

NOTES ON THE EPIPHARYNX, AND THE EPIPHARYNGEAL ORGANS OF TASTE IN MANDIBULATE INSECTS.

BY ALPHEUS SPRING PACKARD, PROVIDENCE, R. I.

(Concluded from p. 199.)

Order *Platyptera*.

Pteronarcys pupa.—In a specimen from Pagosa, San Juan River, Colorado, the surface of the labrum is provided with stout curved setae which are often forked at the end, like those occurring on the joints of the antennae and caudal stylets. The epipharynx is densely pilose on the edge and over the surface, but there are no sense-cups or rods.

Perla sp.—In a specimen from the Glen, N. H., the labrum is broad and very short, full and rounded, and there is no trace of a median furrow. The epipharynx has a narrow, curved, long, transverse area parallel to and situated near the front edge, on which are two opposing sets of broad-based "gathering" or "hooked" hairs; elsewhere the surface is covered with fine tactile setae, which arise from a cup-shaped base. There is a median furrow free from these setae, and I cannot detect any genuine taste-cups.

In another species from Montana there is the same structure of the epipharynx, which bears at the end a number of tactile setae arising from a cup-shaped base, but there are no true taste-cups.

Psocus novae-scotiae Walk. — La-

brum rather large and broad, and somewhat excavated on the front edge. The epipharynx in front is divided into lobes, the front edge of the middle one of which extends a little farther out than the lateral lobes, and has a straight edge. This lobe bears two rows of short setae, those of the distal or marginal row being shorter and consisting of five or six stouter setae, which are blunt at the tip and have the appearance of having been worn off. On the basal half in the middle is a large polygonal pilose area. I cannot detect any sense-cups.

Psocus sp.—In a species from Florida the labrum and epipharynx, with the armature of the latter, are as in the preceding species, and there are no sense-cups to be seen. They seem to be wanting in this genus.

Eutermes ripperti.—In a larval and a winged female from Nassau the labrum and epipharynx have the same shape and armature. The end of the labrum is full and round, with no trace of a median suture. The epipharynx is pilose, with a few long tactile setae. On the front edge is a transverse row of six gustatory (?) setae, each bristle being acute and arising from a beaker-like base. Along each side of the median line on the anterior half of the epipharynx is a group of about 20 scattered

peculiar long depressed tubules ending in a circular membrane, out of which a very short hair projects. These appear to be gustatory. There are also two curved rows of minute cells with a nucleus, three deep, which extend on each side from under the front edge of the clypeus and end near the front edge of the labrum, the two rows converging in front; they are very singular in shape, and towards the front the cells become much elongated and arranged in four or five close ranks. These are probably not sensory cups, but modified surface setae.

Termopsis angusticollis Hagen.—In a female from the Pacific Coast I cannot detect any taste-cups and any organs that appear to be gustatory. The surface of the epipharynx is simply pilose.

Order *Odonata*.

Calopteryx sp.—In a specimen from Florida the armature of the epipharynx is much as in *Diplax*, and there are 25 taste-cups on each side of the median line, but extending farther in front than in *Diplax*.

Diplax sp.—In this as the other dragon flies examined, the labrum is full on the front edge, but there is a fine median suture extending back nearly half way to the base meeting a wide triangular or V-shaped gap. On the anterior edge of the epipharynx is a row of long stiff tactile setae; there is a lateral group of tactile bristles pointing inwards and another smaller group of similar setae in the middle on each side

of the median suture, while a few minute hairs extend to the suture.

There is a group of about 14 taste-cups at the base of the labrum on each side of the median line; the central bristle cannot be seen, but as the nucleus is well defined when looked at vertically there is probably one present in each taste-cup. On the outside of each gustatory field are a few inwardly-directed defensive setae. Also outside of each group of taste-cups are near the base of the labrum a group of singular parallel sabre-shaped setae, pointing inwardly and likewise directed towards the base of the labrum.

Aeschna heros Fabr.—Epipharynx armed with small, short, slender bristles, which along the base (*i.e.*, under the base of the labrum) on each side of the median line become very stout and short. In front of this group of short setae is a pair of short-handled brushes consisting of stiff, coarse setae, one on each side of the median line. In the middle, but situated rather far apart, are two roundish pilose areas. There are two groups of about 25 to 30 taste-cups, like those of *Calopteryx* and *Diplax*, being without a distinct hair and situated as in those genera.

Order *Neuroptera*.

Sialis infumata Newm.—Along the median line of the epipharynx and near the front are about twenty scattered gustatory pegs, which are minute, but longer and more acute than usual. The other setae are large, long and scattered over both sides of the organ.

Chauliodes maculatus Ramb.—The entire surface of the epipharynx is covered with very fine hairs which are broad at the base and very short. There are one or two taste-cups under the front edge of the clypeus; others are scattered along the middle from the base of the labrum to the front, but are not arranged in definite order.

