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CONTENTS

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NOTICE: All articles for publication and correspondence relating to them should be addressed to the Editor: Dr. J. McDunnough, Entomological Branch, Department of Agriculture, Ottawa.

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EXCHANGES

Subscribers are invited to make liberal use of this column. Notices over three lines are liable to be shortened if necessary. All insertions free to subscribers.

FOR SALE.—Cheap, one set of Junk's Coleopterorum Catalogus. G. C. Crampton, Amherst, Mass.

ARGYNNIS of the world wanted.—In exchange for local species, or by purchase. Samuel P. Hayes, Jr., Amherst College, Amherst, Mass.

WANTED.—Sawflies (Tenthredinoidea) from any country in exchange for duplicates, or insects of other orders. H. H. Ross, State Natural History Survey, Univ. of Illinois, Urbana, Ill.

EXCHANGE OR FOR SALE.—Living pupae A. Io. T. polyphemus C. promethea D. myron P. turnus E tityrus, E. egle. Wanted: Collectors in So. America to Exchange Lep. dup. Jos. N. Lang 1433 So. 59th Ave., Cicero, Ill., U. S. A.

IDENTIFICATIONS WANTED.—We will be glad to divide our specimens in many families of the different orders of insects with specialists who can give us accurate identificatons on the ones returned. H. E. Jaques, Iowa Wesleyan College, Mt. Pleasant, Iowa."

EPHEMERIDAE desired from all parts of North America. Will determine for privilege of retaining duplicates. J. McDunnough, Entomological Branch, Department of Agriculture, Ottawa.

WANTED FOR CASH.—Citheronia sepulcharlis, Papilio nitra. F. E. Zeissig, Lock Box 139, Ware, Mass. U. S. A.

EXCHANGE OR FOR SALE.—South American also Java, Borneo, Celebes Butterflies in lots by 12, 50 or 100 monthly arrivals. Wish for revisional study all North American Parnassius and Arctidae also Apantesis communicate with Mrs. Emma Kessler, 499 Manhattan Ave., New York City.

CICADELLIDAE, Hemiptera. Wish to exchange local insects for leafhoppers. Paul N. Musgrave, 601 Walnut Ave., Fairmont, W. Va.

WANTED—Everes comyntas and amyntula from all parts of North America by purchase or exchange for local lepid. Dr. Edwin P. Meiners, 6600 Delmar Blvd. St. Louis, Mo.

Pselaphidae and Scydmaenidae from all regions of earth especially tropics, wanted for cash, exchange, or det.; will give collectors going to tropics instructions for obtaining them. F. C. Fletcher, 1766 James Ave. So., Minneapolis, Minn. U. S. A.

CATOCALAE.—Information wanted as to habits of the larvae, pupae, and adults; especially, where they spend the day, food or other attraction, earliest and latest dates of capture. Can offer many desirable species of Catocala and other Lep. in exchange.—A. E Brower, 508 Stewart Ave., Ithaca, N. Y.

CATOPINI.—Catops (Choleva), Prionochaeta, Ptomaphagus. Wanted to borrow all possible specimens of these genera from North America for a revisional study. Correspondence solicited. Melville H. Hatch, Dept. of Zoology, Univ. of Wash,, Seattle, Wash.

ICHNEUMONIDAE.—Especially of the Tribe Phaeogenini. Will exchange for specimens of other orders, or purchase. Andrew R. Park, Jr., 308 Romine Street, Urbana, Illinois.

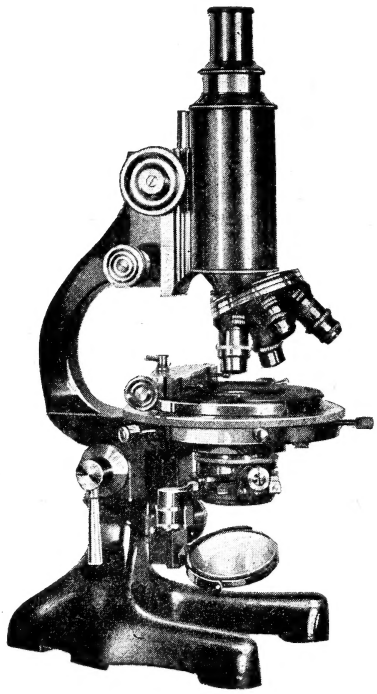
INFORMATION WANTED.—Concerning the distribution, food-plants, length of periods in development, and habits of Pseudolucanus placidus Say. (Lucanidae, Coleoptra). Correspondence solicited. Lorus J. Milne, 92 Quebec Ave., Toronto 9, Ont., Can.

PTILIIDAE of the world wanted for study; will determine for privilege of duplicates and paratypes. Correspondence solicited. Eugene Ray, 1951 Evergreen Avenue, Chicago, Ill.

ORTHOPTERA of the Desert Region of South-Western Texas given in exchange for Orthoptera from other Regions of North America. E. R. Tinkham, Box 242, Presidio, Texas, U. S. A.

MICROSCOPES

By STEINDORFF



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The Canadian Entomologist

LXII. ORILLIA, JANUARY, 1930. No. 1.

THE FIRE BRAT, *THERMOBIA DOMESTICA* PACKARD, (LEPISMIDAE) IN CANADA.

BY G. J. SPENCER,
University of British Columbia.

The Fire Brat, *Thermobia domestica* Packard, seems to have been in Eastern Canada for some time. Since, as its nick-name indicates, it is a heat-loving species, favouring steam-heated buildings, it has probably been established in the country for a long time although the records of its distribution in Canada are few and are all fairly recent.

My records of the distribution of the species across the country are as follows:—

In the winter of 1915/16 I investigated an outbreak in a hospital in Toronto, where it occurred in considerable numbers in food and passenger elevator shafts running to the basement. Recommendations for its control were advocated and no further complaints were received.

The next infestation was reported to me when I was out of the Province of Ontario in winter 1923/24, by Mr. Caesar who found it in great numbers in certain bake-houses in Guelph.

Coming westwards, Dr. O'Donoghue of the University of Manitoba reported it to me in the summer of 1925 as having been found the previous winter for the first time, in the buildings of the University in Winnipeg, where a few specimens had been captured.

In the winter of 1926/27 I received a complaint about it from Saskatoon where it had just been picked up for the first time, in considerable numbers.

During the winter of 1927/28 I was again in Toronto and made a point of visiting the hospital where it had been in 1916. It was still present in the hospital but only in one of the storerooms in the basement. A thin brick wall separated the storeroom from the kitchens, whose extensive cook stoves lined practically the whole length of the wall. While no fire brats were found in the kitchens, they occurred freely on the wall in the other room which was warmed by the heat of the stoves. None were found in the elevator shafts where they had been found twelve years previously. The insect was found also, though in very limited numbers, in the basement of the Biology building of the University of Toronto. However, in the basement of the Royal Ontario Museum it occurred in great numbers in several rooms, on the sides warmed by steam pipes. This infestation in the museum was particularly interesting, in that the insects were of a markedly darker pattern than those found hitherto—exhibiting, apparently, a melanic race. Sufficient work has not yet been done on this race to show that it is anything but a colour variation. It has been kept continuously in cages since that time both in pure and in mixed colonies, and the dark colour pattern still persists. Experiments are under way to prove whether the two strains will inter-breed or not. I am of the opinion that they will.

All other records, before and after this one of the museum, are of the lighter colour pattern.

During this same period of 1927/28, I found it both in Ottawa in steam heated public buildings, and in Guelph in the same bake-houses where Mr. Caesar had taken it in 1923/24.

In the autumn of 1928 I got the first record of it in Vancouver where it had made its appearance in small numbers in laundries of one of the hospitals. Officials declared that this was the first time that it had occurred there.

I have worked out the life-history and reactions of this insect fairly thoroughly and the findings are being published elsewhere. Nevertheless, a few comments are in order here. It is a creature of circumscribed surroundings, favouring hot, damp locations such as the neighborhood of steam pipes and furnaces in dark basements. Temperatures of 90° F. to 110° F. suit it best. It is negatively heliotropic, especially in early instars. It passes through at least fourteen instars before becoming adult and apparently can moult indefinitely for the rest of its life if necessity arises.. Its particular foods are farinaceous substances, certain animal and vegetable glues and most particularly, dried lean meat. Possibly its greatest point of life-history interest is that there is no copulation between sexes; fertilization occurs by the female picking up from the floor a spermatophore deposited by the male after a more or less prolonged "love dance," thus bringing to mind the somewhat similar habits of *Geophilus* of the Chilopods and certain tailed Amphibians. It is the simplest type of fertilization amongst insects, being even more primitive than that of some of the Tettigoniidae.

When present in large numbers, it proves a pest of considerable importance, attacking many starchy products, surfaces of certain glazed papers, and glues. When it occurs in a dwelling house, its habits are very much like those of the German cockroach.

STUDIES IN THE SCARABAEIDAE (IV).*

BY W. J. BROWN,
Ottawa, Ont.

Aphodius smithi n. sp.

Length 6-6.3 mm.; width 2.6-2.7 mm. Oblong, moderately convex and elongate, parallel. Black; the legs and elytra very dark reddish brown, almost black; shining.

Head almost three-fourths as wide as the pronotum; moderately convex; without trace of tubercles; rather sparsely, very finely punctulate, the punctules very indistinct at middle. Clypeus broadly and shallowly emarginate, the angle on each side very broadly rounded. Genae moderately prominent, rectangular, fimbriate.

Pronotum two-thirds as long as wide; the angles obtuse and broadly rounded; the sides broadly, feebly explanate and feebly arcuate; base without trace of marginal line; pronotal disk with a deep depression before each hind angle; pronotal puncturation intermixed, the smaller punctures sparse, very indistinct, regularly distributed; the larger punctures coarse, confined to the sides

*—Contribution from the Division of Systematic Entomology, Entomological Branch, Department of Agriculture, Ottawa.

and basal third, sparse and irregular in distribution except in the depressions at the hind angles where they become confluent. Scutellum very finely, rather closely punctate.

Elytra at base slightly narrower than the pronotum, the sides feebly arcuate; humeri obtuse. Elytral disk finely striate, the striae finely and closely punctate; intervals very feebly convex, sparsely and very finely punctate, the punctures scarcely more distinct near the sides.

