



John B. Smith

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OBITUARY.

JOHN BERNHARDT SMITH.

It is with profound regret that we have to record the death, from Bright's disease, of Dr. John Bernhardt Smith, Professor of Entomology at Rutgers College, New Brunswick, N.J., Entomologist to the New Jersey Agricultural Experiment Station, and State Entomologist of New Jersey, which occurred at his home during the morning of March 12, 1912.

Dr. Smith was born in New York City on November 21, 1858, so he died at a comparatively early age. It is a coincidence that the late Dr. James Fletcher and the one we now mourn, who were such close friends, should be called away at about the same age. Dr. Smith's early education was received at the Public Schools. He practised law from 1880 to 1884, but his heart was not in such work, and during this latter year he was appointed as a special agent to the United States Department of Agriculture, which position he held until 1886, when he was made Assistant-Curator of Insects in the United States National Museum. Here he remained until 1889, when he was appointed Professor of Entomology at Rutgers College and Entomologist to the New Jersey Agricultural Experiment Station. In 1894, he also received the title of State Entomologist of New Jersey. During the years 1882 to 1890 he was the editor of *Entomologica Americana*. For several years he was also editor of the "Bulletin of the Brooklyn Entomological Society."

Dr. Smith was an extremely busy man, one who in every way served his state and country as few men have. A man of wide experience and deep study he has, in his published works, left behind him a monument of knowledge which will last for all time and which will undoubtedly serve as a guide for many future students of entomology. While in the Museum at Washington, he published some very valuable monographic works, namely, "A Monograph of the Sphingidae of America, North of Mexico," "A Revision of the Lepidopterous Family Saturniidae," and "Preliminary Catalogue of the Arctiidae of Temperate North America." Bulletin No. 44 of the U. S. N. M., pp. 1-424, "A Catalogue, Bibliographical and Synonymical, of the species of moths of the Lepidopterous Superfamily

Noctuidæ, found in Boreal America, with critical notes," was prepared by him and appeared in 1893. This is indispensable to students of these insects, as are also his many "Contributions toward a Monograph of the Noctuidæ of Boreal America." His best scientific work was undoubtedly in this family, of which he was our leading American authority. It is impossible to mention here the many articles which he published, in revising genera, describing new species (of which he created many hundreds), etc. The first paper he published in THE CANADIAN ENTOMOLOGIST appeared in Volume XIV. Since that date he has been one of our most valued contributors. Articles from his pen have been published in 24 different volumes of this journal. A bibliography of his systematic papers would fill many pages; it is to be hoped that such will soon be prepared.

In 1891, Dr. Smith published a "List of the Lepidoptera of Boreal America," which was used generally by lepidopterists. This check list was revised and re-published in 1903. "Explanation of Terms Used in Entomology" was prepared by him and appeared in 1906. His "Catalogue of the Insects of New Jersey," the third edition of which recently appeared, is an extremely useful publication, and the only one of its kind which has been published by any state in the United States.

Other important works, of a popular nature, written by Dr. Smith, are "Economic Entomology," published in 1896, which is a valuable book for students of entomology, farmers, etc., and "Our Insect Friends and Enemies," which appeared in 1909. This latter treats of insects in relation to man, to other animals, to one another, and to plants, and in it there is also a chapter on the war against insects.

As an economic entomologist few men in the world were his equal. His series of annual reports, the first of which was included in the Tenth Annual Report of the New Jersey Agricultural Experiment Station, 1889, and the last, that for 1910, which was published in 1911, together with the many economic bulletins which he prepared, form a valuable source of reference concerning injurious insects, particularly those occurring within the State of New Jersey. The very successful work he did on the control of mosquitoes has been commented upon widely. His special report, published in 1904, 482 pp., upon the mosquitoes occurring within the State of New Jersey, in which is included an account of the different species, their habits, life-history, economic treatment, etc., is an extremely valuable contribution and shows the remarkable capability of the man in dealing with problems of such magnitude. Further accounts of this mosquito work are given at considerable length in his annual reports, since the above dates.

At meetings of farmers, horticulturists, etc., and those of scientific societies, which he was closely identified with, his lectures and helpful talks will be much missed. He received honours from many societies, among which may be mentioned that of Fellow of the American Association for the Advancement of Science, Fellow of the New York Academy of Sciences, Fellow of the Entomological Society of America, Honourary Member of the Entomological Society of Ontario, Honourary Member of the Newark Entomological Society, Corresponding Member of the Entomological Society of Washington, and Corresponding Member of the Ottawa Field-Naturalists' Club. He also had active membership in the Association of Economic Entomologists, Society for the Promotion of Agricultural Science, Brooklyn Entomological Society, Philadelphia Feldman Collecting Social, Brooklyn Institute, Washington Academy, and New Jersey State Microscopical Society.

In 1891, Rutgers College conferred upon him the honourary degree of Doctor of Science.

Like many busy men, he always found time to help others; in his death, we in Canada have lost a true and valued friend. To-day there is a gap in our ranks which it will indeed be difficult to fill.

To Mrs. Smith and the two grown-up children who survive him, we extend our deepest sympathy.

ARTHUR GIBSON.

GEOMETRIDÆ AS YET UNDESCRIPTED.

BY RICHARD F. PEARSALL, BROOKLYN, N. Y.

(Continued from page 31.)

Stamnodes ululata, n. sp.

Expanse, 30 mm. Palpi moderate, extending well beyond the bulging front, pink, rough scaled, the last joint clay-yellow. Front dusky clay. Antennæ clay-yellow, heavily dusted with black scales above. The base of fore legs in front, the collar and bases of patagia are deeply roseate. Body clay-yellow, except a white cloud covering the scutellar region and base of abdomen, the latter sparingly sprinkled with roseate scales toward apex. Wings broad and thin in texture, of an even, pale, glistening clay-yellow, a little paler beneath. The primaries along costa, and broadly at apex, are sprinkled with roseate scales. The costa at one-fourth and one-half from the base is crossed by a pale bar, and at three-fourths out, a

semilucent pale band, after crossing costa, curves outward around cell, and is lost at middle of wing. Secondaries with a faint roseate hue at outer apical margin, without markings of any kind. All wings above and below without discal dots or marginal lines. Fringes rather long, pink, sprinkled towards apices with black scales, which tend to gather at end of veins. Beneath, the primaries, over cell to extradiscal luteous band, outlining this rather sharply, and beyond this band a well-defined apical triangle reaching to centre of outer margin, are heavily dusted with roseate scales, the rest of the surface being entirely clear. Secondaries, without markings of any kind, are evenly and finely dusted with roseate.

Type, one female taken at La Puerta, Calif., Oct. 15th, 1911, is in the author's collection. The immaculate under side of secondaries is quite unusual.

Parexelsa, nov. gen.

Palpi very small. Tongue obsolete. Front flat, finely shagreened, opaque, margined above between the orbits by a fine polished ridge, the edge apparently of the projecting vertex, which is slightly elevated between the pedicellate bases of the antennæ, these, together with the whole upper surface, being black and highly polished. Antennæ long, bipectinate to apex, where they are shortened so abruptly as to give a blunt appearance. Thorax and abdomen untufted. Legs normal, the hind tibiae not swollen, without hair-pencil, and having two pairs of spurs. All wings somewhat extended, the outer margins rounded and slightly crenulate, without basal foveæ. Fore wings 12 veins, with 8 and 9 stalked on 7 and with each other, all others free. No accessory cell. Hind wings with costal margin concave, vein 8 parallelling cell for a short distance at or before centre, and showing a vestige of vein 5 toward outer margin; 3 and 4 are widely separate, and 6 and 7 from point.

Type.—*Parexelsa ultraria* Pears.

This genus, by the faint trace of vein 5, shows a Hydriomenid tendency, but is, in my judgment, best retained among the Ennominae, next to *Hulstina* Dyar.

Parexelsa ultraria, n. sp.

Expanse, 28-30 mm. Palpi very short, hairy; pale gray. Antennæ stout, the shaft white, with pectinations dark gray. Front covered with a

velvety pile of livid gray. Head, thorax above and primaries above silver-gray, with a mixture of scattered black scales, frosted with white in

part. Abdomen and secondaries a dusky silver-gray. Head and thorax rough scaled; a tuft overhanging front between antennae. Primaries are marked with jet-black lines, one of which crosses costa at a sharp angle about one-fourth out. Another runs from centre of wing-base along vein beneath cell to its end, and a third from point of cell to apex of wing, broken at its middle by a sharp angle. Below this line to inner margin a series of long sharp points, outlined by a fine black hair line, rest on the veins, their bases joined about centre of wing into an irregular patch. The two lower points are shorter and broader than the rest. Another long point reaches backward through centre of cell nearly to its base, one beneath the black line along its lower margin, and a third, short and broad, between this and inner margin. The included space within these points, and the patch at centre, is a livid gray, almost free from the frosting of white scales, which cover the rest of the surface, forming a snow-white patch above and bordering the black line apex. A short black dash, ending in a cluster of black scales at margin, between the ends of veins. Fringes dusky gray, long and silken. Secondaries without markings. Fringes as on primaries. No discal dots. A fine black marginal line. Beneath ashen, dusky along costa of primaries, and outwardly on all wings, which are bordered with a fine black marginal line. Fringes as above. No discal dots. Body beneath and legs pale ash-gray, sprinkled with black atoms.

