

# The ongoing investigation of the Faroe Bank tardigrade fauna

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## **Abstract**

The calcareous sediments at the Faroe Bank (NE Atlantic) have been intensively sampled over the last two decades, revealing a unique biotope with an extremely rich tardigrade fauna both in specimens and in species. Even though only a partial sorting of the samples has been carried out, 35 species (including at least 22 species new to science) have been identified until now and preliminary results, based on species richness estimators, suggest that the total species number may approach 60-70 species.

## **Introduction**

Marine tardigrades are found in a diversity of habitats, ranging from the intertidal zone to abyssal depths. The majority of species inhabits the interstices of coarse sediment, attached to the detritus in the sediment. The highest diversity is reached in calcareous sediments and the same appears to apply to other meiofauna groups (see Kristensen, 2005). This paper provides a review of the current achievement of the ongoing investigation of the Faroe Bank and gives a description of the taxonomic composition of the tardigrade fauna.

## **The Faroe Bank tardigrade fauna**

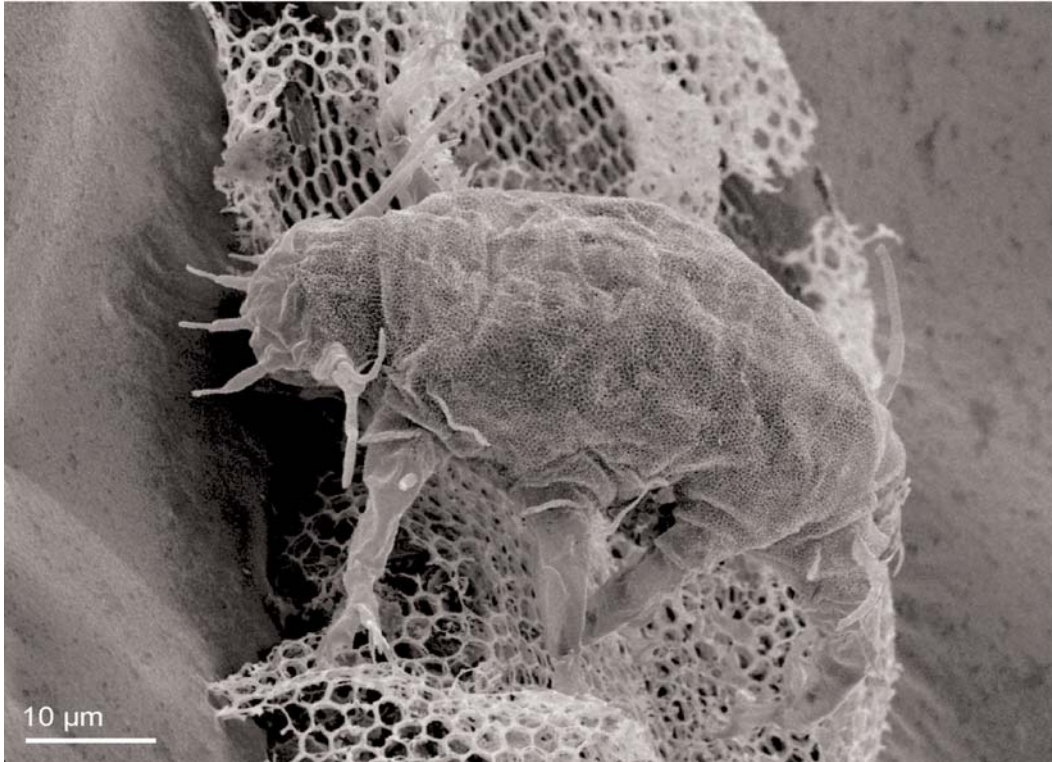
As part of the BIOFAR programme (see Nørrevang *et al.*, 1994; Bruntse and Tendal, 2001), five cruises, conducted in 1989, 1990, 1992, 1998 and 2001 have collected sediment samples for qualitative analysis of the meiofauna. Even though the meiofauna of the Faroe Bank has been well investigated over the last two decades, published data concerning the tardigrade fauna has been scarce. The first observation on the Faroe Bank tardigrade fauna was reported by Thiel (1991), who provided an illustration of a single tardigrade species belonging to *Raiarctus* Renaud-Mornant, 1981. As one of the first to recognize the rich meiofauna at the Faroe Bank, Kristensen (1992; 1999) reported the occurrence of 15 species of tardigrades, adding a specific name only to one species, *Coronarctus stylisetus* Renaud-Mornant, 1987. Kristensen and Neuhaus (1999) identified two more species, *Actinarctus* cf. *physophorus* Grimaldi de Zio, 1982 and *Tholoarctus natans* Kristensen and Renaud-Mornant, 1983, which were included in their study on the ultrastructure of the tardigrade cuticle.

