

Arctic sea-ice decline impacts on primary production

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Arctic food webs are short and relatively species poor, rendering them vulnerable to changes or perturbations at any individual trophic level. High-latitude warming represents one major source of potential perturbation to Arctic marine and terrestrial food webs, which may experience cascading effects derived from changes in primary production through so-called “bottom-up” effects. We synthesize current knowledge on i) the changing Arctic marine icescape, ii) the drivers of biological changes for Arctic marine primary production, iii) the different pulses of Arctic marine primary production, iv) patterns of marine trophic and phenological changes, and iv) some mechanisms through which sea-ice dynamics ostensibly influence terrestrial primary productivity. We deliver a set of predictions for key productivity indicators, propose a semi-quantitative model of the expected future changes in primary production in the ice-covered Arctic Ocean, and close with an overview of the challenges ahead for reaching a holistic and comprehensive understanding of the ecosystem dynamical consequences and associated impacts on human life of warming-related sea-ice decline.