

Abundance and distribution of marenzelleria species in the Baltic Sea

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Photo by Jan-Erik Bruun

Key message

Three species of *Marenzelleria* polychaete worms have established throughout the entire Baltic sea area. The species are difficult to distinguish and therefore this fact sheet assesses them mainly on the genus level.

Results and assessments

Marenzelleria species have been among the most successful and studied alien species (group) in the Baltic Sea during the past decades (Ezhova & Spirido 2005). *Marenzelleria* has established to the entire area of the Baltic Sea (**Fig. 1**), but the areal distributions of the three species are more difficult to assess. Figure 1 shows the distribution of the three species based on the HELCOM expert survey among the Baltic Sea experts, but the taxonomic differences should be read with caution

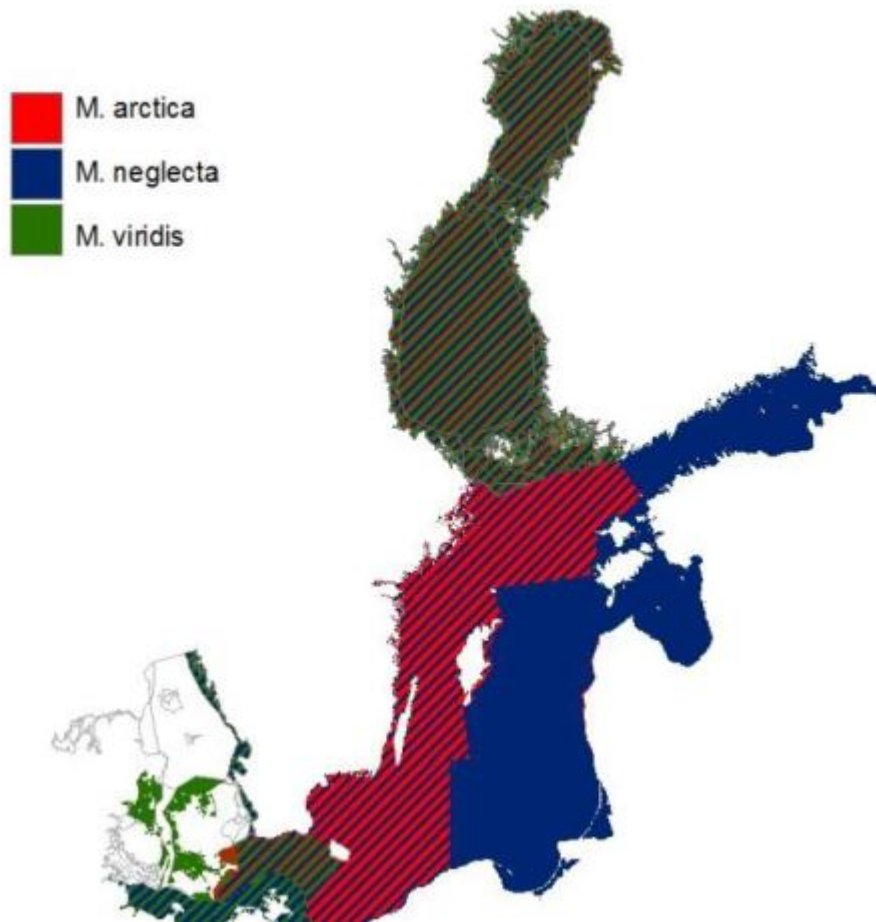


Figure 1. Distribution of the *Marenzelleria arctica*, *M. neglecta* and *M. viridis* in the Baltic Sea. Because the identification of the three species is difficult, the species distributions should be considered with caution. Source: HELCOM List of non-indigenous species.

Population densities

German Arkona Basins. In 1985, the first recorded densities of *Marenzelleria viridis* between the eastern Darss-Zingst Boden and Oder estuary (Szczecin Lagoon) were ~1000 ind. per m² (review by Kube et al. 1996). Almost ten years later, in 1993/94, the mean densities of *M. viridis* in the area were between

1000-5000 ind. per m² (maxima 28 000- 39 000, 30-40 g AFDW per m²) (Kube et al. 1996, Zettler et al. 2002). In offshore and deeper areas, the densities dropped to 100-300 ind. per m² and less. In the late-1990s the densities had settled to 3000 ind. per m² in the outer parts, whereas in the less saline inner parts only a few hundred individuals were found per square meter (Zettler et al. 2002).

