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ABSTRACT

The Effect of Substrate Type on the Survival and Recruitment of Epibenthic Diatoms in Mugu Lagoon, California

by

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Several investigators have found that the distributions of epibenthic diatoms in estuaries and coastal lagoons are controlled primarily by the nature of the sediment associated with the diatoms. Although correlations of sediment size and diatom distributions are quite strong, manipulative experiments testing the influence of substrate are lacking. For this reason, I performed an experiment to test the hypothesis that sediment size is a primary factor regulating patterns of benthic diatom community structure in Mugu Lagoon, California.

The effect of substrate size on community structure was examined by transplanting coarse sediment (sand) and its resident population into an area dominated by silty sediments (mud). After 17 days of incubation, comparisons of the living diatom communities in the transplants, coarse sediment controls and silty sediment controls were

made. In addition, the repopulation of coarse sediments initially devoid of living communities was followed in both the sandy and muddy areas. Selected environmental factors were monitored during the experimental period.

A new method for distinguishing live from dead diatoms was developed since no easily applicable method existed to observe living diatom community structure in sediment-associated habitats.

This study shows that a silt-type diatom community developed on the sand transplanted into the silty area and that the sand sediment community living on the transplanted sand did not survive in the mud area environment. The initially unpopulated sand in the sandy area was colonized by a sand-like community while in the muddy area it was colonized by a silt-type community.

The results of these experiments suggest that epibenthic diatom communities are not substrate specific. Other factors, both environmental and biological, are probably responsible for the observed differences. One factor which may be responsible for differences in diatom community structure between sandy and muddy sediments is

the differences in local daily water temperature variation. The deeper sandy area had a smaller temperature variance than the shallower muddy area. Mean daily salinity, daily salinity variance, mean daily light intensity, daily light variance, mean daily water temperature and total organic carbon did not vary between the two areas and are unlikely to have caused the observed differences in species colonization and succession.

Two conclusions and one hypothesis have emerged from this study: 1) Benthic diatom communities are not substrate specific, 2) Shallow areas at Mugu Lagoon are influenced by atmospheric conditions (i.e. air temperature and irradiance); while deeper areas are primarily influenced by oceanic conditions (i.e. offshore water conditions) and 3) Spatial water temperature variation can greatly influence the spatial distribution of epibenthic diatoms.