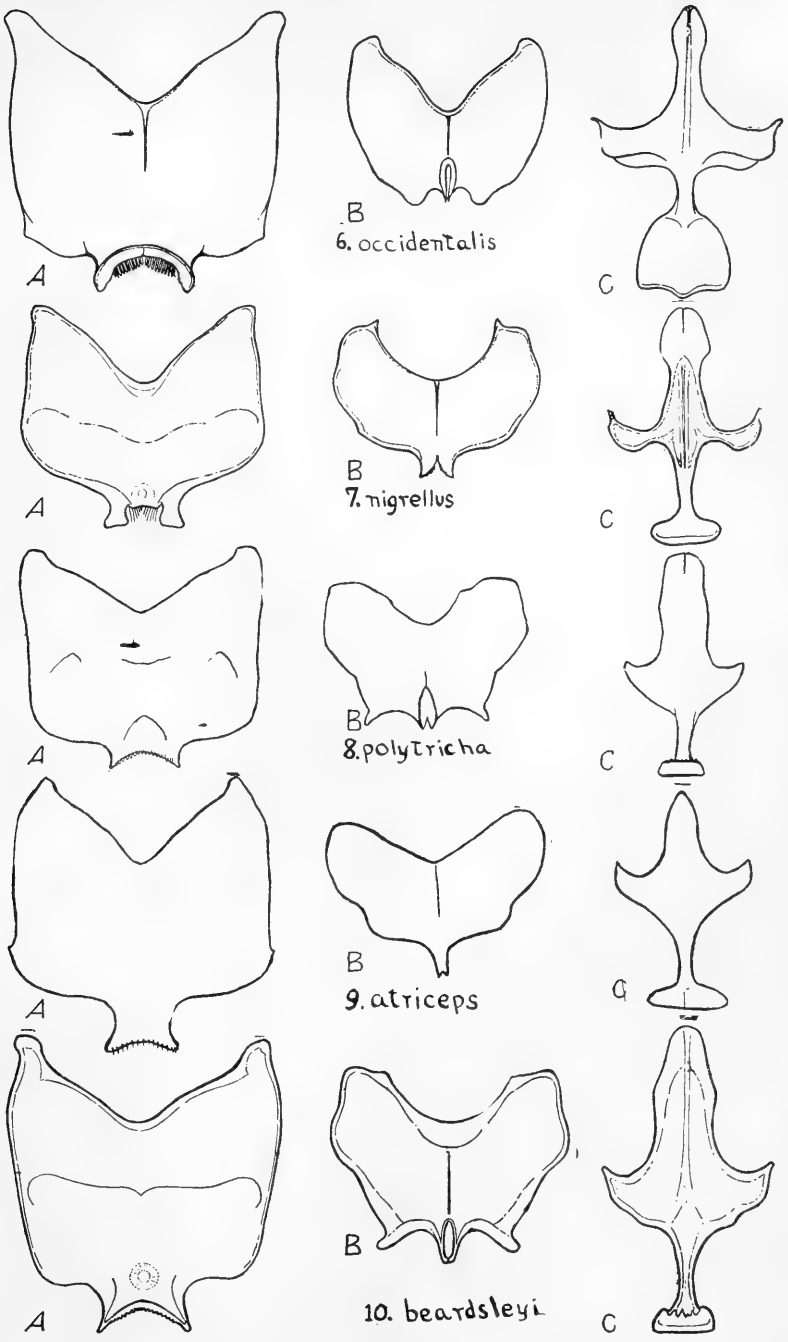
Panurginus potentillae (Crawford) (Fig. 2).