Mesosternum alutaceous, the intercoxal process not carinate. Metasternum punctate throughout, the sides alutaceous and more coarsely and closely punctate.

Abdomen alutaceous, closely and rather coarsely punctate. Ventral face of anterior femur with a few hair-bearing punctures; the tibia strongly tridentate, its margin feebly crenate above the upper tooth. Middle and hind femora very finely and sparsely punctate, each with a few coarse punctures. First segment of posterior tarsus slightly shorter than the three following.

Female.. Anterior tibial spur rather stout, strongly incurved, the apex acute. Minor spur of middle tibia about half as long as the major, the apex simple and acute.

Holotype.—♀, Copper Mountain, B. C., October 27, 1929, on snow, (G. Stace Smith); No. 3111 in the Canadian National Collection, Ottawa

Paratype.—1 ♀, same data, October 30, 1929.

This species is very closely allied to *socialis* and is distinguished by the larger size, deeper pronotal impressions, and the form of the anterior tibial spur which is more slender and feebly curved posteriorly in *socialis*.

Ataenius floridanus n. sp.

Length 4.5 mm.; width 2.1 mm. Elongate, subparallel, moderately convex. Black, shining.

Head seven-tenths as wide as pronotum; vertex coarsely and closely punctate, the median line narrowly impunctate; front very finely and sparsely, indistinctly punctate; clypeus impunctate, with feeble traces of rugae, depressed before the anterior margin, the latter broadly, not deeply emarginate, the margin on each side rounded; lateral margins of clypeus broadly arcuate.

Pronotum two-thirds as long as wide; side margins when viewed from above parallel, distinctly crenate; angles broadly rounded; basal margin arcuate, with marginal line. Pronotal disk without impressions; the puncturation coarse, very dense on the sides, sparse at base of median area, gradually becoming more sparse and fine anteriorly, the median area with sparse, very fine punctures throughout.

Elytra subequal in width to pronotum; the sides almost parallel; humeri dentate. Striae rather fine, with rather close punctures; the internal intervals with their inner margins moderately crenate by the strial punctures, feebly convex and impunctate, becoming cariniform and finely punctate on the apical declivity; external intervals with the inner margins strongly crenate, except for the tenth more convex, the eighth with a row of fine punctures on each side, the ninth and tenth with close, more or less confused, rather coarse punctures.

Metasternum at middle sulcate, with a group of several coarse punctures on each side behind each coxa. Abdomen rather coarsely punctate throughout, the

punctures coarser and closer on the sides. Middle femora with coarse punctures near the apices. Hind femora virtually impunctate, the marginal lines strong, extending from apex three-fourths to base. Posterior tibia with a large accessory spinule, the longer spur equal in length to the first tarsal segment.

Holotype.—Florida, No. 3039 in the Canadian National Collection, Ottawa.

This species is a member of the *cognatus* group and falls nearest *inquisitus*. It differs from the latter by the feebly sculptured clypeus, densely punctate pronotal sides, and long femoral marginal line.

Ataenius oklahomensis n. sp.

Length 3.7 mm.; width 1.7 mm. Elongate, subparallel, moderately convex. Black, shining.

Head three-fourths as wide as pronotum; vertex moderately finely and closely punctate; puncturation of the front finer, sparse; clypeus very finely and sparsely and very indistinctly punctate, rather strongly depressed before the anterior margin at middle, the latter broadly, not deeply emarginate; the margin on each side of the emargination broadly rounded and with a small, triangular, reflexed tooth; lateral margins of clypeus broadly arcuate.

Pronotum seven-tenths as long as wide; front angles broadly rounded; side margins when viewed from above parallel in apical three-fifths, then oblique and strongly converging to base, this oblique portion distinctly crenate; hind angles obliterated; basal margin arcuate, not sinuate, with a strong marginal line. Pronotal disk without impressions; the puncturation coarse, very dense on the sides, close at middle near base and gradually becoming sparse anteriorly, these coarse punctures not quite attaining the anterior margin, the median area with sparse, very fine punctures throughout.

Elytra very slightly wider than the pronotum, the sides feebly arcuate; humeri moderately dentate. Striae coarse and deep, with well spaced transverse punctures which strongly crenate the internal margins of the intervals; intervals feebly convex on the disk, becoming cariniform on the apical and lateral declivities, apparently impunctate but with a few microscopic punctures.

Mesosternum densely punctate, opaque, a polished carina between the coxae. Metasternum coarsely and sparsely punctate at middle, the median line narrowly sulcate. Abdomen coarsely, rather closely punctate throughout. Middle and posterior femora with numerous punctures, their marginal lines deep and entire. Posterior tibia with a small but distinct accessory spinule; first segment of posterior tarsus slightly but distinctly longer than the longer tibial spur.

Holotype.—Payne Co., Oklahoma, Aug. 15, 1926, (W. J. Brown); No. 3038 in the Canadian National Collection, Ottawa.

Paratype.—1 specimen, same data, April 28, 1926.

This species falls near *lucanus* in Horn's table. Its closest ally is *lecontei* in which the elytral intervals are punctate and accessory spinules are absent.

Ochodaeus gnatho Fall.

♀ *Ochodaeus nimius* Fall.

Ochodaeus nimius Fall is evidently the female of *gnatho*. I have seen specimens of both from the type locality, Mesille Park, N. M. In the male, the basal portion of the mentum is produced ventrad to form a thin, wedge-like process, the

mandibles are elongate, the head wider, and the front slightly more concave. In the female, the mentum bears no process and the mandibles are much shorter. There is perfect agreement in all other characters. As in some other species, the size in quite variable; the series at hand measures from 5.3 mm. to 7.6 mm. in length.

In all species of *Ochodaeus* that I have seen, the sexes may be separated by the form of the abdomen. In the males, the median line of the abdominal venter is broadly and slightly but distinctly flattened. In the females, the abdomen is evenly convex.

Ochrosida subvittata n. sp.

Male. Length 11-14 mm.; width 6-7.7 mm. Oval, moderately convex. General color testaceous; the head between the eyes, extreme apices of femora and tibia, and external margins of anterior tibiae black; clypeus, apical segment of abdomen, and tarsi rufous; pronotum with a faint rufous cast, a small spot near each lateral margin and sometimes a small area on each side of middle near apex slightly darker; each elytron with internal third and humeral umbone brownish this dark area not sharply limited and sometimes extended to include the entire disk except a broad submedian area which may be interrupted; pygidium dark brown or blackish, usually paler at base and apex; venter pale testaceous, without a rufous cast. Entire surface except the clypeus with conspicuous yellow hairs.

Head three-fifths as wide as the pronotum; the clypeus two-thirds as long as wide, the sides parallel in basal half, the apex truncate, the angles very broadly rounded, densely punctate, the punctures coarse and very shallow; front moderately coarsely and closely punctured.

Pronotum two thirds as long as wide; rather coarsely, moderately closely punctured, the punctures somewhat irregular in distribution, the median line impunctate at middle; the basal marginal line fine, usually broadly interrupted at middle.

Elytral sculpture of the usual type. Penultimate abdominal segment slightly but distinctly longer than the two preceding united.

Holotype.—♂, Choctaw Co., Okla., July, (G. A. Bieberdorf); No. 3112 in the Canadian National Collection, Ottawa.

Paratypes.—8 ♂, same data.

This species is closely allied to *nigricollis* and appears to differ only by the paler color, the slightly larger size, and the longer pentultimate abdominal segment. Before me are four specimens of *nigricollis* from the series described by Mr. Buchanan (Ent. News, XXXVIII, 166). In these, the length of the penultimate abdominal segment is equal to that of the two preceding united and the color is much darker; the pronotum and ventral surface are distinctly rufous and the elytra are reddish-brown throughout.

Euphoria fuscocyanea Csy.

This is evidently a southwestern subspecies of *fulgida* Fab. and is usually confused with the latter in collections. In *fuscocyanea* the abdomen and pygidium do not always lack tomentose spots as in Casey's single type; these spots are usually more or less developed and are sometimes as numerous and as large as in typical *fulgida*. Nor is *fuscocyanea* always blue throughout; in some examples, only the elytra have a slight bluish cast. In the Wichita Mountains of Oklahoma, *fuscocy-*

anea occurs abundantly with typical *fulgida,* and the specimens I have collected there present a perfectly graded series from typical *fulgida* to well characterized *fuscocyanea.*

RECORDS OF HETEROPTERA FROM NOVA SCOTIA.

BY J. R. DE LA TORRE-BUENO,
White Plains, N.Y.

Mr. C. A. Frost, the coleopterist, to whom of recent years I have been indebted for many interesting and, indeed, rare Heteroptera, has again favored me with some unusual species taken by him this summer (1929), in Nova Scotia. Portaupique, so I learn from Mr. Frost, is on the North shore of Minas Basin, 30 miles west of Truro; Westchester is up in the hills at a lake in the spruce woods.

As might be expected, the general character of the bugs is northern, as indicated by the presence of the rare *Dictyonota tricornis* var. *americana* Parshley, *Corizus crassicornis* and *Nabis flavomarginatus.* Otherwise, the species are those usual in North Eastern North America, largely of the Transition Zone, such as the common and widespread *Euschistus tristigmus* and *Cosmopepla bimaculata.*

The species before me are:

Euschistus tristigmus Say, 2 from Portaupique, July 24 and 25 respectively; and 2 from Westchester, July 31. These are new localities for the species.

Cosmopepla bimaculata Thoms., 3 from Portaupique, July 23; and 2 from Penobsquis, July 20. These also are new localities.

Meadorus lateralis Say, 1 specimen from Portaupique, July 24, a new locality and the second record from Nova Scotia.

Podisus serieventris Uhler, 1 from Portaupique on July 23 and another from Westchester on the 27th, both additional reports from Nova Scotia, from new localities.

Podisus modestus Dallas, Portaupique July 22, a single specimen from a new locality.

Corimelaena nitiduloides Wolff, not heretofore recorded from Nova Scotia, 1 from Portaupique, July 27.

Schirus cinctus P. B., 1 from Portaupique, July 21, a new locality.

Corizus crassicornis L., Portaupique, one on July 27 and another on the 22nd; new locality.

Ligyrocoris sylvestris L, Westchester July 25.

Dictyonota tricornis var. *americana* Parshley, 1 from Portaupique July 27 and another from Westchester, July 25. These are two new localities for Nova Scotia, and apparently the third reported records.

