

Cascading effects of changing environmental conditions and food-web structure on bioaccumulation of contaminants in higher trophic levels

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Marine ecosystems face unprecedented anthropogenic pressure. One such pressure is persistent organic contaminants that pose a significant pollution challenge. The intricate connections between changes in ecosystem, such as climate-related variations, eutrophication and loss of top predators, and their impact on bioaccumulation remain poorly understood. Here, we explore the consequences of changes in environmental conditions (climate and eutrophication factors) and food-web structures on bioaccumulation of contaminants for higher trophic levels in the Baltic Sea. Despite a decrease in input loads of dioxins and furans (PCDD/F) to the Baltic Sea from the late 1970s, the concentrations in guillemot eggs stagnated in the early 1990s. Sprat is the main prey species of guillemot and became abundant in the early 1990s. Our findings suggest that a regime shift in the central Baltic Sea during the late 1980s, shifting from the top predatory fish cod to clupeid sprat dominance, may have cascaded up and influenced the bioaccumulation of PCDD/F in guillemot eggs. Further investigations are imperative to understand the long-term cumulative impact of environmental and food-web changes on the bioaccumulation of contaminants in ecosystems and a better management of persistent organic contaminants in marine social-ecological systems.

Key Words: Organic contaminants, Dioxins and Furans (PCDD/F), bioaccumulation, cascading effects.