

The Canadian Entomologist.

VOL. XLIII.

LONDON, JUNE, 1911.

No. 6

ON THE NOMENCLATURE OF THE MALE GENITALIA IN LEPIDOPTERA.

BY J. MCDONNOUGH, PH. D., DECATUR, ILL.

The genitalia in Lepidoptera have, within the last ten years, become one of the most important factors in systematic work, and no revision of any group can be considered complete which does not deal with the subject of the sexual armature, serving as it does in many cases to separate species otherwise difficult to distinguish. This being the case, it is all the more to be regretted that already at this comparatively early date in the history of the subject the terminology has become so involved. The female armature, owing to its comparative simplicity, and possibly to the fact that it has not been so carefully studied as that of the male, has suffered little in this respect, but in reviewing the literature on the male genitalia we are at once met by a hopeless jumble of terms, which to say the least of it neither tends to elucidate an already difficult subject, nor to awaken a growing interest in the average collector for this particular branch of his hobby. As a case in point, and one that gave the prime motive power for this present paper, we might cite the following: Prof. J. B. Smith, in his various publications on North American Noctuidæ, uses the term "*harpe*" for the two outermost lateral valve-like appendages of the male, applying the term "*clasper*" to a portion of the inner armature of this same harpe, usually in the form of a curved hook or rod arising from the mid-ventral surface. In this he has been followed by various American authors, and also by Pierce, who in the introduction to his valuable work on the Genitalia of British Noctuids, has attempted to define the various parts. If, on the other hand, we turn to Rothschild and Jordan's Monograph of the Sphingidæ, we find these same terms used in exactly an inverse sense; the outermost appendages are termed "*claspers*," whilst for the inner armature the term "*harpe*" is employed. Obviously only one of the learned authors can be correct in his use of the above terms, and prompted partly by curiosity, partly by a thirst for knowledge, we have delved somewhat deeply into the bibliography of the subject. In the following paper we have endeavoured to fix and apply the correct names

to the various parts of the ♂ genitalia as determined strictly by the law of priority; we can promise nothing startlingly new, but consider the lack of a uniform terminology sufficient warrant for thus obtruding ourselves upon the public notice.

The older writers, such as Burmeister, Kirby and Spence, and Siebold and Stannius, dismiss the subject of the ♂ genitalia of Lepidoptera in a few words. All the above authors use the term *valvæ* or *valves* for the two lateral outer appendages. Just who originated the term we have not been able to discover, but it dates back before 1815. Mention of further portions of the genital armature is first made by *De Haan* in 1842. This author has examined the genitalia of several exotic Papilios; he uses the term valves (kleppen) in the sense of the older writers, and makes further mention of two inner lateral appendages (zijdelingsche aanhangsels), and a blunt-pointed spine with two lateral plates at the extremity of the abdomen; he, however, applies no particular terms to these parts.

The first work of importance after this date dealing with ♂ genitalia is that of Scudder and Burgess in 1870. Here we meet with the term *clasp* employed instead of *valve*; a reference to the figures leaves no doubt that the two terms are identical. A "short, frequently bent or curving process, ordinarily somewhat triangular in shape, and very often armed with spinules," which arises from the basal portion of the lower half of the clasps (in the genus under discussion, Nisoniades, each clasp is divided into an upper and lower portion), is termed "*basal process*." The dorsal portion of the armature is simply referred to as the "*upper organ*."

In 1876 Buchanan-White issued a profusely illustrated monograph on the ♂ genital armature in the European Rhopalocera. Owing to the poor technical methods employed, the hair being simply removed from the anal segments, and the portions thus exposed delineated, little reliance can be placed on the figures. The author employs the term "*Harpago*" for the lateral valve, and designates the dorsal portion—the *upper organ* of Scudder and Burgess—by the name of *Tegumen*.

This work was followed in 1882 by a monograph of the clasping organs of the genus *Papilio* by Ph. H. Gosse. Besides a review of the existing literature, the author gives for the first time fairly exact definitions of the various portions of the genitalia. The term *Valves* is again employed for "two broad plates, which by free-working joints are united to the overlapping edges of the eighth abdominal segment. They are clothed on the exterior with scales like those of the body. Their direction

follows the general plane of the sides of the abdomen." Under the heading *Harpe* we find the following: "The interior surface of each valve, which, as I have said, is hollow, is the seat of a peculiar organ, which appears to take a very prominent part in the prehensile function.

Within the hollow lies a plate of what I presume to be pure chitine, usually as transparent as glass, but tinged with a yellow-brown hue, thickening at various parts, especially at its margins and irregular ridges. . . . The parts thus thickened are also elevated, not merely in the bounding walls and ridges that I have mentioned, but in general by the separating of a portion of the organ from the cavity-floor; so that this particular part shall be elevated and projected freely into the inclosed space between the valves. And these projected portions either take the forms of curved acute spines, or, more frequently still, are notched into sharp teeth standing in serried rows. . . . Whatever the form, the base is always expanded, often with ridges, spreading over the basal edge of the valve. I have no hesitation in assigning a distinctive epithet to the organ in question; and it is known throughout this memoir by the term *Harpe*."

In a footnote, the correctness of which we will comment upon later, Gosse says: "Dr. White has used the term *harpago* for the organ which, in the other Rhopalocera appears to represent the *valve* and *harpe* united. But in the Papilionidæ, where these are separate, it is desirable that they should receive separate designations. The terms *harpago* and *harpe* are sufficiently distinct; while they bear a relation to each other not unlike that of the things designated."

The term *Uncus* is used for the hook-like tip at the dorsal extremity of the abdomen, the *tegumen* of Buchanan-White being restricted to the broad basal portion. We further meet with the term *Scaphium* for the first time, this being applied to a "mass of shining white tissue, apparently in organic union with the lower surface of the uncus near its origin," and shaped like a lower jaw or the keel of a boat. Following this various articles by Cholodkowsky, Hoffman, Jackson, Backer, Escherich, Peytoureau, Stichel, Klinkhardt and Poljanec have appeared from time to time. Backer first applied the term *Saccus* to the chitinous process projecting into the abdomen from the anterior margin of the xii segment, a process already observed by Cholodkowsky. Most of these authors deal largely with the ontogenetic development of the genital organs, attempting to bring the results of their investigations in this branch of the

subject into some sort of relation with the morphological details. Owing to the wrong conclusions and the false application of terms, the general result of these works is still very unsatisfactory, and not until 1902, when *Enoch Zander* issued his excellent and most thorough treatise on the male genital organs of Lepidoptera, do we arrive at any clear and definite idea of the development of these organs, and the relationship of the various parts to each other.

We will have to confine ourselves here to a short statement of the various conclusions reached by Zander, but would heartily recommend anyone intending to occupy himself with this subject to study the work itself in detail.

In spite of the great and confusing variety of forms Zander has satisfactorily shown that the male genitalia may be traced to a single

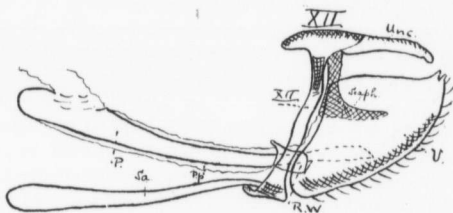


FIG. 8.—Genitalia of *Apatura iris*, side view (according to Zander).
14: 1. P., Penis; Pp., Penis pouch; R. W., Ringwall; Sa., Saccus; Unc.,
Uncus; Scaph., Scaphium; V., Valve.

common plan of construction. The abdomen of *all* Lepidoptera consists of 10 segments, representing the body segments iv-xiii. The *Segmental rings* of segments v-ix consist of a dorsal and ventral chitinous plate, the tergite and sternite respectively; in segment iv the sternite is always lacking. Segments x and xi, while often agreeing exactly with the preceding ones, are sometimes slightly modified and brought into relationship to the genital organs. In certain Geometridæ Seg. x has large hair pencils concealed in lateral pockets (Haartaschen of Poljanec); Seg. xi shows in several neotropical butterflies several enormous lateral processes arising from the posterior portion of the sternite (Rami of Stichel); several species of Bombycidæ show also an armature of chitinous hooks and processes.

The xii and xiii segments are always greatly modified and intimately connected with the sexual system. The chitinous covering of the xii segment is much thicker than in the preceding ones, and forms a closed ring about the body. In the lowest families (Micropteryginæ) this ring is of equal breadth all round, but in the majority of the remaining families the dorsal portion is much more broadly developed than the ventral and lateral portions, the whole bearing a striking resemblance to a signet ring. In many cases, examples of which can be found in every group with the exception of the Rhopalocera, a lateral joint is present, dividing the ring into a ventral and dorsal portion.

