

- - - THE INTERNAL ANATOMY OF THE PERLIDAE. - - -

F. C. Sweet.

The insect chosen for this work is the larvae of the perla - which can be found in almost any running stream having a rocky bed.

The Perlidae are insects of moderate or large size, furnished with four membranous wings; these are usually complex by reticulate. The hind pair are usually much larger and have a large anal area of more simple venation, which becomes pelicate when folded. The coxae are small, the legs, widely separated. The larvae are aquatic in their habits, and the metamorphosis slight.

The family comprises a small number of insects, not especially attractive in their appearance, and having a life history of two abruptly contrasted portions. The first or nymph stage is aquatic, and the latter or adult stage, aerial.

The Perlidae are classified in different orders of the Insecta by different authors; for instance in Vol. V, of the "Cambridge Natural History", the Perlidae is classified as belonging to the order Neuroptera along with the Mallophaga, Embrudae, Sialidae, Panorpidae, Hemerobiidae, Myrmelleonidae and Phryagenidae. Some other authors classify the family in the Neuroptera, but Comstock assigns it to an Order by itself, and calls that, Order "Plecoptera".

The larvae of the Perla is found in clear, rocky streams, where they live on the under side of the loose stones in the running water. The larvae may be found by taking a loose rock from the stream and looking on its under side, where they will appear as small, shrimp like objects, from 1/4 inch to 1 1/2 inches in length, and of a dark brown color. They have a large head, somewhat wider than the thorax, and a tapering abdomen consisting of nine segments.

The larvae state of the Perla lasts one year. The eggs are laid in water, by the female, from about the first of May to the first of June. From these, small, aquatic larvae soon emerge, and may be found plentifully in the same streams a little later in the season.

The larvae hide themselves during the winter, but come forth again in the early spring; and from this time on, catch and devour the weaker inhabitants of the stream.

About the first of May in the Latitude, the larva of the Perla begin to leave the water; and shortly afterward the first of the winged flies emerge. The stones along the stream are then strewn with larva-skins looking very much like the larvae, but having a slit down the back through ^{which} the fly escaped. We quote from Miall as follows "the eyes, legs, jaws and wing sheaths, as well as the rings of the body are so perfect that the outer form of the larva can be described from such a cast skin. Not only these external organs but also the lining membrane of the great air tube and that of the fore part of the alimentary canal, including the armature of the gizzard can be made out in the cast skin; a good proof that these structures are formed by folding of the outer integument into the respiratory openings and the mouth.

The escape of the fly from the larva-skin takes place as follows, - a full grown larva creeps out from the stream, sometimes to a distance of several feet, and fixes its hooked feet securely to some object; the old larva skin begins to swell and air is passed into the place between the old and the new skins; the new skin is still soft and flexible, but is complete in all its parts. Before long, a slit opens in the back of the thorax of the old skin, and the new skin is seen. The head and antennae first come out through the slit;

then the wings are withdrawn from their sheath; next the legs, and last the abdomen and tail filaments.

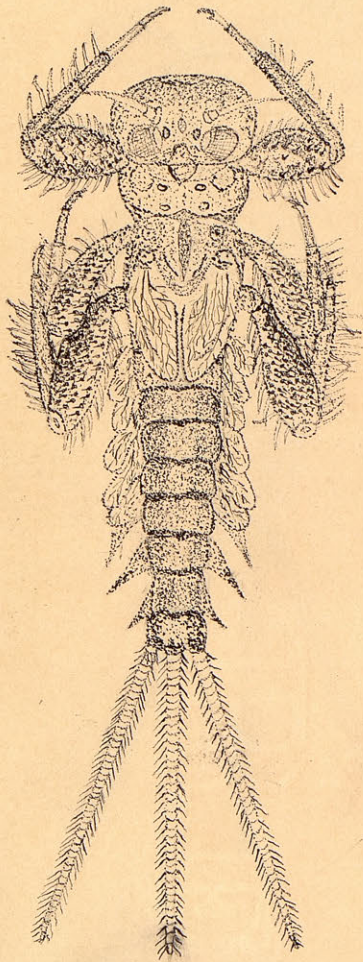
When the fly first emerges, it is soft and of a pale color; but in a short time, varying in different species, the organs of locomotion become hardened, and the insect takes to flight. Although the adult insect is possessed of large wings, it is a poor flier, flying straight ahead with a swift flight, and turning or avoiding obstruction with difficulty. It is easily captured with an insect net, or with the hand. The adult perla does not have a great use for a strong or active flight, for the males and females mate near the place of emergence.

The fertilized eggs are oval and black, and are loosely fastened by a transparent skin to the end of the abdomen of the female. These eggs are dropped into the water, and soon hatch into the small aquatic larvae before mentioned.

