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8 November 1991

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S F D

Dear Bernie,

Enclosed is a copy of the Final Report for my project. I have presented the project as a Final Report rather than an Annual Report because it expired in June of this year. Funding for the project was not renewed.

Sincerely,

David A. Caron  
Biology Department  
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## FINAL REPORT

David A. Caron  
Grant No.: N00014-89-J-1075  
Microbial Ecology of Marine Snow  
Woods Hole Oceanographic Institution  
Water Street  
Woods Hole, MA 02543  
508/457-2000 x2358

## RESEARCH ABSTRACT

### Goals

The long-term goal of this project has been to develop methodology for examining the rates of protozoan grazing on marine snow particles (macroscopic detrital aggregates) in plankton communities. These detrital aggregates typically contain bacterial communities that are enriched up to several orders of magnitude over the densities of these assemblages in the surrounding seawater, and provide favorable conditions for the growth of their primary consumers, the protozoa. The degree to which microbial activities on marine snow contribute to the processes in the entire water mass is poorly known. This uncertainty is due largely to the difficulties associated with the collection and examination of these populations, and particularly to the difficulties associated with conducting experiments on these fragile microenvironments.

### Objectives

The immediate goal of this 2-year project has been to examine and compare several methodologies for determining the rates of grazing of microbial populations in natural communities. Funding was not continued for this program, but the work period was extended to 30 June 1991 to allow the completion of field experiments.

### Approach

A number of methodologies exist for examining the grazing rates of bacterivorous (bacteria-eating) protozoa. These include the use of radioactively-labeled or fluorescently-labeled bacteria as tracers for measuring grazing on natural bacterial assemblages, selective filtration methods to remove some or all of the grazer community (so-called size fractionation experiments), or the inhibition of bacterial grazing through the use of specific metabolic inhibitors of eukaryote (grazer) activity.

### Tasks Completed

We have examined several methods for their efficacy in measuring the rates of consumption of bacteria by protozoan consumers. These methods have been investigated using laboratory assemblages of bacterivorous microorganisms and in a number of marine and freshwater environments ranging from highly eutrophic to highly oligotrophic waters.

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Results

Because of the unique microhabitat structure of marine snow particles, some of the more commonly-used methodologies for examining microbial activities in marine waters are ineffective or inappropriate. Specifically, those techniques that rely on mechanical disruption of the community (e.g. size fractionation experiments), or the introduction of 'tracer' populations, produce results that are difficult to interpret. In general, the use of inhibitors that depress or abolish grazer activity appears to be a more effective manner of examining grazing in these physically and biologically complex communities.

Accomplishments

We have examined and applied a number of techniques for measuring the grazing rates of protozoa in natural samples. Through these studies we have established criteria for the selection of methods most appropriate for specific environments and microenvironments (marine snow). In addition, our field studies on bacterivory in the Sargasso Sea are some of the first measurements from a highly oligotrophic oceanic environment.

**PUBLICATIONS**

- IC - Caron, D. A. Evolving role of protozoa in aquatic nutrient cycles. In: Reid, P.C., C.M. Turley and P.H. Burkill. Protozoa and their role in marine processes, NATO Advanced Study Institute Series, Springer-Verlag, Berlin, #387-415
- IC - Caron, D.A. Heterotrophic flagellates associated with sedimenting detritus. In: Patterson, D.J. and J. Larsen. The biology of free-living heterotrophic flagellates. Systematics Association Special Volume No. 43, Clarendon Press, Oxford, #77-92.
- PS - Caron, D.A., R.W. Sanders and D.K. Stoecker. Planktonic protozoa and the microbial loop: new awareness and perspective for zooplankton research. In: Goulden, C. and A. Tessier. Future directions in zooplankton population biology. Princeton University Press.
- PS - Marrasé, C., E.L. Lim and D.A. Caron. Seasonal and daily changes in bacterivory in a coastal plankton community. Mar. Ecol. Progr. Ser.
- PI - Caron, D.A. E.L. Lim. Nanoplankton density, biomass and grazing activity in surface waters of the Sargasso Sea.

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**STATISTICS**

- 1) 0
- 2) 1 paper submitted to refereed journal
- 3) 2 book chapters published, refereed non-serial publications
- 4) 1 book chapter submitted, refereed non-serial publications
- 5) 3 invited presentations at scientific conferences
- 6) 1 contributed presentation at scientific conferences
- 7) 0
- 8) 0
- 9) 0
- 10) 0
- 11) 1 other professional personnel supported

**EEO AND MINORITY SUPPORT**

- 12) 3
- 13) 2
- 14) 1
- 15) 2
- 16) 0
- 17) 0

**PATENTS AND AWARDS**

None