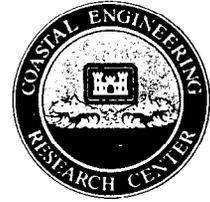




Coastal Engineering Technical Note



BIOLOGICAL EFFECTS OF JETTY CONSTRUCTION ON COASTAL MARINE COMMUNITIES

PROBLEM: Construction of jetties in the marine environment can result in two distinct persistent impacts on marine communities. The jetty structure itself provides habitat space for the development of attached faunal and floral communities, including associated motile invertebrates. This development of a reef-like community is generally viewed as a positive impact of jetty construction (see CETN-V-6); whereas the second impact, community changes of the benthic infauna, may be less desirable.

BACKGROUND: In October 1977, construction of two quarystone jetties began at the entrance of Murrells Inlet, South Carolina, to stabilize the channel entrance between Huntington Beach and Garden City Beach (Fig. 1). To investigate the impacts of the jetties two biological surveys were initiated. One examined the short- and long-term effects of jetty construction on the intertidal and subtidal benthic invertebrate community. The second study examined community development of attached and motile fauna and flora on the hard substrate of the jetties. Prior to these

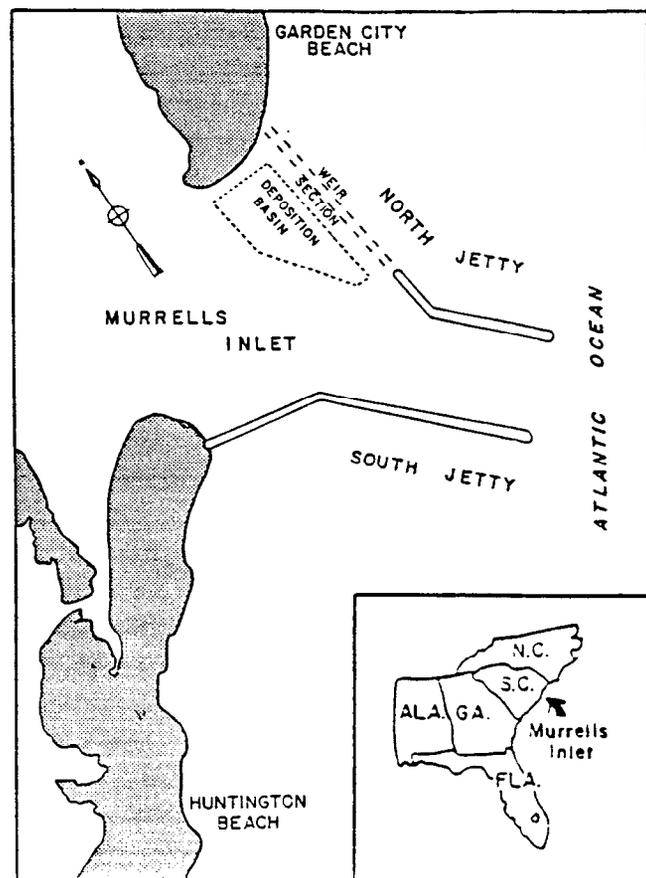


Figure 1. Murrells Inlet Jetties

studies little was known about intertidal and subtidal infaunal communities on hard substrate between North Carolina and Georgia.

EFFECTS ON BENTHOS: Short-term effects of jetty construction are discussed in CETN-V-13. Biological changes observed in these earlier studies did not persist, as the disturbed communities returned to their former state in later surveys (Knott et al., 1984). Longer term effects of the jetty (1977 to 1982) were observed at subtidal stations located near the seaward channel entrance. At these stations sediment became coarser in texture and was mixed with substantially more shell hash than at control stations. The bivalve, *Crassinella martinicensis*, and the polychaete, *Podarke obscura*, were numerically dominant at these sites and were not present at any other stations. However, despite dominance by these species at the coarse sediment stations, other species present and diversity indices were similar to those at control stations. Intertidal areas near the north jetty may also have been affected, as the coquina clam, *Donax variabilis*, was no longer present at these stations in contrast to its continued presence at control stations. Overall community changes were observed at all stations from 1977 to 1982, although these changes were attributed to normal seasonal and long-term community variations (Knott et al., 1984). Major effects of jetty construction may have been undetected, as extensive shoaling occurred south of the inlet in an area not covered by this study.