Jørgensen and Kristensen (2001) provided the first description of a new tardigrade species encountered at the Faroe Bank, and Hansen *et al.* (2001) gave the first species account, introducing species richness estimation and similarity methods, until then not used in faunistic studies of marine tardigrades. Hansen *et al.* (2003) described *Rhomboarctus aslaki*, the same species illustrated by Thiel (1991) as a *Raiarctus* species.

Currently, the Faroe Bank tardigrade fauna comprises 35 identified species belonging to 17 genera, including 22 species new to science, one of which belongs to an undescribed genus within the Florarctinae. Four families of arthrotardigrades, Halechiniscidae, Batillipedidae, Coronarctidae and Stygarctidae, are taxonomically unequally distributed in the area. The family Halechiniscidae is represented by 14 genera and constitutes the majority of both species and specimen number at all stations, while the families Batillipedidae, Coronarctidae and Stygarctidae are so far represented by a single genus each. The Halechiniscidae at the Faroe Bank comprises 6 subfamilies: the Euclavarctinae (one species of *Parmursa* Renaud-Mornant, 1984), the Styraconyxinae (2 species of *Angursa* Pollock, 1979, one species of *Tholoarctus* Kristensen and Renaud-Mornant, 1983, 7 species of *Styraconyx* Thulin, 1942, 3 species of *Raiarctus* Renaud-Mornant, 1981, and one species of the genus *Rhomboarctus* Renaud-Mornant, 1984), the Halechiniscinae (one species in each of the genera *Halechiniscus* Richters, 1908, *Chrysoarctus* Renaud-Mornant, 1984 and

*Paradoxipus* Kristensen and Higgins, 1989), the Florarctinae (one nov. gen. et nov. sp. and one species of *Wingstrandarctus* Kristensen, 1984), the Tanarctinae (9 species of *Tanarctus* Renaud-Debyser, 1959, and one species of *Actinarctus* Schulz, 1935), and the Dipodarctinae (one species of *Dipodarctus* Pollock, 1995). The Batillipedidae is represented by 2 species of *Batillipes* Richters, 1909, the Coronarctidae by one species of *Coronarctus* Renaud-Mornant, 1974, and the Stygarctidae by one species of *Pseudostygarctus* McKirdy, Schmidt and McGinty-Bayly, 1976.

Among the most remarkable results is the extremely high species diversity of the genus *Tanarctus*, represented by 9 species of which 6 species are new to science, almost doubling the number of known tanarctids. Apparently, the environment of the Faroe Bank constitutes a perfect habitat for members of this genus, although no proof can be offered at our present state of knowledge. Another interesting component of the tardigrade fauna is the occurrence of two species of *Batillipes* at bathyal depths. Previously, Batillipedidae has been considered a littoral family with a few sublittoral representatives. Furthermore, one of the new species of *Batillipes* has a pair of very aberrant caudal sense organs, which are almost the length of the body, appearing as *Tanarctus*-like appendages. Of particular importance among the many undescribed species, are the findings of further species belonging to the former monotypic genera *Parmursa*, *Rhomboarctus*, and *Paradoxipus*, and especially the occurrence of a new



**Fig. 1.** Overview scanning electron microscopy (SEM) images of the species *Dipodactylus cf. subterraneus* (Renaud-Debyser, 1959) clinging to the empty lorica of a tintinnid. This association seems to be a very common phenomenon at the Faroe Bank.

genus within the Florarctinae. The first record of this genus is from deep-sea sediment (2475 m) in the South Pacific Ocean, off the coast of Chile, and was sorted out by Higgins and Kristensen in 1966, but never described. This new genus is closely related to the genus *Ligiartus* Renaud-Morant, 1982, however the internal structure of the alae (wings) is very complex and has not been observed in any other known tardigrade species.

Ecological studies of the subtidal tardigrade fauna are few, and have been carried

out mainly in the Mediterranean Sea (Grimaldi De Zio *et al.*, 1983; D'Addabbo *et al.*, 1987; 1999; Villora-Moreno and Grimaldi De Zio, 1996). Compared with these studies, the Faroe Bank has a high species richness with a high proportion of species new to science. Furthermore, by extrapolating the species richness estimation curves calculated by Hansen *et al.* (2001), approximately 60-70 species are expected to be present at the Faroe Bank.

## Conclusions

The Faroe Bank tardigrade fauna is extremely rich both in specimens and in species. The unusually high proportion of species new to science provides a unique foundation for future research, as an inexhaustible source of information on the morphological variation among a large number of species.

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