Corythucha elegans Drake, 4 from Portaupique, July 27. It would seem that this is the first record of this species from the Province.

Anthocoris borealis Dallas, one adult and one nymph from Portaupique, July 22. These are unusually large for the species. Another new locality.

Pegasa fusca Stein, Portaupique, 2 taken on July 27 and one on the 30th. Does not seem to be known from N. S.

Nabis flavomarginatus Scholtz, a specimen from Portaupique, July 22; a new locality.

Gerris marginatus Say, male and female from Portaupique, July 31.
Gerris rufoscutellatus Latreille, one teneral specimen, July 31.
Salda coriacea Uhler, 1 of the shortwinged form, Penobsquis, July 20.
Saldula orbiculata Uhler, same data, one specimen.
Microvelia americana Uhler, Portaupique July 27.

The five species above appear not to have been reported from Nova Scotia.

All the previous records of these species and the absence of certain of them, have been derived from Parshley's paper in Proc. Acadian Ent. Soc., for 1922, No. 8, pages 102-3, entitled "Records of Nova Scotian Hemiptera Heteroptera."

NEW WEST INDIAN BUPRESTIDAE AND CERAMBYCIDAE. (COLEOPTERA).

BY W. S. FISHER,

Bureau of Entomology, U. S. Department of Agriculture.

In working over material received for identification from S. C. Bruner and G. N. Wolcott, the following new species were found.

Chrysobothris haitiensis n. sp.

Female.—Small, short, rather robust, feebly convex, and subopaque; above dark brown, with a rather distinct olivaceous reflection, and each elytron ornamented with small, round, depressed bright green spots as follows: one in basal depression, one at middle, and the other at apical third. Beneath dark brown, slightly more shining than above, and with a feeble cupreous and aeneous tinge in certain lights.

Head slightly convex, with the front triangular, the sides feebly, arcuately expanded, and strongly converging toward the top; surface without longitudinal carinae or transverse elevations on the vertex and occiput, finely, densely granulose, rather densely, coarsely punctate, and sparsely clothed with moderately long, semierect, inconspicuous hairs; eyes large, strongly convex, slightly more acutely rounded at bottom than at top, and separated on the occiput by one-half of the distance between the antennal cavities; epistoma deeply, broadly, triangularly emarginate in front, with the lobe on each side arcuately rounded; antennae short, and the third joint about as long as the following two joints united.

Pronotum strongly transverse, twice as wide as long, distinctly narrower at apex than at base, and widest just behind middle; sides strongly obliquely expanded from apical angles to middle, then regularly, arcuately rounded to the posterior angles; anterior margin slightly, arcuately emarginate, and without a median lobe; base rather strongly bisinuate, the median lobe broadly rounded, and broadly, transversely truncate in front of scutellum; surface evenly convex, and without depressions, very finely, densely granulose, coarsely, rather densely, irregularly punctate, the punctures well separated except near the posterior angles, where they are more or less confluent. Scutellum small, triangular, the sides equal in length, and the surface vaguely granulose.

Elytra distinctly wider than pronotum at base; sides broadly rounded at humeral angles, nearly parallel to behind the middle, then strongly, arcuately nar-

rowed to the tips, which are separately, rather narrowly rounded; lateral margins feebly, coarsely serrate to near the middle; humeri slightly elevated; base strongly angularly lobed; disk without longitudinal costae, but with small, deep basal depressions, and a shallow depression on each side near the humeri; surface densely, finely granulose, and rather densely, coarsely punctate.

Abdomen beneath densely, finely granulose, coarsely punctate, with the anterior and posterior margins of the segments smooth, and the surface sparsely clothed with long, recumbent, cinereous hairs; first segment not depressed at middle; last segment with the lateral margins entire except at the apex, where there is a small emargination on each side, the apex broadly rounded, and without a distinct submarginal ridge. Prosternum with a narrow, obsolete lobe in front, and the surface sparsely, coarsely punctate; prosternal process flat, broadly, triangularly expanded behind the coxal cavities, and with a small tooth at the middle of the apex. Femora robust; anterior pair with a large acute tooth on the outer margin, slightly closer to apex than base, and not serrate on the exterior margin. Anterior tibiae feebly arcuate, slightly flattened on inner surface, and without any dilatations; middle and posterior pairs straight and subcylindrical.

Length, 5.6 mm.; width, 2.8 mm.

Type locality.—Manville, Haiti.

Type.—Cat. No. 42162, U. S. N. M.

Described from a unique female collected at the type locality, April 5, 1926, by G. N. Wolcott.

This species is allied to *sexfasciata* Schaeffer and *insulana* Fisher. In my table to the species of this genus in A Revision of the West Indian Coleoptera of the Family Buprestidae (Proc. U. S. Nat. Mus., vol. 65, 1925, Art. 9, p. 93), this species runs to number 17, but it differs from *sexfasciata*, as well as *insulana*, by being of a uniform olivaceous brown color above, and each elytron is ornamented with three round, deeply depressed bright green spots.

Taphrocerus bruneri n. sp.

Rather broadly elongate, strongly attenuate posteriorly, moderately convex above, strongly shining, uniformly brownish black above and beneath, with a distinct aeneous tinge (head and pronotum slightly more olivaceous in some examples), and without pubescent spots.

Head distinctly narrower than pronotum at base, and when viewed from above is transversely truncate in front, and broadly, feebly concave at middle; front wide, feebly, broadly concave between the eyes, the lateral margins parallel, and with a narrow, vague, longitudinal groove extending from the epistoma to occiput; surface densely, vaguely granulose, coarsely, sparsely, irregularly punctate, and irregularly clothed with a few very short, cinereous hairs; eyes large, elongate, moderately convex, more acutely rounded beneath than above, but not projecting beyond sides or front of head; epistoma slightly elevated, nearly semicircularly emarginate in front, and the surface finely reticulate.

Pronotum moderately convex, nearly twice as wide as long, apex distinctly narrower than base, and widest near basal third; when viewed from above the sides are feebly, arcuately expanded to just behind the middle, where they are broadly rounded, then vaguely narrowed to the posterior angles, which are

obtusely angulated; anterior margin vaguely rounded; base transversely truncate to middle of elytron, then extending obliquely backward to the scutellum, in front of which it is feebly, arcuately emarginate; surface with a few vague, irregular depressions, finely, densely granulose, coarsely, sparsely, irregularly punctate, and clothed with a few short, inconspicuous hairs toward the sides. Scutellum triangular, rounded in front, strongly acuminate behind, and the surface nearly smooth.

Elytra about as wide as pronotum at base, and equal in width at base and middle; humeral angles obtusely angulated; sides broadly, arcuately constricted in front of middle, broadly, arcuately expanded at middle, then strongly, obliquely narrowed to the tips, which are broadly, conjointly rounded, and coarsely, irregularly serrate; humeri rather strongly developed; disk rather strongly convex, with broad, shallow, tranverse basal depressions, but without lateral carinae; surface with indistinct rows of coarse, shallow punctures, the punctures distinct in the basal region, but becoming indistinct toward the apex, the intervals nearly smooth, vaguely rugose, and very sparsely clothed with short, inconspicuous hairs.

Abdomen beneath moderately convex, coarsely, sparsely punctate, the punctures very shallow, oblong, open posteriorly, and each puncture bearing a very short, recumbent, cinereous hair; intervals vaguely reticulate; last segment broadly rounded at apex, feebly flattened, with the apical groove parallel to the margin but not extending to it.

Length, 4.6 mm.; width, 1.5 mm.

Type locality.—Central Baraguá, Camaguey Province, Cuba.

Type and paratypes.—Cat. No. 42163, U.S.N.M. *Paratypes.*—In the collection of S. C. Bruner.

Described from six examples collected by sweeping low herbage along the coast south of "Central Baraguá," a large sugar mill in Camaguey Province, just south-east of Ciego de Avila, July 26 and 27, 1927, by C. F. Stahl and S. C. Bruner.

This species is closely allied to *aeneocupreus* Fisher, but that species differs from *bruneri* in being more cupreous, front of head not concave between the eyes, epistoma narrower and more broadly emarginate in front, eyes slightly projecting beyond the sides of head, pronotum equal in width at base and apex, widest at the apical third, and the surface transversely depressed along the anterior margin and behind the middle, tips of the elytra separately, narrowly rounded, and the last abdominal segment is transversely truncate at the apex.

Parmenonta insularis n. sp.

Elongate, subcylindrical, piceous, and sparsely, rather uniformly clothed with short, recumbent, scale-like yellowish white hairs, without forming spots or designs.

Head rather strongly convex, flattened between the antennae, without depressions, but the surface sparsely, deeply, coarsely and irregularly punctate; eyes entirely divided, the upper and lower lobes small, transverse, and about equal in size. Antennae extending to basal third of elytra, densely clothed with short yellowish white pubescence, and the tips of the joints narrowly margined with paler colored hairs; first joint robust, reversed cone-shape, without a cicatrix at

apex, and slightly longer than the fourth joint; second joint small; third joint about twice as long as the fourth, and joints five to eleven about subequal in length.

Pronotum subcylindrical, about as wide as long, equal in width at base and apex, widest at apical third, and without lateral tubercles; sides nearly parallel, feebly expanded at apical third, then vaguely narrowed to the posterior angles; surface rather sparsely, deeply, coarsely, and irregularly punctate. Scutellum wide, very short, and broadly rounded posteriorly.

Elytra subcylindrical, nearly two and one-half times as long as the pronotum, and widest near middle; sides slightly wider at base than pronotum, feebly, arcuately rounded from base to tips, which are conjointly, broadly rounded; humeri indistinct; surface without depressions, but coarsely, deeply, irregularly punctate, the punctures rather close together in the basal region, but becoming slightly sparser toward the apex.

Abdomen beneath sparsely, coarsely punctate, and rather densely clothed with moderately long, recumbent yellowish pubescence; last segment broadly rounded at apex.. Tibiae moderately robust, and slightly dilated toward apex.

Length, 8.5-10 mm.; width, 3-3.6 mm.

Type locality.—Santiago de las Vegas, Cuba.

Type.—Cat. No. 42164, U.S.N.M. *Paratype.*—In the collection of S. C. Bruner.