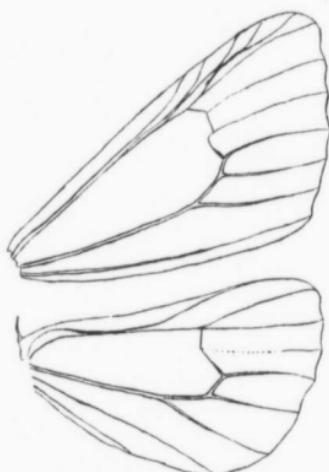
FIG. 5.—*Parexcelsa ultraria*, venation.

point reaches backward through centre of cell nearly to its base, one beneath the black line along its lower margin, and a third, short and broad, between this and inner margin. The included space within these points, and the patch at centre, is a livid gray, almost free from the frosting of white scales, which cover the rest of the surface, forming a snow-white patch above and bordering the black line apex. A short black dash, ending in a cluster of black scales at margin, between the ends of veins. Fringes dusky gray, long and silken. Secondaries without markings. Fringes as on primaries. No discal dots. A fine black marginal line. Beneath ashen, dusky along costa of primaries, and outwardly on all wings, which are bordered with a fine black marginal line. Fringes as above. No discal dots. Body beneath and legs pale ash-gray, sprinkled with black atoms.

Type, ♂ from San Diego, Calif., taken Oct. 9, 1910, and thirteen male co-types, Oct. 28, 1911, are in author's collection. The female is unknown to me.



FIG. 6.—*P. ultraria*, front view of head.



NOTES ON *MELITÆA ALMA* STRECKER.

BY VICTOR L. CLEMENCE, PASADENA, CALIF.

In a recent number of the CANADIAN ENTOMOLOGIST, Karl R. Coolidge published an article entitled "Melitæa alma and Its Synonymy." Since the publication of the above article I have added a considerable number of specimens to that group in my collection, with the intention of verifying Coolidge's classification. I have also received specimens of *M. alma*, *M. fulvia* and *M. cyneas* from Dr. Barnes, which have been compared with the types, and which agree with my own series.

I have *M. alma* from Chiricahua Mts., South Arizona; Santa Catalina Mts., Arizona, and Fort Wingate, N. M.

M. fulvia from Fort Wingate, N. M., and Santa Catalina Mts., Ariz.

M. cyneas from Chiricahua Mts. and the Huachuca Mts., Ariz.

All my *fulvia* males are constant, and show very little variation. A few of the females show a tendency to the *alma* form, which is also the case in my *cynæas*. There is no doubt in my mind that typical *alma* is a variety which occurs occasionally in both *fulvia* and *cynæas*, more often in the females. I have taken two female *alma* in the Chiricahua Mts. flying with *cynæas* males. Out of a series of twenty *fulvia* from Fort Wingate three of the females approach the *alma* form. Dr. J. McDunnough, with Dr. Barnes, says: "Many of the *fulvia* females show a tendency towards becoming yellow, but most of our males are very constant in this respect." I have not heard of any locality where the *alma* form predominates, but on the other hand there was not one *cynæas* among the *fulvia* from Fort Wingate, and I have never seen a *fulvia* either in the Chiricahua Mts. or Huachuca Mts., where *cynæas* is common.

I believe *fulvia* and *cynæas* bear the same relationship to each other that *leanira* does to *wrighti*, *fulvia* being the more northern form occurring in Colorado, New Mexico and Arizona, while *cynæas* is the more southern form occurring from S. Arizona to S. Mexico. The fact that *alma* occurs in the same localities as both *fulvia* and *cynæas* leads me to think that it was the original form occupying the whole general region, and that owing to geographical surroundings each of the others has become permanent and has gradually taken the place of the parent form, which still is occasionally found among both *fulvia* and *cynæas*, the latter becoming a geographical subspecies. According to priority I should give the following classification:

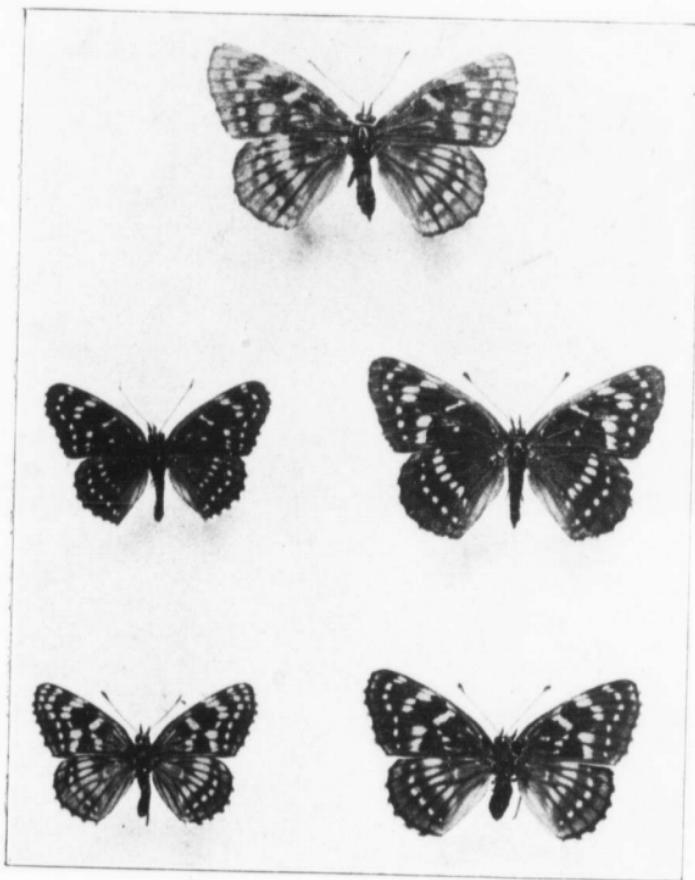
Melitæa alma Strecker.

Sub-sp. " *alma fulvia* Edwards.

" " *alma cynæas* Godman and Salvin.

The accompanying plate shows the three typical forms.

April, 1912



MELITAEA ALMA (♀) STRECKER.
M. ALMA CYNEAS (♂, ♀) GOD.-SALV.
M. ALMA FULVIA (♂, ♀) EDWARDS.

THE TRANSMISSION OF TYPHUS FEVER BY LICE.

In a recent paper* some interesting experiments are recorded by Drs. T. Goldberger and T. F. Anderson, which indicate that not only the body louse (*Pediculus vestimenti*) but the head louse (*P. capitis*) also may transmit the virus of typhus fever. These authors had previously shown that Brill's disease, which appears to be endemic in New York City, is identical with the typhus fever of Mexico, which, accordingly, may be identical with the European typhus fever. Evidence of the ability of lice to transmit typhus fever has been previously adduced by several investigators. In 1909, Nicolle, Comte and Conseil demonstrated that body lice (*P. vestimenti*), which had been allowed to feed upon an infected bonnet monkey (*M. sinicus*), were able to transmit typhus fever to two other monkeys, somewhere between the first and seventh day after feeding. In the following year, Ricketts and Wilder, who were working in Mexico, reported the successful transmission of the virus of typhus fever by *P. vestimenti* from man to monkey and from monkey to monkey. They were also able to infect a monkey by intradermal inoculation with the abdominal contents of infected lice, and similar experiments were successfully carried out by Wilder in 1911. Drs. Goldberger and Anderson commenced their work in 1909. They have confirmed the results of previous workers in regard to the body louse (*P. vestimenti*) and have also shown that the head louse (*P. capitis*) is able to transmit Mexican typhus fever from man to monkey by the subcutaneous injection of a saline suspension of crushed and infected head lice and almost certainly by its bite. The typhus virus is able to retain its virulence in the body of the head louse for twenty to twenty-four hours. The authors' conclusions are as follows:

1. The body louse (*P. vestimenti*) may become infected with typhus. The virus is contained in the body of the infected louse and is transmissible by subcutaneous injection of the crushed insect or its bite.
2. The head louse (*P. capitis*) may become infected with virus. The virus is contained in the body of the infected louse and may be transmitted by cutaneous injection of the crushed insect, and, we believe, also by its bite.

These results are of great interest to the entomologist. One by one our most common insects affecting man have been shown to be important factors in the transmission of disease; the house fly carries typhoid and

* "The Transmission of Typhus Fever, with Special Reference to Transmission by the Head Louse (*Pediculus capitis*).," "Public Health Reports" of the U.S. Public Health and Marine Hospital Service, Washington. W.C. 27, No. 9, 1st March, 1912, pp. 297-307.

certain other infectious diseases ; the flea carries the plague bacillus ; the bed bug has been shown to be transmitting agent of the causative organisms of the serious tropical Black Fever or Kala Azar, and the louse transmits typhus fever. That all the insects directly attendant upon man's person are disease carriers is not a pleasant fact for contemplation !

C. GORDON HEWITT.

TO THE EDITOR OF THE CANADIAN ENTOMOLOGIST :

In your journal of October, 1908, pp. 370-373, I published an account of the attempt made by Hendel to revolutionize the nomenclature of Diptera by introducing generic names from an obscure early paper of Meigen's, which were published without any described species being associated with them—in other words, without types.

