Influences of benthic boundary-layer flow on feeding rates of ciliates and flagellates at the sediment-water interface

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Limnol. Oceanogr., 46(7), 2001, 1709-1719 | DOI: 10.4319/lo.2001.46.7.1709

ABSTRACT: Heterotrophic protists are integral to sedimentary food webs, but influences on their activities are poorly understood, especially the role of benthic boundary-layer flow. Effects of flow on ingestion rates were measured for bacterivorous protists at the sediment surface in a flume. Results from four common, benthic suspension-feeding ciliates were species specific. Mean clearance rates of the scuticociliates *Cohnilembus* sp. and *Paranophrys magna* and the hypotrich *Euplotes minuta* increased by factors of two to three as friction velocity (u_*) increased from 0 to 1.0 cm s21. Above $u_* = 1.0$ cm s^{-1}, clearance rates of *Cohnilembus* sp. and *P. magna* were constant, whereas the clearance rate of *E. minuta* was reduced by 40% at $u_* = 1.5$ cm s^{-1}. *E. minuta* thus revealed an optimal flow regime for feeding. In contrast, the mean clearance rate of the scuticociliate, *Cyclidium* sp., was unrelated to u_*. In experiments with sediment cores from a subtidal, silty sand site, the mean clearance rate of the bacterivorous ciliate community of the sediment-water interface increased by a factor of five between $u_* = 0$ and 0.9 cm s^{-1}. The effects of flow were likely due to enhanced advection of prey to the ciliates. In contrast, the clearance rate of the nanoflagellate community in sediment cores was unrelated to u_*. Tidal currents at the field site were estimated to increase the ciliate community's daily integrated feeding by a factor of 3.2 compared to still water. Epibenthic ciliates create a dynamic link between planktonic and benthic food webs, mediated strongly by benthic boundary-layer flow.

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