

Southern California Bight 2013 Regional Monitoring Program: Volume IV. Sediment Chemistry

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EXECUTIVE SUMMARY

Regional monitoring has become an important component of assessing the status of our coastal resources in the Southern California Bight (SCB). The Southern California Bight 2013 Regional Monitoring Program (Bight'13) is the fifth in a series of regional marine monitoring efforts beginning in 1994 and repeated again in 1998, 2003, and 2008. More than 90 different organizations encompassing regulatory, regulated, academic, and non-governmental agencies collaborated to create Bight'13. Collectively, these organizations asked three primary questions:

1. What is the extent and magnitude of impact in the SCB?
2. Does the extent and magnitude of impact vary among different habitats of interest?
3. What are the temporal trends in impacts?

Bight'13 had five components: Contaminant Impact Assessment, Water Column Nutrients, Shoreline Microbiology, Marine Protected Areas, and Trash and Debris. The Contaminant Impact Assessment component included sediment chemistry and toxicity, benthic infauna, fish assemblages, and bioaccumulation. The focus of this report is on sediment chemistry.

A stratified random sampling design was selected to ensure an unbiased sampling approach to provide areal assessments of environmental condition. There were 11 strata selected for this study including three continental shelf strata (5-30 m, 30-120 m, 120-200 m), upper slope (200-500 m), lower slope and basin (500-1000m), and embayment strata (marinas, ports, open bays and harbors, estuaries). Two new strata, submarine canyon bottoms and marine protected areas, were introduced in Bight'13.

A total of 346 stations were sampled between July and September 2013, and analyzed for grain size, total organic carbon, total nitrogen, 15 trace metals, total PAH (sum of 24 individual polynuclear aromatic hydrocarbons), total PCB (sum of 41 polychlorinated biphenyl congeners), total DDT (sum of two dichlorodiphenyltrichloroethane isomers and 5 degradation products), and total chlordane (sum of 5 forms). Oxychlordane is a new analyte to Bight'13. Two groups of emerging contaminants were measured in Bight'13 including 13 polybrominated diphenyl ether (PBDE) flame retardants and 8 pyrethroid pesticides.

Based on the chemistry indices of California's Sediment Quality Objectives (SQO) assessment framework, 68% of the Bight sediments have minimal or low exposure to sediment contamination. Less than one percent of the Bight sediments have high exposure to sediment contamination, the worst category of contamination according to the Chemical Scoring Index. The relative extent of sediment contamination was generally greater in embayments than offshore strata, and the distribution of many sediment contaminants was a function of their sources.

The extent of acceptable sediment condition (defined as minimal or low chemical exposure) has remained steady over the last 10 years and ranged from 65% to 75% during the three surveys from 2003 to 2013. Over the same period, the extent of high exposure to sediment contamination has remained low (<3% of SCB).

While Bight-wide trends have been stable since 2003, there were varying trends in sediment condition of individual habitats. For example, the extent of acceptable sediment condition in SCB's ports/bays/marinas has steadily improved, increasing from 40% in 1998 to 72% in 2013.

Reductions in sediment concentrations of some contaminants of emerging concern were observed, concomitant with source control measures. PBDEs have the potential to accumulate in sediment and in tissues of fish. This is one reason why regulations restricting the production and use of PBDEs were implemented beginning in 2010. This may also be part of the reason Bight'13 results indicated a 10-fold reduction of average PBDE concentrations in embayments between 2008 and 2013.

The two new strata introduced in Bight'13, Submarine Canyon Bottoms and Marine Protected Areas, reflected the contaminant concentrations in surrounding areas. Submarine canyons were introduced with the hypothesis that contaminant transport from surrounding areas may lead to higher canyon concentrations. Bight'13 indicated this transport was taking place; continental shelf locations with the highest concentrations also had nearby submarine canyons with the highest concentrations. Similarly, MPAs near continental shelf locations with the highest concentrations were also the MPAs with the highest concentrations. The extent that this sediment contamination impacts MPA goals such as fishery production is unclear.

A number of recommendations are provided to help spur improvements in future Bight surveys. These recommendations fall into two categories. The first addresses the survey's ability to reveal new information including using biological and toxicity data to interpret the extent and magnitude of anthropogenic effects using a weight-of-evidence approach, to continue to assess constituents of emerging concern, and to calibrate and validate an SQO chemistry index specifically for offshore sediments. The second category of recommendations is to invest in monitoring infrastructure to improve comparability and efficiency. The areas of specific concern were compliance with Bight performance-based quality assurance requirements, and information management.

Full Text

http://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/922_B13_SedChemReport.pdf