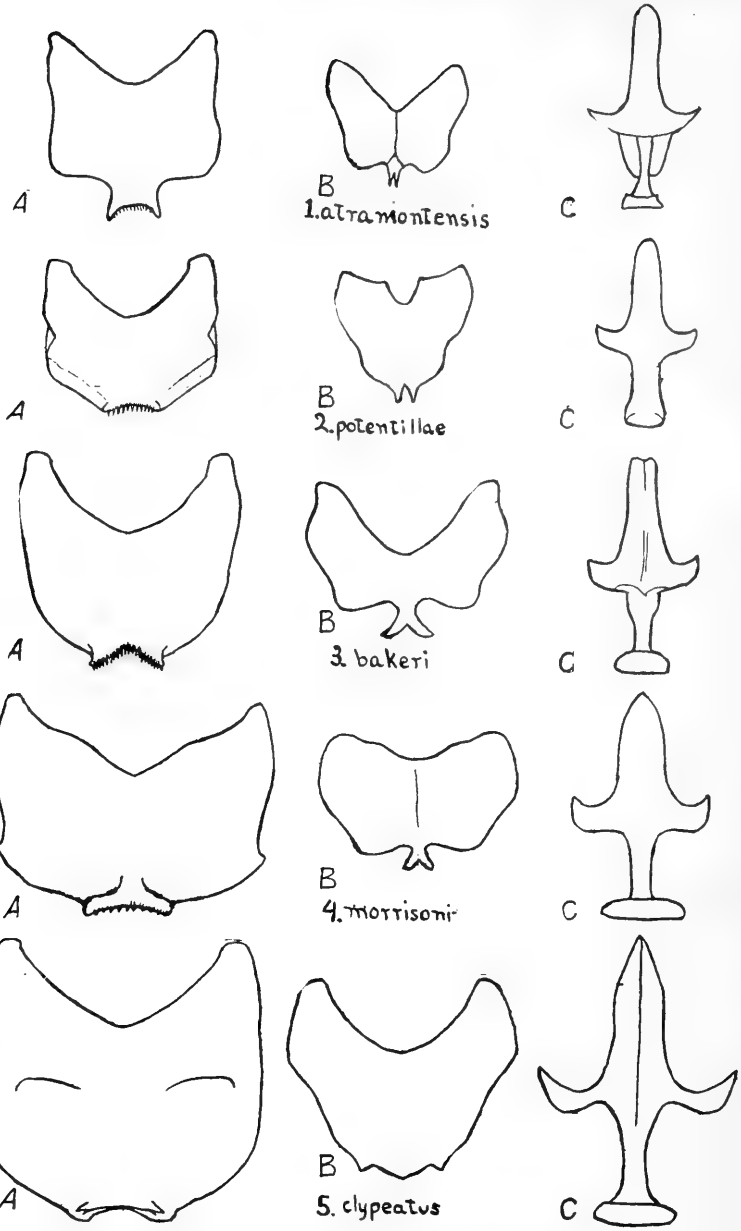
Synonymy.—Greeleyella potentillae Crawford.

The range of this species is considerably extended by the taking of specimens at Raleigh, N. C., and at Bryson City, N. C. Whenever accompanied by flower records, they are always shown to be found on *Potentilla*.

Panurginus atramontensis, new species (Fig. 1).

Type, male. Length, 5 mm. Black, shining, head and thorax thinly clothed with long glittering white pubescence; head with scattered weak punctures; face below antennae smooth; above insertion of antennae tesselate and sparsely punctured, tesselation fading out towards orbits and above eyes where it is entirely smooth and sparsely punctured, as are cheeks; clypeus with a transverse light yellowish mark near apex (in certain paratypes this mark expanded above so as to be triangular); antennae long, about reaching propodeum, flagel reddish beneath; mesonotum polished, sparsely punctured, pleurae tesselated, with scattered fine punctures; base of propodeum with a few irregular rugae reaching apex, rest of surface of propodeum finely tesselate; tegulae dark with a large dark testaceous spot; wings slightly yellowish, stigma and nervures brown, the first and second recurrent nervures received slightly before the transverse cubiti (in some paratypes the first recurrent almost interstitial); legs black, knees and basal joint of fore and mid tarsi ivory color, basal joint of hind tarsi ivory color with a dark brown stripe behind (in certain paratypes practically all brown); apical tarsal joints testaceous; abdominal tergites beyond the first


A
B
6. occidentalis
C
A
B
7. nigrellus
C
A
B
8. polytricha
C
A
B
9. atriceps
C
A
B
10. beardsleyi
C



CRAWFORD—NORTH AMERICAN BEES.

smooth, polished and practically impunctate; first segment, finely tesselated and with fine, scattered punctures, very thinly clothed with short white hairs.

Female. Length, 6 mm. Similar to the male, except in secondary sexual characters and with the pubescence distinctly ochraceous; face entirely black, as is the basal joint of all tarsi but second to fourth tarsal joints very light testaceous; face with a tesselated area below the insertion of each antennae; mesoscutum tesselated along all margins, most apparent at anterior lateral angles; second recurrent nervure practically interstitial.

Type locality.—Swannanoa, N. C.

