



Supplement of

Changes in Arctic Ocean plankton community structure and trophic dynamics on seasonal to interannual timescales

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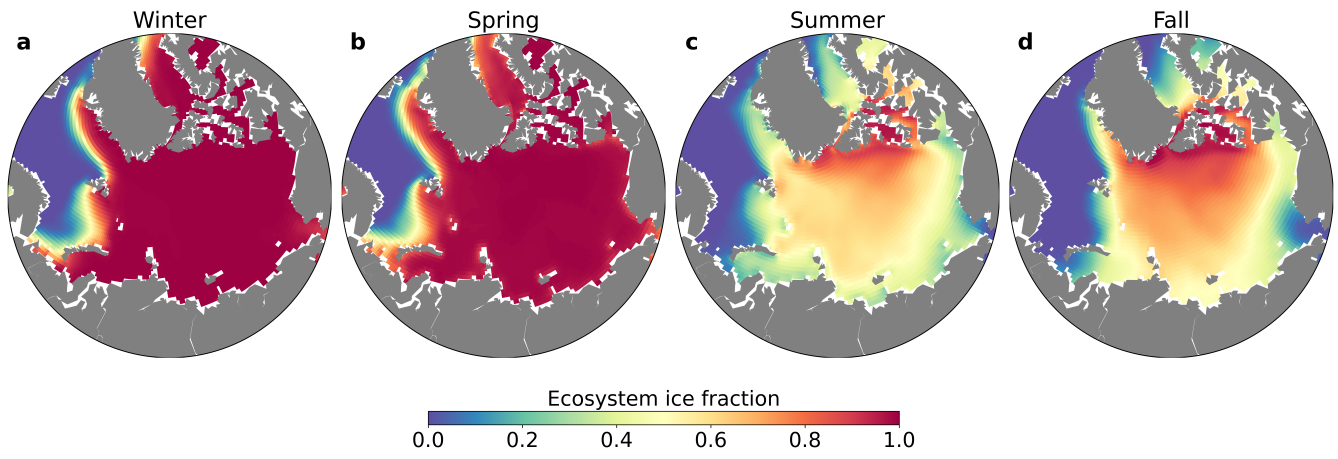


Figure S1. Ecosystem ice fraction in winter (a; December-February), spring (b; March-May), summer (c; June-August), and fall (d; September-November), averaged over 1990-2009

