

PSEPHENUS LECONTEI AND STENELMIS BICARINATUS.

# The Canadian Entomologist.

VOL. XLVI.

LONDON, JUNE, 1914

No. 6

## LIFE-HISTORY NOTES ON TWO COLEOPTERA (PARNIDÆ).

BY ROBERT MATHESON, ITHACA, N. Y.\*

### *Psephenus lecontei* Lec.

Although many notes, brief references, and figures of the larva (fig. 3), water penny, of this beetle have appeared from time to time in American literature, no consecutive account of its life-history has as yet been published. As this extremely interesting species is found very widely distributed in America and is of considerable interest on account of its peculiar larval form it seems to me that a short account, though gathered from desultory observations extending over the past two years, would not be out of place at this time.

Ordinarily the beetles are not usually observed by the collector though practically everyone who has any interest in entomology has seen the peculiar larvæ on the under side of stones, etc., in any of our rapid streams. In some streams they are very abundant and usually so in the swifter-flowing portions, particularly where the stones break the surface of the water into ripples. Here also the beetles are found, often in considerable numbers, but not in the water. H. G. Hubbard, in the *American Entomologist* for 1880 (p. 73), well described the habits of the adults. Both males and females may usually be found, particularly during the heat of the day, gathered upon stones in mid-stream which just break the surface of the water. They are very active, flying about, and chasing one another over the stones. I have never seen them plunge into the water nor suffer themselves to get wet. They are usually very easily frightened and one has to approach cautiously with a net in order to catch them; for they take sudden flight and one can scarcely follow their movements. However, if one will look around carefully they will usually be found only a few feet away actively playing on another stone.

\*Contribution from the Entomological Laboratory of Cornell University.

I have observed the adults performing in this manner in Fall Creek and Coy Glen here at Ithaca and in the Salmon River at Truro, N. S. Guided by the activities of the adults I was not long in finding the eggs. They are laid in masses on the under side of stones, usually in the swiftest water. I have found these egg masses in shallow streams and also in rivers where the water was several feet deep, the current often so swift as to render footing difficult. The females when engaged in egg laying are very sluggish and never attempt to escape. One may easily observe the egg-laying process if he is careful to remove the stone on which the eggs are being deposited. Egg laying was common at Ithaca on June 25, 1911, at Truro, N. S. on July 14, 1913.

The eggs are deposited in a single, irregular layer. They are placed closely beside one another, often forming a layer of considerable extent (Fig. 2). At first the eggs are bright orange in colour, soon turning lemon yellow. They are firmly held together and to the stone by a tough, hyaline substance. In examining an egg mass removed from a stone, each egg is seen to be placed in the centre of a gelatinous envelope, hexagonal in outline. A layer of lemon-yellow eggs, each egg placed in the centre of its gelatinous envelope, presents a rather beautiful appearance, (fig. 1). The eggs are practically spherical in shape, measuring .18 mm. to .2 mm. in diameter. Some eggs may be a little larger, others smaller, but the above measurements represent the average size. The eggs are perfectly smooth without markings of any kind.

I was not able to rear the larvæ from the eggs nor study in detail their natural history. It would undoubtedly be of considerable interest for any one to study the form of the larva at hatching and what changes it undergoes during its larval existence. No one I believe has examined the stomach contents and nowhere have I found mention of its feeding habits. I did not determine the time between egg laying and the hatching of the larva. Judging from observations, the life-cycle lasts slightly less than a year,—egg-laying taking place during the latter part of June and July, the larvæ reaching maturity the following season.

In the references to this species in literature I have found but one note on the pupa. Hubbard in the American Entomologist for 1880, p. 73, speaks of the larva leaving the water and

pupating under the larval skin beneath stones, boards, etc., in damp situations. He did not mention when they could be found. Last summer (Aug. 6, 1913) while collecting along the bank of Salmon River I was attracted by the large number of empty larval skins of this species. Though I had noticed such skins previously I had always discovered them empty. In searching over a large number I was fortunate to find two pupæ not yet transformed. Nearly a month previously the adults had been observed egg-laying, so evidently the time of pupation extends over a considerable period. How long the pupal period lasts I did not determine.

The pupæ are found on the under side of stones, boards, etc., in damp situations. I found the larval skins very abundant under loose rocks overhanging the Salmon River. These sedimentary rocks are soft and many cracks extend in all directions, retaining a considerable amount of moisture. The last larval skin is firmly attached to the rock. Under this skin the pupa is formed. The larval skin on the ventral side splits transversely just in front of the mouth parts and is forced back to the tip of the abdomen where it remains (fig 4). The pupa is pure white in colour and very tender. It is held in place under the larval skin by the unshed anterior ventral portion and the shed skin at the caudal end. In this way the pupa is prevented from coming directly in contact with the hard underlying rock, etc.

Although there are several extended descriptions of the larva and larval structures I have found scarcely a word regarding the pupa. The pupa is pure white in colour, measuring 4.5-5mm. long. The anterior end is firmly held in place by the remaining portion of the larval skin, while the end of the abdomen remains beneath the cast larval skin. However, if one carefully lifts the pupal head, then loosens the abdomen he will be surprised to find the pupa still firmly held in place. Carefully pushing the pupa it soon breaks away and discloses a process on each side extending from the latero-dorsal angles of the first abdominal segment. These processes are firmly attached to the lateral walls of the enveloping larval skin. A dorsal view of the pupa showing these peculiar processes is shown in fig 5. The pupa is perfectly smooth without any spines or setæ. There are eight abdominal segments on the

dorsal side. The seven pairs of spiracles are prominent, all except the third pair being black at the tip. The eyes are prominent and somewhat blackish. The legs and wing-pads are held in position as shown in fig 4 (ventral view of the pupa in position in the larval skin).

***Stenelmis bicarinatus* Lec.**

This species is quite common in Salmon River and I was not surprised to find the larvæ and pupæ under stones along the banks. Unfortunately, however, it was rather difficult to determine the larva or pupa of this species as quite a number of other species of Coleoptera were not uncommon in similar situations. However, I found a considerable number of larvæ transforming and many pupæ, one of which I reared so that I was able to definitely connect all the different stages. The larvæ leave the water about the last of July or the first of August and construct small, smooth, pupal chambers in damp situations under stones. I found many pupæ and a number of larvæ in such situations about August 7, 1913. The beetle reared from one of these pupæ emerged on Aug. 10th. Further than this I know nothing of the life-cycle of this species, but this note may throw a little light on this small family of interesting forms.

*The larva* (fig. 6). The mature larva, ready to pupate, measures 6.25 mm. long, and 1 mm. wide at its broadest part. It is heavily chitinized, reddish brown in colour, the head and terminal segment of the abdomen being almost black.

The head is small and the mouth parts very inconspicuous. The antennæ are three-jointed, yellowish brown in colour, 1st segment measures .05mm., 2nd .09 mm.; the third, consisting of two very small segments lying side by side, .027 mm.

The larva consists of 12 segments exclusive of the head. The last abdominal segment is longer than the two preceding segments and ends in two sharp, short spines with two rounded lobes between (fig. 6). The entire cuticle is densely covered with small, dark elevations, each bearing a very minute spine. Otherwise, there are no distinctive markings. The legs are short, well developed and suited for clinging closely to stones or other objects in swiftly flowing streams.

*The pupa* (fig. 7). The pupa is soft, white in colour, the

thoracic segments, wing-pads and legs being slightly dark in colour. This darkness deepens with the age of the pupa. Length 3.4mm.; width at base of wing pads, 1.2 mm.

The head lies incurved under the prothorax, the developing mouth-parts showing very distinctly. The eyes are small and almost black. The antennæ lie in front of the eyes and extend under the pronotum, thus being concealed from the dorsal view. The wing-pads are prominent.

The pronotum is large and rather densely covered with fine colourless setæ. The outer angles of the anterior margin each bear a long, curving spine, measuring .32 mm. The posterior outer angles also, each bear a spine measuring .28 mm. These spines are yellowish brown in colour. They support the pupa in its chamber, preventing it from coming in contact with the coarse grains of sand.

The abdomen is composed of nine segments, the posterior margins on the dorsal side being strongly elevated into narrow ridges. These ridges are clothed with numerous short setæ. The ninth segment bears on its dorsal side two curving stout cerci, measuring .4 mm. in length. These cerci almost completely conceal the segment from which they arise. The pupa rests on its back in the pupal chamber. By the aid of the prothoracic spines and cerci together with the numerous short setæ arising from the raised ridges of the abdomen, injury from the roughened walls of the pupal chamber is avoided. The posterior margins of the wing pads and the legs are also provided with many short setæ.