Described from nine males and one female taken by the author on June 9 and 11, 1924, the type pair in coitu.

Although a careful search was made in the vicinity in which this material was taken flying, no specimens could be found on any flower.

Panurginus polytricha Cockerell (Fig. 8).

Synonym.—Birkmania andrenoides Viereck.

The National Museum contains a long series of this species from the C. F. Baker collection, from Louisiana.

Panurginus occidentalis (Crawford) (Fig. 6).

Synonym.—Greeleyella occidentalis Crawford.

I have seen no material except the original.

Panurginus bakeri, new species (Fig. 3).

Male. Length, 6 mm. Black with long glittering white pubescence; clypeus lemon yellow; face below antennae shiny, sparsely punctured, above satiny from fine roughening; antennae reddish beneath, third joint subquadrate, hardly longer than fourth; mesonotum smooth, shiny, sparsely punctured; pleurae, finely lineolated, shiny; propodeum finely regulose; tegulae dark; wings brownish; veins dark brown; first recurrent vein received by second cubital cell near base, or subinterstitial; legs dark, a stripe on front of fore tibiae, mid knees, basal joint of all tarsi and *a stripe on under side of hind tibiae at base*, lemon yellow; small joints of tarsi becoming more reddish; abdomen somewhat brownish, shiny, sparsely punctate, first segment almost impunctate; process of 6th sternite bearded apically.

Type locality.—Colorado.

Described from 5 specimens from the C. F. Baker collection with the following Baker numbers: 1580, 1581, 1582, 2019.

Similar to *clypeatus* Cresson but differing in the apical ventral plates and easily recognized by the yellow mark on lower edge of hind tibiae at base.

Panurginus clypeatus (Cresson) (Fig.5).

Synonym.—Calliopsis clypeata Cresson.

The variety *calochorti* Ckll. is based on specimens with dark antennae and *verus* Ckll. on specimens with "the deeper mar-

ginal cell, rounded instead of angled at its upper apical corner and the second abdominal segment more closely and evidently punctured."

Panurginus armaticeps Cockerell.

This species is unknown to me in the male sex.

EXPLANATION OF PLATE 12.

Fig. 1.—*Panurginus atramontensis* Crawford: a, 6th sternite; b, 7th sternite; c, 8th sternite.

Fig. 2.—*Panurginus potentillae* Crawford: a, 6th sternite; b, 7th sternite; c, 8th sternite.

Fig. 3.—*Panurginus bakeri* Crawford: a, 6th sternite; b, 7th sternite; c, 8th sternite.

Fig. 4.—*Panurginus morrisoni* Crawford: a, 6th sternite; b, 7th sternite; c, 8th sternite.

Fig. 5.—*Panurginus clypeatus* (Cresson): a, 6th sternite; b, 7th sternite; c, 8th sternite.

EXPLANATION OF PLATE 13.

Fig. 6.—*Panurginus occidentalis* (Crawford): a, 6th sternite; b, 7th sternite; c, 8th sternite.

Fig. 7.—*Panurginus nigrellus* Crawford: a, 6th sternite; b, 7th sternite; c, 8th sternite.

Fig. 8.—*Panurginus polytricha* Cockerell: a, 6th sternite; b, 7th sternite; c, 8th sternite.

Fig. 9.—*Panurginus atriceps* (Cresson): a, 6th sternite; b, 7th sternite; c, 8th sternite.

Fig. 10.—*Panurginus beardsleyi* (Cockerell): a, 6th sternite; b, 7th sternite; c, 8th sternite.

NEW CACTUS BEETLES.

BY W. S. FISHER, *U. S. Bureau of Entomology.*

The beetles described below were obtained in connection with the prickly-pear insect investigations that are being conducted by the Commonwealth of Australia at Uvalde, Texas, and were sent for identifications by Leith F. Hitchcock. Mr. Hitchcock is anxious to have names for these species to use in papers dealing with cactus insects.

Moneilema (Moneilema) nigriventris, n. sp.

Form elongate, moderately convex, only slightly ventricose, and the surface subopaque, black, except the elytra which have a feeble reddish tinge, and each elytron ornamented with an obsolete vitta of very short, white hairs extending from the middle to the apex.

