# WHITE SEA URCHINS USED IN SEDIMENT TOXICITY BIOASSAYS

Experiments with the white sea urchin, *Lytechinus pictus,* indicate that this benthic organism is a good candidate for sediment toxicity tests. Steven M. Bay, Darrin J. Greenstein and Bruce E. Thompson used both embryos and juveniles of the white sea urchin in short term laboratory bioassays in 1986 to evaluate the relative toxicity of sediments from eight stations along Palos Verdes and Santa Monica Bay.

In preliminary tests in which sea urchin embryos were held in seawater extracts of the sediments, no differences among the stations (for locations, see Figure 1) were revealed. However, juvenile urchins showed significantly reduced activity (Figure 2) with exposure to the sediments of one of the stations, PV 7-3 near the Los Angeles County White Point Outfall.

The development of the *Lytechinus* bioassays is important for a number of reasons. First, it provides a means of conducting much-needed tests of the toxicity of marine sediments. There is growing recognition that sediments near wastewater discharges and other marine inputs may accumulate contaminants over time and thus, potentially, may represent greater reservoirs of toxicity to local marine organisms than do the overlying waters. However, relatively few tests of the toxicity of contaminated sediments to local benthic organisms have been conducted.

Second, the *Lytechinus* bioassay uses an organism that is not only local to southern California waters but is also abundant at the 60-meter depths of most wastewater discharges in the region. Third, it offers two life stages

