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## FURTHER NOTES ON ALBERTA LEPIDOPTERA.

BY F. H. WOLLEY DOD, MIDNAPORE, ALTA.

(Continued from page 68.)

356. *Cucullia montana* Grt.—I have no note of having seen the type of this species, which, according to Smith's Catalogue, is in the Neumœgen collection at Brooklyn, nor have I seen Grote's description. The Calgary form, however, agrees with the description of *montana* in Smith's Monograph, and is also the *montana* of the British Museum collection, with the exception of the actual specimen figured by Hampson, which happens to be a Denver, Colo., specimen of *asteroides*, of which the type is correctly figured on the next plate. It had not, until recently, occurred to me that there was any likelihood of confusing the two, but I must admit that I have examined, and now possess, specimens which I have had considerable trouble in determining. Generally speaking, whilst the arrangement of colour in the two is about the same, the shades in *montana* are more intense, that is, the pale shades are paler, and the dark shades darker. But the colour varies somewhat in different localities, and more reliable points of distinction are as follows. In *montana*, the basal area, as far as the t. a. line, is very pale fulvous. The t. a. line is double, with the included space of the same pale gray colour as the central and outer middle portion of the wing below the spots. In *asteroides* the basal space is unicolorous with the central and outer middle area, and the t. a. line is single, though traces of an inner portion are sometimes discernible. In *asteroides* the tegulæ have a black line near the base, which seems to be lacking in my *montana*, though Hampson gives it as present in both. Slightly worn or poorly-marked specimens are occasionally extremely difficult to place. I have not both species from one locality. *Montana* is recorded from Colorado, and I think I saw it from there in the British Museum, but a Colorado specimen in my collection, sent as *montana*, appears to me to be *asteroides*. I am certainly strongly under the impression that the two are distinct.

358. *C. florea* Guen., = *obscurior* Smith, = *indicta* Smith.—I have specimens compared by myself with all these types. That of *florea* is a female in the British Museum, from Trenton Falls, N. Y. *Obscurior* was described from two females taken by Bruce in Colorado, and a type is at Washington. My specimen compared with this type is from Glenwood Springs, and a Calgary specimen compared with types *florea* and *indicta* is exactly like it. I have three specimens from Kaslo. The "*florea*" of my original list (No. 360) was wrongly identified, and the Calgary specimen figured by Sir George Hampson as *florea* is, in my opinion, a strongly-marked form of *postera*. The two are more nearly allied than I at first thought, as my male type of *indicta* happens to be an unusually pale gray, even specimen. I have two Calgary specimens which puzzled me for a long time, and seemed almost to connect them. Generally speaking, *postera* is better marked, and has more obvious reddish brown shades on costal region of primaries. In *florea* such shades are absent, or nearly so, as in the type, and never conspicuous. What appears to me a more reliable character exists in the dark cloud or shade preceding the crescent-shaped mark formed by the t. p. line below vein 2. In *postera* this shade is itself somewhat crescent-shaped, and about concentric with the t. p. line crescent. In *florea* it is direct, oblique, and if produced would meet the inner margin below the orbicular, and the costa, near the apex. The shade, however, is often very ill-defined, and not always symmetrical on both wings. But I have studied this feature very carefully, and conclude that it is characteristic of each species as a whole. The moth is a great rarity in this district, only three specimens having been taken besides those previously mentioned, on Aug. 1st, 1909, and June 5th and 11th, 1910. I saw a specimen bearing a New York label in the American Museum of Natural History which I took to be this species, and so labelled it. One in the Rutgers collection, labelled "New Windsor, N. J., May 27th, 1892, Emily L. Morton," appeared to be this, but had ochreous-tinted secondaries, differing in this respect from any previously seen.

359. *C. asteroides* Guen?—I was quite wrong in listing this species as *postera*. I have a manuscript name for it, and have several times been on the point of describing it, but shall not do

so until I have seen this and typical *asteroides* from the same locality and can distinguish them. The type of *asteroides* is from New York, and is well figured by Hampson. In it the ill-defined discoidal spots are pale fulvous, and slightly paler than the rest of the fulvous shade, which extends longitudinally through the upper portion of the wing. The secondaries are clear pearly-white, with dusky veins and outer border, though the border sometimes covers nearly half the wing. I have specimens of the typical form from New York, Rhode Island, Ohio, Pennsylvania, Illinois and Denver, Colorado. I gave the name to a Montreal specimen for Mr. Winn, on the strength of which it is entered in the Quebec list. The only other named species with which I am likely to have confused it is *montana*, as mentioned under that head. In the Calgary form the primaries differ but little, but are generally darker blue gray and more even, with the discoidals even less evident. But the chief difference is that the secondaries are smoky throughout, though darker outwardly. This form is the "*postera*" of the B. C. list, and I have specimens from Windermere and Nelson. Some from Manitoba are the darkest of the series, and differ most from true *asteroides*. The dark secondaries contrast strongly with the pearly whiteness of the typical form, and gives the insect a very different appearance, and the primaries of the dark series seem slightly broader and more rounded on the costa. But I must admit that with the primaries alone I might fail to distinguish between some of the specimens. I have not taken it at Calgary for several years.

360. *C. postera* Guen.—This is the "*florea*" of my original list. The Calgary form is figured by Hampson as *florea*, but seems to me darker and more strongly marked only than the type of *postera* from New York. The chief distinctive character between this and *florea* I have pointed out under the latter heading. Judging from the number I have seen, this species is, with the possible exception of *intermedia*, the commonest of the genus in Canada, though I have not seen it from west of the Rockies. I have named a Montreal specimen for Mr. Winn, which seemed to me about typical. In Prof. Smith's collection, the only specimen which stood under this name was a male from Liberty, N. Y. This was like the

Calgary form, except that it was ochreous-tinted throughout, which made me doubt its identity.

361. *C. speyeri* Lint.—Another female. July 10, 1900, formerly in my *intermedia* series, appears to be this species, but was labelled *intermedia* on Smith's authority. The error was excusable, as it is duller and less black-streaked than *speyeri* usually is, but has all the other characters of that closely allied species, including the pearly white though dusky-margined secondaries. I have the species from Illinois, Volga (S.D.), Colorado, and Aweme, Manitoba.

362. *C. intermedia* Speyer.—I consider that this is the correct name for the form occurring here. Any attempt to separate it from *intermedia* from the east is hopeless, though eastern specimens, as a whole, are a trifle darker, due to their being more suffused with brown shades. I have Calgary and eastern specimens matching exactly. Hampson figures a Calgary example as *cinderella*. The latter was described from a single Colorado male collected by David Bruce. I saw it in the Washington collection, and it has the transverse maculation almost obsolete. A Colorado female in the same collection certainly suggested a faintly marked *intermedia*. The validity of *cinderella* as a species is open to much doubt.

365. *Tapinostola variana* Morr.?—I had listed this species as *orientalis* Grt., but that, according to the description, has a t. p. line of blackish dots, and the subcostal and median nervures are finely lined within the cell with black. This sounds like the species figured by Sir George Hampson, from Renfrew County, Ontario, as *inquinata* Guen., of which he has the type from New York, and of which he makes *orientalis* a synonym. My notes on *inquinata* type do not mention a black streak immediately above the median vein, nor does Hampson mention it in his description in the Catalogue. His synonymy, however, is probably correct. Sir George's description is all I have of *variana*, besides a reference thereto by Grote, and the only difference mentioned is the absence of the t. p. line. Holland figures as *variana* a Winnipeg male from the Washington Museum. I compared this specimen and concluded that the Calgary species was distinct and also probably

distinct from type *inquinata*. But the Winnipeg specimen in question has an obvious t. p. line, which the type *variana* lacked, so that its identity is open to doubt. It is at any rate probably a species not at present in my collection and may be a pale *inquinata*. My Calgary specimens are about the colour of *inquinata* type, but lack all traces of a t. p. line, though some show traces of blackish in the cell. Besides the two before mentioned I have two males taken at light on Sept. 8th, 1906.