To the median ventral portion of the wing is attached the *Saccus*, a secondary invagination of the intersegmental membrane, which projects as a strongly chitinized pocket more or less deeply into the abdomen. In several species of *Bombycidae* considerable modification of the *Saccus* has taken place, leading in extreme cases to the formation of a large chitinous sac beneath the sexual organs (*Bombyx rubi*). In but few instances is the *Saccus* completely lacking.

The conical anal segment (xiii) is scarcely visible in the majority of cases in the fully developed organ. The *Uncus* and *Scaphium*, which

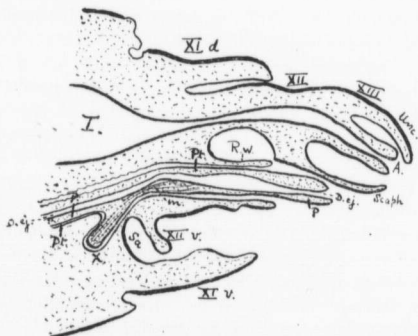


FIG. 9.—Median section through anal portion of pupa of *Parapovyn stratiotaria* in advanced stage of development (according to Zander). 40: 1. I., Intestine; A., Anus; d., Dorsal plate; v., Ventral plate; D. ej., Ductus ejaculatorius; m., Musc. retract. Duct. ejac; P., Penis; P. t., Penis pouch; R. W., Ringwall; Sa., Saccus; Scaph., Scaphium; Unc., Uncus; X, Blind pouch; XI-XIII, Segments.

for long were considered as the dorsal and ventral portions of this segment, prove on examination of pupal stages to be but secondary processes. The true segment wall remains mostly membranous, and is usually concealed within the xii segment. Sometimes, however, the anal cone projects, and in such cases the secondary processes are usually absent, and either the dorsal portion (*Heliopsis*, *Catocala*), or the ventral (*Hadena*, *Nonagria*) is more strongly chitinized. The *Uncus* usually has the form of a single ventrally-inclined hook, but may be bifid or even replaced by several processes or hooks. The *Scaphium* shows a similar degree of variation, and is often lacking in *Rhopalocera*, *Noctuidæ*, etc.

The *Valves* are enormously developed lateral appendages, which are always hinged to the postsegmental margin of the xii segment. Usually symmetrical, they show in several instances (*Nisoniades*, *Pterophoridae*) marked asymmetry, and are furnished on their inner concave side with all manner of hooks and bristles. They originate at a late larval period in the so-called genital pouch, an ektodermal invagination of the xii ventral membrane. At the bottom of this pouch two conical mounds undergo division, forming two lateral warts, the embryonic *Valves*, and two centrally placed ones, which afterwards unite to form the embryonic *Penis*.

During the pupation stage, owing to the disintegration of the genital pouch, the *Valves* come to lie on the surface, while the *Penis* remains at the base of a small secondary depression, the commencement of the so-called *Penis pouch* (*Penistasche*). The remaining development takes place during the pupal period. The *Penis pouch*, which is possibly identical with the *Penis sheath* of Poljanec, possesses generally, as seen from behind, a funnel-shaped appearance, narrowing to a fine tube, which enters the abdomen for a considerable distance. The narrowing may be gradual, but in most instances the transition is sudden, and at the point where the pouch enters the body a so-called *Ringwall* (*Penis-funnel* of Jordan) arises, a hollow cone-like structure, either strongly chitinized all round, thus forming a *Ring*, or else chitinized only ventrally, giving the appearance of a groove (*Sella* of Stichel). The outer wall may show a considerable armature of hooks, etc., which in some cases becomes quite complicated, leading Poljanec into the error of supposing that "inner valves" existed. (*Pygaera pigra*, *Psodos coracina*).

Closely fitted into the *Penis pouch* we find the *Penis* proper; the proximal portion is merely membranaceous, but the distal end projects out of the *Ringwall* as a strongly chitinized tube, which is of varying shape

and size, and often armed with hooks and crotchets. At the ventral base of this end-portion is usually found a chitinous sack, commonly and erroneously taken to be the blind end of the *Penis* itself, giving rise to the idea that the Ductus ejaculatorius entered the *Penis* from the dorsal side. As a matter of fact the *Penis* extends far beyond this point into the abdomen, the use of the sack being to contain the retractory muscle of the eversible Ductus ejaculatorius, which passes through the *Penis* for its entire length as a finely chitinized tube and may occasionally be observed projecting from the distal end in the form of a delicate membrane.

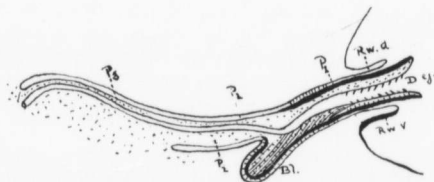


FIG. 10.—Section through Penis and Penis pouch (according to Zander). P1, P2, P3, Penis; D. ej., Ductus ejaculatorius; Rw. d., Dorsal portion of Ringwall; Rw. v., Ventral portion of Ringwall; Bl., Blind pouch with musc. retract.

In this preface to "Genitalia of British Noctuidæ," issued in 1909, *Pierce* has devoted a short chapter to "Nomenclature and Descriptions." While we do not wish to depreciate the excellent work done by the author, we regret to find that his definitions are, in the light of what we have just stated, far from correct. As already noted, the term *Harpe* is applied by *Pierce* to the two outermost lateral appendages. Taking into consideration the ontogenetic development of these parts, as shown by *Zander*, and referring to the original definition of the term as given by *Gosse*, we inevitably come to the conclusion that *Pierce's* use of it is incorrect. He has either followed *Smith's* lead or has possibly confused it with the *harpago* of *Buchanan-White*, which, in its turn, must fall before the older terms *valve* or *clasp*. The *harpago* is not, as *Gosse* has stated, a fusion of *valve* and *harpe*, but rather a simple *valve* which is destitute of any inner armature in the shape of a *harpe*. The term *clasper*, as used by *Pierce* and by *J. B. Smith*, also cannot stand; *Scudder* has already employed the term for another portion, viz., the *valve*. The hook-like process arising from the central portion of the inner side of the

valve in the Noctuidæ, while perhaps not absolutely identical with the *Harpe* as defined by Gosse, and which is typical in Papilionidæ and Sphingidæ, can, in our opinion, be designated by the same term, without risk of confusion; whether the term could be safely employed for the "basal process" of Scudder, as seen in many *Hesperidæ*, is rather doubtful.

Pierce has applied various terms to the different portions of the valve and its armature; these may be retained, but must probably be restricted in their use to the Noctuidæ, owing to the difficulty of applying them correctly in the other lepidopterous families. We would refer readers to the work in question for a full list of these terms.

Pierce's use of *Uncus* and *Scaphium* appears to be correct; he is wrong, however, in stating that the anal opening is ventral to the *Scaphium*; as shown by Zander it clearly passes between these two appendages of the XIII segment. The *Subscaphium* of Pierce, defined as a similar process to the *Scaphium*, but below the anus, is probably but a portion of the latter.

The Ringwall of Zander is termed *Juxta* by Pierce; like most other authors he has fallen into the error of considering the blind pouch containing the retractory muscle to be the end of the Penis, which thus appears to receive the seminal duct through a lateral opening. His *Ædoeagus* is but the strongly chitinized distal end of the Penis proper, and his *Vesica* the Ductus ejaculatorius which, as previously stated, is eversible.

In conclusion, we summarize the results of the above paper, and present the following list of terms for the more important portions, which we would recommend for general use:

- Valves* or *Clasps*.—(= Harpes of Smith and Pierce). The two lateral outer appendages.
- Harpe*.—(= Clasper of Smith and Pierce). Inner hook-like armature of Valve, arising from or near base of same.
- Uncus*.—Hook-like dorsal appendage of XIII segment.
- Scaphium*.—Process arising immediately ventral to *Uncus* and anal opening.
- Ring-wall*, *Penis funnel* or *Juxta*.—Chitinous cone at the base of the valves from which the Penis protrudes.
- Penis*.—A strongly chitinized rod-like structure projecting from the Penis funnel. (This is strictly speaking only the distal end of the organ, but for descriptive purposes all that need be considered).

Ductus ejaculatorius or *Vesica*.—A membranous tube, passing through Penis, and sometimes seen protruding from its distal end, forming a sort of cap.

Saccus.—A medio-ventral chitinous sac projecting forwards into the abdomen and attached to the anterior margin of XII segment.

BIBLIOGRAPHY.

