

Practically all of the work reviewed above is **constructive**, and as such it is to be commended and emulated. The descriptions show careful preparation and that attention to details which is so essential to taxonomic treatment of these flies. Contrasted with this work is that performed by the late Mr. Coquillett, which was **destructive** to the extent that it attempted to sink into the synonymy valid generic and specific names. The synonymy indicated in his "Revision" and "Type Species" very largely remains to be verified, while it is safe to say that a very considerable part of it is absolutely unjustifiable. Furthermore, whenever it was possible so to manipulate type designations as to sink genera, he has not neglected the opportunity. Such work is a pulling down which leaves us worse off than before.

What is needed in the Muscoidea, and especially in the Exoristidæ and more nearly allied families, is an intensive study of the numerous forms thoroughly and conscientiously carried through, without bias and with that keen judgment of character values and natural appreciation of phylogenetic relations which stamp the master zoölogist. Each one of us must strive as best he can to attain this result.

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## NOTES ON THE FEEDING AND REARING OF THE MIDGE, *CHIRONOMUS CAYUGÆ* JOHANNSEN.

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During a brief opportunity for study in the Limnological Research Laboratory at Cornell University, at the suggestion of Professor James G. Needham, I undertook the problem of feeding bloodworms on a known food. Pure cultures were obtained and placed in sterilized media and kept under constant control. The larvæ, hatched from eggs, grew rapidly, pupated, and emerged in adult form in a little over a month's time. The details of the experiments are noted in the following paragraphs.

On April 28 a mass of eggs was collected with algæ in a pond at the field station near Cayuga Lake, Ithaca, New York. It was a rounded, pear-shaped mass of gelatine 2.5 by 6 millimeters in size,



with the eggs arranged in quite distinct rows about the center, some showing the elongated shape of the egg in side view and others pointing toward the center of the mass. Near the edge of the mass the eggs appeared more crowded and the row-arrangement was less distinct (figure *e*). The eggs themselves are oblong, slightly flattened on one side. When collected they showed the little white embryo well developed and nearly surrounding the brownish yolk which is located on the flattened side of the egg.

The eggs were placed in water in a watchglass and, on April 30, the little embryos were hatching out and moving about in the gelatine. On April 31 they all except one or two had left the gelatine and were walking about freely over the bottom of the watchglass. They measured .7 mm. in length and there were about two hundred of them.

The larvæ were raised in jelly glasses where they could be controlled. Mud and dead leaves from the bottom of a pond where chironomid larvæ lived were boiled to kill all the larvæ that might be present and then, when cooled, put one fourth inch deep in the bottom of the glass and covered with one inch of water. A small piece of cheese cloth was also put in for the larvæ to crawl upon. Then the tiny larvæ were transferred to these glasses, April 31, and were fed every other day with pond weed, mainly *Potamogeton crispus*, which had been ground up by scraping it on the side of a file. This was the only food supplied them.

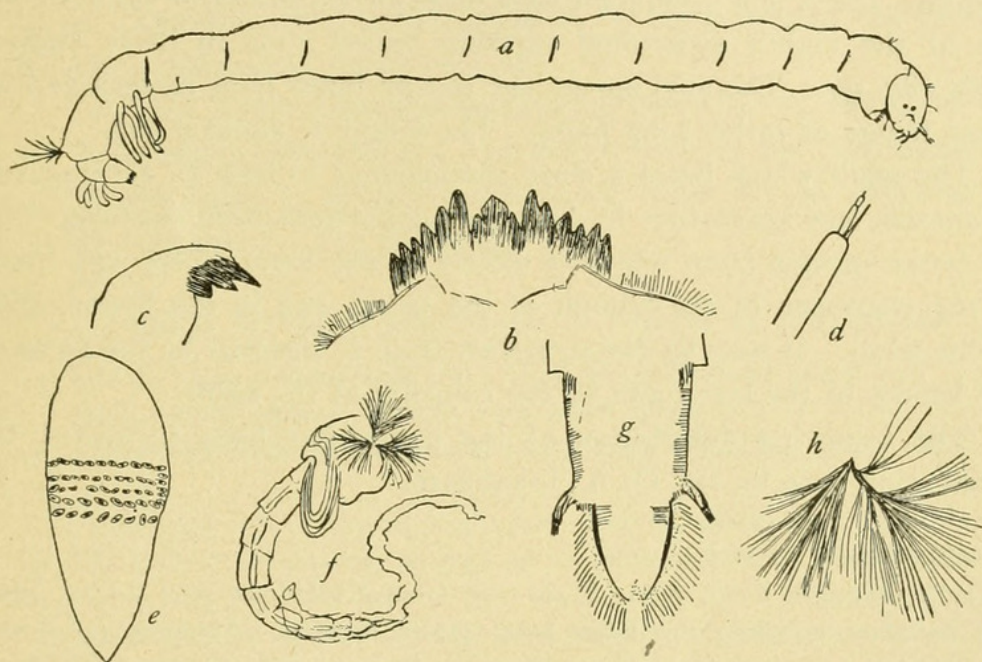
Little as they were, they began immediately to make cases of silk and sediment about themselves. They stay in their cases most of the time, reaching out and weaving about in the water when they wish to feed, with only the caudal end of the larva remaining within the case, sometimes coming out of one end and sometimes the other end of the tube. If disturbed, they retreat quickly into the tube.

