ULTRASTRUCTURE OF THE STOMA IN CEPHALOBIDAE,
PANAGROLAIMIDAE AND Rhabditidae, WITH A PROPOSAL FOR
A REVISED STOMA TERMINOLOGY IN RHABDITIDA (NEMATODA)

BY

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Available information on the terminology and ultrastructure of the stoma in Rhabditida is reviewed, with new data on the cephalobids Seleborca complexa, Triligulla aluta and Zeldia punctata, as well as the panagrolaimid Panagrolaimus superbus. It is shown that the stoma of most examined species can be divided into six regions rather than five, on the basis of the cuticular differentiations and especially the surrounding structures and tissues. Probable stomatal homologies between different families are used as a basis for a revised buccal terminology, in which the following three main regions are distinguished: 1) cheilostom, surrounded by labial cuticle; 2) gymnostom, surrounded by arcade epidermis; 3) stegostom, surrounded by cells that lie enclosed within the peripharyngeal basal lamina layer. The stegostom can be divided further into (usually) four more regions, respectively called pro-, meso-, meta- and telostegostom, defined by the presence of three interradial or six adradial cell. Continued use of the term "rhabdion" as well as the traditional five-part buccal terminology is strongly discouraged, because they prove to be based on incorrect and incompatible anatomical assumptions.

Keywords: buccal cavity, morphology, homology, Rhabditida, Nematoda, TEM

Some of the strongest morphological clues on nematode taxonomy, behaviour and ecology can be found in the structure of the feeding organs. These organs must be studied with great care, however, because they have probably evolved numerous homoplasies through time. A particular case in point is the buccal cavity, in which deceptive similarities are usually exacerbated by the small size of the structures involved. Thus, exaggerated reliance on buccal characters can lead to faulty classifications, as illustrated by the generally rejected system of Cobb (1919). In contrast, the correct use of the buccal cavity as a source of taxonomical information must depend on the distinction of homologies from analogies, which requires more detailed observations than those allowed by light microscopy. Also, the act of observation per se is inevitably coloured by pre-existing concepts and vocabulary, so that a truly homologous terminology is of fundamental importance for the description and comparison of buccal structure in different nematode taxa.
Currently, the most widely used terminology recognizes five parts in the buccal cavity, respectively called cheilostom, prostom, mesostom, metastom and telostom from anterior to posterior. Furthermore, each part is considered to have three interradial thickenings in its lining, referred to as cheilorhabdia, prorhabdia, mesorhabdia, etc. This pentapartite scheme was first presented by Steiner (1933), based on the buccal structure observed in Cylindrocorporidae (Diplogasterida), Rhabditidae and Cephalobidae (both Rhabditida). Numerous attempts to extend the scheme to other groups followed the original proposal: Steiner (1934) and Weingärtner (1955) applied it to Diplogasteridae (Diplogasterida); Chitwood & Wehr (1934) to Spirurida; Maggenti (1961) to Plectus (Leptolaimida); Thorne (1961), Andrássy (1962) and Goodey (1964) to Tylenchida; Coomans (1964) to Dorylaimida; Coomans & Loof (1970) to Mononchulus and Oionchus (Bathyodontida); Jacobs (unpubl.) and Van de Velde & Coomans (1990) to Monhysterida, and Bird & Bird (1991) to Rhabdodemania (Enoplida). Many reference works (e.g. Thorne, 1961; Goodey, 1963; Maggenti, 1981; Andrássy, 1984; Bird & Bird, 1991) represent Steiner’s terminology in diagrams that have effectively become icons of nematode morphology.

Steiner’s scheme was recently brought into question, however, by De Ley & Siddiqi (1991) on the basis of light microscopy observations in Cephalobidae. Subsequently, Van de Velde et al. (1994) examined three species of Cephalobidae by TEM, and found Steiner’s terminology to be partially incompatible as applied in Cephalobidae versus Rhabditidae. The next logical step is taken in this paper, which presents a revised scheme of homology and terminology for the stoma in Rhabditida, based largely on the cellular components underlying the cuticle. Information from previous studies on the buccal ultrastructure of Rhabditidae (De Grisse & Coomans, unpubl.; Albertson & Thomson, 1976; Wright & Thomson, 1981; Endo & Nickle, 1994) is brought together with the findings of Van de Velde et al. (1994) in Cephalobidae. In addition, we have re-examined Caenorhabditis elegans with TEM to check previous findings, and three more species of Cephalobidae were studied to confirm the generality of the stoma organization in this family. We also present new data on a member of the family Panagrolaimidae.

MATERIAL AND METHODS

Details on the origin and culture of the Rhabditida studied are given in Table I. Fixation, embedding and sectioning methods were as described for each laboratory in Van de Velde et al. (1994). Species cultured at the ORSTOM Centre de Dakar were prepared for TEM at the Université Cheikh Anta Diop (U.C.A.D.), Dakar, and observed with a JEOL 100 CXII. Belgian S. complexa specimens were cultured and embedded at the Universiteit Gent (U.G.), and then sent to the U.C.A.D. for sectioning and observation. Other species cul-