only the larvæ, but the beetles, feeding freely on the leaves, showing no disposition to feed on plant lice, the generally acknowledged food of the *Coccinellida*. To test this, one of the beetles was placed in a jelly dish with a leaf, upon which it at once went to feeding, and I saw them doing the same thing on the vines. The larvæ in feeding eat the whole of the tissue on the under side of the leaf, except the veins, leaving the upper epidermis. The beetles usually eat this, leaving only the veins.

Assuming the egg period to be 5 days, and the third and fourth larval periods the same as the first and second respectively, we would have a period from the egg to the imago of 35 days, which can not be far from correct. They probably pass the winter in the imago state, as do others of the family.

PSEPHENUS LECONTEI—ON THE EXTERNAL ANATOMY OF THE LARVA.

BY D. S. KELLICOTT, BUFFALO, N. Y.

This singularly interesting larva occurs in abundance in the rapids of the Niagara above the Falls. The writer has taken it in other rapid streams in Western New York, also at different places in Michigan; besides, its occurrence in widely separated localities has been recorded by observers, hence we are led to believe that it is distributed throughout Eastern North America. Dr. Leconte has described another species, *Ps. haldemanni*, from the peninsula of California; its larva, it seems, has not been described.

The first notice of our larva is that by Dr. Kay in Part VI. (Crustacea), page 53, Zoology of New York, 1844. It is described in that work as a new genus and species of Crustacea, under the name *Fluvicola Herricki*; a poor figure is given. Dr. John L. Leconte, in Agassiz's Lake Superior, page 241, 1850, describes it more exactly; he gives an account of the parts of the mouth; no figures are given. In the proceedings of the Philadelphia Academy of Sciences, Vol. VI., page 41, 1852, the same author has a brief account of the larva, but adds no additional facts. In Dr. Packard's Guide to the Study of Insects, page 450, 1870, the characteristics of the larva are briefly stated, and a figure is given which shows well enough the outline of the insect.

The present paper is intended for a supplement to those already published, while it is believed that in a few instances inaccuracies in them are corrected, and some omissions are supplied; yet it is acknowledged that it is far less complete than it might have been, had full advantage been taken of the material at hand. The dissected parts, particularly those of the mouth organs, which served for the drawings of the figures, have been mounted in balsam for preservation.

The larva of *Psephenus* has been compared with those of *Helichus* and *Elmis*; from the latter it is said to differ in no important particular. Figure 2 of the plate represents a larva supposed to be that of *Helichus lithophilus*, Germ., and is introduced for the purpose of comparison with *Ps. Lecontei* (Fig. 1). The general resemblance is close, some essential differences appear, but no full description of the larva of *Helichus* is at hand for comparison.

The young larva of *Psephenus* is found clinging to stones, the shells of *Unio*, old wood and the like, usually where the flow of water is considerable, often in the wild rapids, yet they have been taken in quiet water along the shore, or even in ponds entirely cut off from flowing water; their flat, disc-like form, concave below, marginal cilia and powerful legs enabling them to resist the swiftest current.

Excluding the head the larva is made up of twelve rings; the body proper is but little broader, relatively, than that of many other Coleopterous larvæ; the shield form is due to an uncommon extension of the tergal folds, *pleurites* of the first ten body rings. The prothoracic segment is broad, and extends over the head like a buckler; it is divided by sutures into six parts; those on either side of the median suture are each divided into two by a suture from near the anterior edge obliquely backwards to near the middle of the posterior border; the external pieces correspond with the *pleurites* of the following rings (Fig. 1, *a*). The second and third thoracic rings are broad, nearly equal, the expanded plate of the mesothorax is, however, more wedge-shaped than that of the post-thorax, in order that its outer margin may complete the outline curve with the prothorax. The first three rings occupy one half of the expanded surface of the larva.

The seven succeeding abdominal rings have nearly equal length, but gradually diminish in width from the first, the widest part of the body, to the eighth and ninth. These two have nearly equal width. They are, however, considerably longer than the abdominal joints above them. The

terminal joint is thick anteriorly, but posteriorly it becomes membranous, thus agreeing with the pleurites of the anterior rings; the anal opening is situated in the thickened part (Fig. 1, *b*). The abdominal segments from one to seven, like those of the thorax, have each a wide, more or less wedge-shaped lateral expansion; that of the first extends at right angles to the body, but those of the following rings are, more and more, directed backward, that of the seventh being parallel to the line of the body, so that the oval outline of the larva is preserved, although the eighth segment lacks the prolongations. There is a plain suture in the median or dorsal line (Fig. 1, *c*); there is also one dividing each ring at the base of the pleurite (Fig. 1, *d*). These lateral sutures or fissures are more pronounced on the terminal segments. The anterior, free edges of the pleurites bear a few stiff hairs, while the outer edges are furnished with a close-set ample fringe of sub-equal hairs.

The general color is grayish brown; under a lens there are blotches of a darker hue spread over a lighter field; moreover, the whole upper surface is marked with irregular lines of black dots, which appear to be elevations.