Polish Bornholm Basin and Baltic Proper, Pomeranian Bay & Gulf of Gdansk. Concerning geographic distribution, the major observed pattern is significantly higher abundances and biomasses in the Gulf of

Gdańsk and Pomeranian Bay than in the open coast. Based on studies carried out by Warzocha et al. (2005), the frequency of occurrence in the Pomeranian Bay, Gulf of Gdańsk, and off the open coast was 100, 91, and 70%, respectively. The mean abundances calculated for the Pomeranian Bay, the open coast area, and the Gulf of Gdańsk were 857, 147, and 388 ind per m², respectively. The mean biomass values for the three areas were 25.30, 4.79, and 37.11 g per m², respectively. The highest abundance and biomass values were recorded off the Świna River mouth (more than 3000 ind per m²) and the Vistula River mouth (in excess of 1500 ind per m²), with respective biomass values of about 90 and 169 g per m². The sandy bottom off the open coast was found to support low abundances and biomass values. *Marenzelleria* occurred within a depth range of 4 m (the shallowest stations) to 45 m on sandy and to 76 m on silty bottoms. They were abundant (more than 100 ind per m²) to depths of 20-25 m, and single individuals were encountered even deeper down (Warzocha et al. 2005). Nevertheless they were observed in depths down to about 60-75 m, where unfavorable oxygen conditions limit the occurrence of other less tolerant species.

Vistula Lagoon. The first *Marenzelleria* observation was from outside the lagoon, near the sea entrance in 1988-1991 when the abundance was about 100 ind. per m² and biomass was 0.08 g per m². In 1992-1994 population increased exponentially and the average abundance reached 5000-7000 ind per m² (Żmudziński et al. 1996). In 1997-2004 *M. neglecta* inhabited the whole lagoon. The average abundance varied from 1100 to 3000 ind. per m², the frequency occurrence was 97%, and the biomass proportion ranged from 5% to 75% of the total benthos in different parts of the lagoon (Ezhova & Spirido 2005).

Szczecin Lagoon. The *Marenzelleria* population in the area was most abundant in 1990-1991 (Żmudzinski et al. 1996). In the initial period of expansion only single juveniles and adults were found and the abundance did not exceed 100 ind per m². *Marenzelleria* was found in the Szczecin Lagoon only in spring and early summer when the salinity of water is higher, and the salinity may be the reason why the polychaete is only temporarily inhabiting this water body.

In 2002 in the open marine waters of the Russian Kaliningrad region, the densities of *Marenzelleria neglecta* were up to 14 760 ind. per m², mean density around 6000 ind. per m² (Gusev & Starikova 2005). Gusev and Starikova, however, note that the samples taken by the van Veen grab underestimate the true densities. Better estimates of *Marenzelleria* densities would be obtained using box corer since adult worms live predominantly in the deeper sediment, even at 35 cm depth where van Veen grab does not reach (Zettler et al. 1994).

In the Lithuanian Curonian Lagoon, *Marenzelleria* densities in the 1990s were usually <500 ind. per m² but during the larval outbursts the lagoon water comprised even 50 000 larvae per cubic meter (Zettler et al. 2002).

Gulf of Riga. Kotta and Kotta (1998) report that *Marenzelleria neglecta* had adult densities ranging between 1-1000 ind. per m² (biomass 0.005-0.05 g dw per m²) in the Estonian Gulf of Riga and Väinämeri area between 1991-1997. In Pärnu Bay, the adult biomass ranged from 0.01 to 0.1 g dw per m² and

larval abundance from 1000 to 4000 ind. per m³ during 1996-2004 (Kotta et al. 2006), but biomasses up to 2 g dw per m² were observed.

