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A welcome can of worms? Hypoxia mitigation by an invasive species

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Hypoxic disturbance is globally one of the major threats to the functioning of benthic communities. Such disturbance can provide an opportunity for invasive species to establish and these species can subsequently become the main drivers of ecological change. There is recent evidence that improved bottom-water oxygen conditions in coastal areas of the Baltic Sea have coincided with increased abundances of the invasive polychaetes Marenzelleria spp. Using a reactive-transport model, we demonstrate that the bioirrigation activities of dense Marenzelleria populations have a major impact on sediment biogeochemistry, in particular phosphorus dynamics, and facilitate the switch from a seasonally hypoxic system back to a normoxic system. The model is used to illustrate mechanisms through which Marenzelleria can act as a driver of ecological change, although hypoxic disturbance or natural population declines in native species may be needed for them to initially establish. Although invasive species are generally considered to have negative ecosystem and economic effects, we here show a potential positive effect of one of the main invaders in the Baltic Sea. A nutrient budget for the inner Stockholm archipelago shows that the positive effect of Marenzelleria on sediment phosphorus retention is three times larger than the external phosphorus load into the area. This highlights the value of abundant benthic communities for sediment nutrient cycling and their importance in recovery from hypoxia.