Mr. Hendel based his action at the time on his interpretation of the rules of nomenclature of the International Zoological Congress, expressing great regret at the overturning of names, but protesting that the rules compelled it ; later, in Wiener Entomologische Zeitung, XXVIII, 33-36, 1909, he took up my argument from the rules themselves, and endeavoured to show that I had not interpreted them correctly. So far, his action was as if forced by these rules. It was interesting, indeed, to find (W. E. Z., XXX, 89-92, 1911), that he has revolted against the rules commission of the I. Z. C., on a minor problem, the mode of designation of types, and refuses to follow them. I cannot help but regret that he did not revolt sooner, so as to spare us the trouble about Meigen's 1800 paper. I think he is perfectly right in his present contention, which relates to point g under Article 30, as amended at the Boston meeting, 1907. But my present purpose is merely to show the embarrassment of a too sweeping acceptance of any rules of nomenclature.

American dipterists have shown a commendable disposition to sit tight during this nomenclatural flurry, and already the worst seems past. On the general question of the validity of a genus without a type, I have noticed two expressions recently that are of interest. One is by S. A. Rohwer, in Technical Bulletin, No. 20, Bureau of Entomology, p. 70. He was fixing the types of saw-fly genera, and used the following language : "In this paper a genus is considered to be without standing until it contains a species ; and genera which were founded without species take the first species placed in them as the type, and date from the time when that species was placed in them." If this rule were followed, Meigen's 1800 genera would date from 1908. The other case I found in the CANADIAN ENTOMOLOGIST itself, 1912, p. 50, where Mr. Girault is discussing the genus *Trichaporus*, and says : "No species was mentioned as belonging to it ; under the code it is therefore without status."

J. M. ALDRICH, Moscow, Ida.

REMARKS ON *GNYPETA* THOMS. (*STAPHYLINIDÆ* COL.).

BY A. FENYES, PASADENA, CAL.

This rather feebly-characterized Aleocharine genus has the following diagnosis :

Tarsi 4-5-5-jointed; antennæ 11-jointed; maxillary palpi 4-jointed; labial palpi 3-jointed; ligula bifid; genæ simple. Hind tarsi with joint 1 not longer than 2 and 3 together. Prosternum membranous under the front coxae; mesosternal process obtuse at tip; middle coxae separated. The first free ventral segment of the abdomen transversely sulcate at base.

Gnypeta differs from *Atheta* Thoms. by the sulcate ventrites, from *Tachyusa* Er. by the obtuse mesosternal process, and from *Myrmecopora* Saulcy by the comparatively short first joint of the hind tarsi.

In the males the sixth ventrite is produced, and at tip rounded; in the females less produced than in the males, and at tip sinuate.

The following descriptions of nearctic forms have been published:

1. *nigrella* Lec., n. sp., N. Amer. Col., I, 1863, 29 (Tachyusa).
2. *baltifera* Lec., ibid., 29 (Tachyusa).
3. *laticollis* Csy., Bull. Cal. Ac. Sc., I, 1885, 287 (Falagria).
4. *experta* Csy., ibid., 300 (Tachyusa).
5. *linearis* Csy., ibid., 301 (Tachyusa).
6. *harfordi* Csy., ibid., 304 (Tachyusa).
7. *crebrepunctata* Csy., Bull. Cal. Ac. Sc., II, 1886, 203 (Tachyusa).
8. *atrolucens* Csy., Ann. N. Y. Ac. Sc., VII, 1893, 346.
9. *lucens* Brnhr., Deutsch. Ent. Ztschr., 1905, 254.
10. *helene* Csy., Tr. Ac. Sc. St. Louis, XVI, 1906, 193.
11. *deserticola* Csy., ibid., 193.
12. *punctulata* Csy., ibid., 194.
13. *ventralis* Csy., ibid., 194.
14. *floridana* Csy., ibid., 195.
15. *bockiana* Csy., ibid., 195.
16. *manitobæ* Csy., ibid., 196.
17. *brevicornis* Csy., ibid., 196.
18. *incrassata* Csy., ibid., 198.
19. *leviventris* Csy., ibid., 198.
20. *oregona* Csy., ibid., 199.
21. *impressiceps* Csy., ibid., 199.
22. *curtipennis* Csy., ibid., 201.
23. *abducens* Csy., ibid., 201.
24. *shastana* Csy., ibid., 202.

April, 1912

25. *majuscula* Csy., *ibid.*, 217 (*Euliusa*).
26. *sparsella* Csy., *ibid.*, 217 (*Euliusa*).
27. *elsinorica* Csy., *ibid.*, 218 (*Euliusa*).
28. *transversa* Csy., *ibid.*, 218 (*Euliusa*).
29. *mollis* Csy., *ibid.*, 219 (*Euliusa*).
30. *pimalis* Csy., *ibid.*, 220 (*Euliusa*).
31. *citrina* Csy., *ibid.*, 220 (*Euliusa*).
32. *wickhami* Csy., *Mem. Col.*, II, 1911, 166.
33. *brunnescens* Csy., *ibid.*, 167.
34. *boulderensis* Csy., *ibid.*, 167.
35. *oblata* Csy., *ibid.*, 168.
36. *pallidipes* Csy., *ibid.*, 168.
37. *uteana* Csy., *ibid.*, 169.
38. *modica* Csy., *ibid.*, 170.
39. *sensilis* Csy., *ibid.*, 170.
40. *limatula* Csy., *ibid.*, 170 (*Euliusa*).

REMARKS.

1. *G. nigrella* Lec.—“*Tachyusa nigrella*. Elongate, black, shining, with delicate ashy pubescence, very finely punctulate; thorax obsoletely canaliculate, before the base transversely slightly foveate, a little shorter than broad; abdomen in front slightly narrowed; segments 1-3 transversely deeply impressed; legs blackish-pitchy. Length, .12. Middle and Western States; common.”

There is in the Leconte collection at Cambridge, Mass., a specimen labelled *nigrella*, and there is a pink disk on the pin under the specimen; the pink disk meaning: Middle States (Ohio, Penna., West N. Y.). Below the above specimen, without any name, but probably referred by Leconte to *nigrella*, is another specimen with a pink *and* yellow disk, the latter disk meaning: Western States (N.-W. Va., Ky., N.-W. Tenn., S. Ill.), and, finally, there is another row with three specimens, all with pink disks.

This species is well characterized amongst the eastern nearctic *Gnypetas* by the prothorax being simply foveate at base in the female and lacking the geminate punctures; the impression becomes longer in the male, but is not traceable beyond the basal half of the prothorax. It is the most common eastern species in our fauna, not closely related to any other from the northern hemisphere; it is known to me from the following localities: Penna. (Pittsburg); Mass. (Chicopee, Framingham); N. Y. and Md. (Baltimore).

2. *baltifera* Lec.—“*Tachyusa baltifera*. Less elongate, blackish-pitchy, shining, finely punctulate, with delicate pubescence; thorax, elytra

and segments 1-3 of the abdomen piceo-testaceous; thorax canaliculate behind, before the base transversely impressed, a little shorter than broad; abdomen slightly narrowed towards the base; joints 1-3 deeply impressed transversely; antennae and legs piceo-testaceous. Length, .10. One specimen, Coney Island, near New York. Less elongate than the other species, with fine punctures, especially of the thorax, less dense and more distinct than in the two preceding species." (The two preceding species are *cavicollis* and *nigrella*.)

If my notes are correct, the specimen in the Leconte collection from Coney Island is labelled "*balteata* Lec." This undoubtedly good species is recognizable amongst the eastern forms by the longitudinally, broadly, entirely excavated prothorax of the male; the first joint of the hind tarsi is fully as long as joints 2 and 3 together, the species thus appearing as a connecting link between *Gnypeta* and *Tachysus*. Not closely related to any other species of the northern hemisphere; known to me from the following localities: Mass. (Tyngsboro, Framingham); Penna. (Jeanette); Ill. (Algonquin); Maine and New York.

3. *laticollis* Csy.—The most common species of *Gnypeta* in California, recognizable at once by the open middle acetabula. It is known to me from Los Gatos, Pacific Grove, Nordhoff, S. Juan Capistrano, Oceanside, Lakeside, Foster, S. Diego, Victorville, S. Bernardino, Elsinore, Riverside, Pomona, Azusa, Pasadena, Sierra Madre, Mt. Wilson, Yuma, all in California. I have also some specimens from El Paso, Texas, which do not appear to be different from the California specimens.

4. *experta* Csy.—Recognized by the male characters. The head in this sex being broadly, almost entirely concave, and the prothorax entirely concave in the middle. The females are somewhat different from the males, especially in habitus, with apparently shorter antennae and a trifle broader abdomen; they are consequently not easily recognized, unless taken in company of males.

5. *linearis* Csy.—I fail to find any reliable characters which would separate *linearis* from *experta*, and propose to unite these two forms under the latter name.

6. *harfordi* Csy.—In this species the male prothorax is obsoletely depressed in about the basal two-thirds, the depression being shallow and not as sharply limited as in *experta*. I believe I interpret this species correctly. I have seen specimens from Cole, Applegate, Nordhoff, Pasadena, Lakeside and Foster, all in California.

7. *crebrepunctata* Csy.—Apparently a good species, differing from our other western forms chiefly by the much less shining surface and by the

coarse punctuation, also by the shorter and outwardly more incrassate antennæ. I have specimens from California (S. Francisco, S. Barbara, Pacific Grove and Point Reyes); also from Oregon (Newport), the latter being co-types of *G. nigerrima* Brnhr. i. litt. My Pacific Grove specimens were taken near the ocean, on a moist, thickly-incrusted salt flat, under cow manure; and I have no doubt that *crebrepunctata* is exclusively a seashore-inhabiting species.