366. *Hydræcia nictitans* Bork.—I feel bound to follow Hampson in treating the North American species as identical with the European *nictitans*. Smith himself referred "Var. *americana* Speyer" to his *atlantica*, so that the former name should have preference in any case. A female type of *atlantica* from Ithaca, N. Y., is in the Washington Museum. No clear differences are pointed out, in fact the impossibility of distinguishing it from the European form except by male genitalia is admitted. Its range is given as "Nova Scotia, Hudson's Bay, Southward to Virginia, West to Colorado". *Interoceanica* was described from three specimens from Winnipeg only. I have none from there exactly, but have seen a pair of types. It was characterized as small and very dark in colour, with the ordinary markings almost blackish, and reniform white. The latter character is of course variable in *nictitans*. I compared Smith's types and did not consider them distinct, nor did they strike me as variations worthy of remark. *Pacifica* was stated to range from California to Vancouver and to be more compactly built than *atlantica* or *nictitans*, and a little more lightly shaded, "the secondaries yellowish or purplish red and somewhat silky, quite different from the eastern examples". I have no Californian examples, but numbers from Vancouver Island, and their variation is much like that of eastern specimens. Concerning his three new names Smith writes in his Revision; "These three species I could hardly have dared to separate from *nictitans* had it not been for the differences in structure in the male genitalia; but these are so radical that specific identity is out of the question". Four genitalic species are claimed for the British Isles, some of which are said to be locally constant in some superficial characters. Hampson unites them all as one species, but quotes six names as

aberrations, including two European, one Asiatic, and three North American; viz:

*"americana*.—Fore wing rather more orange-red. Eastern States and Canada.

*interoceanica*.—Fore wing browner. Western Canada.

*pacifica*.—Fore wing grayer, California." This latter is not in accord with Smith's diagnosis.

367. *H. pallescens* Smith.—The male and female types in the Washington Museum are from Calgary. They differ from *medialis* from Colorado in lacking the reddish tints, and in having the entire ground colour washed with white. Some Calgary specimens are a good deal darker than the type, but scarcely reddish. The form was not even recognised as a variety in Dyar's catalogue, though the difference in colour is somewhat striking. Hampson treats them as species. I think it likely that the differences are merely varietal, but have not seen enough Colorado material to enable me to form a fair judgment, and have none from there in my collection. Mr. Baird has taken *pallescens* at High River, and I have it from Cranbrook, B.C.

368. *Papaipema* sp.? The type of *impecuniosa* is a male from Massachusetts, and is in the British Museum. Sir George Hampson figures a specimen like it. There are two Red Deer River specimens from me in the same series. But, like the rest I have seen from that locality, they differ from *impecuniosa* in the form and course of the central shade, which is more like that in *purpurifascia*, *rigida* and *verona*, the latter being a much paler thing from Winnipeg. The form of the t.p. line is something between that in *impecuniosa* and *purpurifascia*. The colour and maculation otherwise is much like that of *impecuniosa*, but the orbicular and claviform may be either yellow or white. Unfortunately I have only three specimens now left in my collection, not having visited the locality for some years.

(To be continued.)

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#### THE COTTON MOTH, *ALABAMA ARGILLACEA* HBN.

The photograph from which the accompanying illustration was made, was sent to me by Mr. J. F. Calvert, of London, Ont. These moths were noticed in very large numbers this autumn in Western Ontario. At London, they appeared suddenly either late in the

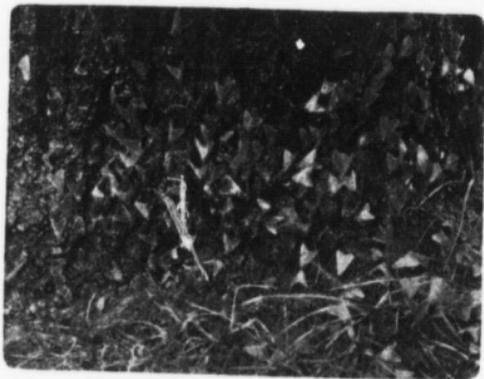


FIG. 2

evening of Oct. 10, or early in the morning of Oct. 11. The characteristic habit of the moth of resting with its head downward is well shown in the illustration. An account of the occurrence of this moth in eastern Canada in 1912 will appear in an early issue of the Ottawa Naturalist.—ARTHUR GIBSON, Div. of Ent., Ottawa.

ON SEVERAL NEW GENERA AND SPECIES OF  
AUSTRALIAN HYMENOPTERA CHALCIDOIDEA.

BY A. A. GIRAULT, BRISBANE, AUSTRALIA.

The following genera and species were included within three small collections of this super-family, loaned to me for study, but do not include all of the material from them. Two of these collections were from Queensland, the third partly from Victoria and partly from New South Wales.

Family Chalcididae.

Subfamily Chalcidinae.

Tribe Chalcidini.

Genus *Tumidicoxa* Girault.1. *Tumidicoxa rufiventris* new species.*Female*: Length, 5 mm.

Opaque black, the abdomen rufous or orange red, as are also the antennal flagellum, the posterior coxæ, tibiæ (except at tip) and femora (except at apex, lateral), the cephalic tibiæ, except at base, and all the tarsi (somewhat diluted with yellowish); cephalic and intermediate coxæ black or very dark, the proximal half or more of the cephalic and intermediate femora black, their distal half or less honey yellow. Scape dark fuscous, the pedicel somewhat lighter. Tegulae, a rounded spot at apex of posterior femur laterad, a distinct oval spot near tip of posterior tibiæ and the knees more or less lemon yellow. Wings very slightly stained throughout, the venation smoky. Pubescence not conspicuous, with a reddish tinge.

Scrobicular cavity nearly smooth, shining; head and thorax rugoso-punctate, the propodeum mesad (dorsal aspect) foveate, the abdomen glabrous, but the distal segments finely, polygonally sculptured. Lateral ocelli distinctly more than their own diameter from the eye margin. Plate at apex of scutellum distinctly bilobed. Propodeum in the dorso-lateral aspect, with at least one tooth-like projection, its lateral aspect moderately hairy, but not conspicuously so. Posterior femora with one moderately large tooth, followed by about ten others, which are smaller distad, all the ten much smaller than the first. Antennæ 12-jointed, the single ring-joint large, the pedicel as long as the first funicle

joint, which is somewhat wider than long, the remaining joints all wider than long, except the distal club joint, which is longest, conical; distal funicle joints transverse; flagellum clavate, somewhat compressed.

(From two specimens, two-thirds of an inch objection, 1-inch optic, Bausch and Lomb.)

*Male*: Not known.

Described from two female specimens mounted on pins, labelled "Warburton, Victoria." This species differs from the South American forms strikingly in coloration; also the funicle joints of the antennæ are shorter, the pedicel longer in relation to them, the lateral ocelli farther away from the eyes, the plate of the scutellum more deeply lobed and the stigmal vein not sessile, yet short. Otherwise, it is similar in all details, with the possible exception of the ventral plate on the thorax, which I was unable to see in these specimens because of the manner in which they were mounted.

*Habitat*: Australia—Warburton, Victoria.

*Types*: No. *Hy 1178*, Queensland Museum, Brisbane, the above specimens (2 pins) plus a slide bearing an antenna and a posterior leg.

2. *Tumidicoxa flavipes* new species.

*Female*: Length, about 5 mm.

Like the South American species, but the plate at the apex of the scutellum is not emarginate at the meson, or barely so. Opaque black marked with lemon yellow as follows: The tegulae except at extreme base (cephalad), tibiæ and tarsi, except the brownish base of posterior tibia and parts of the distal tarsal joint, distal half of cephalic femora, distal third of intermediate femora and the tip of the posterior femora. Legs otherwise black, reddish black on femora and tibiæ on first two legs. Venation and antennæ brownish black, the latter really black, brownish toward tip. Wings perfectly clear. Body rugoso-punctate, the second abdominal segment shining. Pubescence not conspicuous. Antennæ 12-jointed, cylindrical, with one ring-joint, the pedicel small, wider than long, not half the length of the proximal funicle joint, which is the longest joint of the flagellum. Distal club joint longer than the other, obliquely truncate at tip. Distal

funicle joint slightly wider than long, the middle joints subquadrate. Scape short, simple. Posterior femora beneath the others, the last three distinctly smaller in succession, the last very small. The teeth are black, and they rather increase in size at the middle (Nos. 5, 6 and 7 from proximal end). Posterior femur minutely punctulate and clothed with soft, greyish pubescence. Agreeing with the generic description, except as may have been noted. The lateral ocelli are somewhat farther away from the eyes.