Described from two examples collected in a peanut field at the type locality, November 30, 1928, by José M. Osorio.

Seven species of this genus have been described, one from Venezuela, one from Texas, and five from Mexico and Central America, but this is the first time that representatives of this genus have been found in the West Indies. The species of this genus are all closely allied, and resemble each other very closely, but *insularis* can be easily separated from all the previously described species by having the upper surface clothed with uniformly colored pubescence which does not form designs or spots on the elytra.

Micrasta cubensis n. sp.

Nearly regularly elliptical, and about equally rounded in front and behind; above and beneath dark bronzy brown, with a distinct greenish tinge, and rather densely and uniformly clothed with long, recumbent cinereous hairs.

Head slightly convex, and when viewed from above forms a regular arc with the pronotum; front rectangular, with the sides nearly parallel, and a broad, vague depression at middle of front; surface rather densely, coarsely punctate, the punctures more or less confluent, and moderately clothed with long, semierect cinereous hairs; eyes parallel and partially concealed under the pronotum; epistoma rather short, slightly constricted between the antennal cavities, with the anterior margin bisinuate, and feebly, arcuately emarginate at the middle. Antennae long, extending to base of pronotum, and clothed with a few long, stiff, cinereous hairs; first joint robust, and strongly clavate toward apex; second robust, oval, and one-half as long as the first; third distinctly shorter and much narrower than the second, with the sides parallel; fourth and fifth sub-equal in

length, twice as long as the third, and slightly expanded toward the apex; the following joints gradually diminishing in length, more or less triangular, and the last joint slightly longer than the tenth, and broadly rounded at apex.

Pronotum rather strongly convex, one-third wider than long, about equal in width at apex and base, and widest at middle; sides strongly, regularly, arcuately rounded; when viewed from the side the marginal and submarginal carinae are rather strongly arcuate, widely separated at middle, connected to each other at base, but the marginal carina obliterated toward the apex; anterior margin feebly, arcuately emarginate; base transversely truncate; surface very narrowly and feebly constricted along the base, and finely, densely, uniformly punctate. Scutellum large, triangular, longer than wide, and the surface smooth.

Elytra as wide as pronotum at base, and slightly wider at apical third than at base; sides vaguely expanded from base to apical third, then arcuately narrowed to the tips, which are separately broadly rounded; humeri moderately elevated and the surface smooth; base transversely elevated, the elevation one-half as long as the scutellum, with the surface nearly smooth; disk broadly, transversely depressed behind the basal elevation, and each elytron with a broad, vague depression at basal third, a similar depression at apical fourth, and another depression at middle, but closer to the lateral margin; surface rather densely, uniformly, coarsely punctate.

Abdomen beneath strongly convex, densely granulose, and rather densely, coarsely punctate, except along the posterior margin of the segments; first and second segments united, with the suture entirely obliterated; last segment very broadly rounded at apex. Prosternum slightly convex, coarsely, densely punctate, and more or less rugose; anterior margin broadly, vaguely emarginate; prosternal process rather narrow, with the sides feebly, obliquely narrowed to the apex, which is narrowly rounded. Femora moderately robust, especially the anterior pair. Tibiae straight and slender.

Length, 3.4 mm.; width, 1.3 mm.

Type locality.—Taco Taco, Cuba.

Type.—Cat. No. 42215, U.S.N.M.

Described from a single example (sex not determined), collected at the type locality, between April 1 and 6, 1922, by S. C. Bruner, J. Acuna, and C. H. Ballou.

This species closely allied to *Micrasta fisheri* described by Thery from Dominica, but it differs from that species in being larger, more densely clothed with long cinereous hairs, head with a vague depression on the front, pronotum widest at the middle, and the marginal carinae are obliterated toward the apex, elytra without a gibbosity near the apex, prosternum notched at the anterior margin for the antennae but without a groove in the suture between the episternum and prosternum, prosternal process rather narrow, with the sides obliquely narrowed to the apex, which is narrowly rounded, and the last abdominal segment is very broadly rounded at the apex.

REVIEW OF EPHEMERELLA NYMPHS OF WESTERN NORTH AMERICA (EPHEMEROPTERA)*

BY G. STUART WALLEY,
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Studies by Eaton (1884), Dodds (1923) and Needham (1905, 1927) have contributed much to our knowledge of the nymphal forms of *Ephemerella* occurring in Western North America. Needham's recent paper on "The Rocky Mountain species of the Mayfly genus *Ephemerella*" contains a valuable discussion of the nymphs of that region and is the first attempt to treat of the species in a comparative manner.

Nymphal collections made by Dr. J. McDunnough in connection with his studies on the Mayfly fauna of Southern Alberta and the Montana and Yellowstone regions, have contained further undescribed nymphs pertaining to recently described species of *Ephemerella,* also many nymphs of the species described by Eaton, Dodds and Needham. The writer is indebted to Dr. McDunnough for permission to study this material and for the helpful suggestions he has made during the course of this study.

Of the thirteen species of *Ephemerella* described from Western North America the nymphs of ten have been studied. The nymph of *E. infrequens* McD. is not definitely known and both nymph and adult of *E. mollitia* Seemann, described from Southern California, are unrecognized but probably fall close to *inermis* Etn. Material of *E. grandis* Etn. has not been available for study but the descriptions of Eaton and Needham are sufficient to place the species readily.

The nymphs of this genus offer a variety of characters on which they may be distinguished. Of importance among these are the presence or absence of gills on the third abdominal tergite; the development of cephalic, thoracic and abdominal spines or tubercles; the presence or absence of a frontal shelf on the head; the degree of flattening and prolonging of the lateral region of the abdominal segments; the relative lengths of the setae and their ornamentation; the relative slenderness of the legs, particularly the shape and nature of the front femora; the spining of the tarsal claws. Color characters when judiciously used to supplement structural differences have proven valuable in separating closely allied species but the color pattern in some species (e. g. *inermis* and *coloradensis*) has been found to vary considerably. The structure of the mouth parts, employed so extensively by Morgan in the separation of certain eastern species of *Ephemerella,* has been found less valuable. A careful study of the mandibles has shown slight differences. The maxillae are in general very similar but the maxillary palpi provide some characters. The form of the labrum, labium and hypopharynx does not appear to vary appreciably except in distantly related species. While the mouth parts do provide some characters their structure has been given secondary importance in the present discussion in favor of more conspicuous modifications such as abdominal spining,, leg structure and form of head. Most of these latter characters are recognizable in the accompanying photographs which also indicate general form, relative size and color pattern. The finer structural details are depicted by line drawings.

*—Contribution from the Division of Systematic Entomology, Entomological Branch, Department of Agriculture, Ottawa.

Extensive nymphal modifications have led to the consideration of sub-generic units based on nymphal structures correlated with slight genitalic and venational characters in the adult. Needham (1927) gives a key to the sub-genera of *Ephemerella* as he has defined them. The genus *Chitonophora* Bengtsson, 1909, is considered synonymous with *Ephemerella* Wlsh., 1862. The nymph and adult of *E. aronii* Etn. are typical of *Ephemerella* (see description below). In other American forms the characters mentioned for *Chitonophora* intergrade so perfectly with those of *Ephemerella* as to establish a perfectly gradual series.

The following key based on full grown nymphs will separate the species discussed herein.

KEY TO WESTERN NORTH AMERICAN EPHEMERELLA NYMPHS

1. Gills borne on abdominal segments 4-7 ..... 2.
   Gills borne on abdominal segments 3-7 ..... 3.
2. Body greatly flattened; abdominal segments produced laterally and greatly prolonged posteriorly to form long saw-like teeth (Pl. III, fig. 4) ..... *hecuba* Etn.
   Body only moderately flattened; abdominal segments not greatly produced or prolonged (Pl. III, figs. 7, 8) ..... *margarita* Needh.
3. Abdominal tergites smooth, unmodified by spines, tubercles or projections 4.
   Several abdominal tergites with a median pair of spines or tubercles or with the posterior margin produced to form a median pair of slightly elevated projections ..... 5.
4. Face with a broad notched frontal shelf; abdomen with a ventral sucking disk; front femora toothed on anterior margin (Pl. III, figs. 5, 6) ..... *doddsi* Needh.
   Face without a broad notched frontal shelf; abdomen without a ventral sucking disk; front femora smooth (Pl. II, figs. 7, 8) ..... *inermis* Etn.
   ? *infrequens* McD.
5. Three setae of almost equal length ..... 6.
   Middle seta almost three times the length of the lateral ones (Pl. II, fig. 4) ..... *heterocaudata* McD.
6. Vertex with a pair of long spines or tubercles ..... 7.
   Vertex smooth or at most with very low elevations ..... 8.
7. Abdominal spines very gradually increasing in length from segments 2 to 9 ..... *grandis* Etn.
   Abdominal spines very long on segments 8 and 9, less than half as long on segments 2 to 7 (Pl. III, figs. 1, 2, 3) ..... *spinifera* Needh.
8. Front femora slender with anterior margin smooth ..... 9.
   Front femora stouter with anterior margin toothed or tuberculate ..... 10.
9. Abdominal segments expanded and flattened laterally with the posterior-lateral angles distinctly caudally produced; length of body 9-10 mm. (Pl. II, fig. 6) ..... *aronii* Etn
   Abdominal segments without lateral flattened expansions or caudal projections of the posterior-lateral angles; length of body 7-8 mm. (Pl. II, figs. 1, 2) ..... *tibialis* McD.

10. Abdominal spines very small; legs short with femora and tibiae rather stout (Pl. II, fig. 3) ..... *flavilinea* McD.
Abdominal spines more produced; legs longer with femora and tibiae more slender (Pl. II, fig. 5) ..... *coloradensis* Dodds.

Ephemerella hecuba Etn.

Pl. III, fig. 4

This large (length 14 mm.) much flattened nymph is readily recognized by the long saw-like lateral expansions of the abdominal segments. The gills are lacking on the third segment (the right gill is missing from the fourth in the specimen illustrated in Pl. III, fig. 4) and the head is modified to form a broad, entire frontal shelf. The nymph has been described and figured by Eaton and Needham; the latter adds collecting notes. The adult is unknown but the nymph has been recorded from the following localities: Provo River, Utah, July 20; Lanier River, Yellowstone Park, Wyo., August 8, 1921 (Needham); Colorado (Eaton). The writer has studied material from Rocky Canyon, Bozeman, Mont., August 9, 1928 (J. McDunnough).

