

**COASTAL WATER  
RESEARCH PROJECT**

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# BENTHIC RESPONSE AT ORANGE COUNTY OUTFALLS

A preliminary survey of the benthic fauna surrounding the 1- and 5-mile Orange County outfalls was conducted in February and March 1975. The purpose of the survey, which was supported by an Environmental Protection Agency grant, was to obtain a general picture of quality of the sediments near the outfalls and the distribution of dominant benthic invertebrates over a large area so that a more detailed sampling program can be implemented in the appropriate parts of that area to assess the effects of past and present discharges on the benthic environment.

A Van Veen grab sample was taken at each of 41 sites surrounding the discharge area and at six sites in Newport Submarine Canyon, which cuts into the coastal shelf several miles south of the Santa Ana River and the outfalls (Figure 1). Stations were arranged by depth intervals (approximately 16, 30, 50, 60, 100, and 200 meters) along seven transects perpendicular to shore so that effects of depth could be accounted for.

Sediments from samples were examined for color, coarseness to the touch, evidence of hydrogen sulfide or other odors, and presence of excess quantities of vegetable-like fibers and other material characteristic of sludge. Small samples of surface material were refrigerated for analysis of volatile solids. The samples were carefully washed through 1-mm mesh screens, and the animals and material retained were returned to our laboratory for sorting and identification. In the laboratory, the samples were examined, and the animals were roughly sorted into easily identifiable levels of classification (families, genera, and common species) by invertebrate zoologists Jack Word and Brad Myers. To minimize laboratory time, animals were not counted; instead obviously dominant and abundant species were noted.

## RESULTS

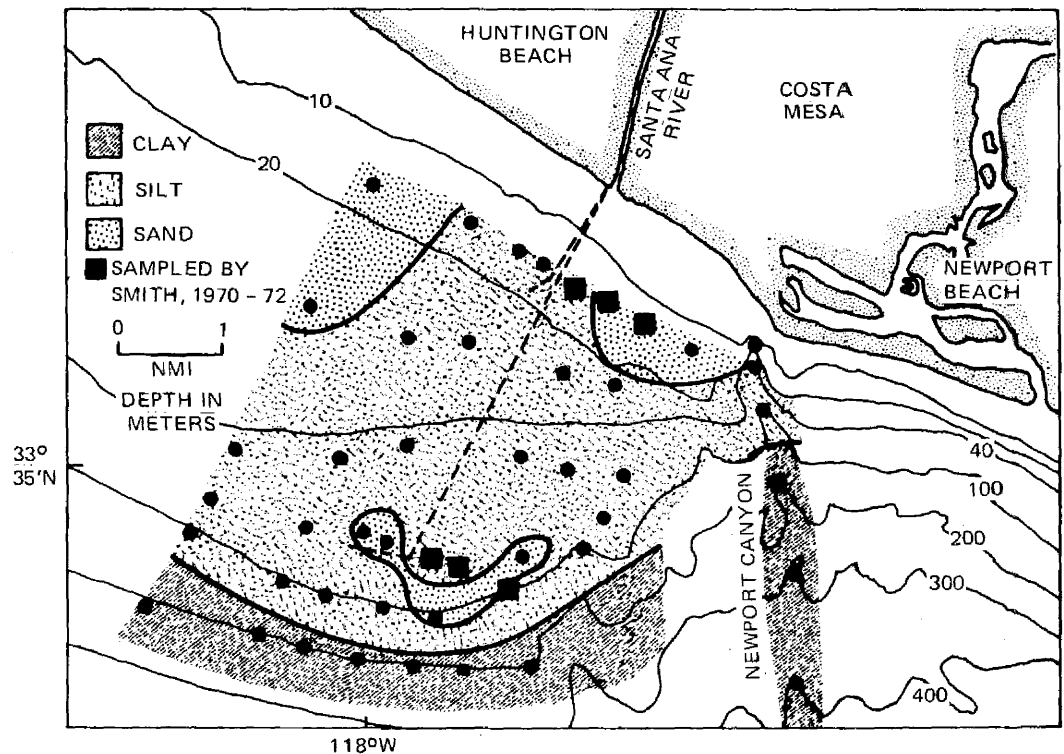
Although qualitative in nature, this preliminary survey provided some important insights into conditions on this

coastal shelf. First, sediments graded from sand inshore to silt and clay offshore in both shelf and canyon transects (Figure 1). Deviations from this pattern included the occurrence of silt at shallow stations adjacent to the presently unused 1-mile outfall and the mouth of the Santa Ana River. Surprisingly, sand was found in an otherwise silty environment at three sites around the 5-mile outfall. Finally, clay and silt dominated the Newport Canyon sites.

Two apparent fields of sludge-like particles were found on the shelf (Figure 2). The first occurred at five shallow stations offshore and downcoast of the unused outfall and the river mouth. The second appeared to include an area several kilometers upcoast and downcoast of the 5-mile diffuser at about 40 to 80 m depth. Volatile-solids analysis of the surface sediments (top 1 cm) for organic material revealed a general low level over the entire shelf. This suggests that the fields of sludge-like particles were covered by a thin layer of silt or sand. Only one canyon station produced samples containing fibrous or vegetable particles characteristic of sewage sludge or particles originating from river runoff.