Gulf of Finland. The density of the *Marenzelleria* individuals in the western Gulf of Finland (Hanko area) was low (11 ind. per m²) after the first finding in 1990, but increased by 1993 to 1000 ind. per m² (Stigzelius et al. 1997). In Helsinki area, the species was first observed in 1991 (possibly 1990) and its density in 1993 was 333 ind. per m². Hundred kilometers to east, in the Loviisa area, *Marenzelleria* density in 1993 was 300 ind. per m² (Stigzelius et al. 1997). According to Maximov (2011), *Marenzelleria* spp. (likely *M. arctia*) are efficient colonizers of hypoxia affected sea floor being the dominant (and sometimes the only) species after hypoxic events. Biomasses ranging from ~30 to 94 g per m² were measured in 2009.

Gulf of Bothnia and Archipelago Sea. The species was found in the Bothnian Sea in 1992 (Rauma area) and by 1993 its density was up to 60 ind. per m² (Stigzelius et al. 1997). In 2006, the density was already ~2500 ind. per m² (HELCOM 2009). In the Åland archipelago, the species was among the five most abundant species in 2000 (Perus & Bonsdorff 2004).

Invasion history

In the Baltic Sea area, the first *Marenzelleria* individuals were found in 1985 in the German side of the Szczecin Lagoon (Bick and Burckhardt 1989), and the first record in the Polish waters dates to 1988 (Gruszka 1991). In 1990 it was observed from southern Finland and by 1996 it had established in the Eastern Gulf of Finland (review by Maximov 2011).

Role in the food web

The wide distribution and high abundance of a non-indigenous species raises the obvious question whether it has had any negative impacts on the Baltic native fauna and flora. There are some indications that *Marenzelleria* has caused species declines in some areas. Kotta et al. (2006) showed experimentally that *Marenzelleria* caused mortality of the amphipod *Monoporeia affinis* and the polychaete *Hediste diversicolor*, but was outcompeted by *Macoma balthica*. Olsen et al. (2008) confirmed these findings by observational data in Isefjord, Kattegat, and added that there are possible biotic interactions with *Hydrobia* mudsnails, *Corophium* amphipods and the bivalve *Mya arenaria*. In the Eastern Gulf of Finland, no major changes in the benthic fauna have been reported as a result of 13 years' presence of the species in the system (Maximov 2011).

Taxonomy of the *Marenzelleria* species

The North Sea and the Baltic populations were found to differ in both morphology and reproduction period (Warzocha et al. 2005). Comparative genetic studies indicated that they were two different species: *Marenzelleria cf. wireni* in the North Sea and *Marenzelleria cf. viridis* in the Baltic (Bastrop et al. 1995). In their recent revision of the genus *Marenzelleria*, Sikorski and Bick in 2004 described five species, four of which occur in brackish areas. These authors argue that the species found in the Baltic represents *M. neglecta* (Warzocha et al. 2005). However, the study by Blank et al. (2008) shows that there are three species in the Baltic: *M. viridis* occurs in the Sound, southwestern areas and in the east,

where it occurs together with *M. neglecta*. *M. arctia* was found only from the northern sub-basins, where it occurred (sometimes) together with one of the two other species.

Policy relevance

This indicator adds supplementary information to the assessment of Good environmental status regarding the HELCOM Baltic Sea Action Plan (BSAP, HELCOM 2007) and the qualitative descriptor 2 'Non-indigenous species' of the EU Marine Strategy Framework Directive (Anon. 2008, 2010).

The Baltic Sea Action Plan does not directly have an ecological objective for the distribution and abundance of non-indigenous species. The management objective 'No new introductions of non-indigenous species' addresses the new introductions and the ecological objective 'Thriving communities of plants and animals' addresses the whole community. Nonetheless, this indicator gives essential background information for the other HELCOM indicators and supports risk assessments of NIS in the region.

Link to the data set

<http://www.helcom.fi/Lists/Publications/ALIENS/Report%20on%20observed%20non-indigenous%20and%20cryptogenic%20species%20in%20the%20Baltic%20Sea.pdf>

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