

*Note on the Crop in the Mallophaga and on the Arrangement and Systematic Value of the Crop-Teeth.* By BRUCE F. CUMMINGS.

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DURING an examination for description\* of the interesting parasite *Trimenopon echinoderma*, Cummings, a row of strongly developed teeth was observed in specimens passed through caustic potash and mounted in Canada balsam, occupying a position in the abdomen at about the level where the proventriculus might be deemed to lie. Reference to Snodgrass's paper† on the anatomy of the Mallophaga showed that no proventriculus has been found to exist in this order. On dissection it became quite clear that in fact no portion of the base of the crop (or ingluvies) is constricted off as a gizzard either in the Ischnocera or in the other suborder, the Amblycera. Yet the base of the crop of the Amblycera in the genera *Heterodoxus*, *Trimenopon*, *Lamobothrium*, *Colpocephalum*, *Menopon*, *Trinoton*, *Boopia*, *Nitzschia*, and *Gyropus*, and probably in the remaining genera, possesses a circular row of beautiful proventricular teeth, so that, *functionally*, a proventriculus may be said to be present in this suborder. There are scattered teeth in the crop of the Ischnocera, but they occupy a different area of the crop, which in the Ischnocera is highly specialized.

The crop presents three types of structure in the Mallophaga. One form—the Amblyceran—is simple in being just an expansion of the lower part of the œsophagus. The second, represented by the majority of the Ischnocera, Snodgrass describes as complicated by a lateral and backward prolongation, so as to form a large expanded diverticulum of the œsophagus. The third type, present in the Ischnoceran family Trichodectidæ, has the remarkable form of a large sac connected with the lower end of the œsophagus by a long narrow neck.

Morphologically the crop is simply an expanded portion of the œsophagus. It is large in locusts and most other Orthoptera and in most adult Coleoptera. It may or may not be followed by the proventriculus, which is present and well developed in many carnivorous Coleoptera, in fleas, ants, and *Cynips*. In fact, the alimentary canal is a notoriously unsafe guide in phylogeny, although the arrangement of the teeth in the proventriculus has been used systematically in

\* Bulletin for Entomological Research, May 1913.

† Occas. Papers Cal. Acad. of Sci. vi. 1899, p. 145.

ants \* and in the Odonata Zygotera †. In the Amblycera the crop-teeth assume characteristic forms in the different genera, and could be used with advantage in classification, as they are of generic if not specific value, and, as a rule, are easily visible through the integument in mounted specimens prepared with caustic potash.

The following is a short description of the position and nature of these teeth in different genera.

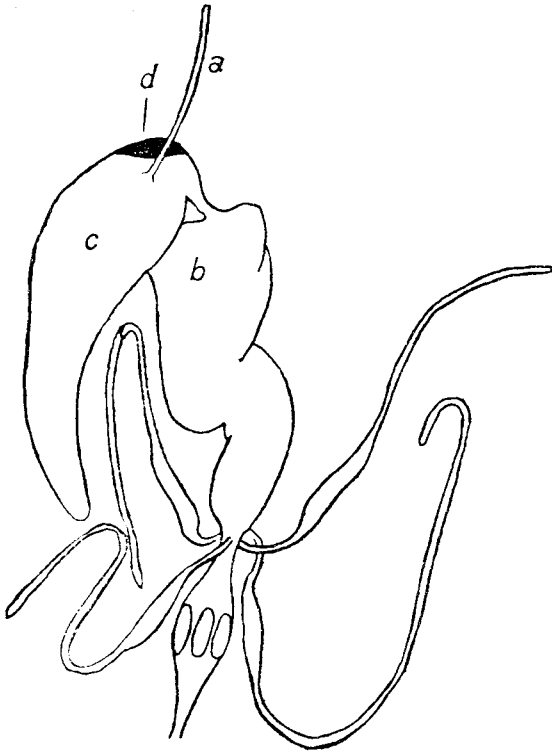


Fig. 1.

Sketch of alimentary canal of *Goniodes falicornis*.

*a*, cesophagus; *b*, ventriculus; *c*, crop; *d*, patch of teeth.

#### ISCHNOCERA.

The crop in the Trichodectidæ is apparently devoid of teeth. I have carefully examined with a high power the

\* Sharpe, D., Camb. Nat. Hist., Insects, part i. p. 125.

† Higgins, Helen T., Proc. Nat. Sci. of Philadelphia, Jan. 1901.

mounted specimens of the genus *Trichodectes* in the collection of the British Museum, but no trace of teeth could be found.

In the crop of *Goniodes fulvicornis* (fig. 1, p. 267) there is a patch of small teeth in the anterior diverticulum of the crop (*d*). The teeth are arranged in short scattered rows of two, three, or four, and are short, sharp, and stout, with enlarged bases. The lining of the crop is grooved longitudinally, and along each groove is a row of wide-spaced, short, minute hairs.

