

**Lethal effect of filamentous algal blooms on Atlantic herring (*Clupea harengus*) eggs in the Baltic Sea**

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**Abstract**

Eutrophication is a primary water quality issue for most freshwater and coastal marine ecosystems in the world, often resulting in mass developments of bloom-forming algae. Harmful effects of macro algal blooms are normally not releasing toxic substances, but last longer than micro algal blooms and have immense ecological effects as they alter the function and structure of affected ecosystems. Numerous fish species depend on those areas for spawning and as juvenile habitats.

This study focuses on Baltic spring herring (*C. harengus*), annually migrating into shallow coastal areas for spawning their demersal eggs onto benthic substrates. Comparing the survival of herring eggs in two natural spawning areas, we found a mortality rate of nearly 100% in the area with a filamentous brown algae bloom. Hypothesizing that the presence of filamentous algae increases herring egg mortality, we conducted field and laboratory experiments that revealed species specific effects. While filamentous forms of the green algae *Ulva intestinalis* induced no immediate effect, a significantly lower egg survival was documented in experiments with the filamentous brown algae *Pylaiella littoralis*.

Recent mild winter conditions seem to increase the overlap of *P. littoralis* vegetation periods and the herring spawning season. The synergy of climate abnormalities with high levels of eutrophication has the potential to affect herring reproduction success via the cascade of harmful algal blooms. This has important implications for coastal zone managements as it underlines the need for further nutrient reduction.

**Keywords:**

coastal eutrophication, macro algal blooms, fish egg mortality, *Pylaiella littoralis*

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