contributing dissolved organic matter in the water column. These preliminary studies suggest that, in McMurdo Sound, microzooplankton and macrozooplankton use detrital pathways of nutrition.

This research was supported by National Science Foundation grant DPP 83-14607. Additional members of our field were Mark Moline, Mary Voytek, and Mary Putt.

References

Beers, J.R., F.M.H. Reid, and G.L. Stewart. 1980. Microplankton population structure in southern California nearshore waters in late spring. *Marine Biology,* 60, 209–226.

Fuhrman, J., and F. Azam. 1980. Bacterioplankton secondary production estimates for coastal waters of British Columbia, Antarctica, and California. *Applied Environmental Microbiology,* 39, 1085–1095.

Fuhrman, J., and F. Azam. 1982. Thymidine incorporation as a measure of heterotrophic bacterioplankton production in marine surface waters; evaluation and field results. *Marine Biology,* 66, 109–120.

Garrison, D.L., K.R. Buck, and M.W. Silver. 1984. Microheterotrophs in the ice-edge zone. *Antarctic Journal of the U.S.,* 19, 109–111.

Hewes, C.D., O. Holm-Hansen, and E. Sakshaug. 1985. Alternate carbon pathways at lower trophic levels in the Antarctic food web. In W.R. Siegfried, R.R. Condy, and R.M. Laws (Eds.), *Antarctic nutrient cycles and food webs.* (Proceedings of the SCAR symposium on antarctic biology, 4 September 1983.) Berlin: Springer-Verlag.

Hodson, R.E., F. Azam, A.F. Carlucci, J.A. Fuhrman, D.M. Karl, and O. Holm-Hansen, 1981. Microbial uptake of dissolved organic matter in McMurdo Sound, Antarctica. *Marine Biology,* 61, 89–94.

Lessard, E.J., and E. Swift. 1985. Species-specific grazing rates of heterotrophic dinoflagellates in oceanic waters, measured with a dual-label radioisotope technique. *Marine Biology,* 87, 289–296.

Rivkin, R.B., I. Bosch, J. Pearse, and E.J. Lessard. 1986. Bacterivory: A novel feeding mode for asteroid larvae. *Science,* 233, 1311–1314.

Roman, M.R., and P.A. Rublee. 1981. A method to determine *in situ* zooplankton grazing rates on natural particle assemblages. *Marine Biology,* 65, 203–309.

Sullivan, C.W., and A.C. Palmisano. 1984. Sea-ice microbial communities: Distribution, abundance, and diversity of ice bacteria in McMurdo Sound, Antarctica, in 1980. *Applied Environmental Microbiology,* 47, 788–795.

Taylor, G.T. 1982. The role of pelagic heterotrophic protozoa in nutrient cycling: A review. *Annales de L'institut Oceanography,* 58 (suppl.), 227–241.

The role of bryozoans in the benthic community at Low Island, Antarctica

J.E. WINSTON *and* B.F. HEIMBERG

Department of Invertebrates
American Museum of Natural History
New York, New York 10024

During the austral summer and fall of 1985, we carried out studies on the ecology of antarctic bryozoans. Part of this work involved determining life-history characteristics and ecological relationships of dominant species at Low Island, the southernmost of the South Shetland Islands (63°25'S 62°10'W). In water between 80 and 110 meters, the benthic community resembled that described in other areas of the Antarctic, with a high biomass consisting primarily of large, sessile suspension feeding organisms (figure 1). Bryozoans made up about 15 percent of the biomass. Five species predominated, all with large, foliaceous, flexible, lightly calcified colonies. The most abundant was *Carbasea ovoidea* (figure 2) which often comprised more than half of the bryozoan biomass in a trawl sample. The other abundant species were *Nematoflustra flagellata, Flustra thysanica, Kymella polaris,* and *Himantozoum antarcticum.*

Fronds of *Carbasea* colonies showed no yearly growth checks, indicating that all frond growth takes place during one season, although basal rhizoids and stolons may be perennial, producing new fronds yearly. The mean growth increment for *Carbasea* fronds was 8.5 centimeters per year. Growth of species with perennial fronds was much slower (0.92–1.34 centimeters per year), but only a little less than that measured in the only temperate species of this type studied, *Flustra foliacea* (1.7 centimeters per year, according to Stebbing 1971). Life spans of these species appear somewhat shorter than the 10–20-plus years found for some rigid erect species from deeper antarctic waters (Winston 1983) but are definitely in the same range (6–12 years) as those of temperate perennials like *Flustra foliacea.*

The reproductive pattern of *Carbasea ovoidea* also contrasted with those of the other common species, with a larger number of embryos (averaging 2,953 per colony) produced over a reproductive season ending by mid-March. Mean number of embryos produced per colony was lower in the other species studied, averaging a few hundred per colony per census, but continued through mid-April, although numbers of empty brood vs. full brood chambers indicated that the end of the reproductive season was then approaching.

