Effect of turbulence on sedimentation and net population growth of the dinoflagellate Ceratium tripos and interactions with its predator, Fragilidium subglobosum

Havskum, Harry, Per Juel Hansen, Elisa Berdalet

Limnol. Oceanogr., 50(5), 2005, 1543-1551 | DOI: 10.4319/lo.2005.50.5.1543

ABSTRACT: We investigated the effect of natural levels of turbulence on the vertical distribution and net population growth of the dinoflagellate *Ceratium tripos* and on the interaction with its predator, the mixotrophic dinoflagellate *Fragilidium subglobosum*. Unialgal cultures of each species were exposed to four kinetic energy dissipation rates, ε: 0.0001, 0.01, 0.05, and 1 $cm^2 s^{-3}$, generated by vertically oscillating grids in 2-liter cylindric containers. Autotrophic growth of *F. subglobosum* was not affected by any level of turbulence tested. In contrast, at $\varepsilon \geq 0.05$ $cm^2 s^{-3}$ (this value is generated in the upper 10 m of the ocean by a moderate gale or at 0.5 m in depth by a gentle breeze), *C. tripos* decreased its net population growth, and the vertical distribution of the cells was affected. At the highest turbulence level, *C. tripos* stopped swimming, settled, and accumulated at the bottom. Mixotrophic growth of *F. subglobosum*, when fed *C. tripos* at high densities (i.e., >> prey cells mL^{-1}), was not affected by turbulence. However, at low prey cell densities (i.e., 5 to 8 *C. tripos* cells mL^{-1}), growth and ingestion rates of *F. subglobosum* were significantly higher at the highest turbulence level compared to the rates at other turbulence levels and were close to the rates measured at high prey cell densities, presumably because sedimentation of *C. tripos* cells resulted in patches where the cell densities were not food-limiting for *F. subglobosum*.