- Backer, G. F.*—Notes on the genitalia of a gynandromorphous *Eronia hippia*. Trans. Ent. Soc. Lond. 1891.
- Cholodkowsky, N.*—Über den Geschlechts-apparat von *Nematois metallicus*. Zeit. wiss. Zool. Bd. 42, 1885.
- Gosse, Ph. H.*—On the clasping organs ancillary to generation in certain groups of the Lepidoptera. Trans. Linn. Soc. 2nd Ser. Zool. Vol. II, pt. 6, 1883.
- Haan, W. de.*—Bijdragen tot de Kennis der Papilionidea. Leyden 1842.
- Hoffman, O.*—Beiträge zur Kenntniss der Butaliden. Stett. Ent. Zeit. 1888.
- Hoffman, O.*—Die deutschen Pterophorinen. Regensburg, 1895.
- Jackson, W. H.*—Studies on the morphology of Lepidoptera. London, 1890.
- Peytoureau, S. A.*—Contributions à l'étude de la morphologie de l'armure génitale des Insectes. 1895.
- Pierce, F. N.*—Genitalia of the British Noctuidæ. Liverpool, 1909.
- Poljanec.*—Zur Morphologie der äusseren Geschlechtsorgane bei den männlichen Lepidopteren. Arb. Zool. Inst. Wien. XIII, 1901.
- Rothschild & Jordan.*—Revision of Sphingidæ (Introduction), 1903.
- Scudder & Burgess.*—An asymmetry in the appendages of hexapod insects.
Proc. Bost. Soc. Nat. Hist., 1870.
- Smith, J. B.*—Contributions towards a Monograph of N. Am. Noctuidæ.
Proc. U. S. Nat. Mus., Vols. 12, 13, 15, 21, 1889-98; Bull. U. S. Nat. Mus. 38, 1890.
- Stichel.*—Kritische Bemerkungen über die Artberechtigung der Schmett. *Catonephele* und *Nessæa*. Berl. Ent. Zeit. 1899.
- Zander.*—Beiträge zur Morphologie der männlichen Geschlechtsanhänge der Lepidopteren. Zeitsch. wiss. Zool. LXXII 557, 1903.

THE "EYE-SPOTS" OF *ALAUUS OCVLATUS*.

BY F. ALEX. MCDERMOTT, WASHINGTON, D. C.

The large elater, *Alaus oculatus*, whose pronotum bears the two large black-and-white eye-spots which give the insect its species name, is a prominent specimen in practically every large collection of Coleoptera in this country; and if not the *oculatus*, then some of its near relatives, similarly marked, will surely be there. Usually, also, one will find in these collections, the cucuyo, *Pyrophorus noctilucus*, or some of its allies, whose thoracic portions bear two spots very similarly situated, but this time of a yellow colour and smaller, and during the life of the insect emitting that remarkable light, which was the basis of the researches of Langley and Very, "On the Cheapest Form of Light."* Those who observe these insects, either alive or dead, would naturally wonder whether the *oculatus* might not be luminous, or at least have beneath its chitin some structure indicating that the eye-spots were a degradation of the photogenic organs of the cucuyo. In the matter of classification, the insects are not particularly closely related; both are elaters, to be sure, but in different subfamilies, and not very strikingly similar in their mode of life.

The extremely hard chitin of the *oculatus* renders it a difficult subject for histologic work. However, the idea above mentioned, that there might be some sub-chitinous structure, occurred to the writer some time ago, and in pursuance thereof, he has attempted to gain some knowledge of the structure of these eye-spots. A number of sections have been made by hand, the sub-tissues being stained with acid carmine, and the mounting being in paraffin. While the general statement may be made that there is no special organic structure beneath these eye-spots, the observations upon them seem to justify publication, as a matter of interest, inasmuch as no previous paper appears to have been published on this point, so far as I have been able to ascertain, though to my knowledge, others have been interested in this same subject.

Each spot consists of an elliptical, convex area, whose edge is depressed below the surrounding thoracic chitin. Under a low-power lens they appear to be covered with a dense, black pile, like black velvet, while the edge of the spots bears short, coarse white hairs. With higher powers the velvety pile resolves itself a mass of flat, scale-like chitinous hairs, showing a few longitudinal ribs, and slightly concavo-convex. Their general shape under the lens resembles the chaff from grain. The white hairs of the edge are similar, but coarser. Both are hard to remove, and

* Smithsonian Misc. Coll., No. 1258, Washington, 1901,
June, 1911

considerable friction must be applied to remove them from the surface of the spot. Neither the white nor the black hairs differ from the hairs of similar colour found on the elytra and other portions of the body. The hairs do not ordinarily grow singly, but bundles usually of from two to five spring from the same point, and at the base of each bundle there is a depression in the chitin; these depressions give the bared chitin an appearance as if etched with acid. The black hairs are dull black, the chitin shiny black.

Under the "eye-spot" the chitin is somewhat thicker than that of the remainder of the thoracic covering. In common with the chitin of the remainder of the thoracic portion, that of the eye-spot is divided into three layers. The outer layer is quite thin, hard, brittle, opaque and jet black, and probably forms a kind of enamel; the second layer is thicker, dark brown in colour, and dense and hard; the inside layer is softer, lighter in colour, and very tough; it is the thickest of the three layers, and appears to be somewhat vascular near its inner surface, though this appearance may be due to muscular attachments at this point. Directly under this inmost layer are the muscles of the thoracic cavity, in which could be seen the usual respiratory tracheæ. No special structures were observed, and certainly nothing suggesting the structures found in luminous organs. Certainly none of the specimens the writer has seen alive has been luminous.

While these spots appear to be somewhat more than merely a portion of the general scheme of pigmentation, it seems hardly likely they represent any special sense organ. The thickened chitin is opposed to this view. It may, of course, be a rather extraordinary development of protective colouration. In this connection it is of interest to note that related insects are found in various portions of North America, in some of which there is much more of the white colouration, with more pronounced "eye-spots" than in *oculatus*, while in some others these spots have dwindled until they are mere black specks.

Somewhat related to this question in *Alaus* is that of the yellow spots on the elytra of the Indian Buprestid, *Chrysochroa ocellata*, which Latreille reported to be luminous, and in which he has been followed by a number of writers. Through the kindness of Mr. H. S. Barber, of the National Museum, I was permitted to examine specimens of this insect and closely-related species. This large and beautiful insect is coloured mainly in rich tones of red, blue and green-gold; each elytron, however, bears a large, almost circular yellow spot, which lacks the metallic lustre

of the remainder of the insect. The colour of these spots is certainly not unlike that of the luminous organs of the Lampyrids, yet it is hard to imagine what possible use a truly diurnal insect would have for luminosity, and how it produces light in a portion so obviously unfitted for the delicate photogenic tissues as a thin, brittle elytron. Some of the related species show an extension of the yellow spot into a band completely crossing the elytra, together with a similar colouration along the front edge and a portion of the sides of the wing-cases, while still others have nearly one-half of the elytra surface taken up with this yellowish, non-metallic colouration.

ON THE IDENTITY OF (*TRICHOGRAMMA*) *NEOTRICHOG-*
GRAMMA JAPONICUM (ASHMEAD).

BY A. A. GIRAULT, URBANA, ILLINOIS.

In the first pages of the current (1911) volume of the Transactions of the American Entomological Society, I described a new Japanese genus of the family *Trichogrammatidae* based on this species, whose identity at the time was more or less uncertain. The genus was *Neotrichogramma*, and before *japonicum* was definitely known, the type species of the new genus was named *acutiventre* MS.; formerly, also, I identified the species as *N. acutiventre* Girault MS., namely, at the time the species was first seen by me. However, the error was corrected in the original description of the genus before publication, but it is desirable to make a brief explanation concerning the basis for claiming identity. This explanation should be expected, if not demanded, for the reason that we have already taken too much for granted in systematic work.

Trichogrammatids have been especially difficult to identify, mostly for the reason that many of the species were wrongly placed as regards genera and also briefly, or else erroneously, described and the type specimens missing or in bad condition. For this reason it once seemed hopeless to me to attempt to identify more than a small fraction of the described species of these minute parasites. Because of the confusion existing in the literature concerning the definition of *Trichogramma* Westwood, and more especially because a comparatively large number of species of different genera had been described as members of this genus, I was forced to conclude that the position of *japonicum* was uncertain generically; its brief original description gave no generic characters, the author of the species had previously described several common species of the family as members of *Trichogramma*, which subsequently have been shown to be

generically distinct, even from each other and his latest (Ashmead, 1904), diagnosis of *Trichogramma* was wrong, and would lead to the belief that *japonicum* was entirely different structurally from what it really is; moreover, as I will show, it is variable in colouration, again misleading me, since the original specimens were black, those first in my possession yellowish-brown.