Ephemerella margarita Needh.

Pl. I, figs. 5a, 5b; Pl. III, figs. 7, 8.

This is the only other species from this region which has the first pair of gills borne on the fourth segment. It is much smaller than the preceding species and lacks the huge lateral abdominal expansions and has no frontal shelf (Pl. I, fig. 5a) on the head. The front legs are slender and smooth and typically banded (Pl. I, fig. 5b). The abdominal color pattern varies somewhat, two color phases being shown in the accompanying photographs (Pl. III, figs. 7, 8). In mature specimens the tails have a dark cross band near the middle. The nymph has been taken by Needham in Utah "in Box-Elder (Brigham) Canyon, in Weber River at the Devil's Slide, at Wanship, and at several points along the Provo River." The writer has studied the following material: Firehole River, Lower Geyser Basin, Yellowstone National Park, Wyo., July 29, 1928; Rocky Canyon, Bozeman, Mont., Aug. 9, 1928; Belly River, Lethbridge, Alta., Aug. 15, 1928 (J. McDunnough). The Bozeman specimens are the ones illustrated. The adult of this species is not yet known.

Ephemerella doddsi Needh.

Pl. III, figs. 5, 6.

This large, stout bodied, uniformly colored nymph bears a large horseshoe-shaped sucking disk on the ventral surface of the abdomen (Pl. III, fig. 5). The front femora are stout with their anterior margin tuberculate and the head bears a frontal shelf which is notched at the sides for the reception of the antennae. The dorsum is entirely without spines or tubercles and the gills are of the normal type placed on segments 3-7. The abdominal segments are slightly expanded laterally with their posterior-lateral angles very slightly caudally produced. The structure of the nymph of this species is fully treated by Eaton (1884) and Dodds (1923) under the name *E. grandis* adds further descriptive and collecting notes. Needham (1927) refers this species to the sub-genus *Eatonella* Needh. on the basis of the peculiar frontal shelf.

The species has been recorded from Colorado, Idaho (Eaton); Colorado (Dodds); Utah, Montana, Washington, California (Needham). The specimen illustrated in Plate III is from Sage Creek, Elkhorn Ranch, Gallatin Canyon, Montana, Aug. 4, 1928 (J. McDunnough) and specimens of full grown nymphs are also at hand from the Alberta localities, Pass Creek. Waterton, Aug. 21, 1928 (J. McDunnough), July 27, 1929 (J. H. Pepper); Banff, Aug. 29, 1928 (J. McDunnough).

Ephemerella inermis Etn.

Pl. II, figs. 7, 8.

This is a rather slender species having the head devoid of spines or tubercles, the front femora smooth and slender, the abdomen without dorsal spines but with its segments with their lateral margins expanded and flattened with the hind angles of the gill-bearing (3-7) segments prolonged. In mature specimens the legs and tails are blackish banded, the head and thorax mottled with light and dark and the abdomen brownish with paler markings most pronounced on tergites 5-6. The accompanying photographs (Pl. II, figs. 7, 8) illustrate two color phases of this rather variably patterned species.

The species has been recorded from Denver, Arkansas Canyon and Colorado Springs, Colorado (Eaton). The present identification is based on a series of full grown nymphs from Yellowstone Lake, Wyo., July 23, 1928 (J. McDunnough) taken at the same time and place as large series of adults of *inermis*.

It might be noted that the nymph of *infrequens* McD., which is unknown is probably very similar to *inermis* Etn. judging by the close structural resemblance in the adults. Needham's description of *inermis* nymphs may refer to *infrequens* since his determination is based on a misidentification of the adult (*vide* McDunnough, Canadian Entomologist, LX, 238, 1928); also Dodds *Ephemerella* nymph No. 2 may be *infrequens* McD. (*inermis* Needh. nec. Etn.).

Ephemerella heterocaudata McD.

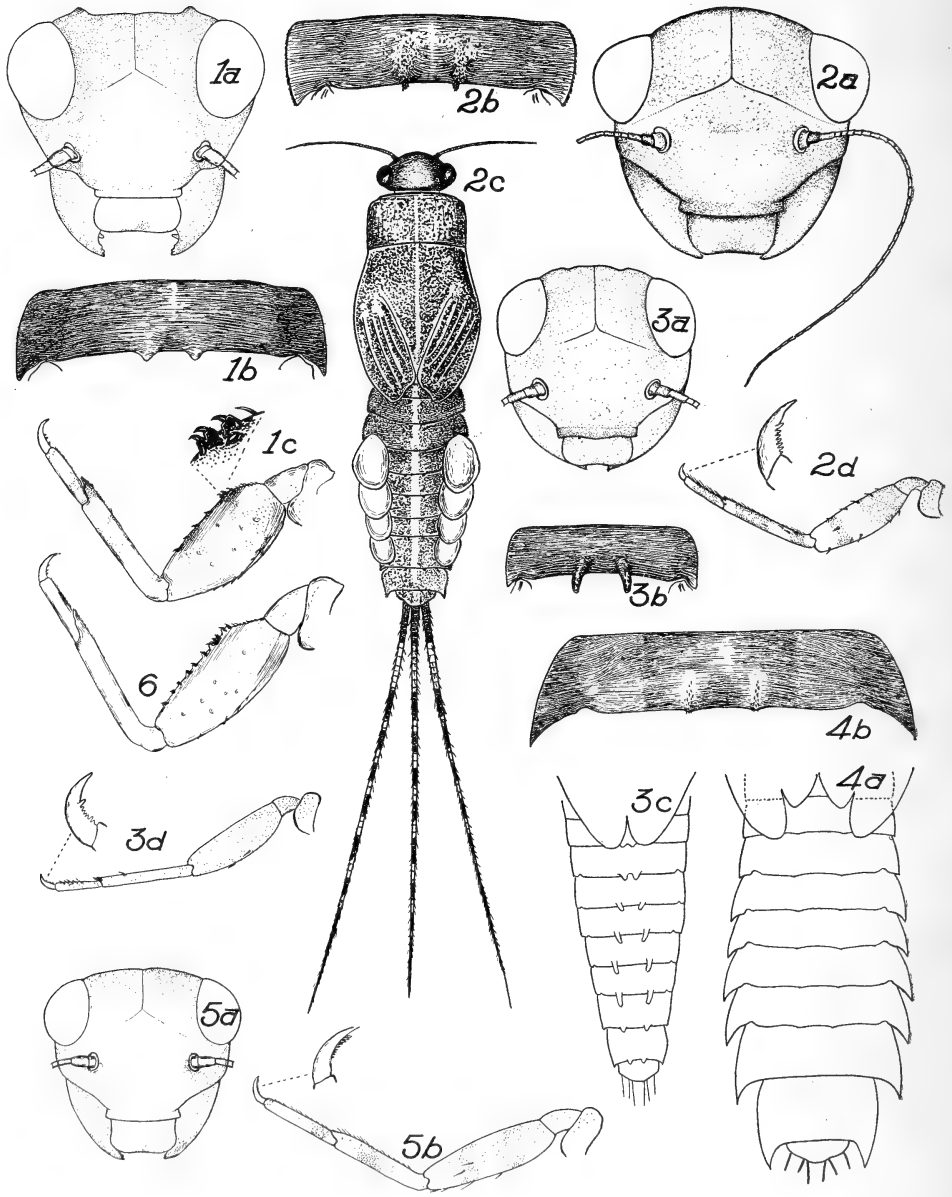
Pl. I, figs. 3a, 3b, 3c, 3d; Pl. II, figs. 4, 4a.

A series of small blackish nymphs taken in the Firehole River, Yellowstone National Park, Wyo., July 22, 1928 (J. McDunnough) are referred to this species (*vide* McDunnough, Canadian Entomologist, LXI, 171, 1929). Though not bred from individual specimens the association of nymph and adult is quite certain since both stages present the much lengthened middle seta, a character apparently peculiar to this species. The full grown nymph is described as follows:

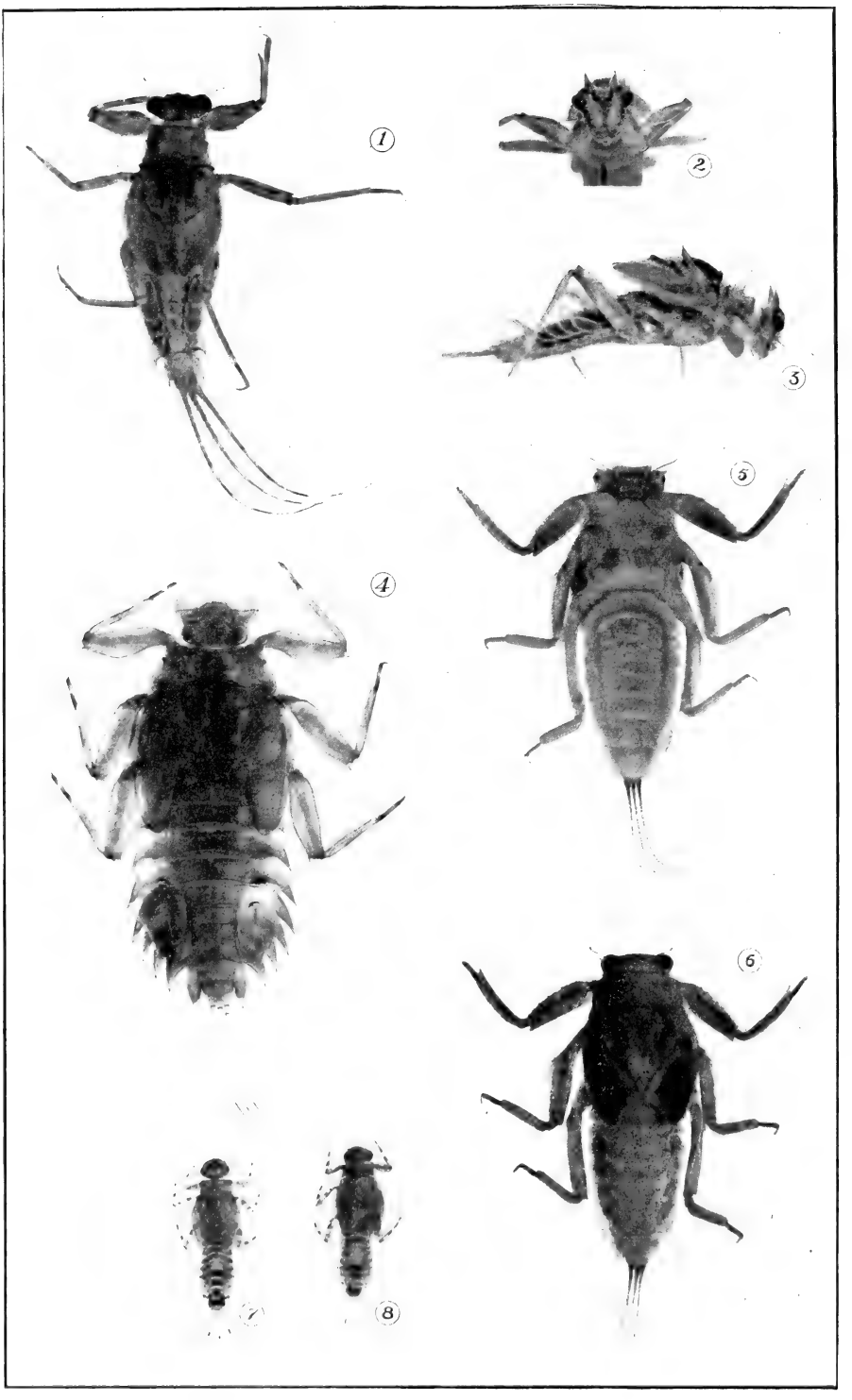
Length of body 6-7 mm.; lateral setae 3 mm.; middle seta 8 mm.

