Effects of chronic bottom trawling on soft-seafloor macrofauna in the Kattegat

Impact studies of chronic bottom trawling aiming to reveal long-term effects on benthic organisms are often hampered by the lack of comparable untrawled conditions and the difficulty in assessing the spatial distribution of trawling intensity. We sampled soft-seafloor macrofauna over a precise trawling gradient in the Kattegat using hourly vessel monitoring systems and logbooks. The gradient included the establishment of a marine protected area (MPA), where trawling intensity declined sharply to zero. Our results show shifts in the macrofauna assemblage and non-linear responses, with decreases in the number and diversity of species at low to medium trawling intensities. The benthic community was dominated by burrowing brittle stars, of which one species, Amphiura chiajei, increased in abundance from low to medium trawling intensities. We interpret this positive response to increasing trawling intensities as a consequence of reduction in predation by benthivorous flatfish and Norway lobster Nephrops norvegicus, which are significant catches of the fishery. The response was supported by a corresponding trend towards lower abundance of the dominating brittle stars following enforcement of the MPA and presumably an increase in benthivore density and predation pressure within the MPA. We conclude that chronic bottom trawling reduces diversity and may boost the abundances of species resistant to bottom trawling. The results emphasize the need to consider food web effects when assessing the impact of bottom trawling.