ATTACHED COMMUNITY DEVELOPMENT: The attached community was well established within 1 year of quarystone placement; by this time most of the 25 algal, 195 macroinvertebrate, and 34 fish species that would eventually colonize the rocks were present. The intertidal zone developed a classic zonation pattern, with blue-green algae occurring highest on the jetties in the splash zone. Lower in the intertidal zone was a band composed of barnacles and blue-green algae which was bordered below by a barnacle-mussel-green algae zone. Subtidally, zonation patterns of attached fauna were less distinct, although some individual species did exhibit definite vertical distributions. Differences between the wave-exposed and protected sides of the jetties were minimal since the region has a normally low wave climate which did not produce strong physical stresses on the exposed areas. Community composition of the intertidal

region remained basically the same once species were established. In contrast, the subtidal attached community continued to change and did not reach a classic "climax" community as can be found in terrestrial plant communities (Van Dolah et al., 1984). This was not an unexpected occurrence since well-established attached communities are commonly observed to shift species composition (Sutherland, 1974).

The motile invertebrate community associated with the attached fauna and flora was more diverse subtidally than intertidally. The groups dominant in both species number and numerical abundance were amphipods and isopods. Community composition of the motile community also changed from year to year, but to a lesser extent than did the composition of the attached fauna and flora.

Fish species attracted to the jetties were able to utilize both the attached fauna and flora and the motile invertebrates as a food supply. The black sea bass, *Centropristis striata*, also appeared to be using the jetties as a nursery area.

CONCLUSIONS: Excluding the unstudied shoaled area south of Murrells Inlet, the jetties seemed to have had only localized effects on the infaunal community composition of intertidal and subtidal soft substrate habitats. Effects were detected subtidally near the channel entrance and intertidally near the north jetty.

The jetty structure itself has provided a substrate for the development of a diverse attached community. This algal and invertebrate community, in turn, is a potential food resource for many fish species attracted to the area.

ADDITIONAL INFORMATION: Contact Tom Fredette of the Coastal Ecology Group, Environmental Laboratory, at (601) 634-3891 (FTS 542-3891).

REFERENCES:

KNOTT, D. M., VAN DOLAH, R. F., and CALDER, D. R., "Ecological Effects of Rubble Weir Jetty Construction at Murrells Inlet, South Carolina, Volume II: Changes in Macrobenthic Communities of Sandy Beach and Nearshore Environments," Technical Report in preparation, Contract No. W74-RDV CERC 77-59, Environmental Laboratory, U. S. Army Engineer Waterways Experiment Station, Vicksburg, Miss., 1984.

SUTHERLAND, J. P., "Multiple Stable Points in Natural Communities," *American Naturalist*, Vol. 108, pp. 859-873, 1974.

COASTAL ENGINEERING RESEARCH CENTER, "Biological Effects of a Rubble-Mound Structure on the California Coast," CETN-V-6, U. S. Army Engineer Waterways Experiment Station, Vicksburg, Miss., 1980.

COASTAL ENGINEERING RESEARCH CENTER, "Short-Term Biological Effects of Near-Shore Jetty Construction," CETN-V-13, U. S. Army Engineer Waterways Experiment Station, Vicksburg, Miss., 1981.

VAN DOLAH, R. F., KNOTT, D. M., and CALDER, D. R., "Ecological Effects of Rubble Wier Jetty Construction at Murrells Inlet, South Carolina, Volume I: Colonization and Community Development on New Jetties," Technical Report in preparation, Contract No. W74-RDV CERC 77-59, Environmental Laboratory, U. S. Army Engineer Waterways Experiment Station, Vicksburg, Miss., 1984.