(From a single specimen, the same magnification.)

*Male*: Not known.

Described from a single pinned female labelled "Dandenong Range, Victoria."

*Habitat*: Australia—Victoria (Dandenong Mountains).

*Type*: No. Hy 1179, Queensland Museum, Brisbane, the above specimen on a card; an antenna on a slide.

3. *Tumidicoxa victoria* new species.

*Male*: Length, 6.1 mm.. Rather large.

Like the preceding species, but larger, more robust, the plate at the apex of the scutellum plainly bidentate, the scape longer, the black parts of the legs darker, and specifically the cephalic tibiae are brown in the middle, the intermediate ones along the proximal half, except at base and the posterior ones, black in the middle, their tips pale yellowish. The posterior femora beneath bear nearly the same arrangement of teeth, but there are only eleven, followed by a minute tubercle; numbers 3 and 4 are larger than 2 and those distad of them. The posterior coxae have a flabellate enlargement at the apex above. The antennae 12-jointed, the distal funicle joints more transverse than with *flavipes*. Wings hyaline.

(From a single specimen, the same magnification.)

*Female*: Not known.

Described from a single male, minutien-mounted and labelled "Dandenong Ranges, Victoria."

*Habitat*: Australia—Victoria (Dandenong Mountains).

*Type*: No. Hy 1180, Queensland Museum, Brisbane, the above specimen plus an antenna on a slide.

4. *Tumidicoxa regina* new species.

*Male*: Length, 4.95 mm.

Like *flavipes*, but more robust, the scutellum terminating in a distinctly bidentate plate and the postmarginal vein longer. The scape is also longer. Posterior femur armed with twelve teeth, the first large, the next two very small, followed by seven larger ones, (of which numbers six to nine are largest) and two shorter ones, the last broad, its flat upper edge at apex thus emarginate; excluding the first tooth, numbers 6 to 9 are largest. In *flavipes*, teeth Nos. 2 and 3 are not distinctly smaller than the ones immediately following (distad).

(From one specimen, the same magnification.)

Female: Not known.

Described from a single male specimen on a pin, from the collections of the Queensland Museum, labelled "Brisbane, H. Hacker. 3-7-11."

*Habitat*: Australia—Brisbane, Queensland.

*Type*: No. *Hy 1181*, Queensland Museum, Brisbane, the fore-noted specimen on a pin, plus one slide bearing antennae and a posterior leg.

*Pseudepitelia* new genus.

*Female*: Resembling *Epitelia* of Kirby, but the abdomen not produced into a stylus distad, the posterior femora without depressed punctures and armed beneath with more teeth, there being six moderately large, more or less, subequal teeth (but the first largest), followed distad by four others, which shorten in succession. The antennae are 13-jointed, with one ring-joint, inserted nearly on a line with the ventral ends of the eyes. the scrobicular cavity reaching the cephalic ocellus, the lateral ocelli plainly more than their own diameter from the eye margin. The postmarginal vein about half the length of the marginal, slender, the stigmal very short, yet with more or less of a distinct neck. The second abdominal segment occupying more than a third of the abdomen. Propodeum with two small, acute projections in the middle of the dorso-lateral line (seen from ventro-laterad). Body nonmetallic, punctate. Abdomen as in *Chalcis*. The scutellum terminates in a short, bidentate plate.

*Male*: Not known.

*Type*: The following species.

1. *Pseudepitelia rubrifemur* new species.

*Female*: Length, 5.10 mm.

Opaque black, the second abdominal segment glabrous black, the posterior femur dark reddish, the venter of the abdomen at the meson more or less suffused with dark reddish or yellowish; tegulae pallid, the wings hyaline, the venation black, face and distal half of the abdomen pubescent. Tarsi more or less brownish. Intermediate and cephalic knees and two distinct elongate spots on each end of the posterior tibiae exteriorly and not at tip, pale yellowish. Antennae wholly black.

Body moderately finely, densely punctate, the spaces between the punctures lined. First abdominal segment, with very minute punctures, which vary in size, the following segments pubescent and transversely wrinkled, the penultimate segment rougher. Posterior femora densely punctulate the punctures very minute; antennae, with the distal joint very short, truncate, only about twice the length of the ring-joint; scape very long, narrowing distad; pedicel much longer than the ring-joint, but only half the length of the proximal funicle joint, which is longest of the funicle, twice the length (or nearly) of the subquadrate distal funicle joint. Proximal two joints of the club subequal, the distal joint flat, very short.

(From one specimen, the same magnification.)

*Male*: Not known.

Described from a single cardmounted female, labelled "Cheltenham, Victoria."

*Habitat*: "Australia—Victoria (Cheltenham)."

*Type*: No. Hy 1182, Queensland Museum, Brisbane, the above specimen, plus a slide bearing an antenna and a posterior leg.

2. *Pseudepitelia tricolor* new species.

*Female*: Length, 5.00 mm.

The same as *rubrifemur*, but the postmarginal vein shorter and stouter, the second (distal) elongate, pale yellowish spot exteriorly on posterior tibia absent, but the two proximal tarsal joints (and less so, the third) of posterior legs white, suffused with

yellowish; the scutellum has not a small patch of greyish pubescence at apex, just above the terminal plate as with the type specimen (*rubrifemur*) and in *tricolor* the third abdominal segment is more roughly finely sculptured. There are eleven distinct teeth on the posterior femur instead of the ten of the type species. Intermediate and cephalic tarsi white or whitish. (Antennæ missing; scape black.) Wings hyaline.

(From a single specimen, the same magnification.)

*Male*: Not known.

Described from a single cardmounted specimen from the collections of the Queensland Museum, labelled "Q.M. Tambourine. H. Hacker, April 2, 1911."

*Habitat*: Australia—Tambourine, Queensland.

*Type*: No. Hy 1183. Queensland Museum, Brisbane, the above female on a card.

*Brachepitelia* new genus.

*Female*: The same as the preceding genus, *Pseudepitelia*, but the antennæ 12-jointed, the scutellum terminating in a short plate, whose distal margins are straight, the plate barely differentiated, The submarginal vein is shorter and stouter. Propodeum without noticeable lateral projections. Second abdominal segment occupying nearly half of the abdomen.

*Male*: Not known.

*Type*: The following species.

1, *Brachepitelia rubripes* new species.

*Female*: Length, 3.70 mm.

Opaque black, marked with dark red as follows: Posterior legs except coxæ; cephalic knees, tibiæ and tarsi; intermediate knees and tarsi (mixed with brownish) and the ends of the tibiæ. Venation dark, the wings hyaline. Head and thorax rugoso-punctate. Posterior femur with ten distinct teeth, the first twice the largest, the distal teeth smaller in succession.

*Male*: Not known.

Described from a cardmounted female, labelled "Larva of Various Moths, Melbourne."

*Habitat*: Australia—Melbourne, Victoria.

*Type*: No. Hy 1184, Queensland Museum, Brisbane, the above specimen; an antenna on a slide.

(To be continued.)

## REMARKS ON THE DISTRIBUTION OF HETEROPTERA.

BY J. R. DE LA TORRE BUENO, WHITE PLAINS, N. Y.

Among the many problems of nature that engage the attention of the biologist there is one that to me has always been of the utmost interest. It is that of the occurrence of the same species in widely separated regions or through extensive and seemingly dissimilar areas or in isolated and restricted habitats. The classic example of the last, familiar to all entomologists, is the peculiar subarctic and alpine butterfly *Oeneis* or *Chionobas semidea* which from the wilds of Labrador jumps to the high peaks of the Presidential Range of the White Mountains and again is not found till we come to the Rockies in Colorado. Here, however, we have a tenable explanation for this great and peculiar range, in the fact that this is an arctic genus which spread during the ice-age throughout its vast territory, and which, with the recession polewards of the ice cap and the frigid temperatures it caused, travelled northward in its wake. Some, however, followed the receding line of perpetual snow up the mountain sides, and where these were of sufficient altitude, they have contrived to maintain themselves to this late date in the geological history of the earth.