#### THE KNOWN NYMPHS OF THE CANADIAN SPECIES OF *LESTES* (ODONATA).

BY E. M. WALKER, TORONTO.

The only attempt that has yet been made to separate the nymphs of the North American species of *Lestes* is that of Professor J. G. Needham in his report on "Aquatic Insects in New York State."\* Professor Needham gives an excellent generic description of the nymph and a table for the partial separation of the five species that he reared, viz., *L. uncatulus*, *unguiculatus*, *rectangularis*, *forcipatus*, and *eurinus*. Good figures are given of *L. rectangularis*.

\*Bull. 68, N.Y. State Museum, 1903, pp. 228-236.  
June, 1914

In 1908† the same author described the nymph of another species, *L. vigilax*.

To these six species I can add two others, *L. congener* and *L. disjunctus*, both of which I obtained on Vancouver Island during the summer of 1913.

These are all the species of *Lestes* known from Canada and the Northern United States, except *L. inæqualis*, although *L. eurinus* has not been certainly reported from the Dominion.

Of the nymphs of this genus reared by him, Professor Needham says: "I find them well-nigh indistinguishable specifically. Aside from slight and inconstant differences in size and a few very minor structural characters, they are all alike." Certainly they are a difficult group and can only be studied satisfactorily with an abundance of material. Nevertheless, I believe that most, if not all, of the species can be distinguished, provided both sexes are present, though I must admit that it is very doubtful whether single individuals, especially males, can be recognized with certainty in all cases.

In regard to *L. forcipatus* and *L. unguiculatus*, I can say very little, as I have seen no good specimens of either. These species have therefore been omitted from the key that I give below, though I have discussed them as far as the material before me permits in the notes that follow.

The key is based upon an examination of specimens kindly lent me by Professor Needham, as well as material collected by Mr. R. P. Wodehouse, of Toronto, and myself.

*Key to the Known Nymphs of Canadian Species of Lestes.*

- A. Lateral spines present on abdominal segments 4- or 5-9; labium, when closely applied to the ventral surface, reaching to or beyond bases of hind coxæ.
  - B. Mentum of labium relatively stout in its proximal half, its narrowest part being about one-third of the apical breadth; lateral setæ 4 or 5. . . . . *congener*.
  - BB. Mentum of labium very slender in its proximal half, its narrowest part being not more than one-fifth of the apical breadth; lateral setæ normally 3.

---

†Bull. 124, N.Y. State Museum, 1908, p. 197.

- C. Lateral spines on segments 4-9; mentum of labium 5.5-5.75 mm. long, barely reaching base of hind coxæ\*; mental setæ 7 or 8, hind femora 6 mm.; outer wing-pad 6.5 mm. . . . . *eurinus*.
- CC. Lateral spines on segments 5-9 (4-9 in one specimen of *disjunctus*), mental setæ usually 5-6, but often 7; hind femora less than 6 mm. long; outer wing-pad 5.5 mm. long or less.
- D. Mentum of labium more than 4 mm. long, reaching generally to apex of hind coxæ or beyond; ovipositor extending beyond apical margin of segment 10.
- E. Mentum of labium 4.3-5.1 mm. long, reaching apex of hind coxæ or slightly beyond; ovipositor 3-3.5 mm., extending beyond basal joint gills . . . . . *uncatus*.
- EE. Mentum of labium 4.75-5.5 mm., reaching beyond apex of hind coxæ, often to apex of trochanters, ovipositor 2 mm. long, extending very little beyond apical margin of segment 10. . . . . *disjunctus*.
- DD. Mentum of labium 3.7-4 mm. long, reaching generally to about the middle of the hind coxæ; ovipositor just reaching apical margin of segment 10. . . *rectangularis*.
- AA. Lateral spines present on abdominal segments 2- or 3-9; labium reaching barely to bases of hind coxæ or not so far. . . . . *vigilax*.

#### **Lestes congener** Hagen.

Both sexes of this species were reared at the Dominion Biological Station at Departure Bay, near Nanaimo, Vancouver Island. The nymphs were obtained from Lonely Lake, a large pond a few miles from the Station in the depths of a rocky, coniferous forest. Two species of *Lestes* occurred near here, *L. disjunctus* and *L. con-*

\*This character is doubtless somewhat variable as in other species.



*gener*, but the latter commenced to transform when the period of emergence of the former was almost over.

The nymphs were taken on July 31, 1913, and emerged on August 7th, 8th and 13th.

*Nymph.*—Labium, when closely applied to ventral surface, extending caudad to a little beyond the base, or to the middle, of the hind coxæ; mentum narrowest about the middle, the breadth here being about one-third of the apical breadth, widening very slightly proximad; lateral lobe with inner margin crenulate, the teeth being much less developed than in other species of the genus; the row of teeth between the two hooks of the outer part also less developed than in the other species; 4 or 5 lateral setæ, there being 3 or 4 on the movable hook and one before its base.

Lateral spines present on segments 5-9, those on 5 minute but distinct; spinules on lateral carinæ of seg. 9 varying from 9 to 14. Ovipositor extending very slightly beyond the hind margin of seg. 10, the styli just reaching the margin. Gills but little tapering distally, being little or no narrower at the distal than at the proximal third, apices convexo-acute. The three dark bands are usually distinct but not sharply defined. The femora have an obscure preapical dark ring.

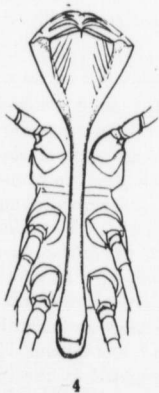
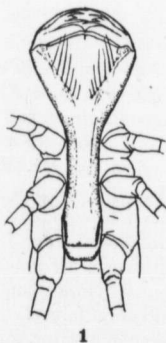
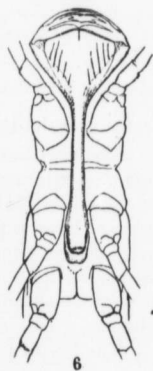
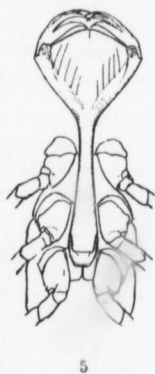
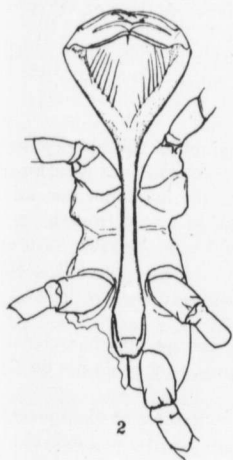
Length of body (without gills) 14.75 (contracted in alcohol) -20 mm.; labium (hinge to apex) 3.25-3.5 mm.; outer wing-pad 4.3-5 mm.; hind femur 4.7-5 mm.; gill 8.25-9.5 mm.

Described from four nymphs and three exuviae.

***Lestes eurinus*** Say.

Of this species I have only one male exuvia, with the imago and a mounted labium from another specimen, both received from Professor Needham.

The labium is not very long for the size of the insect as it extends back only to the base of the hind coxæ. Mentum very slender in the middle, being only about one-seventh of the greatest breadth; broadening towards the hinge to about twice this breadth. The mental setæ of the mounted specimen are 7 on each side, in the other they are 7 on one side and 8 on the other. There is nothing characteristic about the lateral lobes except that the outer part is rather broad and the teeth between the two hooks are more irregular than in most species.



NYMPHS OF LESTES.

Lateral spines on abdominal segments 4-9, small but distinct on 4, increasing to 7, smaller again on 9. Gills tapering but little distally, the width at the distal third little less than at the proximal third, apices broadly convexo-acute.

Length of body (without gills) 25 mm.; labium 5.5 mm.; outer wing-pad 6.5 mm.; hind femur 6.0 mm.; gill 11 mm.

### **Lestes unguiculatus** Hagen.

All that I have to represent the nymph of this species is the slide received from Professor Needham, on which the mouth-parts are mounted. The labium is of about the minimum size for *L. uncutus*, measuring barely over 4 mm. in length from hinge to apical margin of mentum. The mentum is of the same form and bears 7 mental setæ on the right side and 5 on the left, though there is a space on the left side that appears to have borne two others.

The lateral lobes have apparently no special characteristics but their exact form cannot be determined as they do not lie flatly on the slide.

Although nothing is known of the ovipositor of the nymph of this species, it is safe to infer that it is of about the same size as in *disjunctus* or *rectangularis*, as this relation obtains in the adults of these species.

