

BATHYARCA GRENOPHIA (MOLLUSCA, BIVALVIA) UTILISES ASTRORBIZA ARENARIA AND RHABDAMMINA ABYSSORUM (FORAMINIFERA) AS HARD SUBSTRATE ON OOZE BOTTOMS

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The marine bivalve *Bathyarca grenophia* (Risso, 1826) has been found epizoic on the foraminiferans *Astrorhiza arenaria* Norman, 1876 and *Rhabdarina abyssorum* M. Sars, 1868 in central Norway. The upright position of some foraminiferans and the habitats of arcoid bivalves are discussed.

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While examining material from a mud bottom in the Trondheimsfjord, Norway, numerous specimens of *Bathyarca grenophia* (Risso, 1826), (synonym: *Bathyarca pectunculoides* (Scacchi, 1836), were found attached to the arms of *Astrorhiza arenaria* Norman, 1876, and less commonly to *Rhabdammina abyssorum* M. Sars, 1868. One specimen was attached to a grain of sand.

Bottom sediment was collected in Trondheimsfjord at 63°31 N 10°32 E in June 1992, using an epibenthic sledge at 100–120 m depth. The material was sieved on 2, 1, and 0.5 mm mesh sieves, and afterwards sorted under a dissection-microscope.

22 specimens of *Bathyarca grenophia* were found on *Astrorhiza arenaria* and 5 on *Rhabdammina abyssorum*, attached by a small stalk-like

byssus (Fig. 1). Most specimens were attached to the branches, but one species was found attached to the central disc of *A. arenaria*. The byssus thread is relatively thin and ends in a small cone on the surface of the foraminiferan. The attachment to the substrate is very firm and when carelessly handled the stalk tends to break off from the byssus-gland rather than from the substrate, remaining as a small peg-like structure on the foraminiferan.

Bathyarca grenophia is a suspension feeder normally living on the continental shelf and upper slope (Oliver and Allen (1980).

Astrorhiza arenaria occurs between 15 and 4200 m depth but most commonly between 200 and 1500 m (Tendal & Tomsen 1988) and *Rhabdammina abyssorum* has been recorded down on 1000 meters (Goës 1894). Therefore *B. grenophia* should be able to use these foraminiferans as substrate on soft bottoms throughout its depth range. Oliver and Allen (1980) give no information on the type of bottoms on which *B. grenophia* occurs, but they note that it attached itself to a small pebble in the laboratory. In the case of *Bathyarca philippi* (Nyst, 1845), (identified as *B. glacialis* by Oliver and Allen), it is noted that it «appears to inhabit a variety of substrates from rocks to muddy gravel but is most frequent in the latter.» Based on the external similarity between the two species, this might as well be true for *B. grenophia*.

Tendal & Thomsen (1988) have shown that *Astrorhiza arenaria* positions itself vertically in the sediment (Fig. 2), and Cedhagen (1988) made the same observation on *Astrorhiza limicola*, I therefore presume that the same may also apply to *Rhabdammina abyssorum*.