The identity of this species was not suspected until some months after I had drawn up the description of *Neotrichogramma* from the specimens which had been named in MS. *acutiventre*. In January, 1911, Dr. L. O. Howard very kindly sent to me for identification a second lot of the same kind of egg-parasites, consisting of six balsam slides labelled "Formosa, Japan, T. Shiraki." (Bearing sub-labels "No. 35," "No. 12" and "No. 13," respectively, bearing two males, one male plus two females, one male plus two females, two females, two females and one male in the order of their naming). The host was not given. All of these specimens were nearly black, with the exception of a single male of the "No. 13"; some were suffused with brownish. These specimens could not be separated from the others first seen by me, a part of which had been designated as the co-types of *acutiventre* MS., and they were consequently identified as that manuscript species, with a statement to the effect that perhaps the latter would prove to be identical with *japonicum*. Suspecting this to be true, after knowing of the colour variation and again consulting the literature, I addressed Mr. J. C. Crawford, of the U. S. National Museum, in regard to the types of *japonicum* heretofore not found, and he responded by sending me one male and four female specimens on tags, and which had been compared with the types (hence homotypes); these could not be separated from the specimens previously mentioned. They bore the label, "Ex eggs *Chilo simplex*, T. Fukai, Konosu, Saitama," and were coloured like the second lot above, varying from brownish to black, and were from the same host as the specimens first seen by me. Subsequently Mr. Crawford generously sent one of the type specimens (a female), and it in turn, as was to be expected, proved to be identical with the other. Hence there can be no doubt that the specimens mentioned in foregoing, more especially those upon which *Neotrichogramma* was founded, are all *japonicum* Ashmead.

(*Trichogramma*) *Neotrichogramma japonicum* Ashmead is parasitic on the eggs of the lepidopteron *Chilo simplex*; the specimens upon which Ashmead founded the species were stated to have been reared from

unknown lepidopterous eggs; probably they were reared from the same host. The species is fully redescribed in the place first cited above, but from the additional tagged specimens I have noted that the body is shiny, the sculpture inconspicuous, distinctly scaly, however, on the mesonotum; the parapsidal furrows are complete. In black specimens the mesonotum is suffused with yellow sometimes, and in all of the dark variations, the antennæ and legs remain unchanged or brownish-yellow. The usual colour, perhaps, is brown.

TWO NEW GALL MIDGES.

BY E. P. FELT, ALBANY, NEW YORK.

Toxomyia rubida, n. sp.

This species appears to be closely allied to *Toxomyia fungicola* Felt, from which it is most easily separated by its larger size, distinctly darker colour and presumably by a variation in food habit. It was reared February, 1911, by W. H. Patterson, St. Vincent, W. I., from the æcidiospores of *Uromyces pisi* DeBary on the leaves of *Euphorbia pilulifera*.

Male.—Length, 1 mm. Antennæ nearly twice the length of the body, thickly haired, light brown; 14 segments, the fifth having the basal portion of the stem with a length fully $2\frac{1}{2}$ times its diameter, the distal part with a length $3\frac{1}{2}$ times its diameter, the enlargements globose, each with a rather thick whorl of moderately stout setæ and a subapical circumfilum, the loops of the latter extending to the base of the following segment, and as in *T. fungicola*, they are produced on the dorsal surface somewhat; terminal segment produced, the basal portion of the stem with a length six times its diameter, the distal enlargement subglobose and apically with long, finger-like process. Palpi: First segment subquadrate, with a length $\frac{1}{2}$ greater than its diameter, the second $\frac{1}{2}$ longer than the first, tapering distally, the third a little longer than the second, more slender, and the fourth $\frac{1}{4}$ longer than the third. Mesonotum yellowish-brown, the submedian lines yellowish. Scutellum and postscutellum yellowish. Abdomen yellowish-orange. Wings hyaline, costa light brown, the third vein joining the margin just beyond the apex of the wing, the fifth at the distal third, its branch just before the basal half. Halteres yellowish-transparent. Legs mostly pale straw, the distal tarsal segments darker; claws moderately stout, strongly curved, the anterior unidentate, the pulvilli rudimentary. Genitalia: Basal clasp segment moderately stout,

truncate; terminal clasp segment slightly swollen basally, long and evenly curved; dorsal plate short, broad and broadly triangularly emarginate, the lobes obliquely truncate and sparsely setose; ventral plate moderately long, slender, broadly and roundly emarginate, the lobes diverging, moderately stout, setose; style long, stout, broadly rounded.

Female.—Length, 1.2 mm. Antennæ nearly as long as the body, sparsely haired, yellowish-brown; 14 segments, the fifth with a stem $\frac{1}{3}$ the length of the subcylindric basal enlargement, which latter has a length three times its diameter; subbasal whorl sparse, subapical band scattering; circumfili moderately high and irregular; terminal segment produced, with a length over three times its diameter, the apical process stout, with a length over twice its diameter. Mesonotum yellowish-brown, the submedian lines yellowish. Scutellum reddish-brown; postscutellum yellowish. Abdomen rather thickly haired, yellowish-brown. Ovipositor short, the terminal lobes narrowly lanceolate, with a length about $2\frac{1}{2}$ times the width and rather thickly setose, there being two especially stout setæ apically.

Type.—Cecid a2140, N. Y. State Museum.

Lobodiplosis coccidarum, n. sp.

This remarkably interesting form was reared by W. H. Patterson, St. Vincent, W. I., in February, 1911, from larvæ preying on the eggs of *Dactylopius citri*. A study of other forms having similar habits, and an examination of the original description of *Diplosis coccidarum* Ckll., convinces us that the earlier-described species is very different from the one under consideration. This latter is tentatively referred to the genus *Lobodiplosis* because of the rudimentary lobe on the basal clasp segment, though the strongly-reduced terminal clasp segment and the lack of chitinization in the harpes, so conspicuous in typical species referable to this genus, evidences a different line of development.

Description.—Male: Length, .75 mm. Antennæ $\frac{1}{2}$ longer than the body, thickly haired, light brown; 14 segments, the fifth having the basal portion of the stem with a length $\frac{1}{4}$ greater than its diameter, the distal part with a length $2\frac{1}{2}$ times its diameter; basal enlargement subglobose, subbasal whorl thick, moderately long, the circumfilum with rather numerous stout loops reaching almost to the base of the produced distal enlargement, which latter has a length $\frac{1}{4}$ greater than its diameter, a sparse whorl of stout setæ and subbasal and subapical circumfili, the lobes of the circumfilum extending almost to the apex of the

segment; terminal segment produced, the basal portion of the stem, with a length five times its diameter, the distal enlargement produced, swollen at the distal third and with a length about $2\frac{1}{2}$ times its diameter, the apex irregularly obtuse. Palpi: First segment subquadrate, the second subrectangular, with a length over twice its diameter, the third narrowly oval, a little shorter than the second, the fourth $\frac{1}{3}$ longer than the third, slender. Mesonotum dark reddish, the submedian lines yellowish-red. Scutellum yellowish-red, slightly fuscous apically; postscutellum yellowish-red. Abdomen reddish, the distal margins of the segments slightly fuscous, especially the apical segment. Wings hyaline, costa light brown, subcosta joining costa at the basal third, the third vein uniting with the margin at the apex of the wing, the fifth at the distal fifth, its branch at the basal half. Halteres yellowish basally, fuscous apically. Coxæ, femora and tibiæ mostly a light fuscous-yellowish, the tarsi darker, the apical segments nearly black; claws long, very strongly curved, the anterior unidentate, the pulvilli about half the length of the claws. Genitalia: Basal clasp segment moderately long, stout, obliquely truncate, the lateral angles produced as rudimentary setose lobes; terminal clasp segment stout, with a length hardly twice its diameter, excavated and broadly rounded apically, setose; dorsal plate moderately long, deeply and triangularly incised, the triangular lobes tapering to a sparsely setose apex; ventral plate long, deeply and roundly emarginate, the lobes narrowly rounded apically and sparsely setose; style stout, very strongly curved, narrowly rounded apically.

Female.—Length, 1.2 mm. Antennæ nearly as long as the body, sparsely haired, fuscous-yellowish; 14 segments, the fifth having a stem about $\frac{1}{4}$ the length of the subcylindric basal enlargement, which latter has a length twice its diameter; subbasal whorl moderately thick, subapical band thick, the setæ strongly curved; terminal segment subcylindric, with a length over twice its diameter and apically with a short, knob-like appendage. Mesonotum dark red, the submedian lines yellowish-red. Scutellum reddish, slightly fuscous apically; postscutellum reddish. Abdomen sparsely setose, deep red, the dorsal sclerites and the posterior $\frac{2}{3}$ of the segments dark red; venter bright red. Ovipositor short, the terminal lobes narrowly lanceolate, with a length about twice the width and rather thickly setose. Other characters about as in the male.