### **Lestes uncutus** Hagen.

On June 26, 1913, I found the adults of this species in enormous numbers about a prairie pond or "slough" at Prince Albert, Saskatchewan. The exuviae were also numerous here and one nymph was taken when about to transform. I also have a considerable number of full-grown nymphs taken by Mr. R. P. Wodehouse from a pond on Fitzwilliam Island, Georgian Bay, Ont., June 29th, 1912, where they were taken in company with nymphs of *L. rectangularis*. In addition to these I have a slide from Professor Needham, on which the mouth-parts are mounted.

It is a somewhat larger and slightly stouter nymph than that of *L. rectangularis* and the labium is noticeably larger. The females are easily recognized by the very large ovipositor, a character that is also present in the adults. This feature is probably shared by *L. forcipatus* (q.v.).

*Nymph*.—Labium long and slender, extending usually slightly beyond the apices of the hind coxæ but sometimes not quite reaching the apices, in other cases extending as far back as the middle of the hind trochanters. Slender proximal part of mentum about two-thirds of its entire length, the middle breadth being about one-seventh of the breadth at base of lateral lobes, widening proximad to more than twice this breadth at the hinge; mental setæ usually 6 or 7, rarely 5 or 8 on one side; inner part of lateral lobes with the marginal teeth prominent, the outer part broad with the row of teeth straight and more regular than usual; lateral setæ normally 3, rarely a fourth on the movable hook.

Lateral spines present on abdominal segments 5- or 6-9, those on 5, when present, very minute. Spinules on lateral carinæ of 9 varying from 10 to 14. Ovipositor much larger than in any other species examined, the tips of the styli reaching the level of the basal joint of the gills, the apices of the ovipositor slightly beyond the joint. The sides of the valves are perpendicular, and their ventral surfaces narrow; the longitudinal series of minute hairs along the ventro-lateral margins is very inconspicuous. Gills widest about the proximal third, tapering considerably in the distal half, the width at distal third about two-thirds that at the proximal third, apices acute.

In distinctly marked specimens (in alcohol), the dorsum of the abdomen is largely brown, the femora have a brown preapical annulus and the tibiæ and tarsi are apically infuscated. The dark bands of the gills are often sharply defined.

Length of body (without gills) 22-24 mm.; labium 4.3-5.1 mm. (av. 4.7); wing 4.9-5 mm.; hind femur 5-5.1 mm.; gill 8.9-10 mm.

### **Lestes disjunctus** Selys.

I found the adults of this species in great abundance in two marshy coves on the edge of Lonely Lake, Vancouver Island (see under *L. congener*). There were also great numbers of exuviae which I felt safe in referring to this species as it was the only one present. I dredged up a number of nymphs which I also assumed to be *disjunctus*, but the few that were reared all proved to be *congener*. Only one specimen, not reared, was *disjunctus*. The

time for emergence of this species was practically over at the time the nymphs were collected (July 31, 1913).

*Nymph.*—Labium exceedingly long and slender, reaching back beyond the apex of the hind coxæ or even beyond the trochanters. The slender proximal part of the mentum includes about two-thirds of its length and its breadth, at the middle, is about one-seventh of the breadth at the base of lateral lobes. It expands proximad to more than twice its middle breadth. Mental setæ 6 or 7; lateral lobes similar to those of *uncatus*, the row of teeth on the outer part somewhat less regular; lateral setæ 3.

Lateral spines on segments 5-9 (4-9 on one specimen); 11-14 spinules on lateral carinæ of segment 9. Ovipositor extending slightly beyond the hind margin of segment 10, the styli reaching fully as far back as the apex. The longitudinal series of minute hairs on the ventral surface of the valves is slightly mediad of the lateral margin of the valves. Gills broadest at the proximal third, thence tapering gradually to the slender pointed apices, the breadth at the distal third being less than two-thirds of the breadth at the proximal third. The dark bands of the gills are somewhat diffuse in all the specimens, and in some very feebly indicated. The only other indications of a colour-pattern are the very feeble preapical femoral annuli and the darkened apices of the tibiæ and tarsi in some individuals.

Length of body (without gills) 18-19 mm.; labium 4.75-5.5; outer wing-pad 4.5-5mm.; hind femur 5.1 mm.; gill 8.8-10 mm.; ovipositor 2-2.3 mm.

Described from two nymphs and four exuviae.

### ***Lestes forcipatus* Rambur.**

I have only a fragmentary male exuvia with the imago and four mounted labia, of this species, received from Professor Needham. The exuvia lacks both head and gills so that it is impossible to form a proper idea of the characters of the nymph. Moreover, one of the mounted labia is considerably larger than the others and appears to me to belong to a different species. Professor Calvert, however, has kindly furnished me with the following data taken from a male, reared by himself. The nymph was collected in Delaware Co., Pa., July 16, 1891, and transformed on July 22.

Mental setæ 6 on each side; lateral setæ 3+1 small one on the lateral edge of each lateral lobe, just proximal to the articulation of the movable hook. Lateral spines on abdominal segments 5-9, smallest on 5. Spinules on lateral carina of segment 9, 14 on right side, 12 on left. Length of body, without gills, 17 mm.; mentum of labium 3.8 mm.; outer wing-pads 5.5 mm.; hind femur 5 mm.; gills 9 mm.

In Professor Needham's material these characters are quite similar to the above, in so far as they are represented, except that one of the labia is larger than the others, measuring 5 mm. in length, whereas the others measure barely 4 mm. or a little less. One of the latter is labelled "bred." In all the specimens there are 3 lateral setæ and 5-6 mental setæ on each side. The rudimentary seta mentioned by Professor Calvert is present in all the specimens and in fact is rarely absent in any of the species of *Lestes* I have examined. In the exuvia from Professor Needham, there are lateral spines on abdominal segments 5-9, and the lateral carinae of segment 9 bear 13-14 spinules.

In all these characters and also in the form of the labium and its lateral lobes, there is nothing to distinguish the nymph of this species from that of *L. rectangularis*, but the ovipositor will probably prove to be much larger, resembling that of *L. uncatatus*, since these relations obtain in the adult.

#### ***Lestes rectangularis* Say.**

I have bred this species at Toronto and have a large number of full-grown nymphs taken by Mr. Wodehouse from a pond on Fitzwilliam Island, Georgian Bay, in company with *L. uncatatus*. I also have exuviae and adults reared by Professor Needham and a number of nymphs taken by him at Old Forge, N.Y.

*Nymph.*—Somewhat smaller than that of *L. uncatatus*, and of somewhat slenderer build. Labium of moderate length, generally reaching back to about the middle of the hind coxæ, but sometimes not quite reaching their bases while in two specimens, otherwise like this species, it extends a little beyond the apices of the coxæ. In none of the four exuviae of bred specimens that I have does it extend beyond the base of the coxæ. The slender proximal part of the mentum is about 1.25 to 1.5 times as long as

the expanded distal part, and just before the latter, it is narrowed to about one one-sixth of the width at the base of the lateral lobes, widening towards the hinge to about twice this breadth. Mental setæ normally 5, occasionally 6 on one side. Lateral lobes similar to those of *disjunctus*, lateral setæ 3.

Lateral spines on segments 5-9, of small size, those on 5 usually a little longer than in *uncatus*. Spinules on lateral carinæ of 9, 10-14, usually 11-13. Ovipositor of moderate size, the apex and styli reaching the hind margin of segment 10. The longitudinal series of minute hairs is present on the ventro-lateral edges of the valves. Gills slender, gradually tapering from the proximal third, the breadth at the distal third being about three-fourths or three-fifths that at the proximal third, apices bluntly convexo-acute.

The coloration is quite similar to that of *uncatus*. Some specimens are very distinctly marked, the bands on the gills being very conspicuous and sharply defined.

Length of body 19-21 mm.; labium 3.6-4.0 mm.; outer wing-pad 4.5-5.5 mm.; hind femur 4.5-5.13 mm.; gill 8.5-9.0 mm.; ovipositor 1.9-2.0 mm.

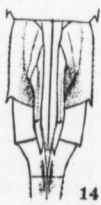
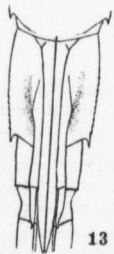
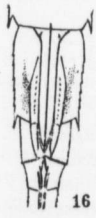
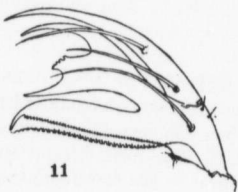
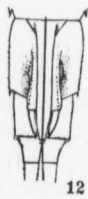
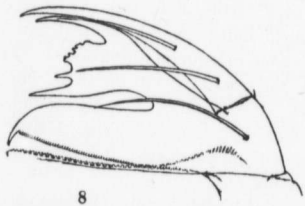
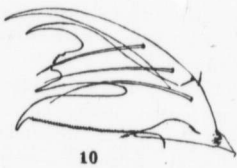
### ***Lestes vigilax* Hagen.**

Although I have bred this species several times at Go Home Bay, where the nymphs are plentiful, I have at present only three exuviae from reared specimens and one immature nymph from that locality and four exuviae from Old Forge, N.Y., received from Professor Needham.