In this paper the Hemiptera only are to be considered, more especially the Heteropterous forms supposed to be common to America and Europe. At the outset we are confronted with a difficulty, which arises from the mistaken reference of American species to European forms. This troublesome condition is directly due to the meagre descriptions of the older authors, who availed themselves principally of colour for specific distinctions and put the structural differences in the generic characterizations. In part, however, our native entomologists are at fault, since much of this confusion can be traced to their neglect of the study of the cognate European species, which, even though they are of the same colour patterns as ours, in so far as any written description can go, are nevertheless sufficiently different in form and structure to be readily distinguishable by the trained eye. This condition in the Hemiptera is being rapidly adjusted, due almost entirely to the labours of the Europeans. In fact, our own present lack of sufficient acquaintance with their writings leads some of us to the perpetuation of errors long since dispelled. It

is to the labors of those eminent scientists, Prof. Momtandon and Dr. Horvath, but mainly to the latter, that we owe what has been done towards correcting these mistakes. Horvath's visit to the United States in 1907 and the collecting he then did, enabled him to make the necessary comparisons, and it is his results which form the groundwork for this discussion.

In the writings of the fathers of American Hemipterology, we find much of this erroneous work, in their case most unfortunately unavoidable owing, as already pointed out, to too great reliance on colour characters alone. Thomas Say, who needs no praise to establish his position as the greatest of American entomologists, had indeed a keen and discriminating eye, and nearly without exception his species and genera have withstood the most rigid tests. His successors however, have not been so uniformly successful, so we have for America a list of species of supposedly European Heteroptera (to which in the heat and haste of Hemipterological youth I have added my mite), which includes such species as:

- Reduvius personatus* L.
- Sciocoris lectularius* L.
- Sciocoris microphthalmus* Flor.
- Nezara viridula* L.
- Zicrona cærulea* L.
- Corizus crassicornis* L.
- Corizus hyalinus* Fabr.
- Nysius thymi* Wolff.
- Nysius ericæ* Schill.
- Stygnocoris rusticus* Fall.
- Sphragisticus nebulosus* Fall.
- Scolopostethus thomsoni* Reut.
- Aradus crenatus* Say.
- Aradus lugubris* Fall.
- Aradus cinnamomeus* Panz.
- Harpactor leucodilus* Stal.
- Gerris rufoscutellatus* Latr.
- Acanthia pallipes* Fabr.
- Acanthia xanthochila* Fieb.
- Corixa germari* Fieb.
- Corixa præusta* Fieb.

These do not include the ones subsequently recognized as undescribed, such for example as *Cymus clavicolus* Fall., which turned out to be new and was described by Horvath as *discors*; *Emblethis arenarius*, which comparison with European material showed to be different and which is now known as *vicarius* Horvath; *Pentatoma juniperina*, which is restricted to the other side of the Atlantic, ours being described as new under the name of *persimilis* Horvath.

Returning to the larger aspect of the question, a consideration of the hemipterous forms common to the two continents discloses the fact that in preponderating numbers these are phytophagous and parasitic, the majority being Homoptera of families notoriously injurious to vegetation, namely, the Jassidæ and Aphididæ. The total number of species of this order found on both sides of the Atlantic is in the neighborhood of 160 to 170, a very small number as compared with the Coleoptera.

How are we to account for this dispersal? There are two chief means, the one natural, by migration of the living beings of their own impulse, and the other artificial, through the agency of man. A large proportion apparently belong in the first category. The small remainder, (including therein the classic examples of the unsavory bedbug and other obnoxious personal parasites), owe their distribution undoubtedly to the more or less involuntary agency of man. To-day the constant importation of nursery stock is bringing with it a constant transfer to this continent of various plant pests. Fortunately, the strict surveillance on plants brought from abroad has thus far held in check the spread of these insects to any great extent. On the other hand, sometimes the good perish with the bad, and important predators are fumigated out of existence together with their prey.

An examination of the forms which evidently owe their distribution to natural agencies has shown that the great majority belong to Palæarctic genera and are in the main Palæarctic species of the most widespread character. Take for example *Gerris rufoscutellatus* Latreille, which is without doubt the Hemipteron of widest actual distribution next to *Nezara viridula*. It is known across Northern Europe through Siberia, thence to British Columbia and Oregon, ranging East to the Northern

Atlantic region. Here we have a form undeniably Palæarctic in origin, which has migrated from its native source and travelled 15,000 miles to found its colonies throughout the North Temperate Zone. Its route has certainly been via Bering Straits into Alaska and thence east and south. Its habitat and its predaceous nature have both contributed largely to its fitness for this long voyage. It is furnished with good wings, sucks any insect it can overcome and lives on the surface of the water. It has therefore had an unimpeded and favourable route from the land of its nativity eastward until stopped at the impassable barrier of the Atlantic ocean. Thus also must have migrated the two *Corixas*, *germari* and *præusta*, out from the Palæarctic region.

This also is the route followed by many of the land bugs, but they indeed must have met the great obstacles, saving only the semi-aquatic strong-flying and predaceous Acanthiidae, to whom the waters can have no terrors. A number of these terrestrial forms are cannibals and live on other insects, their only requirement being that their prey be not encased in impenetrable armor or too large to be overcome. *Zicrona cærulea* may serve as an example of these carnivores, and here we see how much slower has been its progress than that of the aquatic forms, and seemingly it has met with an unsurmountable boundary in the Rocky Mountains. The advent of the phytophagous forms is similarly explained for the majority of cases, in view of the adaptability of the Hemiptera to any vegetable food other than their native food plants, especially when pressed by hunger. The dispersal of one land group, however, is a subject for interesting speculation. I refer to the three species of Aradids common to the Eastern United States and Western Europe. Is this their native home? The genus *Aradus* is boreal in its origin. This much is reasonably certain. But are these three species themselves of Palæarctic or Nearctic origin? And if of Palæarctic origin, how did they get there? And if not, how did they cross Europe?

*Aradus crenatus* was described by Say in 1832; subsequently Herrich-Schaefer described it and figured it in *Wanzenartigen Insekten* (IX., fig. 538, p. 90), under the misnomer *corticalis*; and in 1860 Leon Dufour described it as new, and called it *dilatatus*.

So far as I know, it is confined to the Atlantic States and Western Europe. *Aradus cinnamomeus* is in the same case; and *Aradus lugubris* of Fallen was independently recognized by Say also in 1832, who called it *rectus*, and by Kirby in 1837. It appears to extend throughout the northern part of this continent, from east to west and through Siberia into Western Europe. Seemingly, then, *lugubris* has come in by way of Bering Strait, and has travelled eastward. As to the other two, their dispersal might seem to indicate human agency. It is conceivable that they have travelled east into Europe, or west out of Europe concealed in crevices in logs and planks or under loose bark. The earlier discovery of *crenatus* in this country might appear to indicate its American origin, while the fact that *cinnamomeus* is first recognized in Europe might perhaps lead to the inference that that was its native soil, but possibly erroneously, since being a dweller in pine trees it may conceivably have been exported in such timber from this Continent.

There is another small group with a most remarkable distribution. The type of these may be considered to be *Nezara viridula*, which occurs with us commonly in Florida, and thence down into tropic America, across the ocean into Africa, throughout Europe and thence into Asia. Its home is said to be in Africa, whence it has spread so widely. How? No explanation seems to have been offered of its wanderings, but certainly there is no question of the identity of the species, even though the examples come from many lands. In this class, also, belongs *Corizus hyalinus*, which has spread even unto the distant isles of the Pacific Ocean.

It has not been the intention in these remarks to go deeply into the subject or to expound a theory, but simply to set forth a peculiar biological phenomenon and one well worthy of serious consideration and study. A few forms in a restricted group have been referred to, but all orders of insects present the same problem. Where the migration is over extensive land areas with a more or less homogeneous character of vegetation, or when one certain food-plant is widespread, the question presents no difficulties, but where large bodies of water intervene, it becomes more complex, and is a fit subject for scientific inquiry of a high order.