Type.—Cecid a2141, N. Y. State Museum.

ADDITIONS TO THE JASSID FAUNA OF N. A. (HOMOPTERA.)

BY E. D. BALL, LOGAN, UTAH.

Thamnotettix Schwartzi, n. sp.

Form and structure of *Osborni* nearly, slightly longer and narrower, colour of *geminata*. Smoky cinereous, with two round black spots on front of head, and two angled ones on scutellum. Length, 5 mm.

Vertex blunt, rounding into front as in *Osborni*, but still shorter, margins almost parallel, twice wider than long, but little over half the length of the pronotum. Front inflated, parallel margined to just before the apex. Elytra long and narrow, very closely appressed, giving the insect a wedge-shaped appearance. Venation similar to *Osborni*, the third apical cell extremely long and narrow.

Colour.—Vertex pale yellow, slightly washed with orange, the ocelli red, a pair of round black spots between them equidistant from the ocelli and each other. Face pale yellow, the sutures dark, a few short smoky arcs on lower part of front. Pronotum cinereous. Scutellum yellow, a triangular black spot just within each basal angle. Elytra cinereous, the costal margin subhyaline, a narrow smoky stripe at apex. Veins of clavus and claval suture pale, veins on corium and a line along the claval suture smoky, emphasized on a line which follows the outer sector omitting its outer branch, and ends in the margin of the third apical cell.

Genitalia.—Female segment one-half as long as its width, posterior margin slightly rounding or sinuate, with a slight median projection as wide as the ovipositor. Male valve short, plates together gibbous at base and then rapidly narrowing into long, attenuate tips, one-third longer than their basal width.

Described from a pair from Dewey, Utah, collected by J. R. Horton, and one female from Ash Fork, Arizona, collected by Barber and Schwartz, and received from the U. S. National Museum. Named in honour of Dr. Schwartz, of the National Museum, whose collecting in Utah, Arizona and New Mexico has added so much to the knowledge of the Homoptera of this region.

Thamnotettix Kirkaldyi, n. sp.

Form of *Osborni* nearly, closely resembling *geminata*, smaller and with a more inflated vertex than either. Length, ♀ 4 mm.; ♂ 3.5 mm.

Vertex rounding, one-half longer on middle than against an eye and nearly as long as pronotum. Anterior margin rounding into front. Front

rather narrow and almost parallel margined until just before the apex. Elytra moderately long, appressed behind, costal margin curved, giving the insect a stout appearance. Venation regular, often an extra veinlet or two on the claval area, the third apical cell somewhat narrowed.

Colour.—Vertex creamy yellow, a pair of round black spots between the ocelli as in *Schwartzi*, another pair just outside and posterior to the ocelli, and a third and smaller pair equidistant from each other and the eyes at the base. Sometimes some brown markings midway between these and the apical pair assume the appearance of a pair of spots. Face creamy, the sutures and arcs on lower part of front, smoky brown. Pronotum cinereous, a row of submarginal dots set off by an arcuated line and some irregular mottlings on disc fuscous or brown. Scutellum creamy yellow, a pair of angular spots just inside the basal angles, the impressed line and a pair of round dots on anterior disc black. Elytra cinereous, shading to subhyaline on the margin, the nervures light, a narrow dark, smoky stripe in the cells between the claval nervures and another wider one just inside the outer sector of the corium, ending in the third apical cell.

Genitalia.—Female segment twice wider than long, the lateral angles rounding, the posterior margin triangularly emarginate, one-third the depth of the segment, with a strap-shaped tooth in the centre of the emargination as long as the segment. Male valve short, rounding, plates together, rounding at base, then narrowly attenuately pointed and upturned.

Described from ten examples from Tia Juana, San Diego and Salinas, California, collected by the author. This distinct little group of the genus already contains the names of Heidemann, who has made many eastern forms known; of Osborn, who has done so much in the Mississippi Valley; of Schwartz, for the intermountain region; of Coquillett, to whom we owe much of our knowledge of the Coast fauna, and it seems but fitting that we should add the name of Kirkaldy, who has done an immense amount of work on our Pacific Island fauna and whose recent untimely death is mourned by all.

Thamnotettix intricata, n. sp.

Resembling *flavocapitata* in size and form, slightly smaller, darker, with irregular reticulate veinlets. Rusty brown, with darker spots on vertex and milk white markings on elytra. Length, 5 mm.

Vertex slightly obtusely angled, the apex pointed, conical, half longer on middle than against the eyes, as long as the pronotum, slightly longer than its basal width, disc slightly sloping, anterior margin rounding to the full front except at the apex. Front and clypeus as in *belli*. Elytra long, inclined to be flaring posteriorly. Venation regular, but often obscured by numerous irregular reticulate veinlets on the clavus and in the ante-apical cells.

Colour.—Vertex pale, heavily washed with rusty brown, usually omitting a pale band before the eyes and often intensified as an oblique brown-dash either side the pointed apex. Face pale, with short brownish fuscous arcs and still darker sutures. Pronotum rusty or chocolate brown, with an anterior arcuated submarginal line paler. Elytra rusty or chocolate brown, with the nervures lighter, the irregular reticulations are usually strongly milky white and there is usually an oblique subhyaline light area beyond the middle of the costa. The apical cells smoky, with the nervures light.

Genitalia.—Female segment long, truncate or slightly concave posteriorly, with a broad angular median emargination, from which arises a strap-shaped tooth considerably exceeding the segment. Male valve triangular, apex round, plates strongly transversely convex, long, attenuate with the margins thickly beset with long hairs.

Described from four females and one male from San Francisco, collected by the author in September. The reticulate venation and white nervures will readily separate this species from any other described.

Thamnotettix rupinata, n. sp.

Form and general appearance of *intricata*, but lacking the super-numerary veinlets. Reddish or greenish brown, with a bisected black spot on the apex of vertex. Length, 5 mm.

Vertex slightly obtusely angular, the apex rounding, half longer on middle than against either eye, as wide as its median length in the female, narrower in the male, face long and narrow as in *intricata*. Elytra long and narrow, inclined to be closely appressed in the male, with the tips flaring, venation typical, regular, without extra veinlets.

Colour.—Vertex orange yellow, a large semi-circular black spot on the apex, bisected by the narrow, white median line, face pale, with narrow sutures and traces of arcs brown. Pronotum greenish or reddish brown, with a pale anterior margin, accentuated in the centre. Scutellum pale yellow, the basal angles olive. Elytra olive subhyaline with a reddish

brown cast. The venation obscure except the veinlets surrounding the apical cells, which are a dark rusty brown. The apices of claval veins milky white.

Genitalia.—Female segment moderately long, truncate posteriorly, with a median emargination and produced tooth as in *intricata*. Male valve small, inconspicuous, rounding, plates long, triangular, slightly attenuately pointed.

Described from two males and three females taken at San Francisco, California, in June and September, by the author. The large black markings and dark apical veinlets will at once separate this species from its allies.

Athysanus (Conosanus) Uhleri, n. sp.

Resembling *anthracinus*, but slightly larger and lighter coloured and with a more pointed vertex and shorter elytra. Black, with orange markings and pale nervures. Length, ♀ 4.5 mm.

Vertex slightly obtusely angular, the margins straight, twice wider than long, nearly twice longer on middle than against the eye. Pronotum half longer than vertex. Elytra broad and short, about equalling the body, posteriorly roundly truncate. Venation as in *anthracinus*, the central anteapical cell scarcely narrowed, apical cells broad and short, rarely much longer than wide.

Colour.—Black, a line on base of vertex with a point extending forward on either side, a pair of oblique spots against the eyes, a few spots near apex of vertex and on anterior part of pronotum, a pair of irregular stripes on scutellum and the elytral nervures yellow. A few traces of pale in the discal cells. Face black, a few short yellow arcs. Legs black, the anterior and middle pair abruptly yellow from just before the apex of femora. Hind tibia with the spines yellow.

Genitalia.—Female segment but little longer than penultimate, posterior margin roundly produced on median half, the lateral angles produced.

Described from two females collected by the writer at Ames, Iowa. In the Osborn and Ball Review this species was confused with the one described as *plutonius* Uhler. That is, however, a longer and narrower species, with a wider head and fuscous banded femora.

Athysanus (Commellus) estacadus, n. sp.

Resembling *Curtisii* in size and general appearance, but with a flatter,

black margined vertex. Straw yellow, with venation and margin of elytra light. Length, 3.5 mm.

