

Atypical Inverse Predator-Prey Links in Planktonic Food Webs

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The dinoflagellate *Noctiluca scintillans* (*Noctiluca*) has the ability to reproduce sexually, which may increase or restore population size under environmental stress or during blooms. Here, we documented for the first time a marine ciliate, *Strombidium hongkongensis*, which feeds on *Noctiluca*'s progametes in stages 5 to 9 of nuclear division. *S. hongkongensis* frequently swam on or around gametogenic and some of the vegetative cells of *Noctiluca*. *S. hongkongensis* ingested progametes at a rate of 0.5 to 11 progametes ciliate⁻¹ h⁻¹, depending on progamete size (i.e. nuclear division stage). This trophic interaction constitutes an upside-down predator-prey link in which the ciliate, within the prey size range of *Noctiluca*, becomes the predator. Predation by *S. hongkongensis* likely reduces the effectiveness of sexual reproduction as a strategy for *Noctiluca*, potentially shortening the durations of *Noctiluca* blooms and altering food web structure and energy flows during bloom conditions. In another study, green alga *Dunaliella salina* showed active swimming and an 'attack-like' behaviour towards a ciliate *Diophrys oligothrix*, despite the high ciliate grazing rates on them. A flock of *D. salina* 'attack' the ciliate continuously until it is killed and digested. The 'attack' appears to be density dependent, and over a 72 h observation an average of 15 to 20% of *D. oligothrix* were 'attacked' in treatment with >10,000 *D. salina* cells mL⁻¹. This phenomenon represents a unique type of 'mixotrophy' that are not previously reported. Such atypical trophic interactions among planktonic organisms highlight the complexity of the microbial food webs in the marine ecosystems.

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