This patch of teeth in the anterior cæcum of the crop is characteristic of the Ischnocera. I find similar patches in the same areas in *Nirmus* (*N. prodicepis*, D., *N. fuscus*, N., *N. dioxocephalus*, N.), *Goniodes stylifer*, N., *G. colchicus*, D., *Dochophorus alcedinis*, D., and *Lipeurus ferox*, Gieb. (fig. 2).

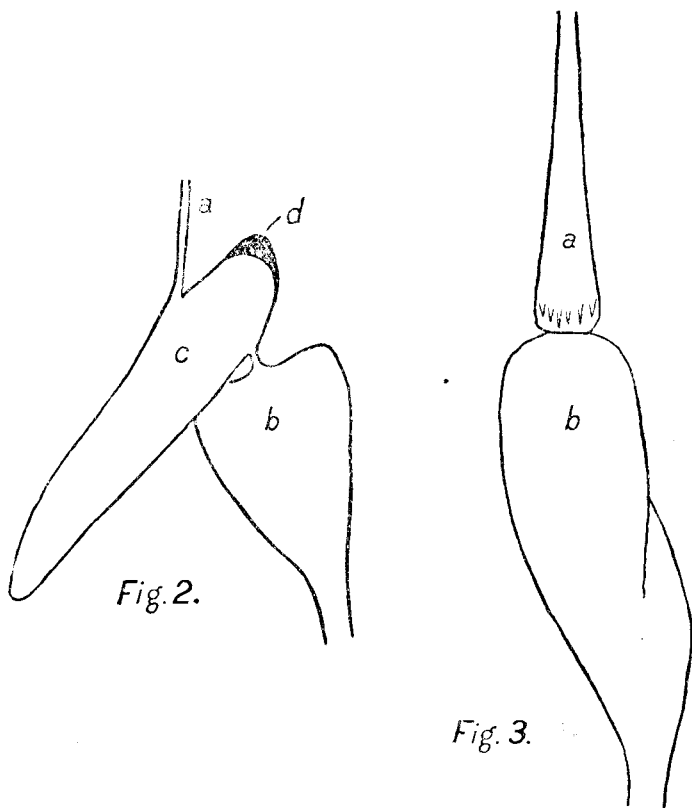


Fig. 2.—Sketch of the upper part of the alimentary canal of *Lipeurus ferox*.

Fig. 3.—Sketch of the upper part of the alimentary canal of *Heterodoxus longitarsus*.

*a*, œsophagus; *b*, ventriculus; *c*, crop; *d*, patch of teeth.

## AMBLYCERA.

*Heterodoxus longitarsus* (Piaget) (fig. 3).—The crop is rather small, and the ventriculus, which follows, is parallel-sided, without anterior cæca. The teeth, situated in front of the opening into the ventriculus, point backwards, and are rather long, tapering, fairly broad, and numerous, arranged in a single row. In *Trimenopon echinoderma* there is a row of teeth of similar shape in the same position. But posteriorly there lie two chitinous flattened lobes, the free ends of the flaps being anterior and the two flaps being side by side, with a narrow longitudinal space between. The free projecting edges of the flaps possess a single row of minute denticles.

*Læmbothrium titan*, P.—The teeth are here grouped in two brush-like patches, one on each side of the base of the crop. The teeth are long, thin, round, acicular, curved, and closely set.

*Trinoton luridum*, N.—The teeth in this species are more developed than in any other genera I have examined up to the present. Seen *in situ* they please the eye with their beautiful symmetry of arrangement and their sabre-like shape. As usual they consist of a single row situated around the base of the crop, rather densely packed and of a dark brown colour. Each tooth is long (about .14 mm.), curved, flat, blade-like, parallel-sided, and at the base has a backwardly projecting sharp spur, which no doubt constitutes the place of attachment of the tooth to the lining of the crop. Just behind the row of teeth there are two patches, one on either side, of scattered teeth of quite a different character. These are long, curved, and round, of a white-coloured chitin. The rest of the crop shows numerous minute scattered bristles or teeth of a clear white chitin, the bases of which appear to be forked, suggesting sponge-spicules.

*Function.*

Plateau, who was able to speak with authority on the digestive arrangements of insects, formed the opinion that the proventricular teeth are used for straining rather than for masticating food. In the Amblycera it seems improbable that the teeth have any masticatory function, as they are long, slender, and sharp, and their development is not correlated with powerful muscular folds. In the Ischnocera the short scattered teeth may be of assistance in clearing out the food which collects in the anterior cæcum, where they are situated.

It has been suggested that some Mallophaga, such as *Tetrophtalmus titan* (P.), which is found firmly attached to the skin of the pelican's pouch, live on blood. This, if authenticated, is interesting when it is remembered that the Anoplura, true blood-sucking parasites, are, perhaps, in their descent Mallophaga which have taken to sucking blood.

A transition from hair- and feather-feeding to gnawing at the epidermis of the skin is easily conceived, when, as soon as blood is extravasated, it can be easily imagined how a further change in feeding-habits came about.

It is a pity that more is not known of the bionomics and feeding-habits of the Mallophaga.