At least 127 taxa of benthic molluscs, polychaetes, arthropods, echinoderms, and miscellaneous phyla were identified from the screened samples. Two genera, *Euphilomedes* (ostracod crustaceans) and *Tharyx* (polychaetes) were dominant in both of the areas characterized by silt and sludge-like material. Other groups of dominant species showed

Figure 1. Types of sediments found around Orange County outfall system, spring 1975.



different patterns apparently unrelated to the qualitative characteristics of the sediments. Further analyses and quantitative sampling is required to determine the significance and importance of these patterns.

Comparison of the total number of taxa found among the samples revealed notable differences between the canyon transect, the transects bordering the canyon, and the outfall and shelf transects. Fewer taxa were found in the canyon (9 to 23) than at shelf stations near the canyon (22 to 37) and near the outfalls (25 to 38). The variety of organisms was higher downcoast (southeast) of the outfalls than upcoast, and there appeared to be a decreasing variety with depth upcoast. A second canyon, San Gabriel Canyon, northwest of the outfalls should be sampled in future surveys.

DISCUSSION

The fauna of the shelf surrounding the Orange County outfall sites is quite diverse; the distribution of the organisms is related to depth but may also reflect a diverse sediment distribution only partly described by this survey. At present, the benthic fauna may be characterized as normal, grading near the 5-mile outfall into patterns reminiscent of somewhat enriched regions around other outfall sites in southern California. Quantitative sampling will help define these patterns.

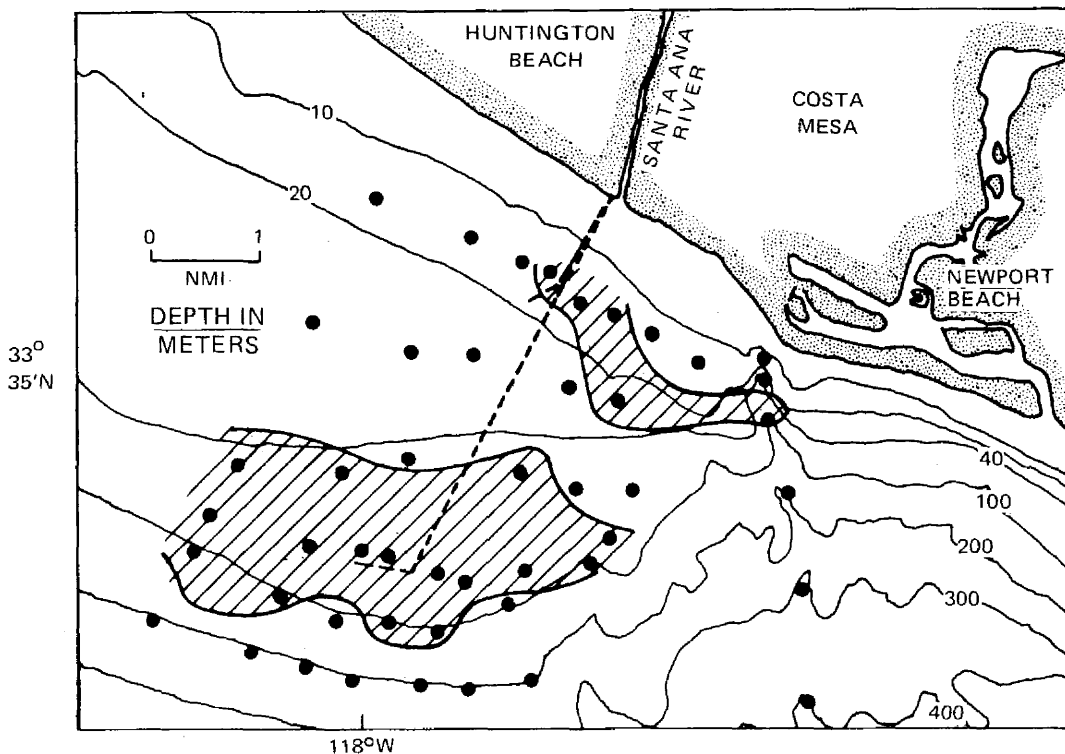


Figure 2. Deposits of fibers and sewage-sludge-type particles around Orange County outfall system, spring 1975.

The apparent outfall-related benthic characteristics around and downcoast of the unused 1-mile outfall are curious and may reflect inputs of silt and particulate matter from the Santa Ana River during periods of runoff as well as from the wastewaters. Dr. Gary Smith, who conducted a study at stations near the 1- and 5-mile outfalls in 1971-72 (while he was a doctoral candidate of Scripps Institution of Oceanography) concluded that the infauna and sediments at the 1-mile outfall apparently approached "background conditions" within 1/2 to 1 year of termination of discharge. A careful study of runoff during recent rains and of the recent discharge history of the 1-mile outfall is needed to verify his conclusions.

A preliminary comparison of our data with that of Dr. Smith indicates little similarity in dominant species. Smith's studies suggested that the offshore organisms were changing in response to the discharge after its initiation in April 1971. We plan to quantitatively document the present fauna at all of his previous sites, determine whether or not changes have been progressive, and look for relationships between changes in sediment chemistry and faunal distribution.

The logistics and sampling for this survey were carried out under the supervision of Mike Moore of the Project.