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TITLE: Sea ice meiofauna distribution on local to pan-Arctic scales

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ABSTRACT:

Abstract Arctic sea ice provides microhabitats for biota that inhabit the liquid-filled network of brine channels and the ice-water interface. We used meta-analysis of 23 published and unpublished datasets comprising 721 ice cores to synthesize the variability in composition and abundance of sea ice meiofauna at spatial scales ranging from within a single ice core to pan-Arctic and seasonal scales. Two-thirds of meiofauna individuals occurred in the bottom 10 cm of the ice. Locally, replicate cores taken within meters of each other were broadly similar in meiofauna composition and abundance, while those a few km apart varied more; 75% of variation was explained by station. At the regional scale (Bering Sea first-year ice), meiofauna abundance varied over two orders of magnitude. At the pan-Arctic scale, the same phyla were found across the region, with taxa that have resting stages or tolerance to extreme conditions (e.g., nematodes and rotifers) dominating abundances. Meroplankton, however, was restricted to nearshore locations and landfast sea ice. Light availability, ice thickness, and distance from land were significant predictor variables for community composition on different scales. On a seasonal scale, abundances varied broadly for all taxa and in relation to the annual ice algal bloom cycle in both landfast and pack ice. Documentation of ice biota composition, abundance, and natural variability is critical for evaluating responses to decline in Arctic sea ice. Consistent methodology and protocols must be established for comparability of meiofauna monitoring across the Arctic. We recommend to (1) increase taxonomic resolution of sea ice meiofauna, (2) focus sampling on times of peak abundance when seasonal sampling is impossible, (3) include the bottom 30 cm of ice cores rather than only bottom 10 cm, (4) preserve specimens for molecular analysis to improve taxonomic resolution, and (5) formulate a trait-based framework that relates to ecosystem functioning.

SOURCE: Ecology and evolution

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