STUDIES ON THE ALIMENTARY CANAL OF AMPHIPODS. EXCRETORY CAECA

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The anatomy and histology of the amphipod gut, more especially the foregut, has been more or less widely studied but detailed and accurate knowledge of certain aspects and regions other than the foregut are lacking. For example, the structure and nature of excretory caeca and their interrelationships with mid- and hindguts as well as their course and position seem to have been erroneously described. Few investigations have endeavoured to describe the excretory caeca in the course of studies on the gut as a whole. Cussans' (1904) monographic work on *Gammarus* may be said to be comprehensive. Mabillot (1955) has given a brief account of the excretory caeca of *Gammarus pulex* (L.). Agrawal (1964) mentioned a few details of the posterior dorsal caeca in some British amphipods and Schmitz (1967) dealt with the anatomical and histological aspects of the so called rectal caeca of *Gammarus lacustris lacustris* Sars. In our studies on the talitrids *Talorchestia martensi* (Weber) and *Orchestia platensis* Kroyer, opportunities were provided to make a detailed examination of the excretory caeca and our observations and conclusions appreciably differ from all the previous studies on the subject. We therefore attempt to give a more correct picture of the amphipod excretory caeca with special reference to talitrids.

MATERIALS AND METHODS

To study the detailed anatomy and histology of the mid- and hindguts, specimens of *Talorchestia martensi* and *Orchestia platensis* were fixed in alcoholic Bouin's, Susa, methanol-formaldehyde-acetic acid, or formol-calcium (Postchromed). After usual procedures of dehydration and embedding in paraffin wax (M.P. 56-58° C) transverse and sagittal sections of 8-10 µ were cut and stained with iron hematoxylin, Heidenhain's Azan, alum carmine and safranin. In some cases bulk staining was resorted to by using the same stains mentioned above. In some cases, after preparing the paraffin blocks of whole animals, trimming was done in such a way that cuticle and much of the muscles were scraped away on both lateral sides. Such blocks were placed in xylol to remove the paraffin. After two or three changes of xylol whole mounts were prepared. This method enabled us to study the internal organisation and disposition of the structures more clearly and comprehensively.
Arising from the posterior end of the midgut is a pair of tubes usually referred to as excretory caeca (pl. 1 fig. 1, pl. 2 fig. 3). Each tube, after emerging from the dorso-lateral region of the midgut near the midgut-hindgut junction runs up to the end of the abdomen where it takes a sharp bend anteriorwards, ultimately reaching the anterior end of the eleventh segment (pl. 1 fig. 2). The wall of the excretory tube, when empty, appears thicker. It is made up of a single layer of closely packed columnar cells. The tallest cell is 25 μ long. These cells possess conspicuous nuclei. Cytoplasm is non-vacuolated and highly granular. The nuclei are vesicular with small nucleoli. The tube could frequently be found with refringent concentrations and crystals (pl. 1 fig. 3). The position and arrangement of the caeca resemble somewhat the malpighian tubes of insects. Mabillot (1955) named them "diverticule postérieur", but many authors refer to these structures as excretory caeca although Schmitz (1967) called them rectal caeca. When filled with excretory material the wall of the caecum becomes distended and the tubes appear more conspicuous. In all specimens the tubes have been found to take the characteristic course as described above. Thus, each excretory caecum runs to the posterior end, later turns on itself to take a "U" shaped bend and then proceeds a short distance anteriorwards. The posterior region is characteristically flexed, and a strand of connective tissue binds its terminal end to the hindgut (pl. 2 figs. 1, 2), in this respect strongly recalling the cryptonephric condition of malpighian tubes in some insects. The hindgut may be said to start from the seventh segment immediately after the origin of the excretory caeca of the midgut. The structure

Figs. 1-3. Talarorchestia martensii (Weber). 1, diagram of alimentary canal showing the course of the excretory caecum and its characteristic attachment to the hindgut; 2, diagram of transverse section passing through site 'A' shown in fig. 1, (note cross section of the excretory caeca stippled); 3, diagram of transverse section passing through site 'B' of fig. 1, showing excretory caeca (stippled). CTS, connective tissue strand; EXC, excretory caeca; HG, hindgut; HP, hepatopancreas; MG, midgut.