Vertex almost flat, slightly transversely convex, a trifle shorter than its basal width. The anterior margin broadly obtusely angled, vertex and front meeting in an acute angle, the margin subacute. Front resembling *Osborni*, in general form, slightly more convex. Pronotum as in *Osborni*, slightly shorter; elytra as in *Curtisii*, scarcely longer than the abdomen; venation distinct, regular, resembling *Curtisii* except that the outer apical veinlets are decidedly curved.

Colour.—Almost uniform bright straw yellow, vertex with the margins light, a broad black band just back of the anterior margin, pronotum with a narrow, light, median band. Elytra with the nervures and margins light, the ground color intensified against the broader veins and margins. Face pale, a black spot on the clypeus, front fuscous with a median stripe, the upper margin and about six pairs of short arcs pale yellow.

Genitalia.—Female segment short, scarcely one-third as long as its basal width, posterior margin slightly broadly emarginate, disc of the segments slightly tumid at the apex of emarginations and brown margins, giving the appearance of a broad median tooth.

Described from three females from Texas, one of which was received through the kindness of E. P. Van Duzee. The black band on the vertex margin renders this quite distinct in our fauna.

Deltocephalus fraternus, n. sp.

Resembling *pectinatus*, but larger and darker, with shorter, less flaring elytra, ashy gray, with large quadrate spots on vertex and pronotum and the margins of the elytral cells fuscous. Length, ♀ 4 mm.; ♂ 3.5 mm.

Vertex long, acute, resembling *pectinatus*, but much longer, as long as in *areolatus*, nearly twice as long as the pronotum, disc flat, the margins straight to the blunt tip. Pronotum short, transverse, set well into the concave posterior margins of the head. Elytra shorter, less flaring than in *pectinatus*. The apices inclined to be narrow, rounding and appressed, exposing the last abdominal segment in both sexes. Venation similar to *pectinatus*, the claval nervures irregular and usually tied to the margins, central anteapical cell divided, often into four cells, in which case the posterior three are small and nearly circular, usually four reflexed veinlets to the costa.

Colour.—Grayish white, with a definite tawny tinge, vertex with the ivory apex broadly black margined, four large quadrate fuscous spots between the eyes and a triangular one between them and the apex, fuscous. Pronotum with six or eight angular and usually transverse spots. Elytra gray, with most of the nervures light, the cross nervures and reflex veinlets broadly light and mostly heavily fuscous margined. Face varying from black with a few pale arcs to black above and tawny brown below, but in any case the fuscous markings extend the entire length of the front on the sides.

Genitalia.—Female segment short and broad, the lateral angles produced into large, triangular, slightly depressed ears, posterior margin between the ears slightly convex, with a narrow median slit half way to base, the margins of which are usually produced into minute teeth, whole posterior disc of segment shining, black. Male valve long, triangular, stout, shining, the apex acutely pointed and slightly upturned, plates smaller, polished, narrow, only appearing as ridges outside the long valve and terminating as two finger-like projections fitting down into the inflated pygofer.

Described from one female from Jacksonville, Florida (Mrs. Slosson), in the author's collection, and three males and six females from St. Petersburg, Sanford, and Oaks, Florida, received from Mr. Van Duzee. The long vertex, with definite quadrate fuscous markings and the three small cells in the antepical like the "three links," renders this a striking and easily recognized species.

Deltocephalus fraternus, var. *mendosus*, n. var.

Smaller and paler than *fraternus*, with the fuscous spots on vertex only faintly indicated in pale brown. Length, 3.5 mm.

Vertex shorter than in the species slightly variable, but with the same form at apex and with the black margin around the ivory tip, rest of marks on vertex and pronotum reduced to pale brownish traces. Elytra as in *fraternus* or slightly shorter, venation the same except that in the shorter forms one of the "three links" may be obscure.

Colour.—Grayish, washed with tawny, usually three black spots in a line on the elytra still remain, one against the cross nervure to claval suture, one against the "first" cross nervure and one against the apex of the third apical cell. Face black above, with light arcs, shading out to tawny below.

Genitalia.—Female segment moderately long, posterior margin slightly concave, the median fifth excavated, the excavation gradually or abruptly narrowing to a slit as in *fraternus*, posterior disc with a quadrangular black area.

Described from five females from Estero, Florida, received from Mr. Van Duzee. This may possibly represent a distinct species, the size and colour are always slightly variable in this group and are not specific. There appears, however, to be quite a difference in genitalia, although both are of the same general type and both slightly variable. A longer series will be necessary to definitely determine whether this is an extreme form adapted to some slightly different faunal region or a distinct species.

Deltocephalus micarius, n. sp.

Resembling *Weedii*, but larger and with longer and more flaring elytra. Brownish straw, with five stripes on pronotum, and nervures light. Length, 3.5 mm.

Vertex flat, almost twice as long at apex as against eye, right-angled in front, the margins straight, the apex not at all produced as it is in *Weedii* and *compactus*, face as in *Weedii*, pronotum with the anterior margin strongly arched, elytra long and narrow, inclined to be flaring posteriorly, extending considerably beyond the abdomen in both sexes. Venation similar to that of *Weedii*, the outer claval area strongly reticulated with central anteapical cell elongated, constricted through the median portion and usually divided by a broad union of the nervures for some distance.

Colour.—Pale brownish straw, the vertex washed with orange, the margins and median line narrowly light, a pair of minute spots just back of the ivory apex and a larger pair midway to the ocelli black. Pronotum with traces of olive on the disc and five narrow light stripes. Elytral nervures light, slightly margined with brownish, which shade into fuscous against the first cross nervure to claval suture, again on the first cross nervure between the sectors and almost filling the apical cells, face fuscous brown, with short arcs on front and concentric markings on genæ light.

Genitalia.—Female segment short, the lateral angles rounding into the posterior margin, which is nearly straight except for a small median tooth. Male valve small, short, plates small, the outer margin concavely narrowing to the rather broad, truncate tips.

Described from two pairs from Seven Oaks, and Sanford, Florida, collected and sent by E. P. Van Duzee. In head characters this species

approaches closely to the *Sayi* group, but the reticulate venation allies it with *Weedii* and *compactus*.

Phlepsius nudus, n. sp.

Form of *ramosus* and *occidentalis* nearly. Stout, with a foliaceous vertex and sparse reticulation. Length, ♀ 6 mm.; ♂ 5 mm.

Vertex roundly right-angled, disc flat or depressed, anterior margin thin and produced beyond the line of the front, front broad above, regularly narrowing from just below the ocelli to the straight clypeus. Pronotum short, scarcely longer than vertex. Elytra broad, short, venation distinct, regular.

Colour.—Dirty straw, slightly tawny on vertex, disc of pronotum and angles of scutellum washed with brown, disc of scutellum pale, with a pair of brown points, elytra subhyaline, slightly milky, with the veins and a few scattered reticulations, tawny brown, face brown.

Genitalia.—Female segment long, truncate behind, surface strongly convex, with a sharp, median carina on disc and traces of two faint lateral ones. Male valve equilaterally triangular, the apex rounded, plates narrow, together long, spoon-shaped, three times the length of the valve, the apices narrowly rounding.

Described from a male from Seven Oaks, Florida, and a female from Fort Meyers, Florida, received from Mr. Van Duzee. This is the smallest of the *humidus* group of Phlepsids and is easily recognized by the lack of reticulation on the elytra.

SHORT NOTES ON INSECTS.

We wish to call your attention to the Editor's request on page 314, Vol. XLII, for notes on habits, food-plants, unusual captures of insects, etc., particularly Canadian species. Not only would such short notes add to the interest of this magazine, but would greatly help those connected with issuing the numbers in filling up spaces. It should be a simple matter to comply with this repeated request during the summer months, at all events.

A. F. W.

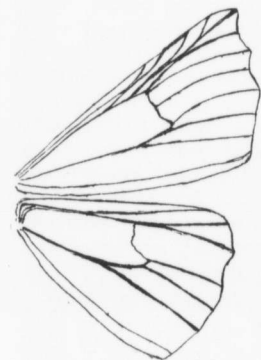
ERRATA.—Vol. XLIII, page 42, line 4, after type insert the word *and*; page 80, line 11 from foot, for Vol. VIII read *XXXVIII*; page 83, lines 3 and 5, also page 85, under figure, for *zerœ* read *zerœ*; page 145, line 18, for *donating* read *denoting*.

A NEW GEOMETRID GENUS, AND A NEW SPECIES FROM THE EXTREME SOUTHWEST.

BY RICHARD F. PEARSALL, BROOKLYN, NEW YORK.

(Continued from page 332, Vol. XLII.)