8. *atrolucens* Csy.—Closely related to (if not identical with), *Gnypeta cœrulea* Shalb. from Northern Europe, differing chiefly from the latter by the more shining integuments. Occurs in the mountainous regions of the Eastern United States (Catskill Mts. in N. Y.; Mt. Washington in N. H.). My 5 specimens from Mt. Washington are, curiously enough, all males, and I have in my collection another male from Vermont. The type of *atrolucens* is said to be a female.

9. *lucens* Brnhr.—A synonym of *laticollis* Csy.

10. *helenæ* Csy.—A good species of the *carbonaria-ripicola* group, with a well-marked, bifoveate antebasal transverse impression on the prothorax. In the male the head impressed, the bottom of the impression impunctate, the prothorax not modified, the 6th ventrite produced and, at the tip, moderately rounded. A species of wide distribution. I have before me specimens from Montana (Kalispell); N. Dakota (Williston); Colorado (Buena Vista); Nevada (Reno); Arizona (Williams), and California (Occidental, Deer Park Springs, Tahoe City and Tallac). My Tahoe City specimens were taken in a swampy place; they appeared to feed on dead tadpoles; other specimens from the same locality were taken during the evening flight.

11. *deserticola* Csy.—Smaller, with paler legs than *helenæ* Cs., but otherwise scarcely different, and probably a synonym of the latter. I have not seen this form.

12. *punctulata* Csy.—Still smaller than *deserticola*, placed at present also as a synonym of *helenæ* Cs. I refer to this form a specimen of the Fall cabinet (from Pomona, Cal.); another specimen from Pasadena, Cal., is more shining, with more sparsely punctate abdomen, but otherwise not different.

13. *ventralis* Csy.—One specimen in my collection from Arizona (Williams), agrees fairly well with the original description, but appears to be quite similar to *majuscula* Cs. also, judging from the description; no opinion can be pronounced about the status of this species until more material is accumulated in our collections.

14. *floridana* Csy.—Can be distinguished by the strongly-dilated abdomen and the very long antennal joint. I have only one male before me, from Enterprise in Florida; it makes the impression of belonging to a good species, possibly from the Central American fauna.

15. *bockiana* Csy.—Can be distinguished from *nigrella* Lec. by the presence of two foveole in the transverse basal impression of the prothorax, and by the absence of punctuation in the transverse impressions of the first three tergites. Of this form I have only males before me, one each from Arkansas (Little Rock); Tennessee (Nashville), and Texas (Vaco). Casey does not mention the sex of the type, which is from Missouri (St. Louis).

16. *manitobae* Csy.—Unknown to me; possibly a more northern form of *bockiana* Csy.

17. *brevicornis*, Csy.—A specimen in my cabinet (collected by Wickham, and labelled "brevicornis"), from British Columbia, makes the impression of being a good species; it has the prothorax bifoveolate at base, and can be recognized by the rather short antennæ and the pale colour.

18. *incrassata* Csy.—Five specimens from Montana (Kalispell) in my collection make the impression of a good species, recognizable by the long antennæ and the unusually long third antennal joint.

19. *leviventris* Csy.—Is a close relative of *incrassata*, and may prove to be conspecific with the latter. I have seen nine specimens from the type locality (Ojai Valley in California), they have shorter antennæ than my specimens of *incrassata*, but do not seem to present other characters of specific value.

20. *oregona* Csy.—A synonym of *helenæ* Csy. (vide Casey, Mem. Col., II, 1911, 167).

21. *impressiceps*, Csy.—Unknown to me, possibly a synonym of *laticollis* Csy.

22. *curtipennis* Csy.; 23. *abducens* Csy.; 24. *shastana* Csy.; are, I believe, synonyms of *harfordi* Csy. I have specimens from British Columbia (Duncans), Washington (Baring) and California (Cole) before me, which, after careful study, must be referred to *harfordi* Csy., yet exhibit some slight differences in the general form of the body and in the length of the elytra.

25. *majuscula* Csy.—Unknown to me; perhaps a synonym of *laticollis* Csy.

26. *sparsella* Csy.; 27. *elsinorica* Csy.; 28. *transversa* Csy.; 29. *mollis* Csy.; 30. *pimalis* Csy., and 31. *citrina* Csy., are all synonyms of *laticollis* Csy. My large series of Southern Californian specimens, while showing

variations in size, shape, colour and sculpture, represents undoubtedly one species only, and must be referred to *laticollis* Csy. I have five specimens of *pimalis* Csy. before me (three from the author himself, two from Wickham), none of them specifically different from *laticollis*.

32. *wickhami* Csy.—Possibly a synonym of *helenæ* Csy.

33. *brunnescens* Csy.—Without much doubt identical with *nigrella* Lec. I have two specimens in my collection from New York, which can be referred to *brunnescens*, and which I cannot separate satisfactorily from *nigrella*.

34. *boulderensis* Csy.—Probably a synonym of *helenæ* Csy.

35. *oblata* Csy.—Probably also a synonym of *helenæ* Csy.

36. *pallidipes* Csy.—Possibly a synonym of *harfordi* Csy.

37. *uteana* Csy.—Unknown to me.

38. *modica* Csy.—Probably a synonym of *laticollis* Csy.

39. *sensilis* Csy.—Is *experta* Csy.

40. *limatula* Csy.—Is a synonym of *laticollis* Csy.

The following list of Nearctic species (with synonym) is offered tentatively:

- | | |
|---------------------------|-------------------------------|
| 1. <i>nigrella</i> Lec. | 5. <i>harfordi</i> Csy. |
| <i>brunnescens</i> Csy. | <i>curtipennis</i> Csy. |
| 2. <i>baltifera</i> Lec. | <i>abducens</i> Csy. |
| 3. <i>laticollis</i> Csy. | <i>shastana</i> Csy. |
| <i>lucens</i> Brnhr. | <i>pallidipes</i> Csy. |
| <i>ventralis</i> Csy. | 6. <i>crebrepunctata</i> Csy. |
| <i>impressiceps</i> Csy. | 7. <i>atrolucens</i> Csy. |
| <i>majuscula</i> Csy. | 8. <i>helenæ</i> Csy. |
| <i>sparsella</i> Csy. | <i>deserticola</i> Csy. |
| <i>elsinorica</i> Csy. | <i>punctulata</i> Csy. |
| <i>transversa</i> Csy. | <i>oregona</i> Csy. |
| <i>mollis</i> Csy. | <i>wickhami</i> Csy. |
| <i>pimalis</i> Csy. | <i>boulderensis</i> Csy. |
| <i>citrina</i> Csy. | <i>oblata</i> Csy. |
| <i>modica</i> Csy. | 9. <i>floridana</i> Csy. |
| <i>limatula</i> Csy. | 10. <i>bockiana</i> Csy. |
| 4. <i>experta</i> Csy. | <i>manitobæ</i> Csy. |
| <i>linearis</i> Csy. | 11. <i>brevicornis</i> Csy. |
| <i>sensilis</i> Csy. | 12. <i>incrassata</i> Csy. |
| | <i>leviventris</i> Csy. |
| | 13. <i>uteana</i> Csy. |

The accumulation of more material in our collections will probably still reduce the above number of species; and I venture to express my belief that *bockiana* may prove to be conspecific with *helenæ*, *brevicornis* and *incrassata* with *harfordi*, and *uteana* with *helenæ*. This reduced number of forms can be tabulated roughly as follows:

I.—EASTERN FORMS:

1. Abdomen strongly dilated in the middle..... *floridana* Csy.
Abdomen at most only moderately dilated in the middle..... 2.
2. Prothorax broadly excavated in the male..... *baltifera* Lec.
Prothorax not excavated in the male..... 3.
3. Colour bluish-black..... *atrolucens* Csy.
Colour black..... 4.
4. Prothorax bifoveolate at base..... *bockiana* Csy.
Prothorax not bifoveolate..... *nigrella* Lec.

II.—WESTERN FORMS:

1. Middle acetabula open behind..... *laticollis* Csy.
Middle acetabula entirely closed..... 2.
2. Prothorax broadly, entirely concave in the male..... *experta* Csy.
Prothorax never broadly and entirely concave in the male..... 3.
3. Prothorax not bifoveolate in the basal impression..... *harfordi* Csy.
Prothorax bifoveolate in the basal impression..... 4.
4. More or less shining..... *helenæ* Csy.
Rather opaque..... *crebrepunctata* Csy.

The described Central and South American forms are:

1. *dissimilis* Shp., Biol. Centr. Amer. Col., I, 2, 1883, 173 (Homalota).
2. *nigricans* Shp., ibid., 227.
3. *fragilis* Shp., ibid., 227.
4. *mexicana* Shp., ibid., 228.
5. *boliviiana* Brnhr., Bull. Soc. Ent. Ital., LX, 1908, 247.

1. *G. dissimilis* Shp. is tentatively placed here in the genus *Gnypeta*; it is described from a single specimen.

2. *nigricans* Shp.—In our fauna *bockiana* Csy. seems to be the nearest relative of this form.

3. *fragilis* Shp.—A good species, having no relatives in the Nearctic fauna; recognizable by the pale eleventh antennal joint and the impunctate basal impressions of the first tergites.

4. *mexicana* Shp.—Quite likely identical with *nigricans* Shp.
5. *boliviensis* Brnhr.—Apparently without relatives in the Nearctic fauna.

