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Colourful coexistence : a new solution to the plankton paradox

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Appendix B

Sampling

The underwater light spectra and light absorption spectra of gilvin, tripton, and phytoplankton were measured in the Pacific Ocean, Baltic Sea, and three Dutch lakes (Lake IJsselmeer, Lake Groote Moost, Lake Heelder Peel). The subtropical Pacific Ocean was sampled at station ALOHA (23.4°N, 158°W) of the Hawaii Ocean Time-series program from the research vessel Kilo Moana on HOT cruise 174, from 6 to 9 October 2005. Water samples were taken with a SeaBird (Model SBE-09) CTD Rosette system from 12 depths within the upper 200 m of the water column. The Baltic Sea was sampled at 9 stations near the Gulf of Finland (from 59.1°N to 60.0°N and from 22.2°E to 26.2°E) from the research vessel Aranda on cruise Cyano-04 08/2004, from 12 to 19 July 2004. Water samples were taken with a Rosette sampler from 0 to 30 m depth using a sample interval of 3 m. Lake IJsselmeer (52°45'N, 5°20' E) was sampled from the research vessel Luctor on 7 September 2004. Lake Heelder Peel (51°12'N, 5°45' E) and Lake Groote Moost (51°18'N, 5°51' E) were sampled from small rowing boats on 16 September 2005 and 16 September 2006, respectively. Water samples were taken at 1 m depth with a Ruttner water sampler (Hydro-Bios Apparatebau GmbH, Kiel, Germany).

Measurement of light spectra

At each sampling station, the incident solar spectrum and depth profiles of the underwater light spectrum were measured with a RAMSES-ACC-VIS spectroradiometer (TriOS, Oldenburg, Germany). Water samples were filtered with Whatman (GF/F) glass fiber filters to separate dissolved organic matter (gilvin) from total particulate matter (tripton and phytoplankton). Absorption spectra of gilvin were obtained by measuring absorption spectra of the filtrate in a 5-cm glass cuvette using a Lambda 800 UV/VIS spectrophotometer (Perkin-Elmer, Wellesley, MA, USA), with distilled water as reference. Absorption spectra on loaded filters were measured with the filterpad method (Yentsch 1972; Cleveland & Weidemann 1993), using the spectrophotometer with a 150-mm integrating sphere (Labsphere, North Sotton, NH, USA). We corrected for path length amplification according to Cleveland and Weidemann (1993). First, the absorption spectrum on loaded filters was measured, representing the absorption spectrum of total particulate matter. Next, photosynthetic pigments were bleached with boiling ethanol, and the absorption spectrum of the bleached filter was measured (representing tripton). The absorption spectrum of phytoplankton was obtained by subtracting the absorption spectrum of tripton from the absorption spectrum of total particulate matter.

Appendix B