In continuing my paper, the title becomes doubly appropriate, for it is necessary to erect still another genus for the reception of a species, whose position would seem to fall between *Pherne* Hulst and *Stenaspilates* Pack., although it differs from these associated genera in having veins 6 and 7 long-stemmed in secondaries. It is to be regretted that none of the examples before me is a ♂, so that my diagnosis refers only to the ♀ form, but I seek to supplement it by presenting a figure of the venation herewith, and call the genus

Apicrena, nov. gen.FIG. 11.—Venation of *Apicrena*, nov. gen.

♀.—Palpi long, beak-like, the terminal joint long and drooping; antennæ long, strongly pectinate to tips. Front loose scaled, with conic hair-tuft above clypeus. Tongue developed, thorax and abdomen without tufts, the latter heavy. Fore tibiæ unarmed, hind tibiæ long, slightly swollen, with two pairs of spurs. Primaries long, falcate at apex, margin doubly crenate to vein 4, straight to anal angle, 12 veins, 10 and 11 from cell, 8, 9 and 10 joining beyond cell at a point, 11 barred with 12 above cell, 6 and 7 from point, 3 and 4 separate. Secondaries rounded at apex, margin with a strong excision between veins 6 and 4, vein 8 parallel to cell for half cell's length, 5 wanting, 6 and 7 long stemmed, 3 and 4 separate. No fovæ present.

Type *Apicrena calcaria*, n. sp.

Expanse, 32 mm. All above white, more or less sprinkled with pale chocolate scales, the primaries, thorax and head being quite evenly coloured and darker, while the abdomen and secondaries are nearly white, the latter thinly sprinkled, but shading slightly darker toward margin. Along costa of primaries a few fine black scales are scattered, clustering

somewhat toward apex and darkening it. In one specimen a few ochreous scales are clustered centrally on thorax and at sides of abdomen. The basal and extradiscal are firm, rather broad, pure white lines. The former starts from costa one-fourth out, running straight, or nearly so, to a point on inner margin, more than half way out to anal angle. The latter one-fifth from apex runs to inner margin, curving slightly outward at centre, and again before reaching inner margin, about 2 mm. outside the point touched by basal line. Another indefinite white line traverses the subterminal space centrally, running toward outer margin to vein 5, thence parallel to extradiscal, reaching inner margin just within anal angle. Discal dots on primaries are white, in one example small, obscured, in the others large, linear, and clubbed at lower end. None on secondaries. Fringes the colour of wings. Beneath the primaries are dusky, darkened submarginally and sprinkled with fine black atoms along costa and at apex. The cross lines are faintly reproduced as above. The outer clear white at costa. The subterminal shows only from costa to vein 7 as a clear white dash. Secondaries as above, but have an indefinite extradiscal white line from costa two-thirds out, parallel with outer margin nearly to anal angle, where it is lost in the white scaling which covers this and all the basal portion of wing. Outside this line the subterminal space is dusted with pale chocolate scales. No discal dots beneath. Body beneath and legs dusky white, lightly powdered with chocolate.

Types.—Two ♀s, taken IV 12, in Yuma Co., Arizona, one of which is in the author's collection, the other in Rutgers College collection at New Brunswick, N. J.

Chlorochlamys appellaria, n. sp.

Expanse, 13 mm.

Palpi short, slender, somewhat porrect. Front broad, dull red-brown. Antennæ, vertex, thorax, abdomen and all wings above have a ground colour of creamy or pale clay-yellow scales, solid and glistening. Over this is spread a thin covering of pink scales, sparingly on the pectinations of antennæ and central area of thorax, rather heavily on base of patagiæ, along sides of thorax and on basal segments of abdomen, leaving its tip and a dorsal line clear. The latter broadens on basal segments, running into central thoracic area. All wings above evenly dusted with pink scales, giving them a mottled appearance, and leaving the *cross lines* and a narrow costal band of the ground colour. These lines cross all wings, as in our

common *chloroleucaria* Guenée, though more slender and slightly waved. No discal dots. Fringes of ground colour, pinkish at base. All wings beneath and body a paler clay-yellowish, the primaries subcostally and near base faintly tinged with pink, as are also the femora. No cross lines apparent or discal dots.

Types.—Two ♂s, taken VIII 19, in Yuma Co., Arizona. One of these in the author's collection, the other in that of Rutgers' College at New Brunswick, N. J.

The following well-known species were also present from localities as noted:

Hydriomena neomexicana Hulst.—1 ♀, Doble, Calif., August.

Hydriomena grandiosa Hulst., = *implicata* Guen.—1 ♀ Walters' Sta., Calif., April.

Pigia multilineata Hulst.—2 ♂s, 1 ♀, Yuma Co., Arizona.

Euacidalia sericiata Pack.—1 ♂, Yuma Co., Arizona.

Cosymbia myrtaria Guen. ?—1 ♀, Yuma Co., Arizona.

Chlorochlamys chloroleucaria Guen.—2 ♂s, Yuma Co., Arizona.

Dichorda illustraria Hulst.—1 ♀, Yuma Co., Arizona.

Fernaldella fimetaria G. & R.—14 ♂s, 3 ♀, Yuma Co., Arizona.

Chloraspilates profugaria H. Sch.—1 ♀, Yuma Co., Arizona.

Deilinia perpallidaria Grote.—1 ♂, Yuma Co., Arizona.

Deilinia carnearia Hulst.—1 ♂, Yuma Co., Arizona.

Sciagraphia mellistrigata Gr.—7 ♀s, Yuma Co., Arizona, and Walters' Sta., Calif.

Sciagraphia heliothidata Guen.—1 ♂, Yuma Co., Arizona.

Macaria S-signata Pack.—2 ♂s, Yuma Co., Arizona.

Sciagraphia irrorata Pack.—10 ♂s, 2 ♀s, Yuma Co., Arizona, and Walters' Sta., Calif.

Euemera juturnaria Gu., var. *californiaria* Pack.—4 ♂s, Doble, Calif., August.

Alcis depromaria Gr. ?—2 ♀s, Yuma Co., Arizona.

Synglochis perumbraria Hulst.—1 ♂, 1 ♀, Yuma Co., Arizona.

Sabulodes truxaliata Guen.—2 ♂, Doble Calif., August.

CORRECTION OF NAME IN DIABROTICA.

At the top of page 92 of your current volume I note a typographical error, the name should be *semisulcata* in place of *semisuclata* as printed.

FRED. C. BOWDITCH.

SOME INSECTS FROM STEAMBOAT SPRINGS, COLO.—III.

BY T. D. A. COCKERELL, UNIVERSITY OF COLORADO.

COLEOPTERA.

Determined by Mr. Chas. Schaeffer, except the Histerid, which was determined by Mr. George Lewis.

Elaphrus lecontei Crotch.—Previously known in Colorado only from Buena Vista.

Platynus sinuatus Dej.—Not in Wickham's Colorado list; reported from New Mexico.

Platynus piceolus Lec. ?—Widely distributed in Western Colorado.

Gyrinus affinis Aubé.—Reported from "Colorado" by Ulke.

Pederus compotens Lec.—Reported from Canon City and Buena Vista.

Hippodamia spuria Lec.—Widely distributed.

Saprinus vitiosus Lec.—Many specimens, differing greatly in size. A species of California and Arizona, new to Colorado.

Canthon simplex, var. *corvinus* Horn.

Canthon simplex, var. *humeralis* Horn.—New to Colorado.

Aphodius alternatus Horn.—Widely distributed in Colorado.

Diplotaxis obscura Lec.

Limonius, sp.

Acmæops longicornis Kirby.—Common in Colorado.

Orsodachna atra Ahr.—Common in Colorado.

Chrysomela lunata Fabr., var.—A pretty insect, found in some numbers.

Phyllotrox nubifer Lec.

Pseudanthonomus validus Dietz.—Reported from "Colorado" by Dietz.

Elleschus ephippiatus Say.

NEUROPTEROID INSECTS.

Determined by Mr. N. Banks.

Tæniönema analis Banks.

Chrysopa, n. sp. (near *oculata*).

Raphidia oblita Hagen.

Brachycentrus similis Banks.—Described from Colorado.

HYMENOPTERA.

Determined by Mr. S. A. Rohwer.

Aphlidictium rubripes Cresson.—Both sexes. The species was described from a female collected by Morrison in Colorado.

Ancistrocerus sexcingulatus Ashmead.—Both sexes. I have also collected this at Eldora, Colorado, Aug. 19, at flowers of *Grindelia subalpina*.

A NOTE ON THE ESSENTIAL CHARACTERISTICS OF
PRESTWICHIA AQUATICA LUBBOCK.

BY A. A. GIRAULT, URBANA, ILL.