They are readily distinguished from other species by the characters given in the key.

*Nymph*.—A slender nymph, similar in form to that of *rectangularis*.

Labium relatively short, not extending behind the bases of the hind coxæ and in one exuvia only to the middle coxæ; somewhat abruptly expanded in its distal part, which is about one-third to two-fifths of its entire length, narrowed at the middle to about one-seventh to one-fifth of the apical breadth, and widening towards the hinge to about twice the middle breadth. Mental setæ 5 (rarely a small sixth on one side). Inner part of lateral



NYMPHS OF LESTES.



lobes slenderer than in the other species, the marginal teeth prominent, the end-hook long and slender. Inner hook of outer part twice as long as the row of teeth, which is shorter than usual; lateral setæ 3.

Lateral spines on segments 2- or 3-9, larger than in the other species, those on segment 9, e.g., being about one-fourth the length of the lateral margin of segment 10. Spinules on lateral carinæ of segment 9 generally only 6-9, in extreme cases 5 or 11. Styli and apex of ovipositor not reaching the hind margin of segment 10, or the styli barely reaching the margin. The longitudinal series of minute hairs on the ventral margin of the valves is quite near the inner margin of the valves. Gills narrow, the margins being for the greater part of their length nearly straight and subparallel, apices rather broadly rounded, with or without slight indications of a point. Femora with a preapical annulus and the extreme apices dusky; a narrow sub-basal tibial annulus is sometimes present.

Length of body (without gills) 21-23.5 mm.; labium 3.33-3.8; outer wing-pad 5.2-5.4 mm.; hind femur 5.0-5.5 mm.; gill 10.0-10.5 mm.; ovipositor 2 mm.

#### EXPLANATION OF PLATES.

Plate XIII. Ventral views of labium and thorax, showing their relative positions when the former is closely applied to the ventral surface of the latter. The mental setæ are seen through the mentum, as they appear in the transparent exuviae.

- |                                  |                                    |
|----------------------------------|------------------------------------|
| Fig. 1. <i>Lestes congener</i> . | Fig. 4. <i>Lestes disjunctus</i> . |
| Fig. 2. " <i>eurinus</i> .       | Fig. 5. " <i>rectangularis</i> .   |
| Fig. 3. " <i>uncatus</i> .       | Fig. 6. " <i>vigilax</i> .         |

Plate XIV. Lateral lobe of labium (figs. 7-11) and ventral views of abdominal segment 10 of the female, showing ovipositor, etc. (figs. 12-16).

- |                                  |                                   |
|----------------------------------|-----------------------------------|
| Fig. 7. <i>Lestes congener</i> . | Fig. 12. <i>Lestes congener</i> . |
| Fig. 8. " <i>eurinus</i> .       | Fig. 13. " <i>uncatus</i> .       |
| Fig. 9. " <i>uncatus</i> .       | Fig. 14. " <i>disjunctus</i> .    |
| Fig. 10. " <i>disjunctus</i> .   | Fig. 15. " <i>rectangularis</i> . |
| Fig. 11. " <i>vigilax</i> .      | Fig. 16. " <i>vigilax</i> .       |

## AMERICAN TRICHOPTERA—NOTES AND DESCRIPTIONS.

BY NATHAN BANKS, EAST FALLS CHURCH, VA.

(Continued from p. 156.)

## RYACOPHILIDÆ.

**Rhyacophila bifila**, n. sp. (Figs. 53, 56.)

Female: Related to *R. coloradensis*, the female appendages on the same plan, but both upper and lower pieces are more slender. Black, with black and gray or whitish hairs; palpi dark brown; antennæ brown, annulate with pale. Wings dark brown, densely irrorate with pale; the costal area mostly pale, stigma long and dark, outer margin with pale spots between the veins; in hind wings the stigma is also very long and dark; forks 1 and 2 equal in length, fork 3 reaching more than one-half way on fork 4.

Expanse 21 mm.

From Vernon, British Columbia, August (Bryant).

**Rhyacophila acropedes**, n. sp. (Fig. 39.)

Blackish, with black bristles and golden hair; palpi pale; posterior warts pale; antennæ yellowish brown; thorax with two strips of golden hair; legs pale, basal part of tibia I and II to middle spurs dark, basal parts of all tarsi dark; spurs blackish. Wings yellowish brown, darker near tip, mostly unmarked, but around apical margin are dark spots at ends of veins and pale spots between them; thyridial spot hyaline white; base of stigma dark; in hind wings, which are gray, the stigma is wholly dark. In fore wings fork 2 is a little longer than fork 1, fork 3 hardly one-half as long as fork 2, fork 4 with base nearly opposite fork 1; discal fork not before fork of median vein.

Expanse 20 mm.

From Deer Creek, Provo Canyon, Utah, 21 Aug. (Spalding).

**Rhyacophila bipartita**, n. sp. (Fig. 54.)

Palpi brown, paler on base; antennæ pale, annulate with brown; head and thorax with pale golden hair; legs pale, darker on tarsi. Wings pale brownish, with faint darker brown transverse marks, on stigma the marks are very distinct, also dark marks along cubitus, and at ends of veins; hind wings yellowish brown, the

stigma dark; fork 2 in fore wings plainly longer than fork 1; fork 3 about one-half way back on fork 4.

Expanse 20 mm.

From Banff, Canada, 30 Aug. (Sanson).

**Glossosoma penitus**, n. sp. (Figs. 16, 19.)

Black; basal part of antennæ pale; legs pale, spurs dark, vertex and thorax with yellowish gray hair; wings dark brown, with black hairs and dark brown fringe; a large corneous, black patch over basal anal area; hind wings with dense black costal fringe. In fore wings fork 3 reaches back as far as fork 2, not stalked, fork 4 about as long as its pedicel; in hind wings fork 3 is longer than its pedicel.

Expanse 12 mm.

From Peachland, British Columbia, 21 July (Wallis).

**Agapetus malleatus**, n. sp. (Fig. 57.)

Black; the tips of coxæ and bases of femora yellow, and basal part of tibia somewhat yellowish; head and thorax with yellowish hair; in fore wings fork 3 is very long, about twice as long as fork 4, fork 5 is long, widely divergent, reaching almost back to base of discal cell; in hind wings forks 2 and 3 are equal in size. Male has the lower appendage with broad tip, reaching beyond the upper piece, the latter very broad with acute process at lower tip; the process of sixth ventral segment short and blunt.

Expanse 11 mm.

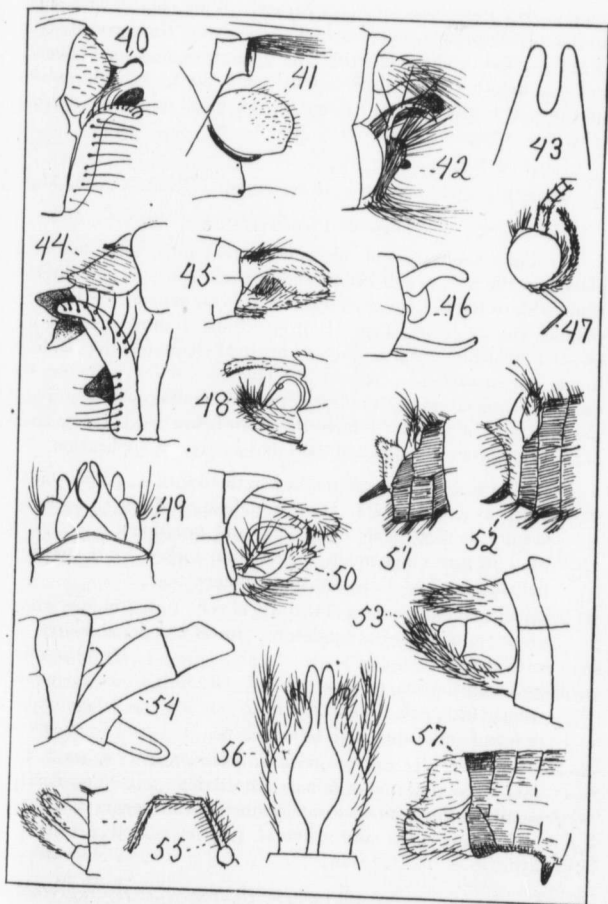
From Switzer's Camp, San Gabriel Mts., Calif., 3,000 ft., 17 June (Grinnell).

