

Aphotic pigment degradation in the hypolimnion: Implications for sedimentation studies and paleolimnology

Abstract—Reversed-phase high pressure liquid chromatography was used to quantify carotenoid and Chl degradation resulting from bacterial and microfaunal action during aphotic, hypolimnetic incubations of natural phytoplankton assemblages and detrital material in three lakes. Decay of carotenoids (to -0.0870 d^{-1}) and chlorophylls (to -0.1226 d^{-1}) was potentially rapid but site-specific. Chl *a* decay spanned a wide range (to -0.1226 d^{-1}) with greatest losses in circumneutral, unstained Peter Lake and least in acidic, stained Tuesday Lake. The usefulness of Chl *a* as an indicator of algal sedimentation was compromised by its rapid degradation, lack of compensatory production of recognizable derivatives, and an abundance of unknown, chlorophyllous compounds. β -carotene degraded less rapidly and variably (to -0.0167 d^{-1}) and is a useful addition to both sedimentation and paleolimnological studies. Differences among ca-

rotenoids in decay pose difficulties in reconstructing accurate estimates of former algal community composition, especially dinoflagellates, whose peridinin decays rapidly (-0.0843 d^{-1}). Changes in the relative (within-core) abundance of individual pigments may be combined, however, with changes in Chl *a* : β -carotene ratios to differentiate between periods of enhanced productivity (or pigment preservation) and changes in the vertical zonation of algal communities.

Acknowledgments

A contribution from the University of Notre Dame Environmental Research Center, funded by NSF grants BSR 86-06271 and BSR 85-21832.

We thank the reviewers for criticism and A. St. Amand for phytoplankton enumeration.