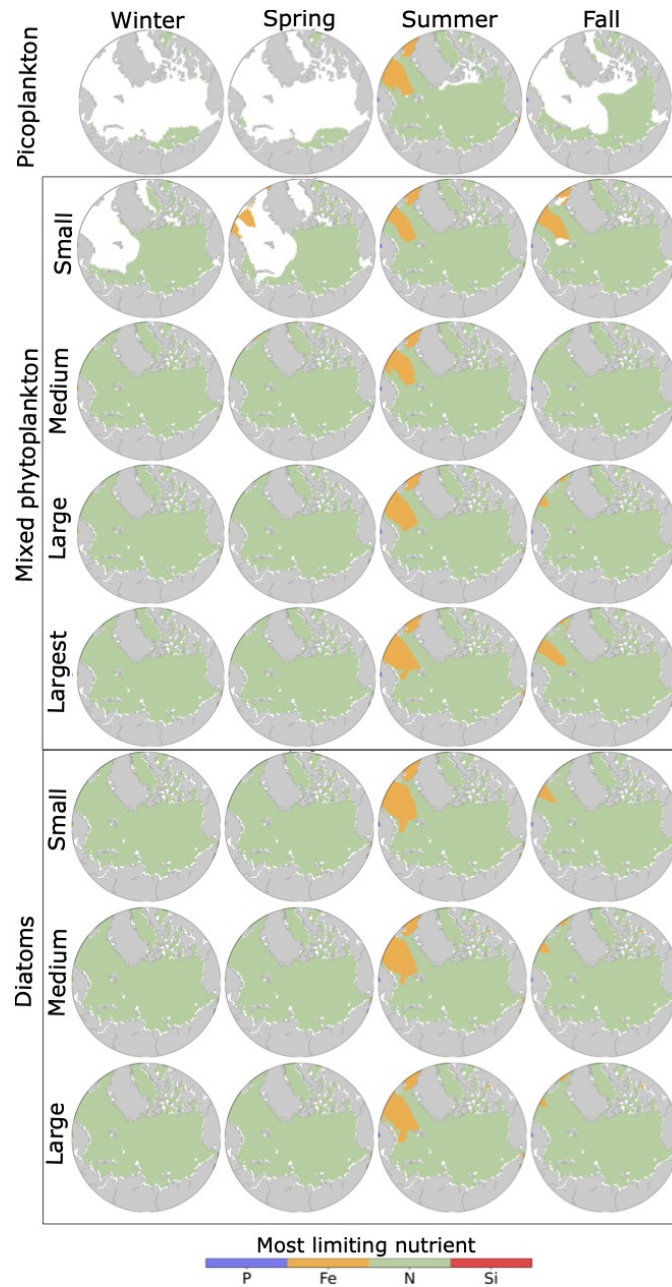


Figure S2. Most limiting nutrient for each phytoplankton group in the Arctic Ocean. The most limiting nutrients (Phosphate-purple, Iron-yellow, Nitrate-green, and Silica-red) for each phytoplankton type were averaged over the three months in each season, averaged over 1990-2009. White regions represent areas where no nutrient was limiting. Silicate was only considered for diatoms.

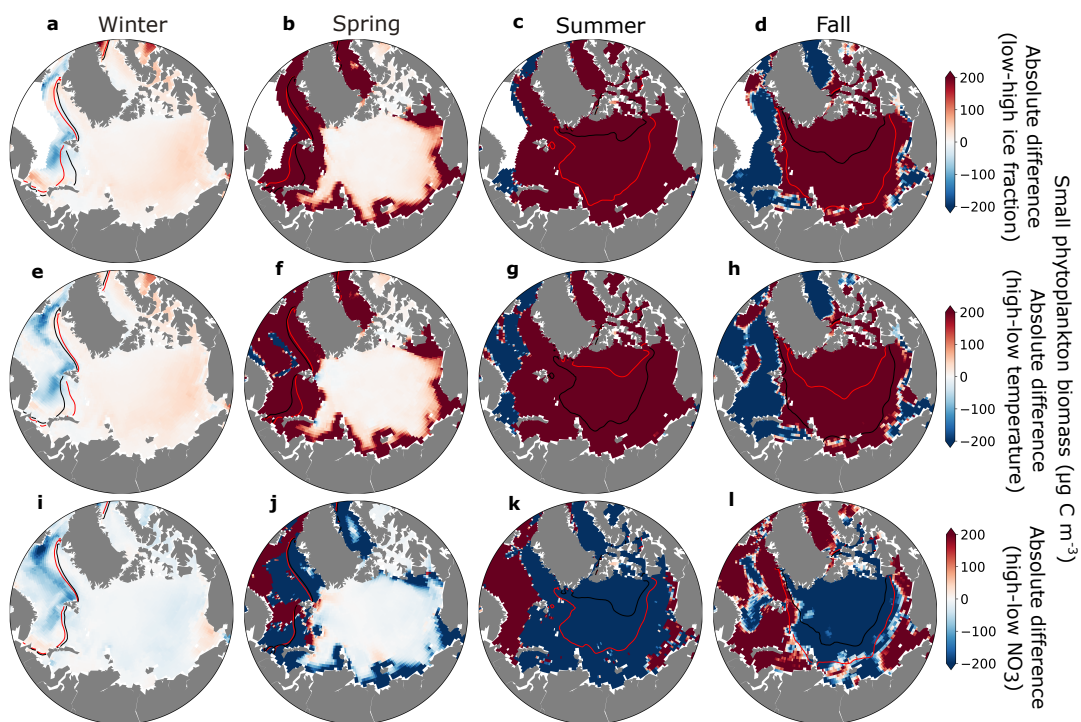


Figure S3. Absolute differences in small phytoplankton (picoplankton (pp), diazotrophs (diaz), small mixed phytoplankton (mp1,mp2), and small diatoms (diat1)) biomass over the top 150 meters ($\mu\text{g C m}^{-3}$) between low and high ice (a-d), temperature (e-h), and NO_3 (i-l) years for winter (a,e,i), spring (b,f,j), summer (c,g,k), and fall (d,h,l). Black contour lines indicate the sea-ice extent in years with high ice fraction (a-d), low temperatures (e-h), and low nutrients (i-l). Red contour lines indicate sea-ice extent in years with low ice fraction (a-d), high temperature (e-h), high nutrients (i-l).