**Paragapetus**, new gen.

Similar to *Agapetus*; venation of front wings about the same, but fork 3 (in type species) is not longer than fork 4, and so does not reach as far forward. In hind wings the venation is similar to that of fore wings, but no fork 4; fork 1 is present and reaches back to discal cell; fork 2 also back to cell.

**Paragapetus moestus**, n. sp. (Figs. 18, 20, 23.)

Palpi black; antennæ dark, annulate with pale, head brown, white hair on the anterior part of vertex, brown hair on warts; abdomen dull black, genitalia yellowish, legs yellowish, tips of



NEW AMERICAN TRICHOPTERA.

tibiæ darker above and tarsi also darker. Wings black, with some scattered yellow hair, the principal marks being three costal spots of yellow, and three on hind margin, one at arculus, one beyond, and one before it; in disc various faint markings, transverse; anastomosis hyaline white, hyaline forked, mark on fork of median vein; hind wings gray, with gray fringe.

Expanse 8 mm.

From Black Mt., North Fork Swannanoa River, N. Car., May.

#### HYDROPSYCHIDÆ.

In the classification of this family great importance has been placed on the presence of ocelli, and of three spurs on the anterior tibia. Since both of these characters are common in the Rhyacophilidæ, the ancestors of the Hydropsychidæ, I think they are not of such great importance, and as ancestral characters are liable to break out in various places in the Hydropsychidæ. To use the two little appendages at the tip of the female abdomen would also produce false alliances. I have therefore below used a new character as of prime importance; one that is easy of application:

1. Fork 5 of fore wings subequal in length to fork 4; palpal joint 2 about as long as 3 or 4; inferior male appendages two-jointed, usually slender; penis often long and prominent. . . . . 2  
     Fork 5 of fore wings much longer than fork 4 (or 4 absent);  
     palpal joint 3 or 4 usually much longer than 2. . . . . 3
2. Hind wings broad, with a closed discal cell; fork 1 in fore wings; no warts in pits of mesonotum; tip of female abdomen not with two little appendages. . . . . *Hydropsychini*.  
     Hind wings narrow, no closed discal cell; fork 1 lacking in both wings; fifth palpal joint not nearly as long as others united; in female mid-tibiæ and tarsi dilated. . . . . *Psychomyini*.
3. No warts in pits of mesonotum; ocelli present; spurs 2, 4, 4, mid-tibiæ and tarsi of female not dilated. . . . *Philopotamini*.  
     A small wart in a pit each side on mesonotum; spurs 3, 4, 4; no ocelli; mid-tibiæ and tarsi of female dilated (at least a little. . . . . *Polycentropini*.

The *Hydropsychini* will include *Hydropsyche*, *Hydropsychodes*, *Arctopsyche*, *Diplectrona*, *Rhyacophylax*, *Smicridea*, *Potamyia*,

*Hydromanicus*, *Antarctopsyche*, *Symphitopsyche* and *Stenopsyche*. This latter genus has been placed in the Philopotamidae since it has ocelli, but is more allied to *Hydropsyche* by all other characters.

The *Psychomyiini* will include, besides the usual genera, *Enomus*; it was also placed here by MacLachlan. *Tinodes* is removed to the next tribe.

The *Polycentropini*, besides the usual genera, includes *Tinodes*; this move is also warranted by the structure of the male genitalia.

The *Philopotamini* has the usual genera, as placed by Dr. Ulmer, but without *Stenopsyche*.

(To be continued.)

## REPORT ON A COLLECTION OF JAPANESE CRANE-FLIES (*TIPULIDÆ*, *DIPTERA*).

BY CHARLES P. ALEXANDER, ITHACA, N. Y.

(Continued from p. 164.)

Genus: ***Tipula*** Linnæus.

*Key to the Japanese Tipulæ.*

1. Large species (over 30 mm. in length).....2  
Smaller species (less than 25 mm. in length).....4
2. Wings ochre-brown, the cross-veins darker, the stigma bright yellow [abdomen ochraceous-brown, the sternum paler].....*præpotens* Wied (<sup>1</sup>)  
Wings not ochre-brown with a yellow stigma.....3
3. Abdominal tergites with the apices brown; hypopygium pale dull fulvous brown, thoracic dorsum blackish with two rusty lines.....*mikado* Westw. (<sup>2</sup>)  
Abdomen with three dorsal longitudinal stripes, the median one indistinct on the basal segments.....*coquilletti* End.
4. Wings hyaline or subhyaline, with the costal region darker..5  
Wings either subhyaline without a dark costal border, or else variegated hyaline, gray and brown.....6
5. Thoracic notum yellowish; abdomen without a distinct stripe on either side.....*yamata*, sp. n.

<sup>1</sup> *Præpotens* Wiedemann; Aussercur. Zweifl. Ins., vol. 1, pp. 40, 41 (1828).

<sup>2</sup> *Mikado* Westwood; Trans. Ent. Soc. Lond., for 1876, p. 594.

- Thoracic præscutum and scutum dark; abdomen yellow, with a broad brown stripe on either side of the yellow median vitta..... *aino*, sp. n.
6. Abdomen with the segments having a dark caudal margin... 7  
Abdomen lined with dark stripes..... 8
7. Caudal margin of the abdominal segments very narrow; wings light yellow without darker markings, except the prominent stigma..... *insulicola*, sp. n.  
Caudal margin of the abdominal segments broad, comprising at least two-thirds of the length of the sclerite; wings light gray with hyaline blotches..... *nipponensis*, sp. n.
8. Head yellowish..... 9  
Head black or dark brown..... 10
9. Abdomen with a median stripe; flagellum of antennæ black..... *japonica* Loew<sup>(1)</sup>  
Abdomen with three stripes, one median and two lateral: two basal flagellar segments yellow, remainder brown at base, yellow at tip..... *serricauda*, sp. n.
10. Large species (length, ♂, 15 mm.; wing, 19 mm.)..... *yusou*, sp. n.  
Small species (length, ♂, 10 mm.; wing, 13-5 mm.)..... *parva* Loew<sup>(2)</sup>

**Tipula coquilletti** Enderlein.

1898 *Tipula nubifera* Coquillett; Proc. U.S. Nat. Mus., vol. 21, p. 305.

1902 *Tipula nubifera* Kertess; Cat. Dipt., vol. 2, p. 299.

1912 *Tipula coquilletti* Enderlein; Zoöl. Jahrb., vol. 32, pl. 1, p. 7.

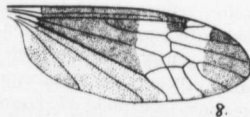
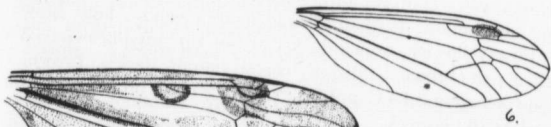
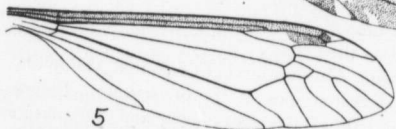
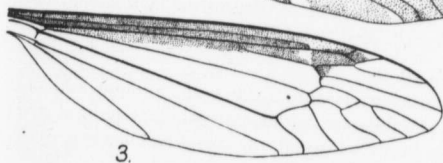
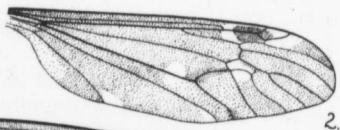
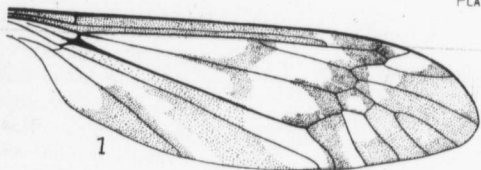
A male and female; the following a *Idenda* to Coquillett's description may be of value:

The legs in my specimens have the femora and tibiæ almost uniformly dark brown; abdomen very long for a *Tipula*. The wing is shown in plate 16, figure 7. Male hypopygium: 8th tergite rather broad, its caudal margin almost straight; 8th sternite (see plate <sup>(3)</sup> figure 17), much produced caudad into a scoop-like lobe which is very deeply notched medially, the tips of the lobes directed

1 *Japonica* Loew; Wiener Ent. Monatschr., Vol. 2, p. 101, 102 (1858).

2 *Parva* Loew; Wiener Ent. Monatschr., vol. 2, p. 102 (1858).