"The articulation itself is prolonged each side for a short distance between the laminae of the expanded epidermis, so that the outline of the proper fleshy portion is serrate." The epidermis of the upper surface is somewhat corneous and thick. Figure 4 shows a cross-section of the second abdominal segment. It exhibits the almost uniform arch above and the thin tegument of the ventral surface extending out to form the under surface of the pleurites.

The *head* is not retractile, except in the sense that the upper surface of the prothorax is permanently prolonged over and beyond it. The head is flattened above; the epicranial suture is short, the clypeo-cranial sutures extending well up on the top of the head; they terminate at the place of insertion of the antennae. The suture separating the clypeus from the labrum extends from antennae to antennae (Fig. 5, *e*). There are six ocelli in each group. When mounted as transparent objects, each shows an oval outline, with a clear border surrounding a dark, more or less, oval center. The resemblance to the reptilian blood corpuscle is very close. Five of the ocelli are in a slightly curved line with their longer axes nearly parallel; the sixth is placed at the upper outer angle of the group, with its axis at right angles to those of the others. It is also the largest one of the group (Fig. 9). There is a little patch of hairs between the ocellus and the adjacent suture.

The antennæ are as long as the head, and four-jointed; the first or basal joint is short and stout; the second is cylindrical, or but slightly narrowed at the upper end, nearly straight, and as long as the width of the labium, or a little more than half the length of the whole antennæ; there are a number of long hairs or bristles on the outer side of the distal half of this joint; the third is more slender, slightly more than half the length of the second (Fig. 5, *a*); the fourth joint is represented by two very short articles inserted in the third, so that they resemble a pair of minute forceps; the larger of the two has a cuspidate apex (Fig. 6).

The *labrum* is broad, the anterior margin straight, or slightly rounded, the outer corners convex; the outer third bears a row of rather coarse spines, the two extreme ones being much stouter. The labrum extends beyond and bends down over the mandibles. Its concave under surface is beset with many stiff hairs, some of which extend beyond the margin, forming a fringe. In the front, near the middle of this concave surface, there are eight protuberances; four smaller ones in a group; outside of these, two on either side, are situated the remaining larger ones. These are tooth-like (Fig. 12, *a* and *b*). Beginning back as far as the middle of the mandibles is a corneous strip, which soon divides, the branches extending to the outer angles of the labrum (Fig. 12).

The *mandibles* are large, brown or black towards the tips. Seen from above the outline is triangular; in the younger larvæ these organs are relatively shorter, making the outline more nearly that of an equilateral triangle. The basal edge is slightly convex, and bears just beyond the middle the ball for the articulation of the organ with the elbowed corneous support of the cheeks. (In some examples the ball appears to be situated nearer the outer angle than in others). At the inner angle there is a process and a chitinous piece, apparently articulated with it, to which the tendon of the flexor muscle is attached; the outer angle is somewhat re-entrant; the termination of the extensor muscle appears to be quite similar to that of the flexor; the outer edge is nearly straight, bending inwards a little towards the apex; the inner line is straight to near the middle where it bends in the blade, becoming spoon shaped; the biting edge is evenly rounded. When the organ lies with the inner face uppermost, it is seen that in the basal part there are two laminæ not united with each other on their front and posterior edges; at the lower part of the concave part of the blade arise two tufts of hair, the outer one is short and bristle like, the other is long, reaching back and nearly across the throat (Fig. 8).

The *maxillæ* are complex ; the stout cardinal piece is chitinous, bearing on its surface two sharp hooked teeth ; the superior part is divided into two lobes, the outer one is soft and fleshy, rounded at the apex, having its surface beset with long, stiff hairs ; the inner one is concave above, and bears at its apex four stout teeth, which have rounded extremities and the inner face concave ; along the inner surface of the lobe there are several strong pointed curved spines. The maxillary palpi are four-jointed ; the basal joint is short and broad ; the remaining articles diminish regularly in diameter ; the second and third are about the same length, equal to twice that of the first ; the third is rounded at the end, and more than half the length of the fourth. There are apparently several minute tubercles on the rounded surface of the extremity. The same appear on the corresponding joint of the labial palpi (Figs. 5 and 10).

The *labium* extends over the under surface of the jaws nearly to their tips ; its texture is membranous ; its surface is densely clothed with hairs ; the somewhat quadrate mentum is situated between the stout maxillæ. On its outer sides there are two elevated corneous pieces ; they each have a pointed, tooth-like upper extremity. A long hair arises from its outer surface. A faint suture divides the anterior or palpi bearing part from the mentum. This piece is as wide as the distance between the maxillæ ; the front edge is bisinuate ; the labial palpi are situated at the posterior outer angle of this palpigerous piece. They are three-jointed ; the first and second are stout, and the terminal one narrower and bent inwards. These organs project a little beyond the anterior edge of the labium (Fig. 11).

The legs are rather long and muscular. The tarsus ends in one strong claw ; there are many stiff hairs over the surface. Above the claw there is one long, straight bristle ; just above it, on the inside, there is a little tuft of bristles.