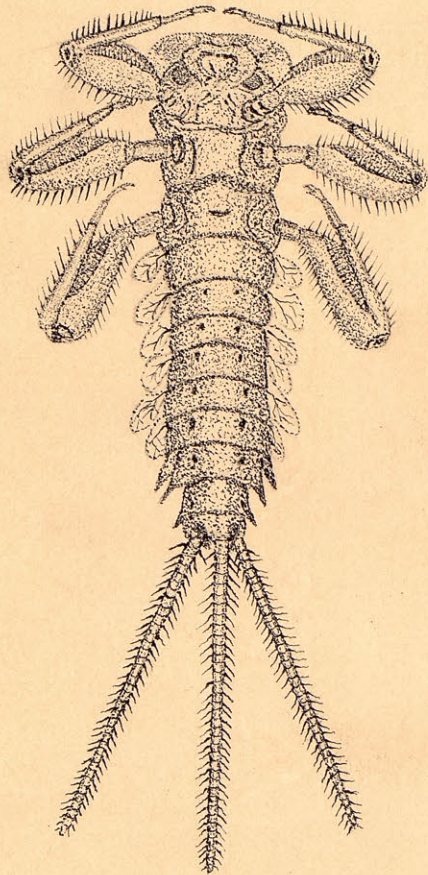
Although the larva of the Perlidae is so entirely aquatic it is not possessed of respiratory organs of the nature of true gills, but is in some species provided with organs known as tracheal gills; but there is not in the larvae of any of the species any orifices for admitting air into the tracheal system. Some species breathe through the integument. This process is aided by the accumulation of brachae at the places where the breathing orifices should be. These filamentous brachae occur in some species, and in some they do not. When they do occur, they may be situated on various parts of the body, according to the species of the perla, in some species they are situated on the thoracic segments, and in some, on the abdominal.

Unlike the larva of the Ephemera which completely casts its gills with the last moult when the spiracles open and allow the air to pass directly into the tracheal tubes, the tracheal gills of a perla

remain after the spericles have opened, though in greatly reduced forms.



Dorsal view of *Perla flavescens*



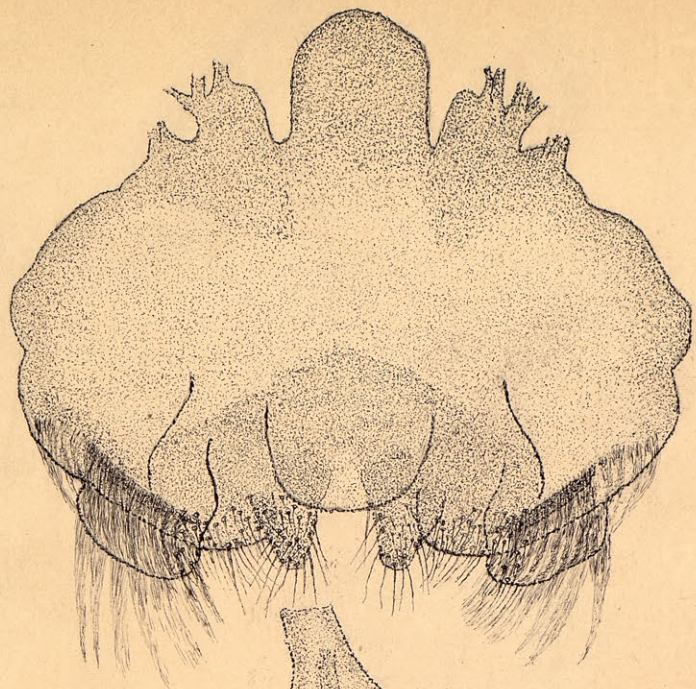
Ventral view of *Perla flavescens*

Mouth parts of *Perla flavescens*. See Plate III.

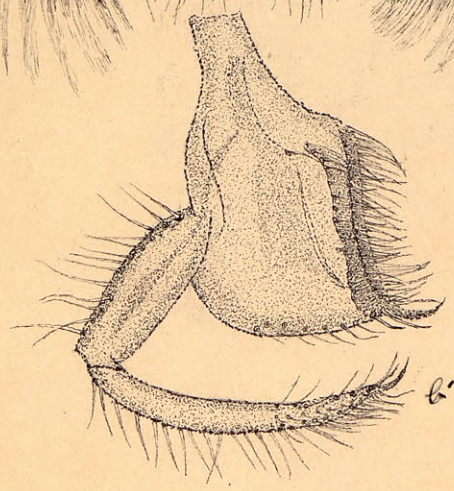
The mouth parts of this insect are somewhat membranous and consist of the following parts.

Plate III.

- a. Labium.
- b. Maxilla.
- b'. Maxillary palpus.
- c. Mandible.
- d. Labrum.