Head rounded and smooth as in *tibialis*. Maxillary palpus with three joints of equal length, the third more slender than basal two. Prothorax slightly more than twice as broad as long with lateral margins broadly arcuate. Legs rather short, femora more flattened than in *tibialis* but quite smooth; legs fringed with fine dusky hairs.. Gills on abdominal segments 3-7, the first pair normal, not forming an operculum. Tergites 2-9 each with a median pair of strong black slightly incurved blunt tubercles, becoming gradually longer and further apart from segments 2-7, shorter and closer together on 8-9, and all beset with fine black spines. Abdominal segments not flattened laterally and with the posterior-lateral

CAN. ENT. VOL. LXII. PLATE I.



WESTERN EPHEMERELLA NYMPHS



WESTERN EPHEMERELLA NYMPHS

angles not at all produced (Pl. I fig. 3c). Middle seta almost three times the length of outer ones.

General color (in alcohol) dark brownish, the head blackish especially on the front. Legs brown throughout, not banded with pale as in *tibialis* and *aronii*. Abdomen dark brown above, the venter paler brown with a median fuscous streak and a row of narrower more sharply defined brownish dashes on either side. Setae brownish with the incisures darker.

Ephemerella spinifera Needh.

Pl. III, figs. 1, 2, 3.

This strikingly modified nymph is easily recognized by the long acute spines on the head, thorax and abdomen (Pl. III, figs. 1, 2, 3). Gills of the usual type are borne on abdominal segments 3-7 and the segments are laterally expanded and posteriorly produced. The nymph is recorded by Needham from Montana and Utah. The specimen illustrated is from Gardiner River, Yellowstone National Park, Wyo., July 26, 1928 (J. McDunnough). The species appears to be rare and the adult stage is unknown.

Ephemerella grandis Etn.

This species appears to be related to *spinifera* Needh. possessing a somewhat similar arrangement of spines. The characters mentioned in the above key will however readily separate the two forms. The Washington specimens figured by Eaton (1884, Pl. 38, figs. 11-15) to which Needham applies the name *grandis* would appear to differ slightly from the Utah specimens figured and described by Needham (1927) particularly in respect to the mesothoracic spining and it is possible that Eaton's nymphs represent a closely allied species.

Ephemerella aronii Etn.

Pl. I, figs. 4a, 4b; Pl. II, figs. 6, 6a.

Ephemerella Aronii Etn., Eaton in Esben-Petersen, Tromso Mus. Aarsh., 25, 149, 1908.
Chitonophora Aurivillii Bgtss., Bengtsson, Lunds Univ. Arsskr. N. F. Afd. 2.5., 6, 1909.
Chitonophora Aronii Etn., Esben-Petersen, Men. Ac. Sci. Petersbourg, 1916.
Chitonophora Aronii Etn., Ulmer, Stett. Ent. Zeit., 81, 120, 1920.
Ephemerella norda McD., McDunnough, Can. Ent., LVI, 223, 1924.

Adults of a species of *Ephemerella* bred from nymphs by Mr. W. J. Brown at Bradore Bay, Quebec Labrador, July 27, 1929, have been identified by Dr. J. McDunnough as conspecific with *E. norda* McD. known only from Nordegg, Alberta and the Pribiloff Islands, Alaska. Dr. P. Esben-Petersen on comparing the Bradore Bay material with a metatype of *aronii* Etn. from Europe, is of the opinion that the two are synonymous; also that *aurivillii* Bgtss. should fall to *aronii* Etn. in which latter view he is supported by Dr. G. Ulmer. The synonymy therefore will stand as above.

The description of the full grown nymph of *aronii* is as follows:

Length of body 9-10 mm.; length of setae 5-6 mm.

Head rounded, smooth, without dorsal or facial spines or tubercles and without a broad frontal shelf. Clypeal margin truncate. Maxillary palpus with basal joint slightly longer than two apical joints combined, the second joint shortest, half the length of the slender third. Prothorax slightly more than twice as broad as long, the lateral margins narrowly explanate. Legs similar in form to *tibialis*. Gills normal on segments 3-7. Tergites 2-7 each with median pair of

very slightly elevated minutely spined projections on posterior margin (Pl. I, fig. 4b). Abdominal segments 4-9 laterally expanded and flattened with their posterior-lateral angles produced (Pl. I, fig. 4a; Pl. II, fig. 6).

General color (in alcohol) rather light brown. Head with darker brown on face and somewhat mottled on vertex, a small pale area between compound eye and lateral ocellar spot. Femora pale brownish with apices narrowly pale, front and mid-femora with a faint incomplete pale sub-apical ring; tibiae with a broad sub-basal and narrower apical pale band, the hind tibiae with the sub-basal band very broad; tarsi with narrow basal and broader apical pale bands. Thorax light brown with a few small scattered darker brownish spots. Abdomen light brownish, each tergite with a pair of rather widely separated dark brownish quadrangular areas most prominent on segments 3-7. Flange-like margin of abdomen pale brownish with a dusky spot on the margin of each segment. Setae pale, a few segments obscurely darker and the apical 4 or 5 segments black.

Ephemerella tibialis McD.

Pl. I, figs. 2a, 2b, 2c, 2d; Pl. II, figs. 1, 2, 2a.

Nymphs of a rather slender, small, blackish species of *Ephemerella* taken at Banff, Alberta are associated with adults of *tibialis* McD. The nymph is described as follows:

Length of body 7-8 mm.; length of setae 4-5.5 mm.

Head rounded, smooth, without dorsal or facial spines or tubercles and without a broad frontal shelf. Clypeal margin entire, very broadly arcuate. Maxillary palpus with basal joint sub-equal to two distal joints combined. Prothorax twice as broad as long, lateral margins parallel. Legs rather short, front femora slender, smooth with a few scattered fine spines. Gills normal, on segment 3-7. Abdominal segments but weakly expanded at sides; posterior-lateral angles only slightly produced in segments 4-7, a little more so in 9. Tergites 2-9 each with a median pair of slightly elevated minutely spined projections (not distinct enough to be tubercles) on posterior margin (Pl. I, fig. 2b).

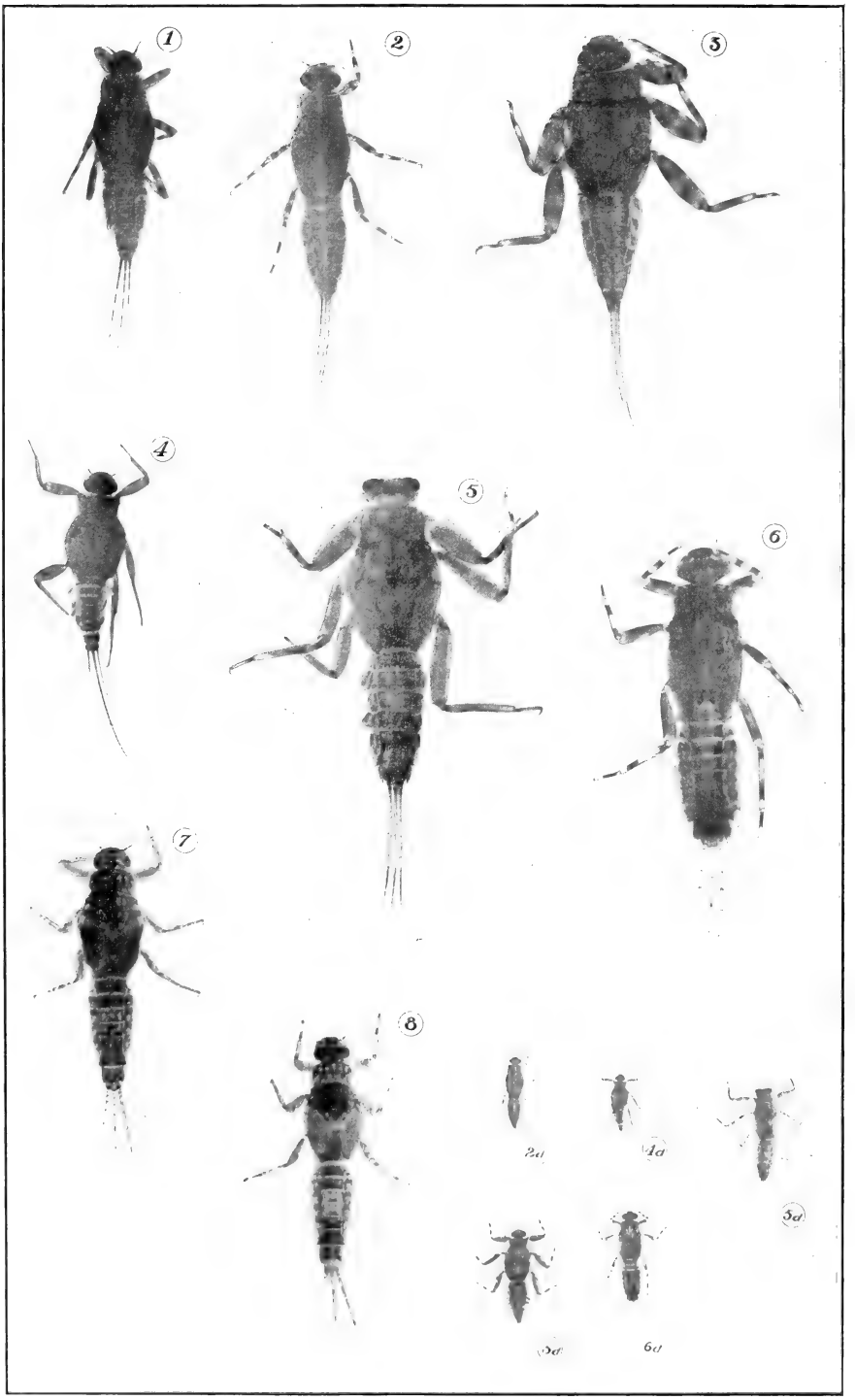
General color (in alcohol) dark brownish, the thorax and abdomen sometimes with a narrow median dorsal pale line (Pl. II, fig. 2). Legs brownish, femora with an apical and an incomplete sub-apical pale annulus and a small pale spot below at base; tibiae with a sub-basal and apical pale band; tarsi narrowly pale at base and apex. Thorax and abdomen dark brownish throughout. Setae alternately brown and pale annulate, the distinctness of the banding varying with maturity of the specimen.

