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Tube-dwelling meiofauna in marine sediments

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Abstract

Tube-dwelling has been recognized previously as a life-style for several meiobenthic species, but behavioural observation of living specimens has rarely been reported. The extent to which tube-building and tube-dwelling occurs within meiofauna, and how they have influenced evolutionary and ecological processes as well as morphology within these organisms, is relatively unknown but potentially of great significance. In addition to direct observation of tube-building and the occurence of tubes in natural habitats, the internal anatomy associated with tube-building in two nematode species *(Ptycholaimellus jacobi, P. ponticus)* and one harpacticoid copepod species *(Stenhelia palustris)* is the focus of this study. Special attention is given to the secretory products, glands, and their association with secretory pores. Also, the role of meiobenthic tube-dwelling activities in relationship to their environment is extensive discussed.

Summary

All individuals observed of the abundant meiobenthic nematodes *Ptycholaimellus jacobi JENSEN* and NEHRING, 1992 and *P. ponticus* (FIUPJEV, 1922) as well the harpacticoid copepod *Stenhelia palustris* BRADY, 1862, live in self-made tubes in muddy coastal sediments. The tubes of *Ptycholaimellus* lie vertically in natural sediments down to 1 cm depth, opening at the sediment-water interface. This was shown by preparing undisturbed intertidal sediment samples of the sediment-water interface to analyse fine sediment structures, using a liquid-nitrogen freezing technique. Ultrastructural observations showed that the ventral gland cell of *P. ponticus* is divided into several compartments, and its structure indicates that it has a secretory function. This is the site where mucus for tube construction is produced. The lateral fields of *P. jacobi* and *P. ponticus* are bordered by sublateral rows of circular pores. The pores are connected with cuticular sense organs consisting of sensory dendrites. The secretions by these hypodermal gland cells also are involved in the construction of the mucous tube. It is suggested that the sensilla in the hypodermal pores may have an (additional) mechanosensory function.

The inner surface of the tube of S. *palustris* is mucoid, with a net of mucous threads that are released through cuticular pores. Adults move in the tube with the aid of their second antennae, juveniles move in crossing steps. They spend much time moving quickly forwards and backwards. S. *palustris* has a positive home-finding ability in contrast to *P. jacobi* and *P. ponticus.*

It is suggested that the behaviour of tube-dwelling nematodes in contrast to tube-dwelling harpacticoid copepods may play vital roles in influencing sediment characteristics as potential micro-bioturbators.