

## THE ROLE OF FOOD CHAIN COMPOSITION AND NUTRIENT AVAILABILITY IN SHAPING ALGAL BIOMASS DEVELOPMENT<sup>1</sup>

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*Abstract.* With the aim of assessing the principal structuring forces for algal biomass development, I conducted field studies along a productivity gradient of Swedish and Antarctic lakes. In accordance with predictions from current ecological theory, the regression line of planktonic algal biomass vs. the concentration of total phosphorus shows a steeper slope for Swedish (functionally three trophic levels) than for Antarctic lakes (functionally two trophic levels). This difference suggests that, besides the effect of nutrients, the food chain composition in aquatic systems has a crucial impact on the biomass development of planktonic algae. However, at very high productivity, phytoplankton biomass in the Antarctic lakes approached levels similar to those in Swedish lakes, suggesting that the algae “grew away” from being grazer regulated and instead became nutrient limited. The mechanistic connections between the components in the food chain, suggested by theory and the descriptive field study, were evaluated in an enclosure experiment. It may be concluded that classical food chain theory can explain a great deal of the variation in the relation between phosphorus concentration and phytoplankton chlorophyll, frequently used by limnologists.

*Key words:* algae; Antarctica; food chain; grazing; phytoplankton; trophic level.