3 Plate 17 will appear in the next issue.



JAPANESE CRANE-FLIES.



inward; 9th tergite rather small (see plate 17, figure 8), viewed from above, the caudal margin is narrowed and evenly concave, the whole caudal end being covered densely with small black spicules; suture between the sternum and tergum not clear; 9th sternite (plate 16, figure 7), broad, its caudal margin concave. Pleural appendage, a large flattened lobe (see plate 17, figure 10), on the inside (plate 17, figure 9), with the dorsal outer angle densely provided with short black spicules, with numerous other spicules down the inner face.

Female (allotypic): tergal valves of the ovipositor long and slender, heavily chitinized, not so deep as the high sternal valves.

Vial 13; Tokyo, Japan; April 25, 1912; 1♂, 1♀.

### ***Tipula yamata*, sp. n.**

Head blackish; thoracic notum yellowish; anterior half of the pleura dark brown; abdomen without distinct longitudinal stripes; wings with a pale brown suffusion, the costal region a little darker.

Male, length 12 mm.; wing 16.6 mm.

Female, length 19.2 mm.; wing 16.8 mm.

Male.—Palpi dull yellow; frontal prolongation of the head rather short, dull yellow; antennæ light yellow, the flagellar segments passing into brown; front, vertex and occiput dark brown passing into yellow on the genæ.

Pronotum brown. Mesonotum light coloured, yellowish, with indistinct, narrow, darker stripes on the præscutum. Pleura, propleura and anterior half of the mesopleura and the metapleura, pale, whitish. Halteres long, slender, pale. Legs: fore and middle coxæ dark brown; trochanters and femora yellow, light brown at tip; tibiæ yellowish, brown darker at the tip; tarsi brown. Wings with a pale brown suffusion; costal border darker brown, this colour including cells C and Sc.; stigma greyish brown. Venation, see plate 16, figure 5.

Abdominal tergites 1-4 yellowish, 5-9 darkened, brownish; sternites 1-6 yellow, 7 yellow with a brown median line, 8 brown basally, yellow at the tip. Male hypopygium: 9th tergite from above with a prominent median chitinized protuberance, its caudal margin gently concave and with short bristles and chitinized points. Pleural suture incomplete; pleural appendages as follows: outermost (see plate 17, figure 3), a broad, flattened lobe quite

densely covered with long hairs, these hairs rather stout except along the caudal margin where they are delicate, fringe-like; just inside this appendage is a cylindrical, chitinized arm directed toward the end of the 9th tergite, the apex evenly rounded; the largest of the pleural appendages is a flattened arm whose apex is notched and crenulated and fits into the notch of the 9th tergite; the penis is very long and slender, the central vesicle large and rounded.

Female.—About as in the ♂, the flagellar segments subannulate, the apical three-fifths of each segment being much paler than the basal portion; abdominal tergites 5-7 with a dark brown basal mark, segments 8 to the end brown; valves of the ovipositor short and sharply pointed. In one ♀, the entire tergum beyond segments 1-3 is almost entirely dark brown but this may be caused by the gravid condition of the abdomen which is greatly distended with eggs.

Holotype, ♂, Tokyo, Japan; August, 1912 (Vial 42).

Allotype, ♀, Tokyo, Japan; August, 1912 (Vial K).

Paratypes, 2 ♀, Tokyo, Japan; May 7, 1912 (Vial 34).

The specific name is that of an aboriginal Japanese race inhabiting the southern and central portions of the southern half of Nippon, facing the Pacific Ocean.

#### **Tipula aino, sp. n.**

Head blackish; præscutum and scutum dark coloured; abdomen yellow with two dorsal brown lines, one on either side of the broad ground stripe; wings with a slight gray tinge, costal region brown.

Male.—Length 16 mm.; wing 16.5-18.4 mm.

Female.—Length 19.4 mm.; wing 20.5 mm.

Male.—Palpi and the frontal prolongation of the head brown; antennæ with the three basal segments orange, segments 4 and 5 orange at the extreme base, entire remainder of the antennæ black; front, vertex and occiput dark coloured, blackish.

Mesonotum with the præscutum and most of the scutum uniformly dark brown with narrow darker stripes, one median and one on either side; scutum pale medially, lobes very dark; scutellum and postnotum dull yellow, the latter a little brown on the sides and in some specimens entirely dark. Pleura dull yellow

with a brown tinge on the propleura and anterior portions of the mesopleura. Halteres rather long, pale. Legs: coxae and trochanters light yellow; femora orange-yellow the tip brown; tibiae yellowish on the basal half, thence passing into brown; tarsi brown. Wings with a dark brown costal border, this including cells C, Sc., and the cephalic halves of cells R and 1st R<sub>1</sub>; stigma even darker; most of cells R and M and the bases of cells R<sub>2</sub>, R<sub>3</sub> and R<sub>4</sub> hyaline; remainder of the wings with a brownish-gray tinge. Venation as in plate 16, figure 3.

Abdominal tergites yellow with a broad brown stripe on each side, these stripes becoming confluent on segments 7 and 8; caudal margin of segments 3-6 narrowly brown; sternites dull yellow, the caudal margins of the segments a little darker. Male hypopygium: 9th tergite from above (see plate 16, figure 4), with the latero-caudal angles produced into strong spines between which is a small rounded lobe covered with hairs; suture between the tergum and sternum not clear; appendages of the pleural region viewed from the side (see plate 17, figure 5), two in number, the more ectad of which is a large, oval lobe, somewhat chitinized on its edges, its ventro-cephalic margin on the inside with a small oval knob provided with hairs; inner lobe very large, its caudal edge thickened and here provided at its tip with a comb of bristles directed caudad and an apical bunch directed dorsad; inner face of this appendage near its tip with a group of about 14 sharp points.

Female.—Ovipositor with the sternal valves very high, blade-like, the tips subacute; tergal valves very slender apically, the tip scarcely enlarged.

Holotype, ♂, Tokyo, Japan; April 13, 1912 (Vial 12).

Allotype, ♀, Tokyo, Japan; April 13, 1912 (Vial 12).

Paratypes, 5 ♂, 5 ♀; as follows:

Vial J; 1 ♀, Tokyo, Japan; August, 1912 (Cornell).

Vial 12; 2 ♂, 2 ♀, Tokyo, Japan; April 13, 1912 (Cornell).

Vial 40; 3 ♂, 2 ♀, Tokyo, Japan, August, 1912 (U. S. Nat. Mus.).

The specific name is that of an aboriginal Japanese race formerly occupying the northern half of Nippon, now confined to Yesso and the islands to the northward.

***Tipula insulicola*, sp. n.**

Antennae annulated black and yellow; thorax without indistinct brown stripes; wings light yellow with a prominent oval brown stigma; abdominal segments with a dark caudal margin.

Female.—Length 11.2 mm.; wing 11.3 mm.

Female.—Palpi and frontal prolongation of the head brown, the latter short and stout; antennae with the three basal segments yellow, remaining segments with the basal two-fifths dark brown, the apices light yellow, these colours abruptly contrasted; front, vertex and occiput brown.

Præscutum dull yellow with three indistinct brown stripes of which the median one is broad, the lateral ones shorter and narrower; scutum with the lobes reddish; scutellum and postnotum dull yellow. Pleura dull yellow. Halteres dull yellow. Legs: coxæ, trochanters and femora light yellow; tibiæ brownish yellow, a little darkened at the tip; tarsi brown. Wings light yellow, cells C and Sc. a little brighter; stigma prominent, oval; an indistinct hyaline stripe across the wing beginning before the stigma and including cell 1st M<sub>2</sub>. Venation, see plate 16, figure 6.

Abdominal tergites dull yellow, each segment narrowly but distinctly margined with dark brown all around, sternites very pale, almost white, each segment with the caudal margin narrowly brown; genital segment reddish yellow. Ovipositor with the tergal valves having a stout, enlarged base, the valves produced caudad into exceedingly slender points which are slightly expanded at their tips; tergal valves much shorter than the elongate, bladelike sternal valves which are directed caudad.

Holotype, ♀, Tokyo, Japan; August, 1912 (Vial K).

(To be continued.)

---

**TWO NEW CALIFORNIA THAMNOTETTIX  
(HOMOPTERA).**

BY E. D. BALL, LOGAN, UT.

While collecting in California, several years ago, a single specimen of a beautiful *Thamnotettix* was captured, but escaped from the net; not, however before its characters were pretty defi-

nately fixed in mind. While collecting in another locality last year the same species was found and instantly recognized, and, like the former one, lost. This now became the chief object of search, and later it was captured in several different places. Its remarkable agility in escaping from a net probably being a reason it has not been captured before.