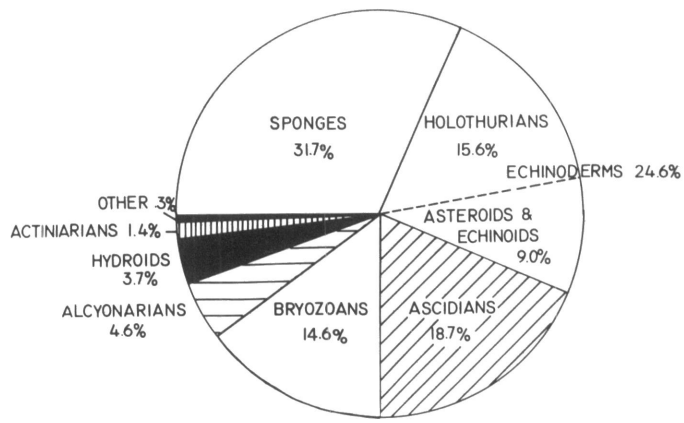

Figure 1. Average proportions of major invertebrate groups present in three trawls taken at 100-meter depths off Low Island.

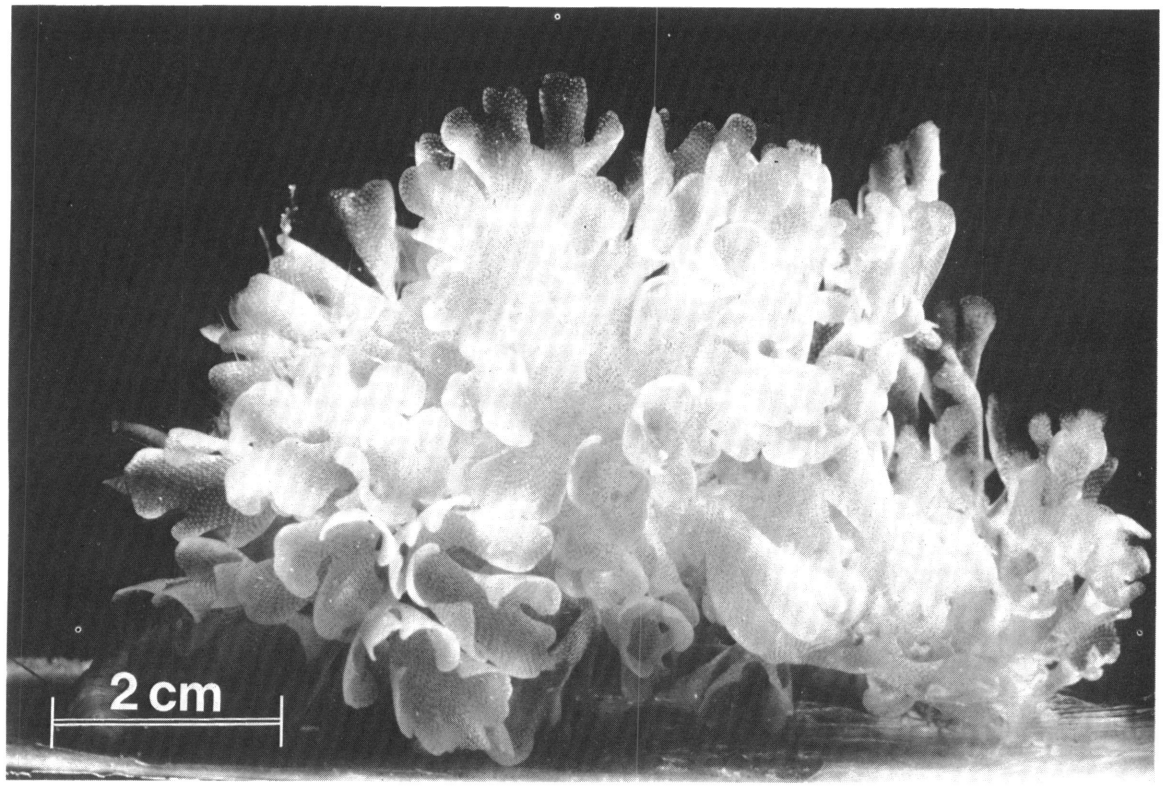

Figure 2. Colony of *Carbasea ovoidea*, most abundant bryozoan species in the Low Island benthic community.

We also examined colonies for injuries of different types. All species had sustained a considerable amount of damage; however, most injuries were apparently not due to feeding by animals specialized as bryozoan predators but were the result of foraging by fish and invertebrates in pursuit of motile invertebrates inhabiting the colonies. Three bushy clumps of *Carbasea* taken from a single trawl were found to contain 496 invertebrates, chiefly amphipods (known to be important in the diets of several notothenid fish).

In addition, we examined gut contents in eight species from Low Island to determine what the bryozoans themselves were feeding on. Particles between 3 and 93 micrometers in size were found, but the majority of particles were less than 20 micrometers in size, suggesting that bryozoans were feeding primarily on nanoplankton. The most common categories were small diatoms and dark red or green rough-walled cysts (6–10 micrometers in size). Another important category was "brown particulate material," shown by epifluorescence microscopy to contain chlorophyll and possibly derived from fecal pellets produced by zooplankton or by other organisms.

This work was supported by National Science Foundation grant DPP 83-18457 to J.E. Winston.

References

Stebbing, A.R.D. 1971. Growth of *Flustra Foliacea* (Bryozoa). *Marine Biology*, 9, 267–273.

Winston, J.E. 1983. Patterns of growth, reproduction and mortality in bryzoans from the Ross Sea, Antarctica. *Bulletin of Marine Science*, 33, 688–702.