There is another species in the Neotropical fauna, described by Sharp under the name *Rechota impressa* (Biol. Centr. Amer. Col., I, 2, 1883, 228, 229). *Rechota* cannot be separated from *Gnypeta*, the only distinguishing feature being the truncation of the meso- and metasternal processes; in *impressa* Shp. the middle coxal cavities are open behind, and, in the male, the prothorax is broadly impressed, very much in the same way as in our *baltifera* and *experta*. In our fauna *laticollis* Csy. is somewhat similar in habitus to *impressa*, but lacks the modification of the male prothorax.

The Palaearctic fauna contains the following described forms:

1. *carbonaria* Mannh., Prec. Brachel., 1830, 75.
2. *cerulea* Sahlb., Ins. Fenn., I, 1834, 351.
3. *velata* Er., Käf. Mk. Brdbg., I, 1837, 319.
4. *ripicola* Kiesw., Stett. Ent. Ztg., V, 1844, 317.
5. *canaliculata* J. Sahlb., Sv. Ak. Handl., XVII, 1880, No. 4, 84.
6. *cavicollis* J. Sahlb., ibid., 85.
7. *œnescens* J. Sahlb., ibid., 85.

1. *G. carbonaria* Mannh.—Represented in our fauna apparently by *G. helenæ* Csy.

2. *cerulea* Sahlb.—Our *atrolucens* Csy. may prove to be conspecific with *cerulea*; they are, at any rate, very closely related to each other.

3. *velata* Er.—Without relatives in our country.

4. *ripicola* Kiesw.—Very near to *carbonaria* Mannh.

5. *canaliculata* J. Sahlb., and 6. *cavicollis* J. Sahlb.—Quite likely conspecific; represented in our fauna by the very closely related *G. experta* Csy.

7. *œnescens* J. Sahlb.—Apparently without close relatives in our fauna.

There is one species described from the Indo-Oriental fauna, *elegans* Brnhr., Deutsch. Ent. Ztschr., 1902, 22, from Ceylon; one species from the Australian fauna, *fulgida* Fvl., Ann. Mus. Civ. Genova, XIII, 1878, 583, and two species from the Aethiopian fauna, 1. *angulicollis* Fvl., Rev d'Entom., XXVI, 1907, 58, and 2. *pulchricornis* Fvl., ibid., 58, both from English East Africa.

A NEW TYPE OF CORIXIDÆ (RAMPHOCORIXA BALANODIS,
N. GEN., ET SP.) WITH AN ACCOUNT OF
ITS LIFE HISTORY.¹

BY JAMES FRANCIS ABBOTT, ST. LOUIS, MO.

Our knowledge of the developmental history of the water bugs is very incomplete. In the early days of embryology, *Corixa* was studied by Metschnikoff,² and Brandt,³ and others with especial reference to the germ layers, the revolution of the embryo, etc. Leon Dufour⁴ had previously described the eggs of the two European species, *Arctocoris striata* (L.) and *heiroglyphica* (Duf.).

The only account of the metamorphosis of any member of the group that I have been able to find is that of F. Buchanan White,⁵ who, in addition to describing the egg of *Corixa nigrolineata* (= *Arctoceris fabricii*), also described the first moult, remarking that the tarsus of the third pair of legs is but one-jointed. "At this stage," he says, "they died"—a result which apparently has been obtained by all who have attempted similar observations since. Indeed the rearing of both *Notonecta* and *Corixa* seems attended with unusual difficulties,⁶ although I believe that by the use of mosquito larvae for food, success has been attained with the former.

The writer has succeeded in carrying a species of Corixid through the whole series of moults from egg to imago, and since the critical study of the larger groups of Hemiptera is greatly hampered by our ignorance of the developmental stages, it seems worth while to describe the various instars in some detail.

The present species, which appears to be undescribed, has the remarkable habit of attaching its eggs to the carapace of the crayfish, some individuals of which were found almost completely covered by hundreds of tiny eggs. As the writer intends later to discuss this habit in detail, it will be merely alluded to here. The egg-bearing crayfish were captured in a small clear-water pond near Columbia, Mo., the early part of July and were isolated in small aquaria. All the eggs were in the same advanced stage of development, with the red eye spots showing through the shell, and they began to hatch July 8th (1910).

1. From the Zoological Laboratory of Washington University.

2. Zeit. wiss. Zool., XVI, 1866, 422-436, Taf., 26 and 27a.

3. Mem. Acad. Imp. Sci. St. Petersb., XIII, 1869.

4. Recherches sur les Hémiptères, 1833.

5. "Notes on *Corixa*," Ent. Mon. Mag., X, 1873, 60-63.

6. Cf. Bueno, CAN. ENTOM., XXXVII, 390, 1905.

The mistake was made of attempting to rear the nymphs in small jars. Whether on account of lack of sufficient oxygen or of appropriate food, or too high a temperature or some other unknown cause, the greater number of nymphs perished as soon as hatched.

The remnant were transferred to a large aquarium used for breeding mussels. This was a zinc-lined tank about two feet deep and with a superficial area of thirty or thirty-five square feet, with a layer of soft mud in the bottom and an overflow arrangement by means of which a quiet but constant stream of fresh water was kept circulating through the tank. There were a number of mussels in the mud and several crayfish. A few water weeds supplied shelter for smaller organisms, of which a large Ostracod was the most plentiful. I observed several of the older nymphs feeding on the Ostracods, and it is possible that the absence of some similar food caused the individuals in the separate jars to die.

The newly-hatched nymphs are very active and, as a rule, keep close to the bottom. They are negatively phototropic until the fourth or fifth instar and this condition, which keeps them in the shadows, aided by their great transparency, is doubtless of much value in enabling them to escape their enemies. The bulk of the eggs hatched July 8. The first moult (second instar) occurred about July 16th, the second about July 24th, the third, July 31-Aug. 3, the fourth, August 10th, and the imagos appeared about August 18th. From the third instar on, the mortality was high. In the morning, numbers would be found on the surface of the water near the edge held by a bubble of air, the buoyancy of which they were unable to overcome and, unless assisted, they perished in this way. It seems probable that they are most active at night as they were rarely seen to dart to the surface frequently, except on dull, dark days.

THE EGG.

Length about 9 mm. Breadth about 4 mm. Shape elongate-oval, bilaterally rather than axially symmetrical, i.e., one side nearly straight, the opposite strongly curved. (See Fig. 1.) Colour grayish yellow (later stages only were observed); the surface ornamented with a delicate tracery in the form of interlocking hexagons like a honeycomb or the facets of a compound eye. The egg is fastened in a sort of shallow cup which is of a leathery texture and dark brown in colour. The distal end through which the nymph emerges,

is provided with six to eight short lobes arranged in a circle. The appearance of the whole egg is much like that of a minute *Grantia* sponge.

Dufour described the eggs of *striata* and *hieroglyphica* as acuminate at the free end and placed on a pad. White speaks of the eggs he describes as pyriform and attached at the broader end. He does not mention the pad or cup, nor does Heidemann,⁷ of *Corixa mercenaria*. It would be of interest to discover if there is a difference in this regard between different species of Corixids or whether in some cases the pad or cup has merely escaped observation.

First Instar.

Length about 1.15 mm. Width about .55 mm. General appearance of adult, but wider in proportion to length. (Fig. 2.) Head about three times as wide as long (dorsal aspect); distance from vertex to tip of beak about equal to the width between eyes (ventral aspect). Eyes prominent and conspicuous, deeply pigmented, facets relatively large. The beak is apparently four-jointed, rather broad and conical. The black tips of the mandibles and maxillæ project slightly between the two halves. The former are somewhat shorter than the latter, curved, with minute serrations at the tips, and may be seen to extend into the head apparently up to the level of the eyes.

The antennæ are two-jointed, inserted far down toward the beak, the last joint about $\frac{1}{3}$ the interorbital width in length. Tarsi all one-jointed. Those of first leg when at rest, curved over beak as in imago. First tarsi triangular in section, about $\frac{1}{3}$ as long as those of third leg, $3\frac{1}{2}$ times as long as broad, oblong-triangular, broadly rounded above, the comb of bristles prominent. (Fig. 2a.) Tibia of second leg $3/5$ the length of tarsus and squarish in section with the anterior angles armed each with a row of short bristles. Intermediate tarsus nearly 8 times as long as broad, with a ventral row of long bristles and several rows of much shorter ones; tarsal claws weak, variable in length. Third leg sparsely bristled, tarsal joint slightly longer than the tibia or the femur, which are subequal. Body a little less than twice as long as broad, the posterior angles not so truncate as in later instars, provided and armed each with a half dozen rather long bristles. Lateral margin of body with bristles on posterior half only.

7. Proc. Ent. Soc., Wash., XIII, 1911, p. 140, Pl. XII, fig. 7.

The tracheal system is comparatively simple, consisting of two longitudinal trunks sending off laterals in each abdominal segment and one stout branch to each leg. Anterior branches supply the brain and the eyes.

Second Instar.

A marked increase in size is noticeable, the length being now about 1.9 mm. and the width about .9, roughly one-half as much. Head strongly convex, the frontal margin with a row of rather long bristles, longest in the middle, shorter toward the eyes. Posterior border deeply sinuate or arcuate.

Prothorax about as long as mesothorax, the two together a trifle longer than metathorax; the contour of the two together forming a narrow oval. Posterior margin of metathorax straight, anterior margin concave; its median length about equal to that of head. Abdomen truncate, seven-jointed, last joint about $\frac{1}{2}$ as wide as first joint, terminated by two groups of rather long setæ at the angles.