**Thamnotettix pasadena**, n. sp.

Size and form of *ursina* nearly, colour pattern resembling *collaris*, but still more highly ornamented. Rich brown, with head, saddle and antepical band yellow. Length ♀ 6.5mm; ♂ 6mm.; width 1.5mm.

Vertex definitely obtusely angled, almost two-thirds as long as its basal width, slightly shorter than the pronotum, one-half longer at apex than against the eye, disc flat, the margins rounding to the front except at the conical apex, front broadly wedge-shaped, the lateral margins nearly straight, clypeus broad, slightly constricted. Elytra moderately long, strongly flaring behind. Venation weak, often obscure, with irregular reticulations in the antepical cells, often especially emphasized along the claval and costal margins.

Colour—Vertex and face light yellow to yellowish ivory, eyes reddish or reddish brown, pronotum rich brown, the anterior submargin rich brown, with a row of irregular coalescing black spots, on either side a transverse median ivory mark; scutellum rich brown, sometimes with a medium light shield ornamented with two round dots. Elytra with the anterior two-thirds of claval areas rich yellowish ivory, the remainder brown, corium yellowish subhyaline, a brown cloud along the claval suture abruptly terminating just before the apex of clavus, where it expands and, uniting with the claval markings, forms a transverse brown band which narrows toward the costa and becomes slightly oblique, the reflexed apices of the elytra, including most of the apical areas smoky brown.

Genitalia—Female ultimate segment three or four times as long as the preceding, deeply angularly excavated from the lateral angles two-thirds of its depth, the bottom of the notch broadly

evenly rounding, whole segment curved around the pygofer until it appears to be only broadly and shallowly excavated on the median third. Pygofer long, but considerably exceeded by the elytra. Male, valve stout, obtusely angular with a strong median ridge either side of which the lateral margins are semicircularly depressed, giving the appearance of a wavy margin and a notched apex, plates together bluntly spoon-shaped, their apices slightly parted and heavily clothed with coarse hairs; just visible above these are two long curved hooks.

Described from eight examples from California collected by the author in July and August, 1912. This is the most strikingly marked species in the genus, and, while the genitalia are slightly variable, its size and colour pattern will at once distinguish it.

***Thamnotettix januata*, n. sp.**

Resembling *flavocapitata*, but smaller, darker and with a shorter vertex. Pale brown with the vertex light yellow. Length 4.75 mm.

Vertex twice wider than long, obtusely angled, one-fourth longer on middle than against the eye; disc convex in both diameters, the apex bluntly subconical; face convex, front long, narrow, wedge-shaped, clypeus long, the apex expanded. Pronotum broad and fully a third longer than the vertex. Elytra long, narrow and posteriorly appressed.

Colour—Vertex lemon yellow, sometimes with a faint brownish line just back of the anterior margin and parallel with the basal margin. Face and below pale straw. Pronotum olive brown, with the anterior margin narrowly lighter, scutellum washed with orange. Elytra olive brown with costal margin shading out to a subhyaline. Whole insect slightly coppery iridescent.

Genitalia—Female segment nearly twice wider than long, the whole posterior margin obtusely, angularly excavated with a narrow median strap-shaped tooth which extends beyond the lateral angles. Male, valve oval convex, plates together, slightly longer than wide with the apices slightly filamentous.

Described from four examples from San Francisco, Cal., collected by the author. A small and obscurely marked but quite distinct species.

## THE CANADIAN ENTOMOLOGICAL SERVICE.

Thirty years ago, in 1884, the Canadian Government appointed a Dominion Entomologist to advise agriculturists and others regarding the control of insect pests. Two years later, on the establishment of the Experimental Farms' system, Dr. James Fletcher, who occupied the position, was attached to the new Branch of the Department of Agriculture in the joint capacity of Entomologist and Botanist, which position he occupied with conspicuous success until his death in 1908. The growth in importance of the two subjects necessitated their separation, and accordingly Divisions of Entomology and Botany were created. Dr. C. Gordon Hewitt was appointed Dominion Entomologist in 1909 and entrusted with the work of organizing the new Division of Entomology of the Experimental Farms' Branch of the Department of Agriculture with offices and laboratory at the Central Experimental Farm, Ottawa.

The urgent need of legislation in order to permit action to be taken to prevent the introduction into Canada and spread within the country of serious insect pests and plant diseases, was responsible for the passage of the Destructive Insect and Pest Act in 1910. The still greater need of investigations on the insect pests affecting agriculture, forestry, and other branches of human activity, has led to the establishment of field or regional laboratories in different parts of Canada with trained Entomologists in charge to study the local problems.

Owing to the consequent expansion of the Entomological work along investigatory and administrative lines and the fact that such work did not constitute a necessary part of the work of the Experimental Farms' system, and executive was virtually distinct, the Entomological Service has now been separated from the Experimental Farms' Branch and has been constituted an independent Branch of the Department of Agriculture under the direction of the Dominion Entomologist. It is proposed to erect a building to provide offices and laboratories for the new Entomological Branch. Will correspondents kindly note that all official communications and publications should be addressed to "The Dominion Entomologist, Department of Agriculture, Ottawa."

This reorganization, which will also include the establishment of a national collection of the insects of Canada in the Canadian National Museum (the Victoria Memorial Museum) at Ottawa, under the care of the Dominion Entomologist, marks an important step in Canadian Entomology. It will result in a still greater development in the study of Canadian insects along scientific and practical lines.

The present organization of the Entomological Branch of the Canadian Department of Agriculture is as follows:

Dominion Entomologist and Chief.....	C. Gordon Hewitt, D. Sc., F.R.S.C.
Chief Assistant Entomologist.....	Arthur Gibson. •
Assistant Entomologist in Charge of Forest Insect Investigations.....	J. M. Swaine, M.Sc., B.S.A.
Assistant Entomologist in Charge of Fruit Insect Investigations.....	

#### FIELD OFFICERS IN CHARGE OF BRANCH LABORATORIES:

G. E. Sanders, B.S.A., Entomological Laboratory, Bridgetown, N.S.
J. D. Tothill, B.S.A., and L. S. McLaine, M.Sc., Entomological Laboratory, Fredericton, N.B.
C. E. Petch, B.S.A., Entomological Laboratory, Covey Hill, Que.
Wm. A. Ross, B.S.A., Entomological Laboratory, Vineland Station, Ont.
H. F. Hudson, B.S.A., Entomological Laboratory, Strathroy, Ont.
Norman Criddle, Entomological Laboratory, Treesbank, Man.
E. H. Strickland, Entomological Laboratory, Lethbridge, Alta.
R. C. Treherne, B.S.A., Entomological Laboratory, Agassiz, B.C.
Field Officer for Forest Insect Investigations—R. N. Chrystal, B.Sc.

#### INSPECTORS AND ASSISTANTS:

A. B. Baird, Fredericton, N.B.; J. Perrin, Halifax, N.S.;	
J. I. Beaulne, Ottawa.	
Artist Assistant.....	A. E. Kellett..



## SUPERINTENDENTS OF FUMIGATIONS AND INSPECTORS:

H. E. Goold, St. John, N.B.	L. Paradis, St. Johns, Que.
G. Manley, Niagara Falls, Ont.	C. Wright, Windsor, Ont.
A. K. Leith, Winnipeg, Man.	T. R. Waddington, North Portal, Sask.
Inspector of Indian Orchards.....	T. Wilson.

## SECRETARIES:

J. A. Letourneau; Miss J. McInnes; J. M. Moloughney; Miss E. Read.	
Laboratory Assistant.....	H. S. Fleming. C. G. H.

## BOOK REVIEW.

"MACROLEPIDOPTERA OF THE WORLD." By Prof. Dr. A. Seitz.

The issue of Volume II. of "Macrolepidoptera of the World," by Prof. Seitz, concludes the palearctic part of this great work, inasmuch as "Moths" (Tineidæ) and "Spinners" (Bombycidæ) are concerned. This edition is quite voluminous, containing fully 440 pages of text alone, irrespective of the index.

It represents, like volume I of "Butterflies," the most complete work of its kind known to-day. Above all, it contains figures of almost all the species of the Amur region of Turkestan, of the Caucasus, of Persia, of Syria, etc., many of these illustrations having appeared for the first time.

The text of this volume was compiled by nine authors, generally known as reliable authorities on Entomology. In this respect it certainly is astonishing that, notwithstanding the "many cooks," a pleasing uniformity has been obtained in regard to the text as well as to the plates, which uniformity does not appear in so marked a degree throughout Volume I.

