

Southern California Bight 2013 Regional Monitoring Program. Volume I - Sediment Toxicity Report

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EXECUTIVE SUMMARY

While a substantial expenditure of effort is made to monitor the health of the benthic environment in the Southern California Bight each year, relatively little is spent on toxicity testing. The Southern California Bight Regional Monitoring Surveys represent the most comprehensive effort to determine the toxicity of the region's sediments. The goal of the Bight'13 sediment toxicity studies was to answer three key questions: 1) What is the extent and magnitude of sediment toxicity in the SCB? 2) How does the extent and magnitude of sediment toxicity compare among specific habitats of interest? and 3) How does the extent and magnitude compare to previous regional surveys? In addition, several special studies were conducted using subsets of the samples to investigate the toxicity results in greater detail and to evaluate alternative toxicity methods.

Sediment was collected from 232 stations for toxicity testing. These stations were sampled between July 1 and September 30, 2013 and located between Point Conception, California, and the United States-Mexico border. The majority of the sites were selected using a stratified random design to ensure representativeness and minimize bias. There were a total of six strata tested throughout the Bight. Two of the strata were offshore; the shelf stratum represented the mainland shelf, while the canyon stratum encompassed deep stations within submarine canyons which had not been sampled in previous monitoring programs. There were four strata within embayments: marina, port, bay, and estuary. Van Veen grab samples were taken at each station and the surficial sediments were tested for toxicity (upper 2 cm for offshore and upper 5 cm for embayments).

Two toxicity tests were used to assess the sediments. A 10-day survival test using the amphipod *Eohaustorius estuarius* was conducted on sediment from all stations. The second test was a sediment water interface test using embryos of the mussel *Mytilus galloprovincialis*, which was conducted only on the embayment stations. The amphipod test has been used in the previous three Bight programs, while the mussel test was first used in Bight'08. The combination of these two tests provides results that are compatible with the requirements of California's sediment quality objectives (SQO) policy for bays and estuaries.

Bight'13 included a comprehensive quality control and assurance program consisting of an interlaboratory comparison, standardized test methods, laboratory audits, and analysis of split samples to ensure the data were comparable and of high quality. All of the 170 samples tested with mussel embryos met test acceptability criteria. For the amphipod test, 95% of the 232 samples met acceptability criteria. The remaining twelve samples that did not meet acceptability criteria were excluded from the data analyses, but are included in the survey dataset (with the addition of qualifiers and other features to prevent their unintentional use).

Methodology from the SQO program was used to classify the results into one of four categories of toxicity. The Nontoxic category represented results falling within the acceptable range for controls. The

Low category corresponded to a small, but significant test organism response. For the purposes of Bight'13 data summarization, these two categories were defined as representing a condition termed "not toxic". The Moderate and High categories indicated a toxicity response of greater magnitude that was considered to be a reliable and substantial level of toxicity. Stations falling in either the Moderate or High categories were termed "toxic".

The prevalence of toxicity in the SCB was quite low. The amphipod test results indicated that 98% of the SCB was not toxic (falling in the Nontoxic or Low SQO categories). An intriguing result was that 17% of the area in the canyon stratum was identified as toxic (Moderate or High SQO categories); a much greater magnitude and spatial extent of toxicity than the surrounding shelf. The cause of the sediment toxicity in the submarine canyons has not been identified, although a toxicity identification evaluation (TIE) is in progress for one sample from the La Jolla Canyon. Preliminary TIE results indicate that organic contaminants are likely responsible.

Embayments also had a low spatial extent of toxicity. Bivalve embryos were tested only in the embayment strata and 99% of the area was not toxic using this species. The integrated toxicity results using both species classified 96% of the embayment area as not toxic. Within the embayments, the greatest prevalence of toxicity was in the estuary stratum with 7% of the area identified as toxic, followed by the bay stratum at 6%, and the marina stratum at 4%. None of the area within the port stratum was identified as toxic. The amphipod test found more stations to be toxic than the mussel test and it was rare that they both agreed a station was toxic.

Temporal analysis of the results indicated that the trend of decreasing toxicity for the amphipod test observed in Bight'08 continued in Bight'13. With the exception of the Shelf, all strata experienced a marked decrease in the percentage of area identified as toxic. The Shelf stratum indicated a slight increase in toxicity extent which was attributable to one station classified as toxic. For the first time, results of integrated results for the two toxicity tests could be compared temporally. The trend toward decreasing toxicity was again evident, but not as pronounced as for the individual tests. A group of 83 stations has now been tested with *E. estuarius* during three different Bight surveys, enabling more detailed analysis of temporal changes.

Overall, the Bight'13 sediment toxicity survey was quite successful. A high level of test completion was attained and comparability of test results was high among the multiple testing laboratories. This survey represented the first time that testing in the SCB has been repeated on a regional basis using the SQO analysis methods. The results obtained for the canyon stratum provide a valuable baseline for the support of additional investigations in this little studied habitat.

Toxicity is just one of multiple lines of evidence necessary to accurately assess sediment quality. Caution should be applied in using the toxicity results reported here as the only basis for depicting sediment quality in the SCB. All of the stations analyzed for sediment toxicity were also sampled for assessment of sediment chemistry and benthic macrofauna community composition. The results for these additional lines of evidence will be described in other Bight'13 reports. The results from all three lines of evidence will be used to make an integrated assessment of sediment conditions in the SCB.

The encouraging temporal trend of decreasing toxicity in embayments is an example of the value of periodic regional monitoring that uses comparable methods. Continued assessment of sediment toxicity using the methods and study design employed in Bight'13 is recommended. Several recommendations to improve the efficiency and utility of future Bight surveys are provided in this document. Expanded studies in submarine canyons and inclusion of monitoring data from other programs are needed to investigate the extent and cause of the sediment toxicity observed in this study. In addition, investigation of methods for onboard sample homogenization is recommended to increase the comparability of the toxicity and chemistry results. Refinement of methods for interpreting toxicity data from offshore areas and integrating them with other lines of evidence is also needed, as our current approach was developed specifically for use in enclosed bays and estuaries.

Full text: [899_B13SedToxReport.pdf](#)