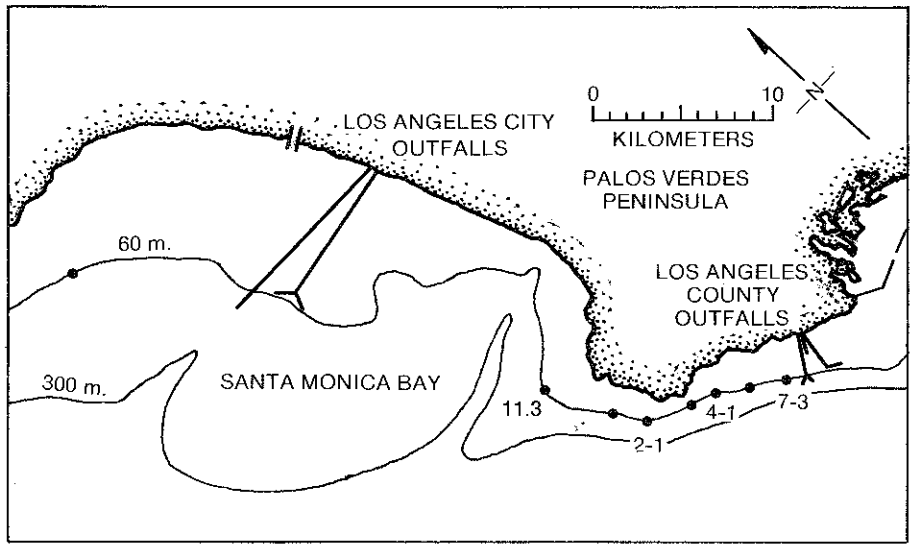


**Figure 1. Location of stations used for sediment toxicity testing.**

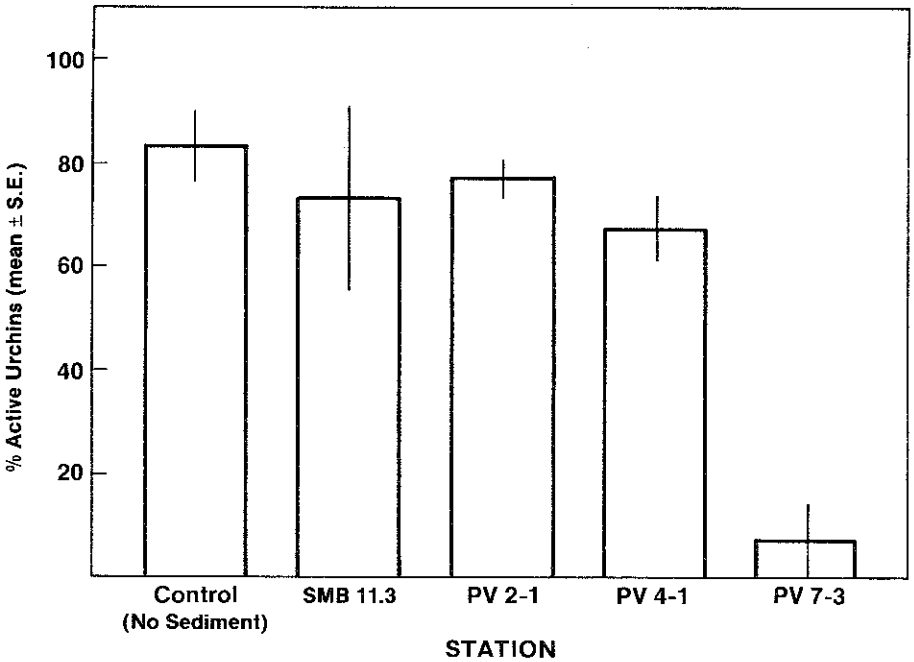


**Figure 2. Activity of juvenile sea urchins following a two-week exposure to sediments from four of the stations sampled.**

that can be tested and two sublethal responses, in addition to mortality, as measures of toxicity. SCCWRP researchers have considerable experience with the highly sensitive 48-hour purple sea urchin embryo test of water samples. White sea urchin embryos may be similarly useful for testing seawater extracts of sediment samples. Besides embryos, early juvenile stages of *Lytechinus* can be tested. Larval *Lytechinus* are reared in the laboratory until they settle out and metamorphose into juvenile urchins. The juveniles are then placed on the sediments for 7 to 14 days and observed for changes in survival, growth and activity.

The study is also part of a valuable collaborative effort with the Ocean Discharge Division of EPA in Newport, Oregon, to assess sediment toxicity. Recent studies by the EPA have measured the toxicity of contaminated sediments to the amphipod, *Rhepoxynius abronius* (Swartz et al, 1986); however, this organism is not usually found as deep as the 60-meter depths of most southern California outfalls. The white sea urchin, on the other hand, is abundant at this depth. The collaborative work will make possible a comparison of the sensitivity of these two organisms to the same sediment samples. In a later phase of the project, EPA will provide sediment chemistry data and analysis of the benthic infauna of the sediment samples.

In this study, Bay, Greenstein and Thompson found that seawater extracts of the sediment samples had no significant effects on the 48-hour development of *Lytechinus* embryos. One week old sea urchin juveniles were also exposed to sediment from these stations for a period of two weeks. Survival of the juveniles was also not affected by the sediments, but a significant effect on urchin activity was found at the station nearest the Los Angeles County outfall, PV 7-3. The juveniles are judged "not active" if they are incapable of coordinated movement of their tube feet and spines. Such movement is essential to feeding and escaping from predators, and loss of this capability in a two-week exposure may be an indicator of conditions that would be lethal.

EPA's 10-day amphipod tests of the same sediment samples showed no effects on survival. These test results support the results of an earlier series of tests conducted by EPA in 1983 in which no toxicity was evident at these stations. These results provide evidence for an improvement in sediment quality since toxicity tests were first conducted by the EPA in 1980. At that time, reduced amphipod survival was observed at stations nearest the outfall.

Because of the relatively low toxicity of the sediment samples in the present study, a conclusive comparison of the relative sensitivity of the white sea urchin and amphipod test methods cannot be made. It can be stated that the relative activity measurements were useful in identifying the most contaminated station. Further tests will be needed to determine relative sensitivity. Because *Lytechinus* appears to be an appropriate sediment bioassay organism, these tests will be conducted in 1987.

**Reference**

Swartz, R. C., F. A. Cole, D. W. Schultz, and W. A. DeBen. 1986. Ecological changes in the Southern California Bight near a large sewage outfall: Benthic conditions in 1980 and 1983. Mar. Ecol. Progr. Ser. 31:1-13.