Adhesive Organs of the Gastrotricha

II. The Organs of *Neodasys*

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Summary. The lateral and posterior adhesive organs of an undescribed species of *Neodasys* can be seen by electron microscopy to have only one gland cell type. This gland has dense spherical secretion granules like secretion granules of the viscid glands of other gastrotrichs, and it extends to the exterior through a tubular extension of the animal's cuticle, the adhesive tubule, as in other gastrotrichs. Each adhesive gland of *Neodasys* has a prominent striated rootlet that extends through its full length, attaching at its distal end to a basal-body-like structure at the tip of the gland's neck. Unlike other gastrotrichs, *Neodasys* has no second gland type that would be equivalent to a releasing gland. The lateral adhesive organs have a sensory cell closely associated with the gland cell but not in direct communication with the lumen of the tubule; it bears a single cilium that projects alongside the adhesive tubule. The posterior adhesive organ has adhesive gland cells whose necks reach to adhesive tubules on toe-like extensions of the animal's body; sensory cells here are not in a one-to-one association with the tubules; a secretory myoepithelial cell extends to the tip of each toe. The adhesive organs of *Neodasys* are interpreted as being of a form that would have been found in a common ancestor to the gastrotrichs and from which the duo-gland organs of other gastrotrichs might have been derived.

A. Introduction

Many of the lower metazoans whose adhesive systems have been studied by electron microscopy have glandular adhesive organs with two gland cell types. These gland types are readily distinguishable by their morphology at the ultrastructural level, and, because of their association together in single adhesive
organs, the organs bearing them have been called duo-gland organs. Most of the turbellarians (Tyler, 1976, 1977; Reuter, 1978; Martin, 1978) and gastrotrichs (Rieger and Tyler, 1979) have duo-gland organs, and at least some members of a few other groups have similar organs, including the Annelida (Martin, 1978) and Nematoda (Adams and Tyler, 1980).

There are a number of other types of adhesive systems in other groups of lower metazoans – systems such as glandular organs with only a single gland type unlike either gland type of the duo-gland organs (e.g., in a rotifer [Dickson and Mercer, 1966] and in a nematode [Lippens, 1974]) and systems composed of adhesive cilia – and so the duo-gland system is not the only means by which adhesion can be accomplished in these small metazoans. The duo-gland system is the most distinctive of the various adhesive systems that have been recognized, and its distinctiveness and the morphological similarities between duo-gland organs in the groups that possess them raise questions of the system's phylogenetic significance. Are all duo-gland organs homologous, for instance, and do they show, therefore, that all groups possessing such organs have originated from a common ancestor?

Gastrotrichs on the whole – i.e., in the order Macrodasyida and in the suborder Paucitubulitina of the order Chaetonotida – have duo-gland adhesive organs (Rieger and Tyler, 1979; Tyler and Rieger, 1980).

We have found one exception to this generalization in Neodasys, a gastrotrich genus of uncertain systematic position presently classified as composing a separate suborder, Multitubulitina, of the order Chaetonotida. In body form, Neodasys is most like macrodasyoid gastrotrichs, and when Remane (1927) described the type species of the genus, *N. chaetonotoideus*, he placed it in the order Macrodasyida because of this resemblance. His later, more thorough, studies of sectioned material revealed that it is more closely allied with the Chaetonotida, particularly in the structure of the pharynx (Remane, 1936). Still, ties between Neodasys and the macrodasyoids are obvious, and Remane accordingly considered it the most primitive chaetonotoid, a form that links the Chaetonotida with the more primitive Macrodasyida (Remane, 1961).

If ultrastructural characters of adhesive organs have systematic significance for the Gastrotricha as they appear to have for the Turbellaria, then our finding that the adhesive tubules of *Neodasys* are different from those of both macrodasyoids and chaetonotoids has a special bearing on the question of the relationship of *Neodasys* to the other gastrotrichs. Moreover, this finding has significance for the question of whether or not all duo-gland adhesive organs – in Turbellaria, Gastrotricha, and any other groups in which they may be found – are homologous.

**B. Material and Methods**

The *Neodasys* used in this study is an undescribed species collected from Bogue Bank, North Carolina, USA (see Ruppert, 1977). It is found in the upper few centimeters of sediment between the mean-low-water and midtide levels.

We have found it difficult to achieve a good preservation of *Neodasys* for electron microscopy with the usual fixation regimes and have therefore experimented with several different regimes.