Corydalis cornutus Linn.—The epipharynx of the female is covered with scattered tactile setae, and there are no sense-cups, pits, or rods to be seen.

Chrysopa sp.—In a specimen from Florida the labrum is deeply notched at the end. Over the epipharynx are scattered cups with a short acute bristle, which are probably gustatory in function, though they are not confined to the median region of the epipharynx.

Myrmeleon diversum Hagen.—Labrum very short, with a slight shallow median excavation. As in *Chrysopa*, the presence in the epipharynx of sense-pits or taste-cups is doubtful. What at first seem scattered taste-cups, mostly bear long tactile hairs, which in some cases are very fine and short. But there is a group of pits, probably gustatory, about twelve on each side of the anterior clypeal region, from one to three of them being situated on the base of the labral region; there are also a few on each side near the base of the labral region, some of those in the triangular area near the front edge of the epipharynx may also be gustatory in function. On the whole I am disposed to regard these structures as taste-cups.

Mantispa brunnea Say.—In a speci-

men from Utah the labrum is rather long and pointed in front, with no traces of a median suture. On the side of the epipharynx are tactile hairs, but along the middle from the base to near the front edge are scattered about 30 unmistakable taste-cups, each bearing a short, fine hair. This confirms me in the belief that the structures above described in *Chrysopa* and in *Myrmeleon* are also gustatory.

Order Coleoptera.

I have been unable to detect any sense-organs in the epipharynx of *Dendroctonus rufipennis* Kirby, or of *Lucanus dama* Thunb; on the other hand, taste-cups occur in the larva of cerambycid, scarabaeid and other beetles; but I have been unable to discover any taste-organs in the larva of a rather large elaterid from Florida. Moreover, taste-cups appear to be about as well developed in the carnivorous beetles *Carabidae* as in the phytophagous or lignivorous groups.

Epicauta maculata Say.—Labrum hollowed in front. Epipharynx with unusually numerous taste-cups, which are conical papilliform, and truncated at the end as if open, the edge of the opening is ragged, but no distinct bristle is present, except in a few. Over 100 taste-cups were counted in the middle and near the front; around the edge of the sinus is a regular marginal row of large, longer, more distinctly chitinized taste-cups, whose walls are streaked up and down by chitinous thickenings. It will be seen that in number, structure

and arrangement these organs present excellent and distinctive specific characters.

Epicauta callosa Lec. — In a specimen from Montana, the labrum is notched and on the epipharynx over the region around the bottom of the notch, and from these to the base of the labrum are scattered about 55 taste-cups; and also on either side of a median setose ridge which passes back under the clypeal region are about 10 cells, which may be taste-cups.

Nemognatha lurida Lec. — In a female from Montana a large triangular area extending to and widening out on the front edge of the epipharynx contains about 80 remarkably small taste-cups, not more than $\frac{1}{4}$ to $\frac{1}{6}$ as large as those on the maxillae of the same beetle. Unless these are gustatory it is difficult to account for their presence here and it will be observed that the taste-cups in *Epicauta* are unusually abundant.

Eleodes obsoleta (Say). — In this tenebrionid from Montana, the epipharynx is provided with a group of from 15 to 20 taste-cups on each side in the middle of a squarish area situated in front of the middle, and whose sides are densely setose.

Diabrotica vittata (Fabr.).—In the common striped squash beetle the labrum is suddenly and deeply notched, though there is no trace of a median suture behind the notch. The epipharynx has a singular armature. Just within the bottom of the labral notch on the under side is a row of four, broad, conical setae, whose tips just reach the

bottom of the notch. Along the front edge on each side of the notch is a row of most singular broad, flat, thin, leaf-like setae which are closely appressed to the broad, naked, epipharyngeal margin. The surface of the epipharynx is pilose, but the median region is naked, and on the anterior half bears from 11 to 12 taste-cups, arranged each side of the median line in a rude Y. On each side at the base of the labial region are two sensory fields, each bearing about 25 to 26 taste-cups. More were seen under the clypeus.

Leptura canadensis Fabr. — Front edge of the labrum and epipharynx densely fringed with slender, curved, truncated setae. I can see numerous taste-cups under the base of the labrum, and what seems to be scattered taste-cups in front, but the labrum is too opaque for a clear view of them.

Euryptera lateralis Oliv. — In a specimen from Florida the epipharynx is fringed with long, slender, truncate, slightly curved hairs projecting from the front edge. Taste-cups are abundant along and near the middle of the anterior half of the labral region.