Tarsi all one-jointed. First tarsus fringed with moderately long setæ, about equal to tibia in length. Second legs; tarsus equal to tibia, both together about as long as femur. Third legs with femora but slightly flattened, tarsus nearly as long as femur and tibia together, clothed with setæ, these longest at the joint, becoming much shorter distally. Colour very transparent. A median grayish line on thorax.

Third Instar. (Fig. 3.)

Length 2 mm. Width 1 mm. Head as before. Eyes a little more than $1/5$ the head-width in width. The wing-pads first appear; about $3/5$ the length of thorax, sparsely hairy. Thorax $\frac{1}{2}$ as long as wide. Abdomen as before, fringed on the sides by rather long setæ, the posterior angles with conspicuous tufts. Ventral surface sparsely pilose.

Tarsi all one-jointed. The whole first leg about equal in length to the femur of second leg. Tarsus about three times as long as broad, terminated by a sharp spine. *Second legs* slender; tarsal claws as long as tarsus, other joints as in third leg, all feebly setose. *Third legs*; tarsus $1\frac{1}{3}$ times the tibia, the latter equal to femur. Tibia and femur together about equal to femur of second leg. Abdomen strongly truncate.

Fourth Instar.

Length 3 mm. Width 1.2 mm. Very much more pigmented and less transparent than previous instars. Posterior margin of

head, posterior angles of eyes, and posterior margin of thorax fuscous. Anterior margin of thorax and inner edge of wing pads with rather dense brownish-black hairs. These together with the pigmented posterior margin of the thorax form a square; a median patch of brown hair joining the band on the anterior margin. General surface of thorax smoky brown with narrow median clear line, and a paler transverse band in the middle. Head pale brown with a darker shading on vertex. Whole dorsal surface of thorax and abdomen sparsely hairy, the abdominal segments faintly indicated by transverse brown stripes. A median longitudinal white stripe $\frac{1}{3}$ the body-width in diameter runs the length of the dorsal surface of the abdomen. Within this is a series of large pale brown blotches, one on each segment, the third and fourth of these with a distinct crescent of chestnut brown,⁸ marginal third of abdomen smoky, fringed with cilia, but these less conspicuous because of the general hairiness of the body. The wing-pads hardly extend beyond the thorax.

Tarsi all one-jointed. First legs as before. Second leg with femur as long as width of head, equal to tibia and tarsus together. Claws $\frac{1}{5}$ longer than tarsus. Third leg with tarsus equal to width of head, feathered with dense hairs. Antennæ $\frac{1}{2}$ the length of tarsus of first leg. Interorbital space $\frac{2}{3}$ the width of head, and equal to $\frac{3}{4}$ the length from vertex to tip of beak.

Fifth Instar. (Fig. 4).

Length 3.8 mm. Width 1.4 mm. Dorsal marking as in previous instar, but more intensified. The two median dark brown marks of third and fourth abdominal terga oblong surrounded by a larger oblong of smoky brown. Hairy covering of wing-pads and thorax conspicuous, the median patch of the anterior border extending more

8. These conspicuous markings are found on the dorsal surface of older nymphs of all species of Corixids that I have examined. I have considered them of glandular nature, and they are so considered by Kunkel d'Herculais (*Comptes Rendus*, cx, p. 1,002, 1895), who remarks that the dorsal position of the "scent glands" differentiates the Corixids from Nepa and Notonecta, and put them phylogenetically nearer the Cimicids. J. Gulde, however, in an elaborate monograph published later ("Die Dorsaldrüsen der Larven der Hemiptera Heteroptera" *Ber. Senckenb. Ges.*, 1902, p. 85-136), describes the dorsal glands in all the various families of Rhynchota, including the aquatic families, and denies the presence of such glands in any waterbugs. The Corixids examined were *Corixa geoffroyi* (Leach), *Arctocoris linnei* (Fieb.) and *Cymatia coleoptrata* (L.). He claims that the conspicuous markings are merely the site of the insertion of certain abdominal muscles. It would seem worth while to investigate the matter further.

than $\frac{1}{3}$ the length of thorax down the median axis. Wing-pads extend half way to third abdominal segment. Beak brownish, with short pubescence. Legs pure white, antennæ no larger than before, but fringed with short cilia. Tarsi of first two legs one-jointed; those of third leg two-jointed, otherwise legs as before.

In comparing the various larval stages one is struck by marked increase in the size of the eyes relative to the size of the head as development proceeds. Another point is of great theoretical interest. As is well known, there exists throughout the group an extraordinary sexual dimorphism, such that the uninitiated might be led to class males and females of the same species in different families, so great is the dissimilarity in structure. It is of interest to note that the larval stages up to the last instar, with respect to those structures (palæ, frontal fovea, asymmetry of abdominal segments, etc.), that exhibit this dimorphism, are *entirely of the female type*.⁹ The writer has dissected the much larger *Arctocoris harrisii* Uhl. during the last moults, and has found the same thing to be true. A specimen in the fifth instar just ready to moult may easily be "shelled out" of its cuticle and, if a male, the irregular arrangement of the abdominal segments will be found fully developed, but entirely concealed by the regular and symmetrical arrangement, characteristic of the females and larvæ.

DESCRIPTION OF THE IMAGO.

Ramphocorixa balanodis, n. gen. et sp.

Colour.—Head yellowish, tegmina pale silvery grayish, almost iridescent in the female, darker in the male, the characteristic vermiculate or banded markings usual in the group nearly obsolete. Pronotum grayish or smoky brown, suffused with darker in the male. Rostrum pale yellowish. Tergum, legs and whole ventral surface of female pure white. Dorsum of male black, except the lateral margins, which are pale, the ventral surface white, except for two broad almost black oblong bands on either side, each nearly $\frac{1}{3}$ the body-width in width, parallel to but not quite reaching the lateral margin and extending over sternites 3, 4 and 5. Genital segments pale in both sexes. A tiny reddish spot on the outer surface of posterior coxae, next the distal joint. The hairs of the limbs tinged with yellow. Anterior and posterior margins of pronotum fuscous, the former line sinuate. Surface of pronotum otherwise with three complete pale brown lines, little, if at all, arched, and two shorter ones alternating. Clavus nearly transparent, margined with brown, about one-third

9. F. G. Smith, Quar. J. Mic. Sci., 1909, pp. 54, 577; 1910, 55.

its area adjacent to the scutellum, immaculate. A few complete markings beyond the middle. Corial lines pale smoky or grayish brown, confusedly interrupted or obsolescent, fusing to form three delicate vermiculated longitudinal stripes, these continue upon the membrane. Corium clothed with sparse, fine depressed whitish hairs.

Pronotum and anterior half of clavus rastrate. The tegmina are semi-hyaline, the colour of the dorsum showing through, on account of which the male appears darker than the female. *Pronotum lenticular*, $2\frac{1}{2}$ times as wide as long, its posterior margin evenly rounded and not produced, a small area of scutellum visible between it and the clavus. Head emarginate behind, the lateral angles (with the eyes) acute and slightly produced. Interorbital space about equal to posterior width of eye. Posterior margin of eye touching occipital margin, except for a short distance at the inner angle. Two parallel rows of punctures on either side of the vertex. Intermediate tarsi $\frac{1}{2}$ the length of tibia, the latter $3/5$ the length of femur. Posterior femora and tibia subequal, a little more than $\frac{1}{2}$ the tarsi in length. Metaxyphus small, short, triangular.

Sexual characters.—*Male:* Head acuminate, strongly carinate, about $\frac{2}{3}$ longer than pronotum. Fovea acorn-shaped, broad and deep, occupying the entire space between the eyes and reaching from the labrum to the acute termination of the carina mentioned. Foveal surface clothed with fine depressed whitish hairs. Palæ shiny ivory-white, very irregular in shape. (*cf. Fig. 6.*) Lower edge entire, slightly concave; upper surface flat, deeply incised about midway the length, so as almost to cut the pala into two joints. Viewed from the inner surface the outline suggests somewhat the head of a bird of prey. Inner surface with a row of 23 dark brown "pegs"; the first nine following the curve of the upper margin, then the line arching downward to the limit of the cleft. Tip of pala with a single long, serrated spur, a row of short spines along the lower inner edge, a row of longer ones along lower outer edge. The posterior upper margin of the pala projects slightly over the tibia in a flattened spur. Tibia a little less than half the pala in length. Femur with a large stridular area composed of fine spines set in rows. *Asymmetry dextral.* Strigil very minute, .05 mm. long and $1/5$ as wide as long, crescentic in shape, lying in a small membranous projection of the 6th tergite, in the antero-posterior axis, with about 18–20 transverse striae. Fifth, sixth and seventh tergites divided, fourth deeply cleft.

Female: Venter evenly rounded, front plane with a small circular depressed fovea between the lower inner angles of the eyes. Palæ oblong-cultate, lower edge straight or slightly incurved, upper edge straight to

the middle, thence truncate to the tip, where there is a short retrorse spine. Tibia same width as palæ and $\frac{1}{2}$ as long.

Length 5 mm.- $5\frac{1}{2}$ mm. Boone Co. and St. Louis Co., Mo. July and November.