ON THE GENUS *LAMENIA* STAL.

BY F. MUIR, H. S. P. A. STATION, HONOLULU.

Stal founded the genus *Lamenia* in 1859 (Eugenies Resa Zoo., 277, Pl. IV., f. 5), for *caliginea* from Tahiti, and the genus *Herpis* in 1861 (K. Vet. Ak. Hanal., III., No. 6, p. 8), for *fuscovittata* and four other species from Brazil; in 1866 in a footnote on page 193 of Hemiptera Africana he sank *Herpis* and *Lamenia*. Uhler in 1889 (Stand. Nat. Hist., II., 233), placed *Pæciloptera vulgaris* Fitch into *Lamenia* and since then several North American species have been placed in this genus, all congeneric with *vulgaris*. Fowler's *Cedusa funesta* is congeneric with *vulgaris* and (according to Melichar, 1905, Wien. Ent. Zeit., 285), *Attalia* = *Herpis*.

Stal's figure of *caliginea* is very clear, and shows the narrow, parallel-sided form of the tegmen with the subcosta and radia amalgamated to near their apices, and the subcostal cell small, a tegmen typical of *Thyrocephalus* Kirkaldy, whereas *vulgaris* and its allies have the tegmen much broader, the subcosta and radia separate from near the base and the subcostal cell large. For these reasons I do not consider it advisable to keep *vulgaris* and *caliginea* in the same genus. All the specimens I have seen from Central and South America are congeneric with *vulgaris* so that it appears best to place that species along with all its allies under *Herpis* and to have *Lamenia* with its type only, or to place all the eleven known species of *Thyrocephalus* under the latter genus.

*Cenchrea dorsalis* appears to differ from *Herpis* in having no subantennal keel across the gena, the antennal chamber being entirely pronotal (Westwood's figure of the tegmen also shows differences, which I do not like to emphasize until I can examine a specimen); from *Syntames* it differs by the absence of a central longitudinal keel on face, and from *Basileocephalus* and *Phaciocephalus* by the presence of a transverse keel between vertex and face.

## OBITUARY.

Mr. L. E. Ricksecker, well-known collector of California insects, died in San Diego in that State, January 30, 1913. He was especially devoted to the collection of Coleoptera, and distributed amongst his correspondents in the east many interesting specimens.

April, 1913

## A NEW SPECIES OF CORIXIDÆ.

BY J. F. ABBOTT, WASHINGTON UNIVERSITY, ST. LOUIS.

*Palmacorixa buenoi*, new species.

With the general facies of *P. gillettei* Abbott, from which it differs in the coarser texture of the tegmina, the character of the lineations and in the palæ of the male and the first femora of the female. The discovery of a second species of this genus necessitates a revision of the generic diagnosis given with the original description (Ent. News, XXIII, 337). The genus may be characterized as follows: Elongate, tegmina tapered posteriorly, with vermiculate markings. Male palæ thin, plate-like, pegs variable. Large stridular area on femur. Metathoracic wings aborted in both sexes. Male asymmetry and strigil dextral; fifth tergite entire, sixth divided.

Description: Similar to *P. gillettei* in size and appearance, in the flattened short pronotum, and large head, with prominent posterior angles. Dark yellow to smoky brown, and much darker than *gillettei*. The tegminal lineations are complete, more or less inosculated and confused, but without a marked tendency to longitudinal seriation. Lineations of clavus complete—i.e., not effaced on the inner anterior area as in *gillettei*. Head smoky brown; its length  $1\frac{3}{4}$  in the width in the male,  $2\frac{1}{4}$  in the female; interorbital width twice in the head length in the male,  $1\frac{1}{4}$  in the female. Male fovea more prominent than in *gillettei*, reaching the middle of the eye and clothed with delicate depressed hairs. Pronotum flattened, margined, lenticular in outline, evenly rounded posteriorly, dull and minutely rastrate, with 7-8 approximately parallel lineations, which are more or less broken. the lineations about as wide as the yellow interspaces. Posterior margin brown. Claval lineations delicate, vermiculate and inosculate, covering the whole clavus, fused externally to form a more or less definite oblique line parallel to the corio-claval suture. Clavus rather infuscated and clouded across the middle third. Markings of corium similar to those of clavus, running without interruption over the membrane; inosculated, but scarcely interrupted, sometimes fused into one or two rather indefinite longitudinal lines, which do not extend beyond the embolium. Surface of clavus and corium rather dull and rough, the clavus usually

rastrate, the corium merely punctate. Margins of embolium and of clavus elevated. Lower surface and legs pale; posterior tibia fringed with brown hairs. Metaxyphus very short, acuminate. Strigil rounded, 5 striæ, diameter 0.1 mm.

Male palæ cultrate, somewhat produced at the base, the length three times the greatest height. Pegs blunt, elongate, 24-33 in number. The distal ones are somewhat longer and crowded, and may be displaced into two irregular rows; the main row begins midway the base and rises in a curve after the first half dozen pegs; then follows the upper margin, but at some distance from it. A second row of peg-like spines along the lower margin, about  $1\frac{1}{2}$  to 2 times the length of the pegs. Tibia subglobular, about as high as the pala. Femur oblong, a little less than twice as long as wide, the stridular area covering the proximal half and consisting of short spines set in transverse rows. Female palæ cultrate, not produced at base, slightly more than three times as long as wide, broadly joined to the tibia. Tibia rounded oblong, tapered proximally, twice as long as high. Femur oblong,  $2\frac{1}{2}$  times as long as wide (the width at base in *P. gillettei* is two-thirds the length) with stridular (?) spines on the surface as in *P. gillettei*. Second leg: Femur  $2\frac{1}{2}$  times the length of the tibia, the latter equal to the claws,\* and  $1\frac{1}{3}$  the length of the tarsus. Length,  $5\frac{1}{2}$ -6 mm.; width across pronotum,  $1\frac{1}{2}$  mm.

Types 2 ♂ and 2 ♀ from White Plains, New York, collected in August and September by J. R. de la T. Bueno. Other specimens have been examined from Washington, D.C. (coll. W. L. McAtee) Oglethorp, Georgia (coll. T. C. Bradley) Hadley, Mass. (coll. C. A. Frost) and Valhalla, N.Y. (coll. Bueno). The species, therefore, appears to be distributed pretty widely up and down the Atlantic Coast of the United States.

Variation.—Some twenty specimens have been examined in addition to the described types. These individuals show a wide range of variation, such that the extremes would seem to belong to different species were it not for the intergradation. The writer has been unable to find any constant character, however, which would serve as a basis for discrimination. The smallest (White

\*Through a *lapsus calami* these are called "spines" in the description of *P. Gillettei* (l. c., p. 339).

Plains) measures but  $4\frac{1}{4}$  mm., the largest (same locality)  $6\frac{1}{2}$  mm. The tegminal surface may be smooth and polished, or dull and rastrate, the lineations varying from the regular complete lines of the type to interrupted and confused markings, resembling those of *P. gillettei*; the inner angle of the clavus, however, is never bare of lineations. Pronotal lines 6-9, either entire or much broken and confused. The index of pronotal width divided by pronotal length ranges from 2.22 to 2.60 in the ♀, and 1.79 to 2.73 in the ♂; that of the head width divided by the interorbital width ranges from 2.87 to 3.57 in the ♀ and from 3.60 to 4.20 in the ♂; that of the head width divided by the head length from 2.07 to 2.60 in the ♀ and from 1.68 to 2.33 in the ♂. In the male the paler pegs are sometimes crowded into two rows at both ends of the series. The absence of functional wings in both sexes in this genus certainly interferes with the rapid dispersal or mixing of individuals from adjacent localities, and thus brings about a partial segregation which would preserve and intensify aberrant variations. This possibly explains the very unusual range of variability above described.

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#### ENTOMOLOGICAL MEETING IN CALIFORNIA, 1915.