Cyllene robiniae Forst. (or *pictus* Drury). — Labrum slightly excavated. Epipharynx with a dense row of long, slender, blunt rods, filling the sinus and extending beyond the edge of the labrum. An area on each side gives rise to very long tactile hairs, between which and the median field of taste-cups is a pilose lateral area. The taste-cups are more numerous than usual, extending in an unbroken sensory field

from near the front margin of the clypeal region to near the front edge of the epipharynx. The cups vary much in size, some being one-half as large as others; and those on the sides of the sensory field bear short, and a few others rather long bristles, showing that the taste-cups are modified tactile bristles.

Lachnosterna fusca Fröhl.—Labrum deeply notched, the sides of the sinus armed with large, blunt setae. Epipharynx bearing on each side, outside of a spring area, a group of about 50 taste-cups, each bearing a long setae, and passing externally into a few high, rather slender papillae, without a seta. On the under side of the clypeus is a median group of 10 taste-cups of singular form, the cups being large, with broad bases which posteriorly bear three spines, of which the median one is the largest. Behind these organs, the membrane is covered with slender "gathering" hairs, which differ from any previously observed in having a nucleus at the base.

In a specimen from Montana belonging to an allied genus, there is a group of about 30 taste-cups, which occupy the same relative position as in the preceding species.

In *Lucanus dama*, the entire surface of the epipharynx is pilose, and there are no taste-cups, or sensory organs of any kind present.

Clerus nigripes Say. — Labrum deeply cleft, but with no trace of a median suture. Surface of the epipharynx not pilose, but with scattered defence setae. Near the edge of the

bottom of the sinus is a group of 4 or 5 taste-cups, situated on each side of the median line, each bearing a small, acute bristle. Behind these, under the clypeus are two groups of 10 taste-cups each, situated some distance from the median line.

Telephorus rotundicollis Say.—Labrum notched. The epipharynx is quite unlike that of other beetles described, extending quite far in front of the labrum, forming a thin, pale, membranous, pilose edge, and not provided with taste-cups. On each side behind under the clypeus, is a sensory field with 26 taste-cups, which are rather smaller than usual. Over the labral surface are scattered a few taste-cups (?), but they are small and perhaps not gustatory.

Lucidota punctata Lec.—In a Floridan specimen the labrum is narrow, rather long, slightly rounded in front, with no traces of a median suture. Under the clypeus is a group of 12 taste-cups, and in the middle region of the labrum situated in a field extending from near the base to near the front edge are about 40 taste-cups, which, however, are not, as is usual, arranged on each side of the median line. The whole surface is pilose, and the taste-cups instead of being as usual, situated in a bare region, are scattered among the hairs forming the pile.

Buprestis maculiventris Say. — Epipharynx with a few scattered, peculiar, large setae appressed to the surface, and among them are a few minute, sharp, either curved or straight pegs or setae, which may possibly be gustatory,

but no true taste-cups were observed.

Corymbites hieroglyphicus (Say).—Labrum full, slightly notched in front with apparently faint traces of a median suture. Epipharynx pilose, the hairs longest on each side. A few small, scattered taste-cups under the base of the labrum and others scattered along the middle towards the front edge. On each side of the anterior clypeal region is a group of 5 taste-cups.

Campylus denticornis Kirby.—Over the pilose surface of the epipharynx are scattered what may be sensory pits, but they are not situated in a bare area, but among the fine hairs, and these organs may be simply tactile.

Staphylinus violaceus.—In a specimen from Florida, the structure of the labrum is most singular. It is cleft to its base, being divided into two long lobes, with large long setae, and the deep sinus is filled with very long, densely arranged setae. Epipharynx pilose; under the clypeus, on each side near the middle, is a bare rounded area in which are situated 4-5 papilliform taste-cups, and at the base behind them is another linear group of about 7 slender, somewhat curved taste-cups.

Dytiscus sp.—In a ♀ Floridan specimen there are on the epipharynx under the clypeus, about 25 taste-cups, which are papilliform, being higher than usual; and on each side under the base of the labrum is a sensory field containing a number of taste-cups.

Harpalus faunus Say.—Epipharynx with a median triangular depression beginning at the base and widening

towards and ending on the front edge; this trough is lined with a row of spines, which are shortest towards a point lying under the base of the labrum. Over the bottom of the triangular depression (as it appears under the microscope, but in reality the roof of the area) are scattered shorter spines, and since ganglionated nerves can be traced to each of the spines along the front edge, they are evidently at least tactile setae, and not simply adapted for defence. At the bottom of the furrow are four brushes of bristles, and the posterior surface is covered with very fine, short, "gathering hairs." The taste-cups are situated on a narrow linear field, one on each side, lying half-way between the middle and outer edge of the epipharynx, beginning under the middle of the clypeus and extending only to a point situated under the base of the labrum. The taste-cups themselves are in irregular rows, 50 in all, and in addition there is an aggregation of 9 or 10 cups at the anterior and inner end of the gustatory field. Like the others, these aggregated cups bear each a central, short, conical peg. A bundle of thick nerves can be seen ending each at the base of the cup.