This species resembles the nymph of *inermis* Etn. The latter, however, has the abdominal tergites entirely smooth. Adults have not been bred from the nymphs but full grown nymphs were found common in the Spray and Bow Rivers at Banff, Alberta, Aug. 29-30, 1928 (J. McDunnough) where adults were taken swarming a few days later, so the association appears reasonably certain. Nymphs are also at hand from Sage Creek, Elkhorn Ranch, Gallatin Canyon, Montana, Aug. 4, 1928 and Rocky Canyon, Bozeman, Montana, Aug. 9, 1928 (J. McDunnough. The illustrations are from the Bozeman material.

Ephemerella flavilinea McD.

Pl. I, figs. 1a, 1b, 1c; Pl. II, 3, 3a.

This species has not been bred from the nymph but full grown nymphs



WESTERN EPHEMERELLA NYMPHS

have been taken in the Firehole River, Yellowstone National Park, Wyo., July 22, 1928 (J. McDunnough) and in the Yellowstone River, Yellowstone National Park, July 26, 1928 (J. McDunnough). A few days later subimagos of *flavilinea* were taken in the same places (*vide* McDunnough—Canadian Entomologist, LXI, 170, 1929).

These nymphs have been carefully compared with a co-typic nymph and a series of nymphs of *coloradensis* Dodds. The close relationship of the adults is borne out by a similar resemblance in the nymphs but constant characters for the separation of *flavilinea* may be found in the shorter abdominal spines, stouter legs (particularly the mid and hind pairs) and the shorter thumb (Pl. I, figs. 1c, 6). The full grown nymph of *flavilinea* is described as follows:

Length of body 9-10 mm.; length of setae 6 mm.

Head broad, face flattened between the eyes, vertex usually with a pair of very low tubercles and the face roughened slightly. Maxillae as in *heterocaudata*. Legs rather short; the front femora broadened flattened, the posterior margin with a few spines, the anterior margin with numerous tubercles each surmounted by a short stout spine, upper face of femora with scattered wart-like excrescences; tibiae more slender than in *coloradensis*. Prothorax twice as broad at anterior margin as long, lateral margins slightly diverging posteriorly with a shallow sinus just beyond middle. Gills on abdominal segments 3-7, the first pair of gills not forming an operculum. Abdominal segments with very narrow flat pleural expansions, the posterior angle developed, not prominent, slightly longer in 9. Tergites 2-8 each with a median pair of slightly elevated projections (scarcely tubercles) on the posterior margin.

General color (in alcohol) varying from light to dark brown, the paler specimens more mottled in appearance than the darker ones. Femora with indistinct broad pale basal, median and apical areas; tibiae more conspicuously banded with pale at base and apex; tarsi with a single median pale band. Cerci pale narrowly banded with blackish beyond middle and at apex.

Ephemerella coloradensis Dodds.

Pl. I, fig. 6; Pl. II, figs. 5, 5a.

This species has been described and figured by Dodds (1923) and by Needham (1927). The type locality is Tolland, Colo. and Needham mentions the species as common in Northern Utah and records having seen material from Yellowstone Park, Wyo., Pecos, N. Mex. and Volcano Co., Calif. The writer has studied a nymph from the type series and a long series of nymphs from Sage Creek and Spring Creek, Elkhorn Ranch, Gallatin Canyon, Mont., Aug. 4, 1928; Brackett Creek, Bozeman, Mont., Aug. 7, 1928; Spray River and Bow River, Banff, Alta., Aug. 29, 1928; Cameron Creek, Waterton, Alta., Aug. 17, 1929 (J. McDunnough).

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Needham, J. A., 1905. N. Y. St. Mus. Bull. 86: 41-47, pls. 9-10.
" " " 1927 Ann. Ent. Soc. Am., XX, 107-117.
" " " 1927a Utah Agr. Exp. Sta. Bull. 201.

PLATE I.

1.—*E. flavilinea,* 1a—head, 1b—sixth abd. tergite, 1c—front leg. 2—*E. tibialis,* 2a—head, 2b—sixth abd. tergite, 2c—dorsal view of entire body, 2d—front leg. 3—*E. heterocaudata,* 3a.—head, 3b.—sixth abd. tergite, 3c.—dorsal view of abdomen, 3d.—front leg. 4.—*E. aronii,* 4a.—dorsal view of abdomen, 4b.—sixth abd. tergite. 5.—*E. margarita,* 5a.—head, 5b.—front leg. 6.—*E. coloradensis,* front leg. (Above drawings not to same scale).

PLATE II.

1.—*E. tibialis.* 2, 2a.—color form of same. 3, 3a.—*E. flavilinea.* 4, 4a.—*E. heterocaudata.* 5, 5a.—*E. coloradensis.* 6, 6a.—*E. aronii.* 7.—*E. inermis.* 8.—Color form of same. (figures 1-8 greatly enlarged, same scale; figures 2a, 3a, 4a, 5a, 6a slightly less than natural size, same scale).

PLATE III.

1.—*E. spinifera.* 2.—head of same. 3.—lateral view of same. 4.—*E. hecuba.* 5.—*E. doddsi,* ventral view showing sucking disk. 6.—dorsal view of same. 7.—*E. margarita.* 8.—color form of same (figures 1-8 greatly enlarged, same scale as in Pl. II, figs. 1-8).

THE STATUS OF THE BARN SWALLOW BUG, OECIACUS VICARIUS HORVATH.

BY G. J. SPENCER,
University of British Columbia.

In 1909 I was interested to hear from a farmer in Ontario, that barn swallows are undesirable because they harbour bedbugs which spread from their nests to human habitations. Several times since I have heard the same complaint from various sources. In 1926 an instance cropped up in Vancouver where cliff swallows nests were systematically knocked down from some public buildings, for the same alleged reason.

In summer 1929 I received complaints from three men in the Chilcotin that cliff swallows always filled a house with bedbugs towards the end of the season. In one of the instances, the man systematically destroyed the nests of dozens of birds that were very persistent in building on his outbuildings. In all three cases I asked the men if the bugs so introduced, could be accused of actually "biting." Two claimed that they certainly did "bite" while the third stated that the bugs invaded the premises only after the birds had finished nesting for the season and had migrated, and that he personally, had never been "bitten." Owing to the fact that in the first two instances the homes of the men were in such conditions of neglect that practically any human parasite could (and probably did) flourish there, I was inclined to doubt their statements.

In October of this year, Mr. Alan Dustan of the Entomological Branch, Ottawa, wrote to me, citing an instance in Alberta where certain bugs from swallows' nests were invading a building and asking if I had any information as to the bugs attacking human beings. According to my findings up to that date, I was forced to declare the case "not proven." However, I wrote to Mr. Jenkins at Fishburn, Alta. whose house was mentioned, supplying what information I had and asking for full particulars of his infestation. He sent the following very explicit reply, exhibiting a most praiseworthy spirit of investigation:—

Sept. 3..... "I am sending five specimens of bugs which I believe to have been brought by swallows. All of these have bitten me. Two of them bit at night, the other three I found around the house and I put them on my arm and let them bite before putting them in the bottle. The white one, although he bit, did not get any blood for some reason."

"About the end of July we discovered these insects in the house and on

knocking down the swallows nests (about 200 of them) we found they were simply swarming with them. After this they came into the house in thousands and bit us so much we had to move into tents to sleep. They bite just as badly in the day only of course there isn't the same chance of them getting on one. They seem to be practically all gone now although there are still odd ones."

The bugs he enclosed were *Oeciacus vicarius* Horvath.

On making further enquiries around Vancouver, I have since found two men, one an ornithologist of standing and the other a much travelled and experienced forest officer whose findings can be relied on, who have personally been attacked by these insects from swallows nests and have been "bitten." They state that the infestation lasts only a few days after the host birds have left their nests.

In the scanty literature on the subject available to me, I can find no reference to the identity of the birds reported to carry these bugs, apparently the list has yet to be compiled. The birds under censure in the Chilcotin last summer, were Cliff or Eave Swallows—those mentioned in literature are merely "swallows."

SUMMARY

It would seem that several species of swallows in North America are hosts of *Oeciacus vicarius* Horvath, one of the bedbugs. The insects breed freely all summer in the birds' nests and in early autumn when migration occurs, the bugs scatter from the birds' nesting areas and invade dwellings where they may attack human beings for a few days: the infestation then dies down. In certain instances, apparently of very heavy infestation, invasion of dwellings from nesting areas may occur some weeks before the birds leave their nests.

CROESUS VARUS (DE VILLARET). (HYMENOPTERA).

BY J. W. BUCKLE,

Montreal, Quebec.