They grew rapidly, beginning to show the red color May 6, and twist about in the water. May 12 they measured 5 mm. in length; May 21, 10 mm., and May 30, 11 mm. The largest one was 12 mm. The cases of the large larvæ were very long, many extending upward from the bottom, so the opening nearly reached the surface of the water. They were made mainly of silk and were so thin that the larvæ within could be plainly seen.

The larval period is about one month. May 31 one pupated, and another June 2, but both died. June 6 another pupated and emerged as an adult male June 7. Others continued to emerge until June 25.



The grown larva is blood red in color and 11 to 12 millimeters in length. The antenna is short, consisting of one main segment two thirds of the whole length, bearing two other parts, one slender and unsegmented, and the other divided into three unequal segments (fig. *d*). The eye consists of two distinct spots on the side of the head. The larva is free from setæ except six microscopic ones on the top of the head and two on the thorax. The mandible is rather large,



(*a*) Lateral view of larvæ showing two kinds of blood gills. (*b*) Border of labium of larva. (*c*) Larval mandible. (*d*) Larval antenna. (*e*) Egg mass (details, in part, omitted.) (*f*) Pupa not wholly withdrawn from the old larval skin. (*g*) Caudal end of pupa showing tail fin and lateral spine. (*h*) One of the three thoracic gill tufts.

with three prominent black teeth (fig. *c*). The labium has a blackened edge with a three-lobed tooth in the middle and a pair of closely united teeth longer than the middle one, together with four other shorter teeth on each side (fig. *b*). On either side and a little below the labium is a prominent row of setæ. The anal blood gills on the eleventh segment are present and those on the twelfth segment are rather long and rounded (fig. *a*).

The pupa is blood red at first, like the larva, but soon takes on the brownish color of the adult. The respiratory organ consists of a cluster of three beautiful white plumes located on each side back of



the head and composed of finely divided filaments (figs. *f* and *h*). The pupa is not very active and lies much of the time on its side at the bottom of the glass with the abdomen bent under until the caudal fin touches the head and occasionally it moves the abdomen rapidly back and forth, causing the caudal fin to beat against the respiratory plumes as if to create currents of water over them. The lateral margins of all the segments of the abdomen, except the first, have two brown dashes. There is a prominent dark spur on the posterior lateral margin of the eighth abdominal segment which ends in three slender teeth (fig. *g*). The anal appendage has an inner dark margin and an outer fringe of rather long hairs. The length is about 9 mm.

The adult which bears a close resemblance to both *C. decorus* and *C. dorsalis* has heretofore in American collections been confused with the latter species from which it differs in the form of the egg mass, in the character of the labium of the larva, and in the hypopygium of the adult. It may be distinguished from *C. decorus* by the form of the labium of the larva and by the coloring of the adult.

The following description of the imago has been furnished for publication here by Dr. O. A. Johannsen.

***C. cayugæ* new species.**

Male.—Length 6–6½ mm. Head and frontal tubercles pale yellow, palpi and antennæ including the large basal joints fuscous. Antennæ 12-jointed, the twelfth segment about three times as long as the ten preceding ones. Thorax and scutellum pale yellow, the humeri greenish, stripes on mesonotum dark chestnut brown, pectum and metanotum fuscous. Abdomen fuscous, the first segment greenish yellow with a more or less distinct brown transverse fascia; segments 2, 3, and 4 with the apical third of each, yellow; fifth segment with a narrow yellow apical margin. Hypopygium as in *C. decorus* (see Pl. 32, fig. 13, Bul. 86, N. Y. State Museum), the superior forceps being strongly curved. Legs yellow, the fifth and the tips of the other tarsal joints and of the tibiæ brownish. The joints of the fore leg beginning with the femur bear the relations to each other as 41, 37, 58, 30, 23, 20, and 11. Fore tarsi without long hairs; pulvilli extend beyond the middle of the claws on all the feet. Wings hyaline, cross-vein brown, costa and  $R_{4+5}$  end together a short distance from the tip of the wing; cubitus forks under the proximal end of the cross-vein.

Female.—Like the male in color except that the paler margins of the abdominal segments are narrower and covered with a grayish bloom. The antennæ are 6-jointed, the fore metatarsus is slightly over 1.6 times the tibia in length, and the cubitus forks slightly distad of the proximal end of the cross-vein.



Tilbury, Mary Ruth. 1913. "Notes on the Feeding and Rearing of the Midge, *Chironomus cayugæ* Johannsen." *Journal of the New York Entomological Society* 21, 305–308.

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