Chlaenius tomentosus (Say).—The epipharynx bears at a point situated under the base of the labrum midway between the median line and the outer edge, a field on which are situated 25 taste-cups. This area extends towards the middle of the labral region. In front of this region, owing to the capacity of the labrum itself, no taste-cups could be detected.

Calosoma calidum (Fabr.). — Labrum very deeply cleft; the sides of the cleft lined with long bristles. There are about 45 taste-cups on each side under the base of the labrum. The cups are papilliform, being rather high, with a seta arising from each.

Cicindela hirticollis Say.—In a Floridan example, the structure of the epipharynx is singular; there are no taste-cups, except a few on two large,

round, raised areas, which are guarded in front by a few very long setae. On the surface of each area are numerous very long setae which may if not tactile, have some other sense, as they arise from cup-like bases or cells. Those on the outside are like true taste-cups, with a bristle but little larger than normal in taste-cups generally. I am disposed to regard this sensory field as a highly specialized gustatory apparatus.

VARIATION OF COLOR IN THE LARVAE OF SPHINX GORDIUS.

In September, 1888, we found, in Nonquitt, Mass., feeding on sweet fern (*Comptonia asplenifolia*) and low huckleberry (*Gaylussacia dumosa*) five larvae of peculiar coloring. The head was large, rounded, green, with face-lines of pale yellow-green, edged behind with black. Mouth-parts dark.

The body was 2 inches long, of a very dark olive-green overlaid with deep wine-color, especially on the back. It was *very smooth* in every specimen, and irregularly dotted with white points encircled with black, except the anal shield, which was dotted with black.

There were seven white obliques, shaded above with a little crimson, then edged with very dark wine-color.

Caudal horn was black with no side lines.

Anal shield edged with light green.

Spiracles were red lines set in light green spaces, and inconspicuous except the first segment.

Feet red; prolegs of body color, being lighter on the under side.

On June 16th, 1889, one of the pupae formed by these larvae gave *Gordius* ♂.

We can find no mention of such coloring in any of the books to which we have access, and it differs much from that of the ordinary larvae, of which we had fifteen or twenty.

Ida M. Eliot, Caroline G. Soule.

PROCEEDINGS OF SOCIETIES.

COLORADO BIOLOGICAL ASSOCIATION.

REPORT ON ENTOMOLOGY — JAN., FEB., MARCH, 1889. — The membership now numbers 51; the following entomologists have joined during the past three months: Lord Walsingham, Mr. W. S. Foster, Dr. Geo. H. Horn, Mr. J. Jenner Weir, Prof. A. S. Packard, Rev. C. J. S. Bethune, Mr. H. Edwards, and Mr. John T. Carrington.

The additions to the insect-fauna of Colorado, recorded in the books of the association,

are as follows: coleoptera, 118 and 2 vars.; hymenoptera, 68; orthoptera, 1; rhopalocera, 6 and 3 vars.; heterocera, 76 and 4 vars.; homoptera, 5; heteroptera, 5; diptera, 9 and 1 var.; arachnida, 3 and 2 vars. Several of the hymenoptera are undescribed, but will be fully dealt with by Mr. Ashmead, who has in preparation a list of the hymenoptera of Colorado.

Nine reports have been published, containing, among other entomological matter, accounts of the tent caterpillar, the Colorado cabbage flea-beetle (*Phyllotreta pusilla*), the thistle-bud fly (*Scriptotricha culta*), the large flat-headed pine borer (*Chalcophora virginensis*), and *Euryomia inda*.

The library has been enriched by numerous additions, notices of which have appeared in the weekly reports.

A meeting was held at West Cliff on 29 Jan.: the secretary read a paper on ichneumonids.

Owing to the time of year, but little field-work has been done, and our energies have been mostly directed to the identification and classification of specimens captured last year. Mr. Horace G. Smith, Jr., of Denver, has submitted a small but interesting collection of butterflies from Arapahoe co., to Mr. H. W. Nash, and among them he finds a ♂ *Callidryas philea* L., which is new for Colorado, and also an example of *Paphia troglodyta*, and one of *Papilio rutulus*. Mr. W. S. Foster has sent some valuable notes on his captures at Salida and in Marshall Pass, the latter locality being above 10,000 feet. Mr. H. W. Nash sends a note of the occurrence of *Nisoniades alpheus* Edw., in Pueblo co.

Numerous species of insects have been kindly examined and identified by Prof. C. V. Riley, Dr. Geo. H. Horn, Dr. John Hamilton, Prof. A. S. Packard, Mr. W. H. Ashmead, Mr. W. H. Edwards and Lord Walsingham.

T. D. A. Cockerell (Secretary)



Hindawi

Submit your manuscripts at
<http://www.hindawi.com>