The Entomological Society of America has received an invitation from the Panama-Pacific International Exposition to hold a meeting in some Californian locality in the summer of 1915. This gathering may be at either of the Universities or on the Exposition Grounds. It has received the enthusiastic support of western entomologists. These latter have attended many eastern meetings, and this is an excellent chance for us to return the compliment. It may be possible for a number to go out with a party, stopping off at one or more interesting points en route. As chairman of a special committee to consider this matter and report at the next meeting of the Association, the undersigned would welcome suggestions in regard to this meeting, and also expressions relative to the support it would probably receive from eastern entomologists.

E. P. FELT, State Museum, Albany, N.Y.

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### BUMBLE BEES AND WASPS WANTED.

Mr. F. W. L. Sladen, Assistant Entomologist for Apiculture, Division of Entomology, Department of Agriculture, Ottawa, is making a special study of the Bumble Bees (genera *Bombus* and *Psithyrus*) and the Social Wasps (genera *Vespa*, *Polistes* and *Polybia*). He would be glad if anyone who finds a bumble bee's nest would send him a few specimens of the bees, without destroying the nest, so that he may determine the species. He would also like to receive specimens caught on flowers, especially in out-of-the-way districts.

Bumble bees and wasps are best killed with cyanide of potassium. Crushed tissue paper should be placed in the killing bottle to absorb any moisture, which otherwise mat and spoil the coats of the specimens. Wasps should not be allowed to remain in cyanide fumes for long, or their yellow markings will turn red. The specimens should be packed in soft tissue paper, or mounted on entomological pins and labelled with the date and *locality of capture*, and also *the collector's name*, and sent in a strong box, by mail, to the "Dominion Entomologist, Central Experimental Farm, Ottawa." Postage is free.

Specimens should be in good condition, not faded or damaged by exposure, and should include the large queens that are to be found chiefly in May and June, as well as the smaller workers that occur in abundance in July and the males that are common in August and September. Any notes on their habits and about the flowers they frequent and pollinate would be valued.

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### OBITUARY.

WE regret to record the death of William Greenwood Wright at San Bernardino, California, at the age of 83. Mr. Wright travelled extensively on the North American continent, collecting chiefly Lepidoptera. He assisted W. H. Edwards in the preparation of his "Butterflies of North America", but his most important work was "The Butterflies of the West Coast" published in 1905. He contributed to this Journal.

THE DISASTROUS OCCURRENCE OF *VANESSA CALIFORNICA* IN CALIFORNIA AND OREGON DURING THE YEARS 1911-1912.

BY F. M. WEBSTER, BUREAU OF ENTOMOLOGY, WASHINGTON, D.C.

The interesting note of Mr. J. B. Wallis on the occurrence of this species at Peachland, British Columbia, in 1912, as given in the "Canadian Entomologist" for December, 1912, comes in very appropriately with the notes and observations made by correspondents of this Bureau, at Lakeview and Waldo, Oregon, and Willow Ranch, California. As the Bureau of Entomology is not likely to publish on this species in the near future, the information here given may be useful in case there should be a re-occurrence of these caterpillars during the summer of the present year.

Our first report of injuries by these caterpillars came from Mr. T. V. Hall, of Lakeview, Oregon, under date of July 27, 1911. Mr. Hall states that there had suddenly appeared in his neighborhood a worm which had taken almost the entire alfalfa crop. "Also has entirely destroyed the prospects for seed, which usually brings in to the farmers of this neighbourhood about \$40,000 annually. The worm is from one-half to one inch in length and slender; perhaps 1-8 to 1-12 in thickness, brownish color and sleek appearing surface. It destroys the small tender alfalfa entire. The more mature growth it takes all but the fibre. This worm travels in vast armies. It almost seems as though the ground were in motion when they are in motion. The oldest settlers here state that nothing of the kind has ever appeared here before. This history reaches back at least forty years. We would like well to learn of some method for their destruction, or some way of preventing a repetition of the past, for they have caused a total loss to the year's crop."

The next report came from the same locality, under date of August 25, 1911, from Mr. A. J. Swift, who sent two specimens of these butterflies, which, he says, had been produced in his locality in enormous numbers during that month. Mr. Swift's further statements relative to this occurrence are given in his own words. "So far as known, this butterfly has never occurred here before, or at least in such small numbers as to have escaped comment.

This year, during July, various sections of the country have been covered with a worm of various sizes, but sometimes as large as  $1\frac{1}{2}$  inches long and near a  $\frac{1}{4}$ -inch in diameter. As I remember it now, it had two pairs of legs forward and three pairs aft, and varied in color with its food supply, some specimens being a bright green and grading from that to nearly black. The worm did immense damage to growing alfalfa and grasses, but so far as I am advised, did not trouble the trees. After the passing of the worm, this butterfly developed, which in its original swarming filled the air with myriads of them, and at this place the entire swarm was headed in one general direction, west, in very rapid flight."

Our next report for 1911, by a coincidence, was of the same date—August 25—from Mr. J. J. Monroe, of Willow Ranch, California, whose letter appears to be of sufficient interest to give in full.

"About June 1, of the present year, an old gardener told me that he noticed many of the specimens of butterfly I send you flitting about his garden and alfalfa fields. About six weeks later many of the destructive larvæ were noticed in the alfalfa fields and in gardens. Thousands of the larvæ left the hay (alfalfa) that I hauled into my barn and attacked one of my gardens which was nearby—i.e., 30 or 40 feet from the barn. They ate any kind of green vegetation—potato tops, peach tree leaves, garden weeds of any and all kinds, gooseberry leaves; in fact, apparently any and all kinds of green vegetation except death-weed. The larvæ have very much the appearance of the ordinary cutworm in the earlier stages of its growth, but it grows to be larger and much longer than the ordinary cutworm, and in the latter stages of the larval growth is of a light green color. Many of the larvæ attain a length of at least two inches, and some a length of probably as much as two and one-half inches. These larvæ while in my garden worked at night—i.e., during the darkness. Looking in the daytime, it was remarkable to find in sight even one larva, but they could be found in abundance in the ground about one inch from the surface. The domestic hen and the ordinary blackbird are very fond of both the larvæ and of the butterfly. The larvæ have destroyed quite an amount of alfalfa that was to be cut for seed, and also some alfalfa that would have been a second cutting

for hay. A U.S. forest ranger told me this morning that the first damage he noticed from the larvæ in the forest was the leaves that were eaten from the Snow Brush, in many places the leaves being entirely stripped, eaten off,—i.e. consumed. Yesterday I saw many of these butterflies flitting among the branches and above the tops of the tall pine trees. Sunday, the 20th, I saw millions of these butterflies coming from the direction of the timber and flying on in the direction of Goose Lake. In other words, they were flying just about due west, and at the time there was quite a stiff, constant north wind blowing. These butterflies seem to congregate and alight on the willows, green-growing alfalfa, and in wet, muddy places. At other times—at least, during the day time—they are mostly on the wing. Now, the larvæ haven't done any remarkably great amount of damage yet, but there are butterflies in sufficient numbers now to produce a crop of larvæ next year to entirely destroy all the vegetation that would be produced here next year—i.e., if they are of the kind that comes every year."

Under date of June 12, 1912, Mr. Louis R. Webb, of Waldo, Oregon, wrote us of the appearance there of these caterpillars as follows: "There has appeared in this section of Josephine County a sort of army worm that resembles somewhat the caterpillar, and different from anything I ever saw. It has attacked the grease wood and mountain lilac mostly, and there are many acres in this locality and South River County, Del Norte County, Cal., that have been completely stripped of their foliage, and it has begun to attack fruit trees. It builds no web like the army worm of previous years, and its colour is black, with light streaks along its back. The worm at present is about an inch long and about one-eighth of an inch in diameter. So far, I have failed to find the moth that deposits the eggs."

"Also, under date of July 4, same year, specimens of the larvæ were submitted, and we quote from this letter as follows: "I wish I could send you photos of vegetation destroyed by these caterpillars. When they had eaten all the foliage off grease wood and mountain lilac, they started a sort of exodus and took possession of everything—even our homes could not exclude them. The streams and river were black with them, and tons of them

went down the Illinois River, tons of them starved to death, and the brush and trees are covered now with their pupas like the enclosed. They seemed to care for nothing to speak of but greasewood and lilac, but did eat some on willows, ferns, currant bushes, and very few young apples were gnawed by them like the sample enclosed. I think the enclosed samples will tell you a true story of what they did."