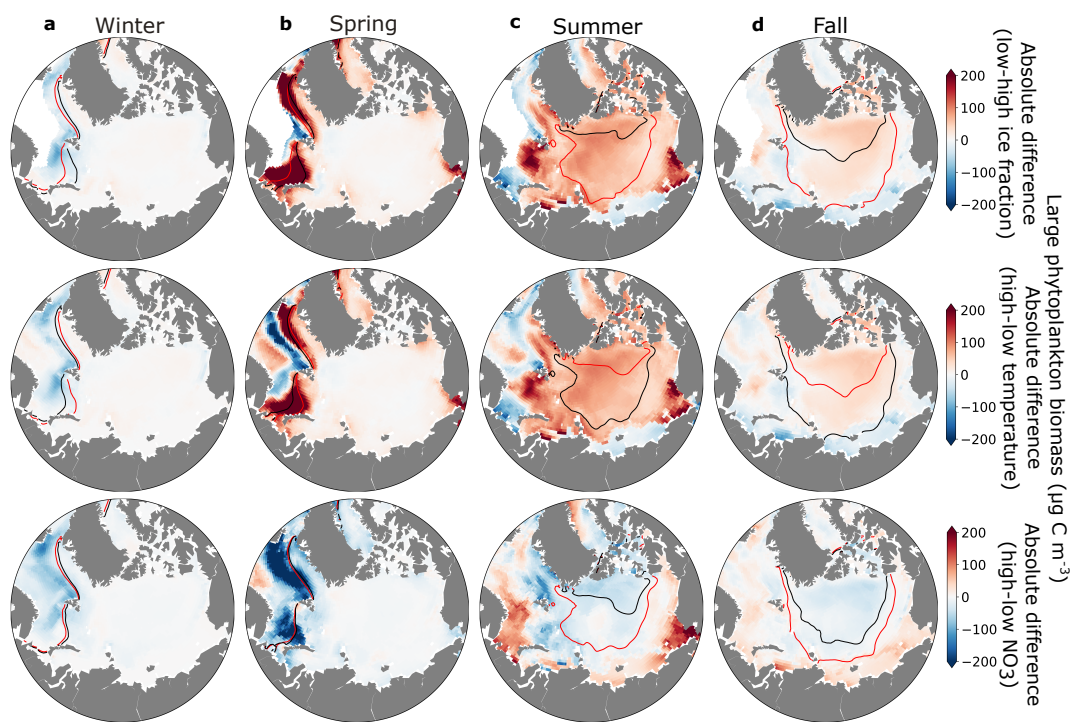


Figure S4. Absolute differences in large phytoplankton (medium and large mixed phytoplankton (mp3,mp4), and diatoms (diat2,diat3)) biomass over the top 150 meters ($\mu\text{gC m}^{-3}$) between low and high ice (a-d), temperature (e-h), and NO_3 (i-l) years for winter (a,e,i), spring (b,f,j), summer (c,g,k), and fall (d,h,l). Black contour lines indicate the sea-ice extent in years with high ice fraction (a-d), low temperatures (e-h), and low nutrients (i-l). Red contour lines indicate sea-ice extent in years with low ice fraction (a-d), high temperature (e-h), high nutrients (i-l).