It is known that the amount of suspended food

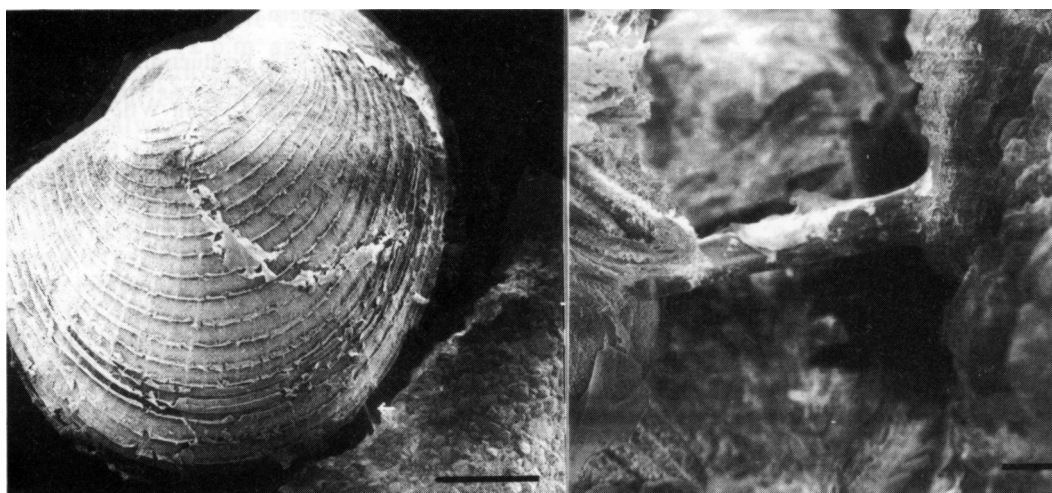


Fig. 1. Left: *Bathyarca grenophia* attached to branch of *Astrorhiza arenaria*. Arrow indicates byssus. Scale bar: 500 μ m. Right: Detail of byssus (Shell removed). Scale bar 100 μ m.

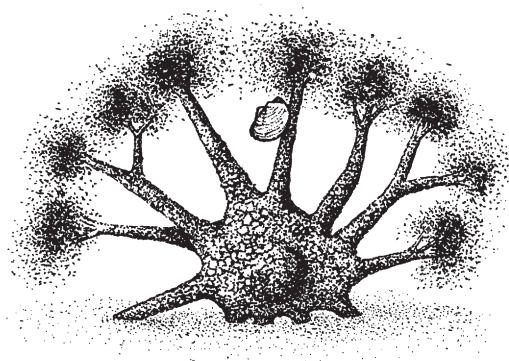


Fig. 2. Assumed position of *Astrorhiza arenaria* in sediment with a young *B. grenophia* attached to a branch.

in the deep sea is scarce (see e.g. Wangersky 1978). It can therefore be an advantage for the bivalve to live above the viscous layer, close to the sediment surface, where the water flow is low. This means that a small mussel attached to the arms of an upright foraminiferan will come in a better feeding position than one clinging directly to the surface. The disadvantage is that it might be more exposed to predation.

The present note shows that the mode of life of *B. grenophia* is an exception to the common rule that arcoids with shell shorter than 1.3 times the height, live attached by byssus and are buried in the sediment (Stanley 1970, Oliver and Allen 1988), since it is epibyssate rather than endobysate although its *L/H* ratio is less than 1.35.

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foreminiferans and to Dr. A. Warén Swedish Museum of Natural History, Stockholm for identification of *Bathyarca grenophia* and for critically reading the manuscript which also Prof. Christer Erséus, same institution, has done. Finally, I would like to thank the staff at Trondheim Marinbiologiske Stasjon for providing excellent working conditions.

SAMMENDRAG

Den marine muslingen *Bathyarca grenophia* (Risso, 1826) er funnet epizoisk på foraminifereartene *Astrorhiza arenaria* Norman, 1976 og *Rhabdammina abyssorum* M. Sars, 1868. Diskusjonen kommer inn på den vertikale stillingen av enkelte foraminifere-artene, og biotop og levevis av arcoide muslinger.

REFERENCES

- Cedhagen, T. 1988. Position in the sediment and feeding of *Astrorhiza limicola* Sandahl, 1857 (Foraminifera). *Sarsia* 73: 43—47.
- Goës, A. 1894. A synopsis of the Arctic and Scandinavian Recent marine Foraminifera hitherto discovered. *K. Svenska Vet.-Akad. Handl.* 25: 1—127.
- Oliver, G. & J. A. Allen. 1980. The functional and adaptive morphology of the deep-sea species of the *Arcacea* (Mollusca: Bivalvia) from the Atlantic. *Phil. Trans. Roy. Soc. London.* 291: 45—76.
- Stanley, S. M. 1970. The relation of shell form to life habits of the Bivalvia. *Mems U. S. geol. Soc.* no. 125.
- Tendal, O. S. & E. Thomsen, 1988. Observations on the life position and site of the large foraminifer *Astrorhiza arenaria* Norman, 1876 from the shelf off northern Norway. *Sarsia* 73: 39—42.
- Wangersky, P. J., 1978. Production of dissolved organic matter. — pp. 115—220 In: Kinne, O. (ed.) *Mar. Ecol. vol. 4.* John Wiley & Sons, Chichester.

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