This species appears to resemble *Corixa (Arctocorisa ?) acuminata* Uhl., but the structure of the male palæ, which are quite unlike those of any other species in the group, together with the shape of the head in the male, the minute strigil, and the short lenticular pronotum, sharply sets it off from other species. The presence of a frontal fovea in the female is also extraordinary, and together with the points mentioned above seems to warrant separating the species from its congeners in a new genus, for which the name *RAMPHOCORIXA* is proposed, and of which the following may stand as a diagnosis :

RAMPHOCORIXA, n. gen.—*Allied to Arctocorisa Wallen., from which it differs in the form of the male palæ, strigil and shape of head. Differs from Glanocorisa Thoms. in the absence of bristles among the palar pegs. Pronotum lenticular rastrate. Head of male sharply acuminate, with fovea acorn-shaped, ♀ palæ dorsally, deeply cleft, much longer than tibia, terminated by a long serrated spine; femur with a large stridular area of minute spines. Strigil minute. Fifth, sixth and seventh tergites divided in the male. Asymmetry of male dextral. Female palæ cultrate with a short retrorse terminal spine; face of ♀ foveate.*

EXPLANATION OF PLATE IV.

Fig. 1.—Egg of *Ramphocorixa balanodis*, $\times 34$. The dorsal cup is affixed to the carapace of the crayfish.

Fig. 2.—First instar, ventral aspect, $\times 82$. A = the pala or first tarsus, $\times 240$.

Fig. 3.—Third instar, dorsal aspect, $\times 24$, showing the beginning of the wing-pads. The setæ of the legs and body are omitted.

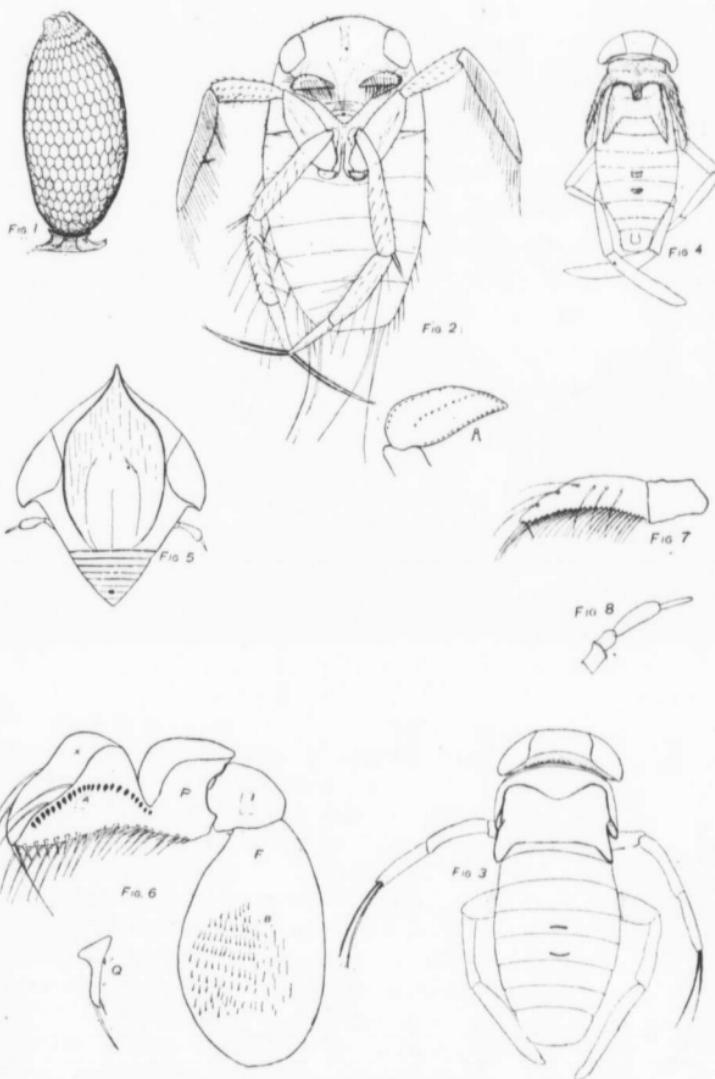
Fig. 4.—Fifth instar, dorsal aspect, $\times 10$. The wing-pads have grown beyond the thorax and are covered with downy hair. Cilia of abdomen and legs omitted.

Fig. 5.—Frontal aspect, head of male, $\times 20$.

Fig. 6.—Pala of male, $\times 51$, viewed from inner upper angle. F = femur ; T = tibia ; P = Pala or tarsus ; A = row of pegs ; B = stridular area ; Q = diagrammatic section of pala marked X.

Fig. 7.—Pala of female, $\times 68$.

Fig. 8.—Antenna $\times 68$.



RAMPHOCORIXA BALANODIS, N. GEN. ET SP.

NEW SPECIES AND GENERA OF NORTH AMERICAN
LEPIDOPTERA.

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

(Continued from page 93.)

Subfamily *Hypeninae*.*Epizeuxis terrebralis*, sp. nov.

♂.—Antennæ rather lengthily ciliate; palpi upturned, 2nd joint smoothly scaled, attaining to front, 3rd joint long, narrow, pointed; thorax and primaries deep black-brown with indistinct maculation; t. a. line single, waved, black, inclined slightly outwardly with rather prominent outcurve in submedian fold; reniform an indistinct dark lunular mark, very faintly and only partially outlined in ochreous; from it a faint wavy shade proceeds to inner margin parallel to t. p. line; this latter most distinct of the inaculation, slightly outcurved around cell and then parallel to outer margin, slightly wavy with faint inward angle on submedian fold; s. t. line only traceable in costal portion, faint, black; black terminal line and dusky fringes; secondaries dark smoky with broken terminal line. Beneath uniform dark smoky with darker terminal line and small discal spot on secondaries. Expanse, 23 mm.

Habitat: White Mts., Ariz., 1 ♂. Type, collection Barnes.

Smaller and darker than *suffusalis* Sm.; t. p. line less waved and without the ochreous blotch in reniform.

Bleptina flaviguttalis, sp. nov.

Palpi ochreous; head and thorax pale purplish gray sprinkled with black scales; primaries purple-gray, shaded outwardly with darker and with the remaining area thinly sprinkled with black scales; basal line an indistinct dark upright shade line across the whole area of wing; subbasal area very slightly shaded with ochreous; t. a. line single, black, upright, very slightly bent inwards at costa; orbicular a pale yellow dot, indistinctly outlined with brownish; reniform yellow, triangular, with apex produced towards costa, lower portion containing a black dot; a dark median shade line, indistinct in costal half, wavy below reniform and equidistant from t. a. and t. p. lines; t. p. line black, crenulate, concave below costa, again opposite reniform, outcurved between veins 3-5, incurved between veins 1-3, slight outward angle on vein 1; s. t. line pale yellow, even, outcurved between veins 3-5, otherwise straight, shaded

anteriorly with dark brown ; a terminal row of black dots ; fringes dusky cut by a waved indistinct black line ; secondaries deep smoky with faint pale subterminal line only distinct near anal angle. Beneath pale smoky shading into dark brown outwardly ; a discal dot and faint dark median line on both wings and pale subterminal line, most distinct on secondaries ; fringes dusky. Expanse, 24 mm.

Habitat : Palmerlee, Ariz., 1 ♂. Type, collection Barnes.

A typical *Bleptina*, most closely related to a Texan species which we have identified as *inferior* Grt. In our species the t. a. line is straighter, the lower portion of the reniform larger and the subterminal line of secondaries is distinct at least in the anal half of wing.

Bleptina minimalis, sp. nov.

Palpi recurved, third joint long, very pointed, with slight tuft of scales on posterior side in both sexes ; antennæ finely ciliate ; general colour pale ochreous to dark gray, primaries often considerably shaded with black scales ; maculation varying in distinctness, often almost lacking, in other cases quite distinct ; when present, basal line a slight dark streak very close to base ; t. a. line single, dark, slightly waved, most prominent below orbicular ; this latter spot just beyond t. a. line, longitudinally oval, yellow, small, obscurely outlined in brownish ; reniform yellow, constricted medially, lower portion broader than upper and containing a blackish dot, the whole partially outlined in dusky ; at times the whole reniform is much reduced, becoming a mere yellow streak ; occasionally traces of a faint dusky median shade, usually however lacking ; t. p. line dark, crenulate, shaded outwardly with paler, excurved from just below costa around the reniform, with strong incurve in submedian fold ; s. t. line pale, shaded more or less strongly on both sides with dusky, slightly wavy, excurred in central portion ; a terminal series of dark dots ; secondaries smoky brown, occasionally with traces of a crenulate dark median line and pale subterminal one, mostly however immaculate. Beneath uniform smoky, lighter in basal area of secondaries in the paler forms, which also show traces of the lines of upper side. Expanse, 14 mm.

Habitat : Babaquivera Mts., Ariz.; Redington, Ariz., 2 ♂s, 6 ♀s. Types, collection Barnes.

The small size will readily distinguish this species. In general the ♀s are darker and more obscurely marked than the ♂s. Fresh specimens also appear considerably darker than those that have been in the cabinet some time.

Family *Notodontidae*.

Hyperæschra stragula, var. *ochreata*, var. nov.

♀.—Primaries pale ochreous brown, maculation as in *stragula*; on costa between basal and t. a. lines a bar of blue-black extending downwards to first brown dash in cell and somewhat sprinkled with whitish; just beyond the discal lunule a large blue-black patch, rather irregularly circular, resting on costa, defined outwardly by the t. p. line, basally by vein 3; this contains two whitish patches, one between veins 4 and 5, the other smaller between veins 6 and 7, and opposite the discal lunule it is indented with white; costal area between it and t. a. line whitish, containing the reddish-ochre discal mark; terminal area blue-black; basal half of inner margin broadly blue-black crossed by the pale curved t. a. line. Secondaries white; fringes shaded with blue-black at inner angle. Expanse, 46 mm.