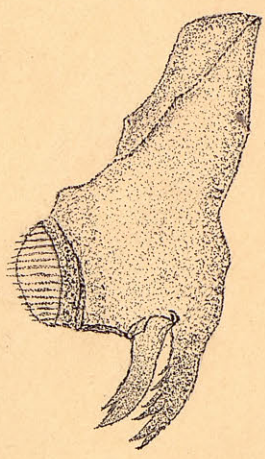


- a

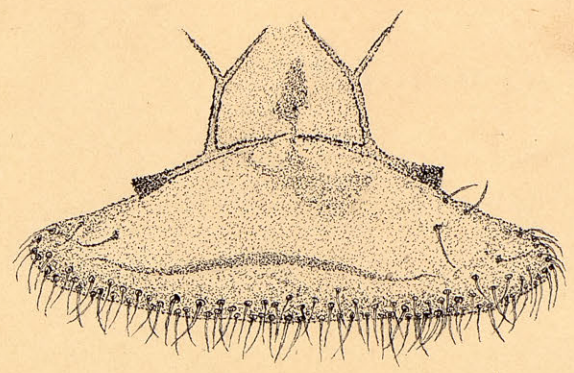


- b

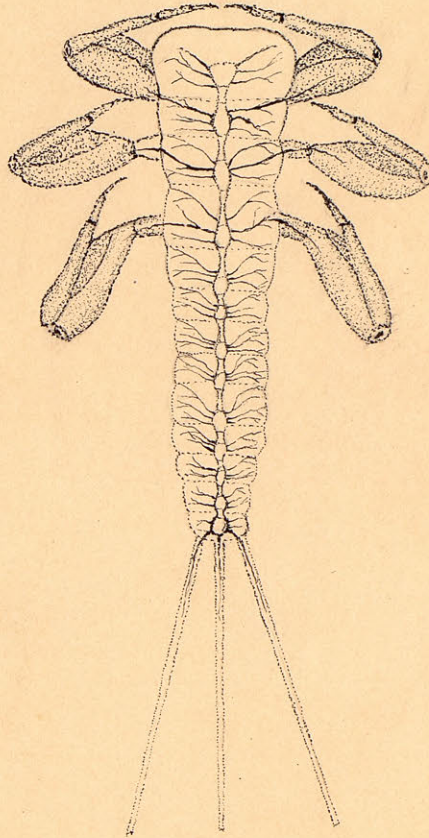
b'



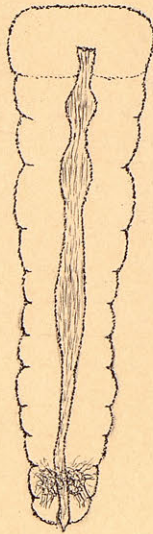
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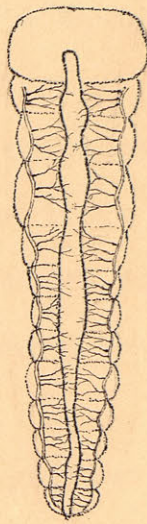
- d



Nervous system of *Perla flavescens*



Digestive system of *Perla flavescens*



Respiratory system of *Perla flavescens*

Legs of *Perla flavescens* . See Plate VII.

Length 7 m.m. long.

Femore 3 1/2 m.m. long.

Tibia 2 3/4 m.m. long.

Tarsus 1 1/4 m.m. long.

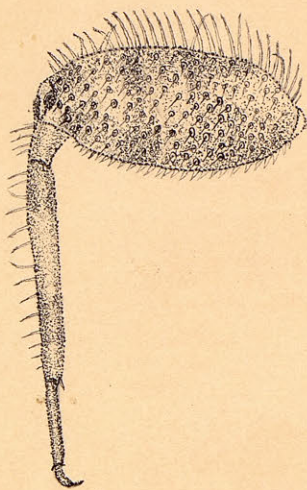
Femor 1 1/2 m.m. wide at the widest portion and tapers to about 3/4 m.m. at each end.

The femour is clothed with short thick spines and is bordered on its outer margin by long hairs. The tibia is also fringed on the outer margin with long hairs and has a few spines like those on the femor. The tarsus is one jointed; has a few hairs on its outer margin and is furnished with a long claw.

The drawing represents the leg magnified 10 diameters.

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Plate VII

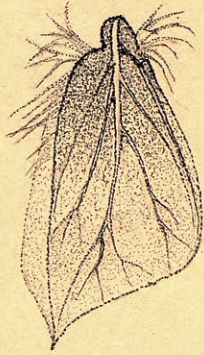


Gills of *Perla flavescens*. See Plate IX.

The *Perla florescens* has six pairs of gills at the joints of the first six abdominal segments, there is one pair of gills, one gill to each side. Each gill consists of a small pouch containing many small branchiae that come from the main trachael tubes.

Drawing magnified 20 diameters.

Plate IX



Antennae of *Perla flavescens*. See Plate VIII.

The antennae is composed of twenty-five to thirty-two joints. It is flexiform and placed just in front of and below the eyes.

Plate VII.



Caudal Appendages. See Plate X.

The *Perla flavescens* has three long, filiaform, caudal appendages composed of from fifty-one to seventy-two segments and clothed with fringes of fine hairs growing from the joints.

Plate X