Head slightly depressed between the antennal tubercles, sparsely, minutely punctate, with a few coarser punctures toward the sides, and sparsely clothed with very short, inconspicuous pubescence; clypeal suture impressed, but abbreviated at the sides; antennae about three-fourths as long as the body, rather robust, and gradually tapering to the apex; first joint long, robust, acute externally at apex, and the surface with a few widely separated punctures; fourth joint broadly annulated with whitish pubescence at base, and joints three to five with more or less whitish pubescence on the under side.

Pronotum about one-fourth wider than long, the sides nearly parallel and very unevenly arcuate, and without trace of visible tubercle or spine; sparsely, irregularly punctate over entire surface, and the punctures becoming coarser and denser toward the sides.

Elytra nearly two times as long as wide, regularly oblong-oval, widest near middle, strongly convex, and the flanks rounded and not very abruptly deflexed; sides very broadly rounded at humeral angles, and broadly, transversely sinuate at the tips; surface with feeble, broad, wavy, longitudinal lines (more distinct in female), coarsely, irregularly punctate on basal half, the punctures becoming obsolete on apical half, and somewhat scabrous on the deflexed area near base.

Abdomen feebly convex, smooth, and nearly impunctate; last ventral segment entirely black, broadly, arcuately emarginate at the apex in the male, and broadly rounded in the female; last dorsal segment uniformly black. Legs smooth and not distinctly punctate, and the femora of the female much less inflated than in the male; both sexes with the first three joints of anterior tarsi spongy pubescent beneath; first joint of posterior tarsi not spongy pubescent beneath, the second and third densely so throughout though divided by a very fine line.

Length, male 15 mm., female 20 mm.; width, male 6.5 mm., female 8 mm.

Type locality.—Texas Panhandle (between Dumas and Stratford).

Type and allotype.—Cat. No. 29363, United States National Museum.

Described from two specimens, male type and female allotype collected at the type locality during June, 1926, by Leith F. Hitchcock.

This species is closely allied to *appressa* Leconte, but can be at once distinguished from that species by the entirely black fifth dorsal and ventral abdominal segments, which are more or less red in *appressa*. The labrum is also black in *nigriventris* and not red as in *appressa*.

Moneilema (Collapteryx) mexicanum, n. sp.

Form small, elongate, moderately convex, only slightly ventricose, and the surface glabrous, feebly shining, and uniformly black.

Head rather deeply but obtusely depressed between the antennal tubercles, rather densely, minutely punctate, and with a few vague, coarse punctures in-

termixed; clypeal suture feebly impressed; antennae about two-thirds as long as the body, moderately robust, and gradually tapering to the apex; first joint long, robust, not at all armed, truncate and widest at apex, and densely, minutely punctate; fourth joint feebly, broadly annulated with whitish pubescence at base.

Pronotum only slightly wider than long, the sides nearly parallel, and armed with a short, obtuse tubercle just behind the middle; surface smooth, impunctate, except for a few deep punctures in front of the scutellum.

Elytra nearly one and three-fourths times as long as wide, oblong-oval, widest near middle, strongly convex, and the flanks rounded and not very abruptly deflexed; sides obtusely rounded at humeral angles, and very broadly rounded at the tips; surface obsoletely wavy, coarsely, irregularly punctate except on sutural region posteriorly, and the punctures deeply impressed and widely separated.

Abdomen feebly convex, nearly impunctate, and clothed with a few short, inconspicuous hairs; last segment entirely black, and broadly, arcuately emarginate at the apex. Legs robust, gradually expanded toward the apex, and the surface with a few coarse, vague punctures; first three joints of anterior tarsi spongy pubescent beneath; first joint of posterior tarsi spongy pubescent at the sides, the second and third spongy pubescent throughout.

Length, 13 mm.; width, 5 mm.

Type locality.—Pachuca, Mexico.

Type and paratype.—Cat. No. 29365, United States National Museum.

Described from two males (one type) collected at the type locality during May, 1926.

This species is closely allied to *crassa* Leconte, but it is smaller, more slender, and the pronotum has only a few punctures in front of the scutellum.

Moneilema (Collapteryx) punctipennis, n. sp.

Form short and robust, moderately convex, strongly ventricose, and the surface glabrous, moderately shining, and uniformly black.

Head rather deeply but obtusely depressed between the antennal tubercles, rather densely, minutely punctate, with a few deep, coarse punctures intermixed, especially toward the sides, and clothed with a few short, inconspicuous hairs; clypeal suture deeply impressed, and with a few coarse punctures from which arises a long, stiff, black hair; antennae about two-thirds as long as the body, robust, and strongly tapering to the apex; first joint long, robust, cylindrical, gradually expanded to the apex, which is unarmed, and finely, minutely punctate, with a few shallow, coarse punctures intermixed; joints not distinctly annulated with whitish pubescence.