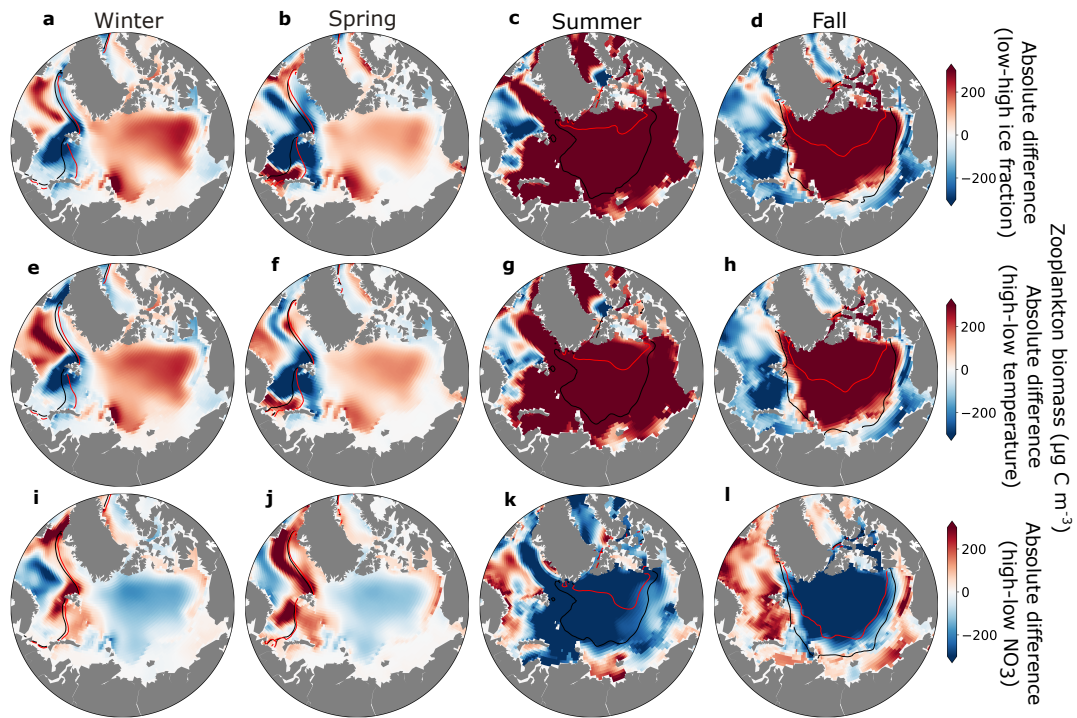


Figure S5. Absolute differences in zooplankton biomass over the top 150 meters ($\mu\text{gC m}^{-3}$) between low and high ice (a-d), temperature (e-h), and NO_3 (i-l) years for winter (a,e,i), spring (b,f,j), summer (c,g,k), and fall (d,h,l). Black contour lines indicate the sea-ice extent in years with high ice fraction (a-d), low temperatures (e-h), and low nutrients (i-l). Red contour lines indicate sea-ice extent in years with low ice fraction (a-d), high temperature (e-h), high nutrients (i-l).

