

Including drift in analyses of observation data reveals environmental effects on copepod biomass in the Barents Sea

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Abstract: The advective nature of marine systems presents a challenge in zooplankton studies. Knowledge about the role of advection is needed to (1) assess the relative importance of advection versus other environmental variables in shaping zooplankton dynamics, and to (2) reveal the actual habitat of zooplankton to more accurately study the role of local environmental variables. In highly advective areas such as the Barents Sea, zooplankton might drift vast distances during the growth season, but these trajectories are not detected by traditional sampling methods.

We analysed spatially resolved *Calanus finmarchicus* biomass data collected bi-annually in the Barents Sea between 1959 and 1993 (Nesterova 1990). Generalized additive models were used to assess the effects of environmental variables in spring, and advection from spring to summer, on the spatiotemporal variation in summer biomass. Particles representing *C. finmarchicus* were released in spring based on observed spring distribution, using a particle tracking model with input from the Regional Ocean Modelling System (ROMS). After drifting, the particles were sampled at the time and positions of summer observations, and the density of particles was used as explanatory variable in the statistical model. Temperature and mixed-layer depth at back-tracked locations in spring were used as proxies for zooplankton growth conditions.

Significant positive relationships were detected between *C. finmarchicus* summer biomass and particle density, spring temperature and mixed-layer depth. The simulation was thus able to reproduce some of the variation in the observation data. This study demonstrates how combining hydrodynamic modelling and statistical analyses of observation data can shed light on the importance of advection and local environmental variation on zooplankton dynamics.

References

Nesterova, V. N. (1990). Biomassa planktona na putiakh dreifa lichinok treski (spravochnyi material) [Plankton biomass along the drift route of cod larvae (reference material)]. PINRO, Murmansk. (In Russian).