The role of nutrients in decomposition of a thecate dinoflagellate

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Limnol. Oceanogr., 45(1), 2000, 123-130 | DOI: 10.4319/lo.2000.45.1.0123

ABSTRACT: The decomposition of freeze-dried whole cells and empty thecae of the dinoflagellate *Peridinium gatunense* Nygaard originating from dense blooms in Lake Kinneret (Israel) was followed experimentally under controlled conditions in the lab. The two materials (whole cells; empty thecae) were suspended in replicate bottles containing nutrient-poor epilimnetic water from the lake. After 7 d, nutrients (N, P, and trace metals) were added to half the bottles. We followed the changes with time in dry weight, the dynamics of nutrients, microbial abundances and a range of microbial activities including leucine incorporation rates and activities of hydrolytic enzymes. Because of the low N and P content of thecae (C : N: P atomic ratios .3000 : 19 : 1) relative to protoplasts (276 : 51 : 1), the microbial utilization of thecae was expected to depend much more on the availability of external nutrient sources than the utilization of protoplasts. Indeed, decomposition of thecae did not occur in the absence of external nutrients but was rapid (1-2 d to their disappearance) after nutrients were added. In contrast, almost no stimulating effect of nutrient addition was observed for the decomposition of whole cells. The results suggest that intensive regenerative nutrient cycling or external nutrient inputs are a necessary precondition for an efficient trophic transfer of the energy stored in blooms of thecate dinoflagellates. The high nutrient demands of microbial degradation imply furthermore a competition for nutrients between heterotrophic degradative and phototrophic productive processes. Because of the generally assumed stronger competitive ability of heterotrophic bacteria, reduced primary production is expected as an indirect result of dinoflagellate bloom degradation. Indeed, reduced primary production is observed in Lake Kinneret every summer after the decline of the annual *Peridinium* bloom in June-July.