Pronotum about one-fourth wider than long, the sides nearly parallel, unevenly arcuate, and armed with a distinct short, obtuse tubercle just behind the middle; surface smooth, densely minutely punctate, with a row of deep, coarse punctures along base, and a few widely scattered, coarse, shallow punctures over the surface.

Elytra about one and one-half times as long as wide, oblong, strongly convex, strongly deflexed behind the middle, the flanks abruptly deflexed and vertical; sides nearly rectangular at humeral angles, vaguely, arcuately expanded to near middle, then arcuately narrowed to the tips, which are conjointly, broadly rounded; surface densely, very coarsely punctate except for a small area near the apex, the punctures deep and more or less confluent toward the sides.

Abdomen rather strongly convex, obsoletely punctate, and clothed with a few short, inconspicuous hairs; last segment entirely black, and feebly, broadly, arcuately emarginate at the apex. Legs robust, rather strongly expanded toward the apex, and the surface with a few coarse, vague punctures; coxae ornamented with a distinct spot of densely placed, yellowish white pubescence; first three joints of anterior tarsi spongy pubescent beneath; first joint of posterior tarsi spongy pubescent at the sides apically, the second and third densely so throughout though divided by a very fine line.

Length, 15 mm.; width 6 mm.

Type locality.—Tehuacan, Puebla, Mexico.

Type and paratypes.—Cat. No. 29364, United States National Museum.

Described from three males (one type) collected at the type locality, April 29, 1926, by Leith F. Hitchcock. The specimens examined are quite variable in size, measuring from 12 to 17 millimeters in length, and 5 to 8 millimeters in width.

This species can be distinguished from all other described species of this genus by its having a nearly smooth pronotum and very coarsely, deeply punctured elytra.

Cactophagus spinolae rubronigrum, new variety.

This form is similar to the variety *validus* Leconte in all respects except color. The body above and beneath is of a distinct reddish black color, whereas in *validus* it is uniformly black.

Length, 20–22 mm.; width, 7.5–8.5 mm.

Type locality.—Tehuacan, Puebla, Mexico.

Type and paratypes.—Cat. No. 29366, United States National Museum. Two paratypes returned to Mr. Hitchcock.

Described from six examples (one type) collected at the type locality, April 29, 1926, by Leith F. Hitchcock. At first this form was considered merely as an immature specimen of *validus*, but recently Mr. Hitchcock submitted more material, and in a letter stated that 15 specimens were collected, and that all of the adults seen in that locality were reddish black. Since this seems to be a good color form, and so far as known, restricted to a certain region, it should at least have a new varietal name.

A NEW SATYRID FROM CHINA (LEPIDOPTERA).

By W. Schaus, *U. S. National Museum.*

Palaeonympha avinoffi, new species.

Female.—Palpi white, the second joint with lateral black points, the third with a black streak above, both with long fringe of black and white hairs in front. Thorax black. Abdomen white with transverse black lines. Wings pale olive buff with a very fine terminal black line, the cilia white, dark shaded at base. Fore wing: costa finely black; traces of a double subterminal grayish line; an outer row of oval black spots between veins 2 and 6, the spot above vein 2 small and round. Hind wing: an outer row of five round black spots, the spots at each end reduced to points. Wings underneath: the basal half citrine drab, its edge slightly sinuous, the outer half white; the spots larger with bluish white points on fore wing, and white spots on hind wing; the spots on hind wing broadly edged with cream white and then by a fine lunular dark line; a straighter dark line surrounds the group of spots on fore wing; a dark subterminal line irrorated with silver scales.

Expanse, 38 mm.

Habitat.—Mowchow, Szechuen, China.
Type.—Cat. No. 33125, U. S. N. M.
Collected by D. C. Graham at an elevation of 3000 ft. in July.

Another female has the wings white, the dark basal half of underside more noticeable in transparency; the ocelli reduced in size, the subterminal and terminal lines more conspicuous. On the underside of hind wing the ocelli margined with maize yellow.

Expanse, 42 mm.

Named in honor of Mr. A. Avinoff, Director of the Carnegie Museum.

Actual date of publication, January 15, 1927.

INDEX TO VOLUME 28