

and upper part of the head. Their common name indicates their principal function as sense organs. Note their composition; they seem to be made up of bead-like parts.

The large compound eyes are just back and before the feelers. Examine with a lens. From Fig. 3. locate on your specimen the front ocellus, Fig. 1. shows the position of the other (lateral) ocelli. These are the single eyes. The eyes are not considered appendages, hence do not represent somites. Count the number of somites found in the head, thorax and abdomen. Later it will be interesting to compare this number with that found in other jointed-legged animals, as the lobster, crayfish, etc.

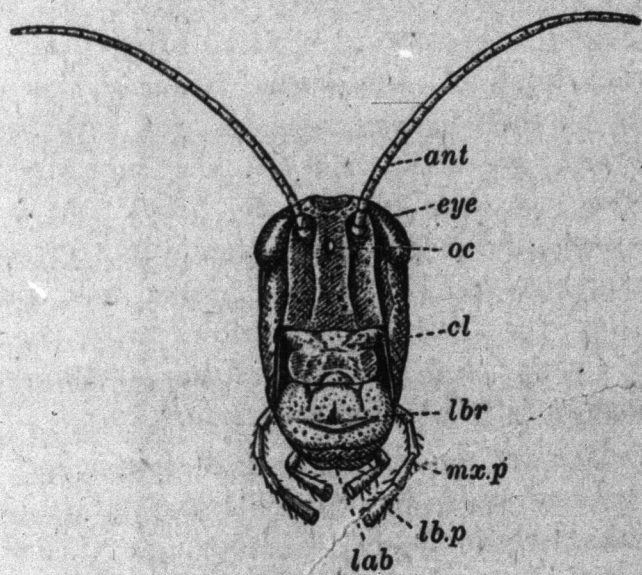


FIG. 3. Face of a Grasshopper. Ant. Antennae or Feelers; eye, Compound Eye; oc, Ocellus; cl, Clypeus; lbr, Upper Lip; mx.p, Under Jaw Palpus; lb.p, Lower Lip Palpus.

The digestive tract, or alimentary canal, consists of a fairly straight tube occupying the larger part of the centre of the body, and divided into parts with special functions.

The food after being ground up by the mouth parts is carried into the mouth, and there acted upon by the saliva. Note the position of the salivary glands, and their ducts. The duct has its opening near the base of the tongue.

The esophagus is a straight tube leading from the mouth to the crop. Compare it with the esophagus in man. Also compare it with the esophagus of the chick, with its similar associated parts, crop and gizzard. In fact the gizzard or proventriculus was so named from its resemblance in structure and function to the gizzard of birds. Procure the gizzard of a fowl and give a lesson on it. Its strong thick muscular walls will at once suggest its work, and the small stones inside will help to make plain how it grinds the food.

The stomach or ventriculus is beyond the gizzard and is usually a simple tube. When the food passes into the stomach it is acted upon by the secretions of the gastric caeca, whose tubes open into the anterior end of the stomach. The lining of the stomach is glandular and its secretions aid in digestion, but its chief function is to absorb the digested food and pass it into the circulation.

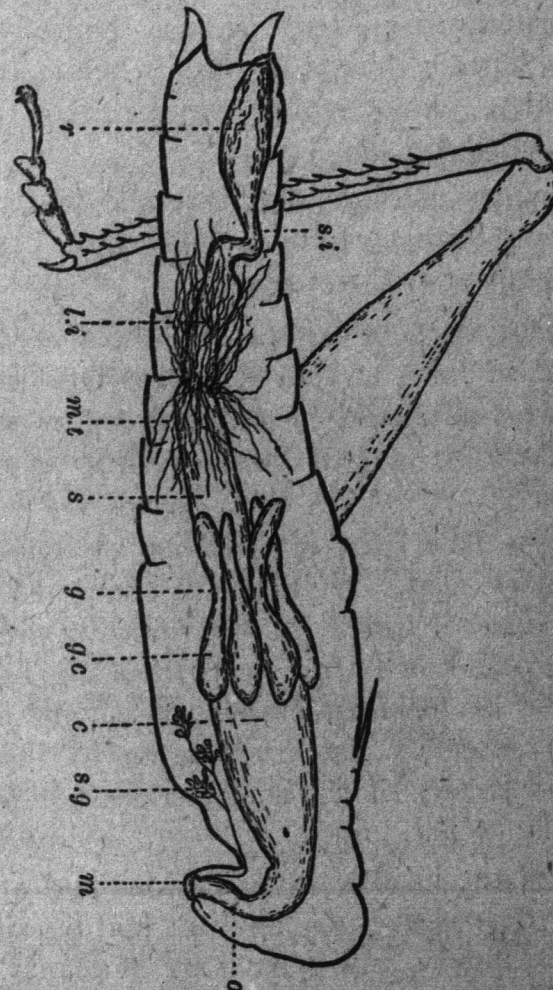


FIG. 4. Digestive and Excretory System of a Grasshopper. C, Crop, g, Gizzard or Proventriculus concealed by Caeca; g.c, Gastric Caeca; l.i, Large Intestines; m, Mouth; m.t, Malpighian Tubes or Kidney Tubes; o, Esophagus; r, Rectum; s, Stomach; s.g, Salivary Glands; s.i, Small Intestines.

Beyond the stomach is the intestine, with its distinct parts: large intestine, small intestine, and rectum. Compare the whole digestive tube with that of man. This work will also serve as standard for similar work in other insect forms.

The malpighian tubes open into the intestine just posterior to the stomach. They are excretory organs and similar in function to the kidneys of higher animals.

So far we have used the name "grass-hopper" in its popular sense, in which it includes both grasshoppers and locusts. The length of the antennae is a good distinguishing feature between these two groups. If they are as long or longer than the body the form belongs among the true grass-hoppers; if