Habitat: Provo, Ut. (July 21st), 1 ♂. Type, collection Barnes.

The large circular black mark beyond cell is very characteristic, the ground colour is paler than in *stragula* and the s. t. line much less waved. May prove to be a distinct species on receipt of more material.

Family *Thyatiridae*.

Habrosyne rectangula, var. *arizonensis*, var. nov.

Ground colour of primaries and thorax mouse-gray with none of the brownish shading characteristic of *rectangula*; white dash at base of wing reduced in size; pinkish-white costal and subterminal shading somewhat reduced; secondaries similar to ground-colour of primaries, not brownish as in the type form.

Habitat: White Mts., Ariz., 1 ♂. Type, collection Barnes.

Family *Geometridæ*.

Genus *Grossbeckia*, gen. nov. (type *G. semimaculata*, sp. nov.).

Antennæ of ♂ shortly bipectinate; palpi long, drooping, pointed at extremity, smoothly scaled; fore legs with the femur slightly hollowed out distally to receive the tibia which is $\frac{1}{2}$ the length of the femur and possesses a slight hair pencil beneath, concealing the epiphysis; posterior

tibiae normal, spurred, outer spur about half as long as the inner; wings long, narrow, primaries with slightly convex costal margin, well rounded apex and rather oblique outer margin; inner margin straight; secondaries slightly crenulate with sharp angle at junction of inner and outer margins; primaries with vein R_1 from about middle of cell; areole long, narrow, exceeding the cell by about half its own length; R_2 , R_3 and R_4 stalked from apex of areole; R_5 from a point with R_2 ; M_1 from lower angle of areole; M_2 from centre of discocellular; M_3 and Cu_1 from lower angle of cell; Cu_2 from near angle; anal vein parallel to inner margin; secondaries with vein M_2 absent, vein S. C. joined to the cell for about $\frac{2}{3}$ of its length; veins R and M_1 stalked; M_3 and Cu_1 connate from lower angle of cell; Cu_2 from near angle; 2nd anal very close to inner margin; frenulum present.

The genus is remarkable in lacking vein M_2 of secondaries and having the subcostal vein distinctly united with the cell, which would place it in the family *Fernaldellinae* of Hulst. The type species possesses very little resemblance to specimens of the genus *Fernaldella* and is in fact very distinctly *Hydriomenid* in general appearance. We take pleasure in naming the genus after our friend Mr. J. A. Grossbeck.

Grossbeckia semimaculata, sp. nov.

Palpi, thorax and abdomen dark gray, latter pale ochreous beneath; primaries with the costal half of wing alone showing maculation; below cubital vein, with the exception of the inner margin, the whole area is dull gray-brown; costal half of primaries brown, suffused with light and dark gray; a slight black streak at base of wing; from costa near base an obscure dark shade extends obliquely across wing to cubital vein, bordered outwardly slightly with gray; at apex of cell a large white quadrate patch; costal area above this patch largely dark smoky-brown with several pale gray streaks, beyond the patch the brown ground colour forms a small round blotch; from apex of wing inwards nearly to white patch a diffuse gray shade extends, bordered inferiorly by a slightly notched dark line ending in a dark shade, from which two curved dark lines, parallel to outer margin, arise, extending to vein Cu_2 and enclosing a dark gray blotch; terminal area shaded with dark gray; cubital and median veins marked with black; a black shade, broken twice by gray scaling, extends narrowly along the inner margin; secondaries rather pale smoky, fringes

somewhat lighter. Beneath primaries uniform pale glossy brown; secondaries whitish, shaded with brown along outer margin. Expanse, 31 mm.

Habitat: Palmerlee, Ariz., 1 ♂. Type, collection Barnes.

Bears considerable resemblance to *Cataclothis frondaria* Grt., but the pale immaculate area is much larger and the venation totally different. This pale area is due to the fact that when at rest the wings are so folded that only the costal half of wing is visible, the insect then having much the appearance of a Phycitid.

Diastictis (Cymataphora) pallipennata, sp. nov.

♂.—Palpi, head, thorax, and abdomen white; ground colour of primaries white, marbled with gray, which shade is predominant beyond the t. p. line; t. a. line single, rather broad, especially at costa, dark gray, angled outwardly below costa and with slight inward angle on submedian fold; median space more or less shaded with gray; a small oval gray mark at end of cell, slightly filled with white; t. p. line dark gray-brown, curved outward from costa, inward opposite cell and with a rather sharp outward angle in submedian fold, in general parallel to t. a. line; subterminal and terminal spaces almost entirely olive-gray with the exception of a white costal patch; through this area a broad white subterminal line runs, rather irregular in course, angled slightly outwardly below apex, the angle preceded by a short dark dash in subterminal space, another slight angle or outcurve between veins 3 and 4, termination at inner angle; fringes white, checkered with dark gray. Secondaries white, heavily mottled with dark gray, leaving only traces of the ground colour visible; a faint discal dot and rather heavy dark postmedian line, parallel to outer margin, with slight outcurve before inner margin; terminal area somewhat darker; fringes white, faintly checkered with gray. Beneath white, heavily sprinkled with gray; primaries with discal dot and straight postmedian line; secondaries with dark postmedian and subterminal lines and discal dot.

Male paler than ♀; the subterminal and terminal spaces white with but little dark gray shading; subterminal line wanting; from costa near apex a dark dash inward to vein 7, semiparallel to t. p. line. Antennæ bipectinate, posterior tibiæ swollen but without hair pencil. Expanse, 19-22 mm.

Habitat: Redington, Ariz., 1 ♂, 4 ♀s. Types, collection Barnes.

The species has considerable resemblance with *Macaria s-signata* in general type of maculation. The extent of the dark olive-gray shading

is variable, the median area is in some specimens pure white, in others quite smoky; the discal mark may be present or absent.

Phycitiinæ.

Euzophera strigalis, sp. nov.

Palpi upturned, 3rd joint moderate, pointed, smoothly scaled with whitish; pectus and legs pale gray; antennæ of ♂ lamellate and ciliate; front gray; thorax and primaries dark gray, sprinkled with lighter; primaries with the basal area and central area at end of cell slightly less sprinkled than remainder of wing; all maculation wanting, except that the veins are prominently outlined in black, giving a strigate appearance to the wing. Secondaries, hyaline, with white fringes, slightly smoky at apex of wing. Beneath primaries smoky; secondaries as above, costal margin sprinkled with dark scales. Expanse, 42 mm.

Habitat: Eureka, Ut., 1 ♂. Type, collection Barnes.

Related to *E. gigantella* Rag., but lacks all traces of the transverse lines.

BOOK NOTICE.

INSECTS OF FARM, GARDEN AND ORCHARD.

"INSECT PESTS OF FARM, GARDEN AND ORCHARD," by E. Dwight Sanderson. Publ. John Wyley & Sons, 43 East 19th Street, New York; also The Renouf Publishing Company, 25 McGill College Ave., Montreal. XII, 684 pp., 513 figs. \$3.00.

The increasing number of workers in economic entomology and the consequent enormous output of literature embodying the results of their, or other people's, investigations is rendering it gradually more difficult for the student, farmer or fruit-grower to gain a knowledge of the life-histories of and means of controlling the insects with which they have to deal. Any means whereby this difficulty can be lessened is an addition to the insect-fighting organization as a whole, and its welcome is proportionate to its efficiency. We give a whole-hearted welcome to this last addition to our economic literature, and are glad that the author found the necessary leisure time to develop and complete a work which he is eminently fitted to carry out.

It is impossible in a review of this nature to give more than a superficial idea of the contents. In the author's words, it has been his effort "to

discuss all of the important insects of farm, garden and orchard at sufficient length to give a clear idea of their life-histories and habits, and also the best means of control, so that the book may be used as a reference work both by the student of economic entomology and by the practical farmer, gardener or fruit-grower." His effort has certainly been successful, with the result that in addition to a well-balanced treatment of the insects affecting staple crops, such as his previous work, now out of print, gave, he has included insects affecting small bush and orchard fruits. The well-selected references which are given under each insect to the more important bulletins on that insect and its control, will prove of great value to the student or to the agriculturist with a thirst for more knowledge, and there are many such.

Like our injurious insects, the author recognizes no international boundary, in fact, his free annexation of our provinces is almost startling at times; Nova Scotia, however, is not "Southern Canada" (p. 619), but eastern.

While the author has succeeded to a remarkable degree in his use and choice of popular names, there are one or two instances where we believe that the name is too long to be suitable for popular use; nevertheless, we fully realize the difficulty of choosing a short name, which is at the same time distinctive. The author calls *Cephus pygmæus* Linn. the Wheat Saw-fly Borer; this name might not be recognized by persons accustomed to call the species the Wheat-stem Saw-fly or the Wheat-stem Borer. Such instances serve to indicate that we are still a long way from the solution of the question of popular nomenclature, and that there is much careful work yet to be done by not only our own Committee on Nomenclature, but by an International Committee.

The book is illustrated by over 500 figures, which, with a few exceptions, are excellent, and their clear reproduction is due to the fine quality of the paper used. With the exception of a certain number of typographical errors and one or two inverted figures, which are troubles from which all authors are compelled to suffer at the hands of their printers, there is no fault to find with the printer's share of the work. Its reasonable price should make it one of the chief books of reference, especially for those for whom the book is written, and we hope that the second edition will soon make its appearance.

C. GORDON HEWITT.