This peculiar aquatic trichogrammatid has been so very little understood in regard to its essential characteristics—its systematic position has long been disputed and its characteristics erroneously described—that I have drawn up the following descriptive notes. In the first place, I desire to confirm its present position as a member of the Trichogrammatidæ; and secondly, to state that I have before me several females of it which agree exactly with the generic characteristics as at present understood, and with the specific characters of the female as described originally by Lubbock, and in general as recently figured by Schmiedeknecht. The specimens were very kindly sent to me by Dr. Richard Heymons, Director of the Königl. Zool. Museum at Berlin, in the vicinity of which place it was collected. It should be understood that the figure of the female given by Schmiedeknecht is not correct in regard to the details of structure. The same is true of the figure of the male given by Willem.

The following description is appended :

Female.—Length, 1.45 mm., including ovipositor.

General colour black-brown; legs, antennæ, all of thorax except pronotum and mesoscutum, which are brown, tip of abdomen and sheaths of ovipositor (last abdominal segment) and the ovipositor itself, gamboge; distal or third tarsal joint and tip of ovipositor darker. Mesoscutum with distinct polygonal sculpture. Colours contrasting and characteristic.

Wings appearing as described and figured by Willem for the male, excepting that with these specimens a strong vein runs along the cephalic wing margin of the minute fore wing, terminating before tip (the wings are not developed to perfectness in the specimens before me, and casually appear like those of the male; in one specimen, however, I could plainly discern the shrivelled portions of both a fore and posterior wing). Legs long and slender, the coxæ large, rounded, those of the posterior legs much larger, conical, as long as the slender, proximal tarsal joints of those legs; femora only slightly thickened; tibiæ long and slender, setigerous; tarsi plainly 3-jointed, the joints long, longer in the caudal tarsi, there the proximal tarsal joint longest, over a third longer than the posterior tibia, long and slender but not greatly so; proximal tarsal joint of the cephalic legs short. Tibial spurs single, slightly curved, short, shorter on the

cephalic leg, cephalic tibial spur terminating in three fine spine-like points; strigils absent. A pair of rather distinct claws on each tarsus. Trochanters pallid, weakly 2-jointed.

Antennæ: Scape, pedicel, minute ovate ring-joint, one funicle joint and a 3-jointed club. Scape cylindrical, moderately long, curved,* about twice the length of the rather long pedicel, slightly longer than the flagellum; ring-joint cup-shaped, very small, often completely hidden, appearing as a small bulb-like base at the funicle joint; pedicel long-ovate, nearly thrice longer than broad at the apex, obconic, nearly as long as the club; the single funicle joint small yet very much larger than the ring-joint, longer than wide, subcuneate, narrower than the pedicel and the club, and subequal in length to the proximal club joint. Club 3-jointed, ovate, the intermediate joint somewhat longest, the proximal joint slightly wider than long; articulation between the second and third joints indistinct, apparently absent in some cases. Pubescence apparently absent.

Mandibles with two distinct, equal, acute teeth; three normal ocelli on the vertex, the lateral ones near to but not touching the eye margins. Pronotum short, parapsidal furrows complete, distinct, curved; sides of abdomen clothed with sparse, long, stiff hairs, in more or less distinct, weak clusters. Abdomen long and pointed, the ovipositor exerted for about half its length (protected by the valves nearly to tip)*; abdomen sessile. Abdominal segments large†, distinct; scutellum and metathorax simple, weak but rather large. Eyes naked.

(From three specimens, two-thirds-inch objective, one-inch optic, Bausch and Lomb.)

The foregoing notes taken from three females, Berlin, Germany, mounted together on a slide and deposited in the collections of the Illinois State Laboratory of Natural History, Urbana, Ill, as accession No. 44,231.

The species, though aquatic and swims with its legs, shows no marked adaptive structures for such a life; the hairs along each side of the abdomen, however, probably serve to protect the spiracles from the water.

*I can make out but six abdominal segments, the sixth or last one being long and tubular, reaching nearly to the end of the ovipositor and completely sheathing its valves. Hence, in one sense only the distal end of the ovipositor is exerted.

†The tubular distal segment is nearly a third as long as the remainder of the abdomen. The fifth segment of the abdomen is conical, rather broad at base and taken in conjunction with the sixth, which it enfolds at the latter's base, dorsad, is as long as half of the abdomen; the other segments are rectangular, somewhat wider than long, their margins straight.

TWO NEW SPECIES OF CYNIPIDÆ.

BY WILLIAM BEUTENMULLER,
American Museum of Natural History, New York.

Andricus Yosemite, sp. nov.

Female.—Head, thorax, scutellum and abdomen deep black. Antennæ and legs dark pitchy brown. Head distinctly granulated. Antennæ 15-jointed, third joint a little longer than the fourth. Thorax distinctly rugulose. Parapsidal grooves fine and continuous. Anterior parallel lines smooth and shining, not extending to the middle of the thorax. Lateral grooves fine and only indistinctly visible. Pleure rugulose. Scutellum rugulose like the thorax, with two large shining foveæ at the base; apex slightly curved, almost truncate. Abdomen smooth and shining. Wing hyaline, veins brown. Second cross-vein heavy and infuscated on each side. Radial area open. Cubitus continuous. Areolet large. Length, 3 mm.

Gall.—On the twig of *Quercus chrysolepidis*, in August. Polythalamous. Irregularly rounded or almost globular, with a small nipple at the apex. It is covered with many short spine-like projections. The surface is also somewhat wrinkled. Light yellowish brown, with some of the spines tipped with pink. Inside it is completely filled with a light brown porous or pulpy substance, and at the base at the place of attachment to the twig are a number of hard oval larval chambers close together, and imbedded in the soft part of the gall. Diameter about 20 mm. Larval chamber 4 mm. long.

Habitat.—Foot of Yosemite Falls, alt. 4,000 feet, Sierra Nevada, California. (Alfred C. Burrill.)

Described from five females cut from the gall. The species is allied to *A. singularis* and *A. Osten-Sackenii* in sculpture of the head, thorax and scutellum.

Andricus rugulosus, sp. nov.

Female.—Form robust. Head, thorax, scutellum and abdomen black. Legs: anterior pair dark brown, middle and hind pair pitchy brown-black. Antennæ dark brown, in some examples almost black terminally. Head finely rugose, face with whitish hairs. Antennæ 16-jointed, first joint stout, thickened at apex, second joint shorter, third and fourth long and almost of the same length, fifth and sixth shorter than the preceding, and of same length; following joints shorter. Thorax distinctly rugose, subopaque. Parapsidal grooves broad and shining at

the scutellum, gradually becoming narrower and very fine at the collar. Median groove continuous, fine and narrow anteriorly, broad at scutellum. Anterior parallel lines fine, close to the median line and extending to the middle of the thorax. Lateral groove rather long. Pleuræ rugose, finer rugose on the mesopleuræ. Scutellum large, rugose, more so than the thorax, with a very narrow carina along the middle. Foveæ at base distinct, shining, and widely separated. Abdomen globose, shining, and densely but minutely punctate. Wing hyaline, veins brown. Radial area open. Areolet very large. Cubitus not extending to the first cross-vein. Length, 2.75-4 mm.

Gall.—Singly or in clusters of two to about eight, on the trunks of young trees or along the stems of very young shoots of red and black oaks (*Quercus rubra* and *Quercus velutina*) late in April until early in May (8th), when the leaves begin to develop. Monothalamous. Ovate or bud-like, somewhat rough and longitudinally ribbed. Bluntly pointed at the apex. Soft, fleshy and green when fresh, often tinged with red. Hollow inside. When mature they drop to the ground, and when old they turn brown and become thin-shelled, with a large chamber inside. Length, 5-6 mm.; width, 3-3.25 mm.

Habitat.—New Jersey (Fort Lee district); New York (Van Courtlandt Park).

The perfect insect reaches maturity late in October, but does not emerge from the gall until April in the year following. The species is closely allied to *Andricus (Trisolenia) saltatus* Ashm. and *punctatus* Ashm.

The gall exudes a honey-like liquid, which is greedily partaken by ants, and, like *A. saltatus*, has the power of jumping, due to the contraction and sudden relaxation of the larva within.

INBREEDING OF LEPIDOPTERA.

At one of the meetings of the Montreal Branch last season, Miss Hutchinson, Leominster, Eng., exhibited a brood of larvæ of a Geometrid moth, *Eupithecia consignata* feeding on English hawthorn. These were descendants of a ♀ taken in 1874 and in all these years of inbreeding no change has been noted, except that both larvæ and imagoes have lost their desire to escape if left uncovered.—A. F. WINN.

Mailed June 2nd, 1911.