The following figures will serve to give a good idea of the thoroughness of the volume in question:

In the Catalogue of Staudinger-Rebel, which appeared 13 years ago, 238 forms of Zygænidæ were enumerated, while "Seitz" lists 418 Zygænidæ of the palearctic region alone; of Saturnidæ "Seitz" has 122, against "Staudinger-Rebel's" 31. Furthermore, "Seitz" describes 329 Sphingidæ against 100 mentioned in the

"Staudinger-Rebel"-Catalogue; of Cymatophoridae 86 are given in the "Seitz," while in "Staudinger's" work only 23 are shown; of Limacodidae 46 are found in the "Seitz," whereas 15 are accounted for in the catalogue mentioned above.

All in all, this volume describes about 3000 species of Spinners (or varieties thereof), besides about 300 Sphingidae. The number of coloured figures on 55 plates amounts to nearly 2400. When it is considered that the Moths and Spinners in the Staudinger do not quite number a thousand (in which, of course, some varieties are to be counted), one must readily admit that our knowledge of the palearctic region, with reference to Entomology, has been vastly increased by means of this gigantic work.

The reliability of the text, it must be said, can only be judged by those versed in this subject, or by specialists of the palearctic Fauna. The names of the authors, who contributed to this work, are so well known in the scientific world that one may readily place confidence in their statements and their scientific work.

By reading a chapter of the "Seitz," it will doubtless be ascertained that the numerous serviceable hints on collecting and rearing moths and caterpillars, are based upon personal experience; and that, furthermore, the author himself has personally bred the principal representatives of almost all the species, no matter whether they live in the Amur region, or in Syria, or in Mauretania, etc. He has, at any rate, observed them alive. The vast amount of information on food-plants, on methods of collecting, etc., are, no doubt, of the utmost importance to any collector; for is there any other book which mentions, e.g., at what hour the caterpillars of *Emydia striata* must be collected, in order to obtain them in greatest abundance? or is there one that cautions against delay in taking in the *Ognogyna* caterpillars, and admonishes us to collect them before the grass has grown so high that they are completely hidden from sight?

As in the first volume the plates are the most important features of the work. If anyone should presume the assertion to be too bold that it was left to the "Seitz" to show the world what really good figures are, he certainly ought to make a critical comparison with other works of this kind. The average collectors are, of course, satisfied with the illustrations in the new "Berge," and

everybody admits that the butterflies illustrated therein, in that complex mixed company, in which caterpillars, plants and butterflies are placed together upon a tinted background, present an attractive picture. But how do these "pictures" compare with those of the "Seitz" from a scientific viewpoint. If, for instance, a *Batis* in the "Seitz" be compared with the corresponding figure of a *Batis* in the "Berge" (Plate 28, figure 49e), a vast difference manifests itself. This also applies to the illustrations of the Vienna Emperor Moth. Looking at Plate 29 of "Berge," without comparing with nature, one is well pleased with the figure of "pyri," fig. 1b; but a comparison with the figure in the "Seitz," table 31b, discloses the mistakes of the former at once. The borders and the ground colour of the wings in the "Berge" are yellowish red, whereas, in reality they are grey, as correctly depicted in the "Seitz." Of course, the representation of *pyri* in the "Seitz" does not make a brilliant showing, as only one-half of the insect is illustrated, and is furthermore not as finely elaborated, in order to be in accordance with real nature, and because it does not show any head. But by comparing it with a specimen in one's collection, it is at once evident that, viewed from above, *pyri* seems to be headless, as do also *spini* and *pavonia*. The figure in the "Berge," which shows a big head, is a mere phantasm, while the half figure in the "Seitz" is genuine nature. It is, therefore, to anybody who earnestly intends to work in Entomology far more valuable, than the "trimmed-up" and "pleasingly grouped" illustrations of amateur-works.

This apparently trivial point has been mentioned quite intentionally, as there is a species closely resembling *pyri*, namely, *atlantica*, in which, viewed from above, the forehead is clearly to be seen.

To convey an idea of the number of plates contained in the different volumes of "Seitz," so far printed, it may be mentioned that up to last year they already exceeded 500.

As it is, the author has unquestionably earned well-deserved praise with the eminently satisfactory issue of the "Second Volume of Macrolepidoptera." In the meantime Volume III has also been finished, and Volume IV is nearly completed. It goes

without saying, that these new publications are just as excellent in every particular as the two former ones.

"MACROLEPIDOPTERA OF THE WORLD" is also published in a separate English Edition by the "Verlag des Seitz'schen Werkes," Stuttgart, Germany. WILHELM LEHR, Baltimore, Md.

THE officers of the London Biological Club, whose names were omitted from our notice in the May number (p. 184), are as follows: President, Dr. H. W. Hill; Vice-President, Dr. S. Wolverton; Curator, Mr. J. F. Calvert; Secretary-Treasurer, Mr. J. W. Noble.

#### THE OCCURRENCE OF THE HOUSE CENTIPEDE, *SCUTIGERA FORCEPS* RAF., IN CANADA.

When retiring for the night on April 15th I was most interested to capture in my bathroom at the hotel in which I was staying in Toronto, an adult female specimen of this remarkable myriapod, whose occurrence in Canada has not been previously recorded, so far as I am aware.

It is a southern species, its normal habitat being the Southern States. As early as 1849 it was observed in Pennsylvania, and it has gradually spread northward. Mr. R. V. Chamberlin informs me that the most northerly locality which he has recorded from it is Boston, Mass., and that it also occurs at Ithaca, N. Y.

The captured specimen, after enabling me to study its method of capturing flies, died a few days after my return to Ottawa. *Scutigera* feeds on house-flies, roaches and other household insects, springing on them and imprisoning them in its unusually long legs. An account of its habits is given by Marlatt in Howard & Marlatt's "Household Insects" (Bull. No. 4, N. S. Div. Ent., U. S. Dept. of Agric., pp. 47-50, 1896. C. GORDON HEWITT.

PROFESSOR WALTER C. O'KANE, Entomologist to the New Hampshire Experiment Station, and Professor of Economic Entomology in New Hampshire College, has been elected Professor of Zoology and Entomology at the Ohio State University, from which he graduated in 1897. He is widely known as the author of an excellent work on injurious insects, published in 1912.

## A NEW WASP FROM THE PHILIPPINE ISLANDS.

BY T. D. A. COCKERELL, BOULDER, CALIF.

**Cerceris angularis**, n. sp.

♀.—Length about 16 mm., anterior wing a little over 14; black, with the abdomen largely red; no yellow markings, except that a high keel between the antennæ is pale yellow, and the mandibles have a broad, dull straw-coloured longitudinal band on the basal half; head very large; eyes converging above; vertex and cheeks very broad, with strong punctures on a shining ground; ocelli close together; face covered with appressed silvery hair; antennæ black, apical joint partly red; clypeus not keeled, but transversely obtusely elevated in middle, the part above the elevation dull and feebly punctured, that below it smooth and shining, the lower margin indistinctly bidentate, with a little round tubercle in the submarginal region above each tooth; mandibles with an enormous triangular shining tooth on inner side about the middle; molar space wanting; thorax dull, with large but not very deep punctures, those on the mesothorax in grooves, the margins of the grooves forming longitudinal ridges, especially in the anterior middle region; area of metathorax with weak basal plicæ, and beyond with oblique plicæ, which arch over and join in the middle line, where they become transverse; under side of thorax with fine silvery tomentum; mesopleuræ grooved, extended into a great angular projection or tooth, the sharp edge of which is vertical; legs black; tegulæ black; wings dark fuliginous, venation normal; abdomen with the joints beyond the second not constricted; punctures distinct but sparse; first segment black with an apical red band; second and third segments bright ferruginous; remaining segments black, except that fourth is red at extreme sides; venter with very minute punctures, and scattered larger ones; fifth ventral segment depressed in middle, sixth deeply incised; pygidial plate finely rugose, narrow, truncate.

*Hab.*—Mt. Makiling, Luzon (Baker). Structurally somewhat allied to *C. elizabethæ* Bingham, but that is a much smaller species, with different colours. In many ways *C. vafra* Bingham is apparently allied, but it is larger, with a different clypeus, etc.

FORMER students of Professor John Henry Comstock have raised a fund, to be known as the Comstock Memorial Library Fund, which is to be presented to Cornell University for a permanent memorial of Professor Comstock's forty years of distinguished service as instructor and professor of entomology. He is to retire from active teaching as a member of the faculty next June, at the age of sixty-five. The ceremony of presentation will take place on June 13.—[*Science*.

Mailed June 10th, 1914.