He also wrote us farther, under date of July 23—this time including pupæ of the insect and also specimens of some parasites. The butterfly accompanying this letter was determined by Dr. Dyar as belonging to the species under consideration. The hymenopterous parasites accompanying this letter were determined by Mr. Viereck as *Theronia americana*; while the supposed dipterous parasite was determined by Mr. Walton as *Helicobia helcis*. This latter was more likely to have been a scavenger than a parasite, although both species were reared from material submitted. In this letter Mr. Webb states that the butterflies seem to migrate after they emerged, and that fully half of the chrysalids were destroyed by parasites.

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### NEW LIFE-HISTORIES IN PAPAPEMA SM. (LEPID.)

BY HENRY BIRD, RYE, N. Y.

(Continued from Vol. XLIII., p. 47.)

#### *Papaipema moeseri* Bird

The larval history accords with the usual routine experienced in *Papaipema*. As it is such a distinct species and so well distributed and accessible when the facts are known, it may be excusable to give some details of its discovery. The root-boring habit of the larva, its superficial resemblance to *P. impecuniosa* Grt., and the fact of its often occurring in the same locality, though in a different food plant, served, through a peculiar chain of circumstances, to retard its apprehension for several years at least.

The first intimation of the species came from Mr. A. F. Winn, of Montreal, whose query as to what *Papaipema* was boring *Chelone glabra*, Turtle-head, had to go unanswered. None of the few plants occurring about Rye gave evidence of being bored, and Mr. Winn was advised to look into the question another year, for we were

glad to delegate the matter to such able hands. In due course, the next season, he reported finding a freshly emerged moth of *P. impecuniosa* crawling up the stem of a *Chelone* plant when he was examining it to find the pupa of its borer, and naturally concluded he had found a new food plant for the Grote species.

The following year the writer was at Montreal in mid-July, and happened upon a large colony of Turtle-head borers, working, as it chanced, in a damp area where *Aster puniceus* was flourishing plentifully. The Aster was being bored by numerous *impecuniosa* larvæ, whose identity was beyond question, and a careful comparison of them with the larvæ from the Turtle-head failed to note the slightest difference. It was conceded Mr. Winn was doubtless correct in his surmise—a mere case of substitution of food-plants was occurring. Larvæ were then in the fourth stage, and, knowing the trouble it would be to carry them through, the Montreal colony were in no way depleted by accessions in my behalf.

About this time the *Papaipema* investigations of Mr. F. E. Moeser, at Buffalo, prompted a recurrence of the question, what species bores Turtle-head? And the writer replied with considerable assurance that it was without doubt *impecuniosa*. But when later in the season Mr. Moeser went to get the pupæ from the borings, as can be readily done with the normal workings of the species in Aster, he found they had pupated elsewhere. Even then we were not convinced, for it was recalled when working in *Helenium*, *impecuniosa* usually forsakes its gallery to change. The next year Mr. Moeser decides to settle the matter to his own satisfaction, and scores the breeding of a new species. My own dull eyes had by this time seen a mature larva and had awakened to a realization it could not be the Grote species.

The stations for *moeseri*, doubtless, long endure. Turtle-head is a tenacious perennial in those wet locations that are congenial, and indications point to the well-established colonies existing many years at a given spot. Such a one on Staten Island, N.Y., is called to our attention. Here, almost in sight of the former home of the late A. R. Grote, a woodland rill meanders through the undergrowth, edged with a fringe of *Chelone* that takes root in its very bed. This station for the plant has long been a botanical record for Mr. W. T. Davis, and under his guidance

in July, 1911, the place is visited to see if *moeseri* can be found there. Numerous larvæ are located, and in 1912 the colony is found to be still flourishing. There is considerable difference apparently in the time at which the hibernated ova hatch, due to the very moist conditions they endure. While the egg may withstand inundation very well, the young larvæ cannot, and, as with *marginidens* working in *Cicuta* and *Sium*, both water-loving plants, many tardy larvæ occur. Though neither the ova nor the first stages were observed, the first week of June can be figured as their date of general emergence. The stems are entered several inches above ground, and a more or less extended tunnel drilled upward. As they become larger, the boring of necessity becomes small for them, and they turn downward in the underground portion of the stem or root. The stems are often weakened so as to fall, and there are several openings made whereby the frass is thrown out. These castings form in little whitish mounds and become a conspicuous clue to the hidden host. Thus far, parasitism seems abnormally low, but one *Hemiteles* attack having been noticed.

As *moeseri* is so clearly a denizen of the wild woodland or swamp, it seems a coincidence to have been first met within the confines or immediate vicinity of such large cities as Montreal, Buffalo or New York. In southern West Chester Co., N.Y., and on the opposite shore of Long Island no infestations have been found, though it is true no stations of the plant were met that could be expected to support flourishing colonies. The following larval stages were observed:

Stage IV.—Head normal for group, polished, pale brown, marked with a black line at the ocelli, which extends posteriorly oblique across the epicranium, labrum and mouth parts black, seta at tubercle VIII seems longest. Body cylindrical, thoracic joints have the skin puckered, colour is a livid cast of umber brown, which shows on joints four to seven inclusive as a dark band or girdle, the remaining joints relieved by the white longitudinal lines; the dorsal line is unbroken, but its continuation across four to seven is by the merest thread; subdorsal line wider, but breaks abruptly at joints four to seven; subspiracular shows on thoracic joints, on eight to twelve is fused with the white of the ventral

area. Tubercles well shown, brownish black; on joint one the cephalic plate forms a complete covering dorsally, being wider than the head, of similar texture, and edged at the side with black; on joint two an elongate plate occurs anterior to Ia and Ib, the fusion of Xa and Xb apparently, and is about twice the length of a spiracle; Ia, Ib and IIa show as mere dots; IIb, III and IV are much larger, being greater than a spiracle; VII of similar size; on joint three tubercles similar, except the elongate plate is absent; on the abdominal joints IV slightly exceeds the spiracle, and on ten is low down; on joint eleven III and IIIa are well separated, and I and II assume their usual large proportions; anal plates well developed; spiracles black.

Stage V.—Similar; on joint ten there is indication of tubercle IVa, but it is not stable for this nor succeeding stages.

Stage VI.—Body colour much lighter; otherwise no change.

Stage VII.—Head has lost oblique lateral marking, body colour fades to whitish translucence at maturity; the fused tubercle Xa and Xb is less prominent; otherwise similar. Larva measures 21, 27, 35, 40 mm. for the stages respectively.

Maturity is reached August 8th to 15th, and the gallery is left for pupation. The pupa is shorter and chunkier than usual, of chestnut brown colour and shows no unusual developments; the cremaster is two sharp, curved hooks; length, 15 to 16 mm.

The emergence dates for thirty specimens include August 26th to September 19th.

*Moeleri* larvæ in early stages are almost identical with *impecuniosa*, in the last two stages its larger size and middle girth, together with a slight difference of tubercle delineation, readily separate them.

*Papaipema stenocelis* Dyar.

This species, represented by a unique type from Baltimore, Md., was described in 1907. A second specimen was taken at light at Lakehurst, N.J., by Mr. O. Buchholz, in September, 1910. A relationship is apparent to *P. inquaesita* G & R., and more closely still to *speciosissima* G & R.

It seemed clear that so distinctive a species must have remote haunts and be restricted to a more southern range, else collectors would have cognizance of it long ago. Believing this second capture had bred at Lakehurst, since the habits of this group controvert an assumption of migration, to which the appearance of many late-flying, southern Noctuids is often assigned, led the writer to make an extended search for its larva in the pine barren flora of Lakehurst, in 1911.

The results were negative, and subsequent studies of lists of more southern flora, gave little intimation what particular plant was likely to shelter the *stenocelis* larval tunnel in its stem or root.

The larger perennials, with which we are wont to associate these borers, are strikingly absent from pine barrens, and we finally conceived the notion it must bore some fern.