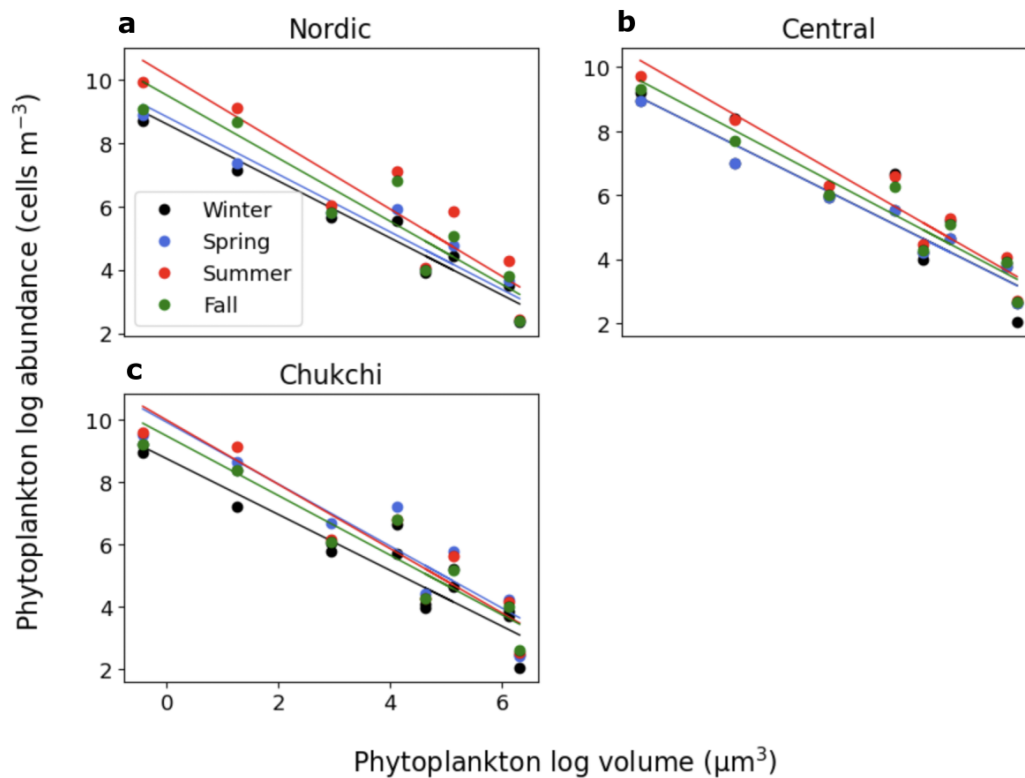


Figure S6. Seasonal log-log relationship between phytoplankton abundance (cells m^{-3}) and phytoplankton volume (μm^3) in three locations in the Arctic Ocean (Fig. 1): the Western Nordic Seas (a), the Central Arctic (b) and the Chukchi Sea (c). In this figure, the lines are color-coded to represent different seasons: black lines correspond to winter, blue lines depict spring, red lines indicate summer, and green lines represent the fall.

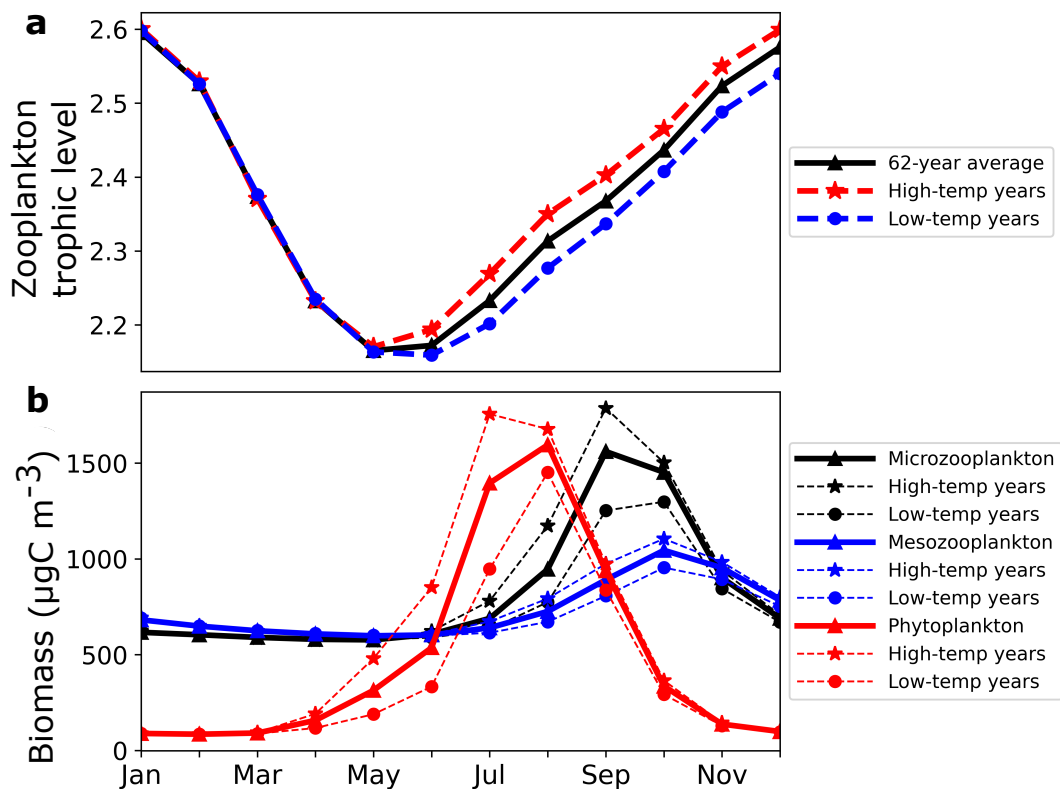


Figure S7. (a) Monthly averages of mean zooplankton trophic level (black) compared with mean zooplankton trophic level during high temperature years (red) and low temperature years (blue). (b) Plankton biomass ($\mu\text{gC m}^{-3}$), including microzooplankton (black), mesozooplankton (blue), and phytoplankton (red). The solid lines represent the 62-year average, while dashed stars and circles indicate high-temperature and low-temperature seasonal averages, respectively.