IMPACT OF SEWAGE ON THE DISTRIBUTION, ABUNDANCE AND COMMUNITY STRUCTURE OF ROCKY-INTERTIDAL MACRO-ORGANISMS

Abstract
The biological effects of a low-volume domestic sewage discharge were studied near Wilson Cove, San Clemente Island, California (USA), from February to June, 1972. There were fewer species and less cover near the outfall (7 macro-invertebrates, 17.6%; 13 macrophytes, 91.7%) than in nearby "unpolluted" control areas (9 macro-invertebrates, 9.2%; 30 macrophytes, 103.4%). The outfall biota was less diverse than that of the controls, as shown by 5 different diversity indices.

A great reduction in community stratification (spatial heterogeneity) and, hence, community complexity occurred near the outfall; this reduction in stratification was primarily due to the absence of Egregia laevigata, Halidrys dioica, Sargassum agardhianum and Phyllospadix torreyi.

These were replaced in the mid-intertitdal near the outfall by a low turf of blue-green algae, Ulvi californica, Gelidium pusilum and a small Petrocladia capillacea, and in the intertidal by Serpulorbis squamigerus covered with Corallina officianalis var. chilensis. A statistically-based determination of assemblages or groups of organisms (i.e, cluster analysis) revealed 3 discrete control area groups; 3 assemblages contained samples from both areas. The distributional patterns of these groups indicate that near the outfall the degree of dilution of discharged sewage is more important in regulating zonation than is tidal height.

The enhancement of the suspension feeder Serpulorbis squamigerus and the omnivores Ligia occidentallis, Pachygraspsus crassipes and Anthopluera elegantissima in the outer fringe of the outer outfall plume hypothetically is due to their ability to utilize sewage as a food source. A critical effect of the outfall may be to decrease environmental stability thereby favoring rapid-colonizers and more sewage-tolerant organisms. The outfall smaller growth forms, simpler and shorter life histories, and most were components of early successional stages.