On July 28, 1912, we again invaded the Lakehurst region, with the idea of investigating the unfamiliar ferns, and in a half hour's time had discovered the desideratum. Some orange-coloured frass, similar, yet a little different from that thrown out by *inquaesita* when in the root of *Onoclea*, was noticed about the stipes of *Woodwardia virginica*, and gave intimation that this was the species of which we were in search. Upon uncovering the larva, which was working in the long running rootstock, we became more certain of the determination, as it transpires the tubercles on joint eleven accords with the unique departure shown in *inquaesita*, except that it is more pronounced. Confirmation of the matter occurs on September 13, following, when the first beautiful male moth appears.

The life cycle clearly follows the usual course, the hibernated ova placed in September hatch forth about the first week of June. The normal larval period will likely cover sixty to sixty-five days, and the pupal condition lasts about thirty days.

The newly emerged larva enters the stipe near the base and works down to the running rootstock, where it finds an ample opportunity to mine an extended burrow. Communication with the original entrance is discontinued after a while, and more convenient openings for disposing the frass are made as the tunnel progresses. An Hemiteles parasite, which hibernated in its

cocoon, had claimed 85% of the larvæ encountered. Larvæ were observed in the following stages.

Stage V.—The general features as given for the preceding species apply. The colour is a warm shade of brown, the longitudinal lines are narrow and not so contrastingly white, the dorsal alone continuous. On joint eleven tubercles III and IIIa are fused into a plate about three times the size of the spiracle, IIIa occurs distinctly on the preceding abdominal joints; on joint twelve the plates are stronger than with the compared form.

Stage VI.—Little change, colour paler and more of a sienna tint, tubercles appear with better prominence.

Stage VII.—General characteristics normal; colour a pale, dull, pinkish hue, fading to translucence at the sutures; lines indistinct; the blackish tubercles stand out in greater prominence, of the lateral ones, III on joint two, and the fused III and IIIa on joint eleven are most conspicuous, the latter constituting the chief specific character. This plate is four or five times the size of the spiracle. Setæ are so weak as to be unnoticeable without a lens. The first pair of prolegs on joint six are aborted in early stages, and never develop so fully as the succeeding three pairs; crochets here number twelve, while for joint nine the number is eighteen. Larval length, 30, 38, 46 mm., for the stages respectively.

A feature of individuality with *stenocelis* is the prominence of tubercle III on joint eleven, which has evidently taken in IIIa. While these plates often coalesce in other species of the genus, there is not the comparative enlargement as in this case. *Cerussata* and *cataphracta* are examples of large tubercle development, III and IIIa fuse, in this instance, into a large plate with them. But it does not reach the proportions attained in *stenocelis*. With *inquaesita* this plate is of unusual size, since the remaining tubercles are so very weak. Tubercle IIIa on the abdominal joints of Noctuid larvæ seems always obscure and generally wanting, especially is this so on joint eleven. With such a well tubercled larva as that of *Achatodes zeeæ*, IIIa seems normally wanting on

joint eleven, though it occurs conspicuously on the preceding joints. One specimen was observed that had it on joint eleven, but it occurred on one side only.

When ready to pupate, the larva leaves the burrow and changes in the ground. The pupa is of normal appearance, and the period is of usual duration—about a month.

*Stenocelis* was placed in *Hydroecia* by Dr. Dyar, his type being imperfect in the characteristic tufting that is a feature in differentiating these moths. It is a conventional *Papaipema*, however, and was so referred by Hampson, perfect material having the typical tufting present, while the genitalia conform to the unusual pattern of this group. What is really a better characteristic exists in the larval appearance which accords with the unique pattern disclosed in *Papaipema*—at least, as occurs with thirty of the species whose larvæ are known. One very notable departure happens with *frigida*, whose larva approximates *Hydroecia* characteristics, and is evidently a relic of the stem species, whence both these groups sprung.

The genitalia have not been discussed. These male characters show little to distinguish them from the general type. The broad, heavy side-piece, or clasp is tipped with an irregularly formed cucullus, shaped somewhat like a foot with an over-developed heel, and having the toe, which is the anal angle of the corona, pointing ventrally. This area is set with spine-like setæ that point anteriorly. The harpe is a stout, sharp-pointed hook, curved like a cow's horn. It is shorter than with most species, and is toothed slightly on the outer edge. These teeth, too, are of less prominence. The clavus is marked only by a slight prominence, which is covered with fine setæ. The uncus is the usual finger-like appendage, widened a little near the point.

From our studies of southern flora, now that the food-plant is known, we might predict *stenocelis* may find its principal metropolis in the Dismal Swamp region of Virginia, where *Woodwardia* reaches a prolific development.

## BOOK NOTICES

A CONTRIBUTION TO THE MORPHOLOGY AND BIOLOGY OF INSECT GALLS. By A. Cosens. (Reprinted from the Transactions of the Canadian Institute, Vol. IX., pp. 297-387, 13 pls., 1912.)

That aspect of cecidology which treats of the causes that are operative in the formation of insect galls and the manner in which the plant tissues react to the stimulus is one that has been much neglected, particularly by American students of the subject. Mr. Cosens' work throws considerable light on these interesting problems and is one of the most important contributions to our knowledge of the morphology of galls that has ever been published.

The greater part of the work is devoted to descriptions of the anatomy of sixty-eight kinds of American insect and phytoptid galls. The descriptions are arranged in the order in which the producers are classified, most of the gall-producing families, except those of the Coleoptera, being represented.

Although dealing mainly with matters that are chiefly of interest to the botanist, the author has also cleared up some important difficulties concerning the feeding habits of various gall-producing insects. Cynipid larvæ were found to secrete an enzyme which converts the starch in the nutritive layer of cells surrounding the larval chamber into sugar, which is taken up by the larva through the mouth. The cells of the larval chamber thus remain unbroken, and their inner surfaces present a marked contrast to the ragged cell-layer lining the cavities inhabited by inquiline larvæ. This view is confirmed by the discovery that though, contrary to current views, the intestinal tract in Cynipid larvæ is complete, an anus being present, no frass is expelled, as would be the case were the entire cells devoured, as they are in sawfly galls.

It is suggested that this ferment "may indirectly stimulate cell proliferation by storing the nutritive zone with an unusually large quantity of available nourishment, which can diffuse to all parts of the gall."

Adler's discovery that the gall of *Nematus vallisnerii* is partly formed while the larva is still within the egg, was confirmed in

the case of several species of *Pontania*. It is suggested that the curious power of the excrement of such sawfly larvæ to induce cell proliferation is possibly due to their having swallowed tissues still containing these enzymes, which have retained their stimulating power, even after having passed through the intestinal tract of the larva.

The work, which should be in the hands of every student of insect galls, is beautifully illustrated by thirteen heliotype plates from photomicrographs of sections of the various galls described in the text. There are also a few good text figures.

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CONTRIBUTIONS TO THE NATURAL HISTORY OF THE LEPIDOPTERA OF NORTH AMERICA. Parts IV., V. and VI. By Dr. Wm. Barnes and Dr. J. H. McDunnough.

Three more parts of this valuable publication, by Dr. Barnes and Dr. McDunnough, have appeared, bearing dates of July, 1912. Part IV. is entitled, "Illustrations of Rare and Typical Lepidoptera," and contains 27 plates, reproduced by half-tone process from photographs, which present in all 506 figures. Most of these are of moths which have not previously been figured, and a large percentage are the actual types, so the usefulness of the work to students will be realized. The text, 54 pages, and index is mostly an explanation of the figures, with locality of the specimens shown, but in some cases additional notes are given.

Part V.—"Fifty New Species: Notes on the Genus *Alpheias*"—contains 44 pages of text, three half-tone plates showing 62 figures of types and cotypes of the species described, one plate of genitalia and one of venation. The new species are from Arizona, California, New Mexico, Texas and Utah.

Part VI. is of 13 pages "On the Generic Types of N.A. Diurnal Lepidoptera," and deals with one of the many phases of the vexatious muddles which entomological nomenclature, at present, is in, but it seems probable that the International Congress of Entomology will be able before long to overcome many of the difficulties that make it so easy to keep generic and specific names in a constant state of chaos.

A. F. WINN.