The *branchiæ* are situated on the posterior border of the ventral surface of the second, third, fourth, fifth and sixth abdominal rings—five pairs in all. The stout branchial trunk, a short distance above its origin, bends outwards, and bears along its lower surface eleven long filaments, the middle ones are longest. These long white organs are seen waving to and fro continually while the animal is alive. This motion appears to be due to the up and down strokes of the last segment, which repeatedly strikes the water as the tail of a cray fish does when swimming. A large tracheal tube may be traced, on either side, from the posterior border of the eleventh ring forward, over the insertion of the branchiæ, connecting with

them into the thorax (Figs. 4 and 7). No tuft of branchiæ thrust out and withdrawn at will, as in *Helichus*, could be seen, after watching living specimens for hours, and after dissecting many examples. The writer is inclined to think it does not exist, and that respiration is wholly accomplished by the ventral branchiæ.

It may be interesting to note the different sorts of hairs found upon the body and organs. These are, of course, those of the usual pattern common to all parts of the body surface. Found on the antennæ there are long, blade-like hairs, with their edges spined; they occur elsewhere (Fig. 13, *a*.) A modification of this sort is common on the legs, etc. They are short, with the spines finger-like (*b*); another variety is long and irregularly branched, found upon the labium and palpi (*c*); still another form fringes the posterior border of the *pleurites*; they have a short stalk, from the top of which radiate numerous fibres, fan-like (*d*). The hairs of the border fringe are invested in a sheath slightly colored brown. Immersion in potassa removes them from their sockets, leaving the edge of the segment serrate.

EXPLANATION OF THE FIGURES.

Fig. 1.—Larva of *Psephenus Lecontei*, dorsal view, magnified eight times; *a*, suture; *c*, dorsal suture (dotted line should extend further); *d*, suture base of pleurite; *b*, anus.

Fig. 2.—Larva of *Helichus lithophilus*, enlarged eight times; *a*, dorsal stripe; *c*, one of four light spots; *b*, anal tuft of branchiæ, protruded or withdrawn at will.

Fig. 3.—Leg of *Ps. Lecontei* (enlarged).

Fig. 4.—Cross section of second abdominal segment (enlarged); *c*, *c*, pleurites; *b*, *b*, branchiæ.

Fig. 5.—Head (enlarged); *a*, antennæ; *b*, maxillary palpus; *c*, chitinous band on under surface of labrum; *d*, ocellus.

Fig. 6.—Tip of antenna, showing forceps-like terminal joint (enlarged).

Fig. 7.—Branchia.

Fig. 8.—Mandible (enlarged one hundred times); *b*, chitinous support, the cheek articulating with the mandible; *b*, flexor muscle of the jaw; *c*, ball article; *t*, tufts of hairs.

Fig. 9.—Ocelli.

Fig. 10.—Maxilla; *a*, palpus; *b*, inner lobe; *c*, outer fleshy lobe; *d*, cardia; *e*, pointed papilla. Magnified one hundred times.

Fig. 11.—Labium ; *a*, palpus ; *b*, mentum ; *c*,

Fig. 12.—Labrum ; *a*, four small papillæ ; *b*, four strong teeth ; *c*, chitinous support. Enlarged one hundred times.

Fig. 13.—Hairs of different types ; *a*, from antennæ and elsewhere ; *b*, legs, etc. ; *c*, palpi ; *d*, posterior border of the pleurites.

CORRESPONDENCE.

FURTHER NOTES ON THE PSYLLIDÆ.

If I might judge of the feelings of the readers of the CANADIAN ENTOMOLOGIST by my own, I should say that they were much obliged to Prof. Riley for his note on the Psyllidæ, and for the accompanying illustration. Figure 7 of that illustration is, however, imperfect, in that (1) it fails to show the feet of the insect—an important consideration as regards Westwood's classification ; (2) it gives the appearance of the *dried* galls on an apparently fresh leaf : the fresh galls are much more pear-shaped—in many instances they are nearly globular ; (3) the section of the gall does not show the hardened inner roof of the cavity or cell.

I hope Mr. Riley will pardon me if I say that he indulges a tendency to be needlessly exact. When I wrote my description (and it proves to be the first description published) of the *Psylla* under our notice, I used the indefinite article *a*. In my subsequent note, when the insect had been distinguished by Prof. Riley's remarks—at any rate, when it was the insect under our consideration, I wrote *the*. The Professor seems to think that the readers of the ENTOMOLOGIST will mistake my meaning. I feel sure that they will not.

With regard to the term *Celtidis*, Endlicher and De Candolle (and the latter is undoubtedly a great name amongst Botanists) could scarcely have known Latin better than Pliny ; and one cannot help feeling that, as regards *Celtidis*, they went—well, to use Mr. Mantalini's gentle euphemism, “to the Bow-wows” for their Latinity. The nettle-tree, perhaps, was useful to the Celtic females, as the fig-tree was to Mother Eve ; but the tracing of *Celtis*, gen. *Celtis*, to *Keltidos*, genitive of *Keltos*, is indeed