

INSECT MORPHOLOGY

Lab 10 - A study of the Alimentary Canal of the Grasshopper (*Romalea* sp.)

As in all other insects, the alimentary canal of the grasshopper is divided into three parts: (1) **foregut** made up of the **buccal cavity**, **pharynx**, **oesophagus**, **crop**, and the **proventriculus**; (2) the **midgut** consisting of the **ventriculus**, or **stomach**; (3) and the **hindgut** consisting of the **small intestine** or **ileum**, the **large intestine** or **colon**, and the **rectum**.

The division point between the foregut and the midgut is marked by the **gastric caecae**; that between the midgut and the hindgut by the **Malpighian tubules**. The foregut is long, extending as far as the fifth or sixth segment. The midgut is short and the hindgut forms a loose coil in the posterior end of the abdomen. This must be carefully uncoiled to disclose the divisions of the alimentary canal.

Obtain a specimen of the grasshopper preserved in alcohol and place it with the ventral surface upwards in one of the petri dishes with wax in the bottom. During the dissection it will be necessary to pin the lateral edges of the insect to the wax. During the dissection you should keep the tissue moist by adding alcohol to the specimen.

Carefully cut away the ventral body by making two longitudinal cuts, one along each lateral edge of the body from the posterior end to near the head. The ventral abdominal segments should be fairly easy to remove; the thoracic segment will require a little more care. First it will probably be necessary to cut the legs from the body. The internal leg muscles reach into the body cavity and will have to cut or torn free. Once the ventral body segments have been removed locate the alimentary canal. You will need to remove extraneous tissues (fat bodies, trachea, muscles, etc.) to be able to see the detail of the alimentary canal.

Foregut: Find the **crop** and the smaller **proventricus** that immediately follows the crop. This is the grinding stomach and is fitted with heavy teeth actuated by strong circular muscles surrounding the outside of the proventriculus. In the grasshopper, there is little differentiation between the **buccal cavity**, the **pharynx**, and the **oesophagus**.

Midgut: The midgut that follows is short and slender. At its anterior end are located the **gastric caecae**.

Hindgut: The **Malpighian tubules** at the junction of the ventriculus and the **ileum** are arranged in six bundles but number between sixty and seventy fine tubules together. Embryologically these tubules arise ectodermally from the inner end of the proctodaeum, and are therefore part of the hindgut. The ileum has the same external appearance as the crop and oesophagus.

The second division of the hindgut, the **colon**, is longer than the ileum and is irregularly folded in a longitudinal direction, forming a loose spiral coil in the posterior part of the abdomen.

The caudal end of the hindgut is the **rectum**. It is deeply grooved and is equipped with powerful circular muscles strengthened externally by longitudinal muscles located along the edges of the external ridges. The development of epithelium is peculiar. It is thickened in the walls of the folds which are six in number, but it is entirely missing along the external ridges, the basement membrane and the cuticula in these regions being continuous. The anus opens beneath the tenth tergum between two lateroventral plates of 10th abdominal segments.

A. Prepare a drawing of the alimentary canal of the grasshopper and label all of the above structures.

Include in the drawing the outline of the body to show the relationship of the tract to the external features of the body.

When you have finished the drawing of the alimentary canal, carefully remove it from the body by cutting it as close to the anal opening as possible, and at the anterior end, far enough back so as not to injure the connections of the nervous system in the vicinity of the **circumoesophageal commissures** (connectives between brain and ventral nerve cord).

Cut a longitudinal slit in the proventriculus and pin it out flat with the ental surface uppermost. Notice the large heavy grinding teeth.

B. Prepare a drawing of the internal aspect of the proventriculus showing the proventricular teeth.

C. Examine the demonstrations.