On August 8th, 1926, I captured a sawfly of the genus *Croesus* at the flowers of the common parsnip (*Pastinaca sativa*) at the foot of Mount Royal.

The only species of this genus listed in the Hymenoptera of Connecticut, List of the Insects of New York, List of the Insects of New Jersey, and in Marlatt's "Revision of the Nematinae of North America" (in which he refers to them as the two North American representatives) are *latitarsus* (Norton) and *laticulus* (Norton), but the descriptions given did not correspond with the specimen I had taken.

Some time afterwards, with the assistance of Mr. A. F. Winn, we located an illustration and description of *Nematus varus* (De Villaret) in the Annals of the Entomological Society of France, 1832, Vol. 1, page 306, which corresponded with my specimen, and our determination of the species was verified when I found in a collection of Hymenoptera received recently from Hungary a sawfly labelled *Croesus varus* (De Villaret) which corresponded with my insect and is evidently the same species.

This seems to be a very rare sawfly in North America, as the only reference I can find to it is in Kirby's List of the Hymenoptera in the British Museum, where the habitat is given as Europe and North America, with one record only from North America, a male from Nova Scotia collected by Lieut. Redman. The other references to captures were all from Europe.

ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO, 1929.

The Sixty-sixth Annual Meeting of the Entomological Society was held at the University of Western Ontario, London, on Thursday and Friday, November 21st and 22nd, 1929.

The morning and afternoon meetings were held in the lecture amphitheatre of the Natural Science building. On Thursday at the close of the afternoon sessions the members of the Society and their friends met in the cafeteria and enjoyed an excellent banquet tendered to them by the University of Western Ontario. The Thursday evening meeting was held in Convocation Hall, when Dr. W. Sherwood Fox, President of the University of Western Ontario, acted as chairman and Mr. K. W. Babcock of the United States Bureau of Entomology, delivered an interesting address on "The Trend of Ecological Research in European Corn Borer Investigations." After this meeting a smoker was held in the Cafeteria. During the smoker, Dr. John Dearness and Mr. W. E. Saunders entertained the members of the Society and friends with some very interesting reminiscences of the early days of the Society.

The meetings were well attended and proved very successful. During the Meetings the following papers were presented:—

History and Present Status of Entomology in the Colleges and Universities in Canada.—A. W. Baker, Ontario Agricultural College, Guelph, Ont.

Preliminary Observations on the Flight of the European Corn Borer, *Pyrausta nubilalis* Hubn.—G. M. Stirrett, Entomological Branch, Chatham, Ontario.

Progress in Breeding Corn to Resist the European Corn Borer, *Pyrausta nubilalis* Hubn.—A. R. Marston, Corn Borer Experiment Station, Monroe, Mich., U.S.A.

Progress Report on Corn Borer Control.—L. Caesar, Ontario Agricultural College, Guelph, Ont.

Biography of the Rev. Canon Huard.—Georges Maheux, Department of Agriculture, Quebec, P.Q.

Role of Chemistry in the Battle Against Insect Pests.—J. W. Burns, University of Western Ontario, London, Ont.

Some Problems of a Chemical Nature of Interest to the Entomologist.—E. A. Herman, Central Experimental Farm, Ottawa, Ont.

Injury to Potatoes by the Larvae of *Agrotis ypsilon* Rott.—R. P. Gorham, Entomological Branch, Fredericton, N. B.

The Life-History of the White Cutworm, *Lycophotia scandens*. Riley.—H. F. Hudson and A. A. Wood, Entomological Branch, Strathroy, Ont.

Control of the Wheat-stem Sawfly by Parasites.—H. L. Seamans, Entomological Branch, Lethbridge, Alta.

Notes on the Head Capsule of Orthopteroid Insects.—E. M. Walker, University of Toronto, Toronto, Ont.

The Satin Moth in British Columbia.—L. S. McLaine, Entomological Branch, Ottawa, Ont., and R. Glendenning, Entomological Branch, Agassiz, B.C.

The European Pine-shoot Moth in the Niagara Peninsula.—R. W. Sheppard, Entomological Branch, Niagara Falls, Ont.

Notes on the Fir Sawfly, *Neodiprion abietis* Harris.—R. D. Bird, University of Oklahoma, Norman, Okla.

Insect Life of the Canadian Labrador.—W. J. Brown, Entomological Branch, Ottawa, Ont.

Some of the Recent Developments of the Entomological Branch.—Arthur Gibson, Entomological Branch, Ottawa, Ont.

An Insect Survey of Illinois.—T. H. Frison, Urbana, Ill., U.S.A.

The Trend of Ecological Research in European Corn Borer Investigation.—K. W. Babcock, United States Bureau of Entomology, Washington, D.C.

Injurious Insects of 1929 in Canada.—*British Columbia.*—E. R. Buckell, *Alberta.*—H. L. Seamans and E. H. Strickland, *Saskatchewan.*—H. E. McMillan and K. M. King, *Manitoba.*—N. Criddle and A. V. Mitchener, *Ontario.*—L. Caesar and W. A. Ross, *Quebec.*—G. Maheux and C. E. Petch, *New Brunswick.*—R. P. Gorham, G. P. Walker and L. J. Simpson, *Nova Scotia.*—F.. C. Gilliatt.

Insect Pests that have Recently Arrived in the Vancouver District.—B. C. 1928-29 (specimens), G. J. Spencer, Univ. of B. C. Vancouver.

The Biology of *Nemeritus canescens* Grav., a Parasite of the Mediterranean Flour Moth.—V. R. Diamond, Purdue University, Lafayette, Ind.

The Status of the Barn Swallow Bug, *Oeciacus vicarius* Horvath.—G. J. Spencer, University British Columbia, Vancouver, B.C.

Mosquito Control in New Jersey.—Frank W. Miller, Agricultural Experiment Station, New Brunswick, N. J.

Some Observations and Remarks on Mosquito Control—(Illustrated) C. R. Twinn, Entomological Branch, Ottawa, Ont.

An Outbreak of Mycetophilid and Chironomid Larvae in a Greenhouse.—R. W. Thompson, Ontario Agricultural College, Guelph, Ont.

The Fire Brat, *Thermobia domestica* Pack, in Canada.—G. J. Spencer, University of British Columbia, Vancouver, B.C.

Observations on the Life-History and Control of the Fern Scale *Pinnaspis aspidistrae.*—W. H. R. Werner, University of Michigan, Ann Arbor, Mich.

Notes on the Cyclamen Mite in Canada.—W. A. Ross, Entomological Branch, Vineland Station, Ont. and A. G. Dustan, Entomological Branch, Ottawa..

Two Insects Destructive to Iris.—Arthur Gibson, Entomological Branch, Ottawa, Ont.

Progress Report on the Tarnished Plant Bug Investigations.—R. H. Painter, Entomological Branch, Ottawa, Ont.

Preliminary Notes on the Mortality and Feeding Habits of Newly Hatched Peach Moth Larvae.—G. G. Dustan, Ontario Dept. of Agriculture, Toronto, Ont.

Some Experiments on the Control of the Oriental Peach Moth.—W. A. Ross, S. Armstrong and D. F. Patterson, Entomological Branch, Vineland Station, Ont.

Progress Report on Work with the Parasites of the Oriental Peach Moth in Ontario.—W. E. Steenburgh, Entomological Branch, Belleville, Ont.

Some Aspects of the Pollination Problem in Apple Orchards.—W. H. Brittain, Macdonald College, Ste. Anne de Bellevue, P.Q.

The Spray Service in Canada.—L. Caesar, Ontario Agricultural College, Guelph, Ont.

The Mediterranean Frut Fly in Florida.—L. S. McLaine, Entomologcal Branch, Ottawa, Ont.

Notes on Some Apple Leaf Rollers.—J. A. Hall, Entomological Branch, Laboratory, Simcoe, Ont.

A New Orchard Pest in Ontario.—L. Caesar, Ontario Agricultural College, Guelph, Ont.

The officers elected at the Annual Meeting for the year 1929-30 were as follows:—

President.—Dr. J. D. Detwiler, University of Western Ontario, London, Ontario; *Vice-President.*—Dr. W. H. Brittain, Macdonald College, Ste. Anne de Bellevue, P.Q.; *Secretary-treasurer.*—Reg. H. Ozburn, O.A. College, Guelph, Ont.; *Curator and Librarian.*—Miss Rose King, O.A. College, Guelph, Ont.; *Directors.*—G. Maheux, Dept. of Agriculture, Quebec, P.Q.; A. B. Baird, Dept. of Agriculture, Belleville, Ont.; L. S. McLaine, Entomological Branch, Dept. of Agriculture, Ottawa; A. V. Mitchener, Manitoba Agricultural College, Winnipeg.

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Index to Volume LXI.

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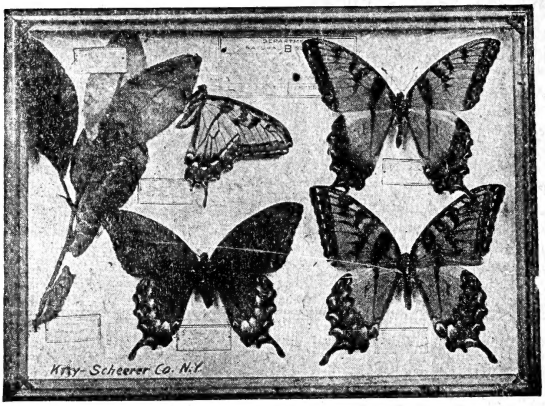

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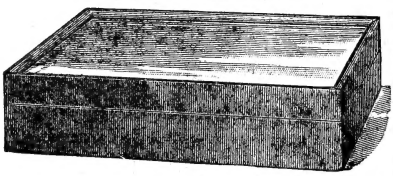

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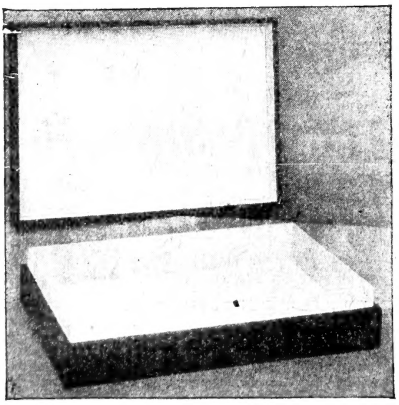

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