Coastal Engineering Technical Note

SAMPLING FISHERIES RESOURCES AT MURRELLS INLET, SOUTH CAROLINA

PROBLEM: Comprehensive environmental assessments of coastal engineering projects evaluate beneficial as well as detrimental impacts. In the case of rubble-mound structures (e.g., jetties, groins, breakwaters, etc.), one beneficial aspect of construction is the creation of artificial reef habitat. This is evidenced by the popularity of coastal rubble-mound structures as recreational fishing spots. Few studies, however, have examined the utilization patterns of these structures as shelter, foraging, spawning, or nursery habitat by fish and invertebrate populations. Consequently, a lack of documentation of beneficial impacts of rubble-mound structures exists.

BACKGROUND: Construction of rubble-mound jetties at Murrells Inlet, South Carolina was completed in April, 1980 (Figure 1). A series of pre-, during, and post-construction field studies have been conducted to determine short and long-term effects of construction on local macrobenthic communities (Knott et al. 1984) and colonization of the structures by attached and motile fauna and flora (Van Dolah et al. 1984). A third field investigation was conducted between April, 1985 and February, 1986 to supplement the results of the prior studies. Specific objectives were to: (1) document fish species composition, abundance, and seasonal occurrence, (2) assess seasonal abudance of commercially and recreationally important crabs, (3) determine if different portions of the jetties supported different fish populations, (4) characterize the food habits of fishes captured on or near the structures, and (5) evaluate the recreational fishery supported by the jetties.

APPROACH: Fish communities were assessed by a variety of techniques. Variable mesh gill nets were set perpendicular to the structures for standardized time periods (3 hrs both day and night) at stations selected at random among benchmarks on the structures. Modified, baited crab traps were placed along the base of the jetty. To collect small, cryptic fishes, an area on the inside of the north jetty was treated with rotenone during each seasonal sampling effort. Fishes incapacited by the rotenone were then gathered with dipnets and beach seines. Finally, underwater visual surveys by divers were conducted during high tide periods. Subsamples of the fishes caught by these methods were processed for stomach contents analysis. Additional food habits samples were obtained by hook-and-line fishing.

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To assess crab populations (mainly stone and blue crabs), conventional blue crab traps were deployed at randomly selected stations among the benchmarks on the structures. Traps were retrieved after 12 hr soak periods on a day versus night basis.

Recreational fisheries were evaluated by conducting interviews with anglers on the jetties and adjacent beaches, and taking counts of boats in predetermined zones surrounding the structures. Surveys were conducted four times per day on eight separate days during each quarterly sampling period. Information gathered by interviews included the angler's state and county of residence, number of hours fished, fishing methods, fish species sought, and the number and species of fish caught.

RESULTS

Fish Community: 1662 fishes, representing 48 species, were captured by gill net. Highest catch/set values were in spring outside the south jetty, when smooth dogfish (Mustelus canis), bluefish (Pomatomus saltatrix), and clearnose skate (Raja eglanteria) were particularly abundant. Summer gill net catches were dominated by spanish mackerel (Scomberomorus maculatus), bluefish, Atlantic menhaden (Brevoortia tyrannus), and spot (Leiostomus xanthurus). Spot were the only abundant species in fall gill net collections, whereas winter collections were very low in both diversity and abundance.

Modified crab traps caught 573 fishes representing 10 species, primarily Atlantic silversides (Menidia menidia) and juvenile black sea bass (Centropristis striata). Conventional crab traps caught an additional 347 fishes, notably conger eel (Conger oceanicus), black sea bass, pinfish (Lagodon rhomboides), spottail pinfish (Diplodus holbrooki), and oyster toadfish (Opsanus tau).

Rotenone collections resulted in 804 fishes of 24 species. Dominant species, which were present in all seasons, included the seaboard goby (Gobiosoma ginsburgi), skilletfish (Gobiesox strumosus), crested blenny (Hypleurochilus geminatus), and feather blenny (Hypsoblennius hentzi).

Thirty-two species and over 4400 fishes were observed by divers while swimming transects along the jetties. Atlantic silversides and black sea bass dominated the counts in terms of numbers and weights respectively.

Fish Food Habits: Food habits of 55 species were examined. Sample size varied according to the relative abundance of each species (a total of 920 individual stomachs with identifiable contents were processed). Among recreationally important fishes, spadefish (Chaetodipterus faber), sheepshead (Archosargus probatocephalus), and black drum (Pogonias cromis) utilize jetty biota as a food resource, while black sea bass, red drum (Sciaenops ocellata), bluefish, spotted seatrout (Cynoscion nebulosus), and weakfish (C. regalis) feed on smaller fish associated with the structures.

Crab Population Assessment: 349 crabs representing 8 species were captured in traps set around the north jetty. Stone crabs (Menippe mercenaria) comprised 90 percent of the catch of spring, summer, and fall

samples. A substantial decline was noted in the stone crab catch from spring through fall. Significantly greater numbers of stone crabs were caught at night than during the day, reflecting their nocturnal behavior. Female stone crabs dominated the catch during both spring and summer.

Recreational Fishery: An estimated 4100 boats and 3900 bank-anglers used the jetties during the year-long study period. Bank fishing was restricted to the south jetty because a weir section prevented access to the north jetty. A total of 460 interviews was conducted with anglers around the Murrells Inlet jetties. Red drum and flounder (Paralichthys sp.) were the most sought after species (by 42 and 28 percent of the anglers respectively). Interviewed anglers had caught 818 fishes representing 23 species. Black sea bass, smooth dogfish, bluefish, red drum, and flounder were, in decreasing order, the five most often caught fish species. Red drum were primarily fished for around the north jetty, where it was caught most frequently in the deposition basin area. Similar trends were noted for flounder and bluefish, which were commonly caught in the navigation channel as well.

CONCLUSIONS: Distinct seasonal differences were noted in the community composition of fishes around the jetties. Species composition was found to be similar to that of fishes associated with natural and artificial reefs elsewhere in the South Atlantic region. In general, the jetty community represented fishes attracted to the substrate provided by the structures as well as fishes common to estuarine inlets and fishes following coastal migratory routes. The jetties also served as nursery habitat for a variety of fish species.

Food habits analyses demonstrated that numerous fishes derived trophic support directly from the biota associated with the structures or indirectly by preying upon smaller forage fishes which congregated around the jetties.

Based on the size of stone crab catches in this study, it appears unlikely that the jetties can support a substantial crab fishery.

Considerable recreational angling activity was observed during the study. Most activity occurred on weekends, although during the week fishing was high in summer. Overall catches were much greater around jetty structures than in non-jetty areas.

ADDITIONAL INFORMATION: Contact Dr. Douglas Clarke of the Coastal Ecology Group, Environmental Laboratory, at (601) 634-3770 or FTS 542-3770.

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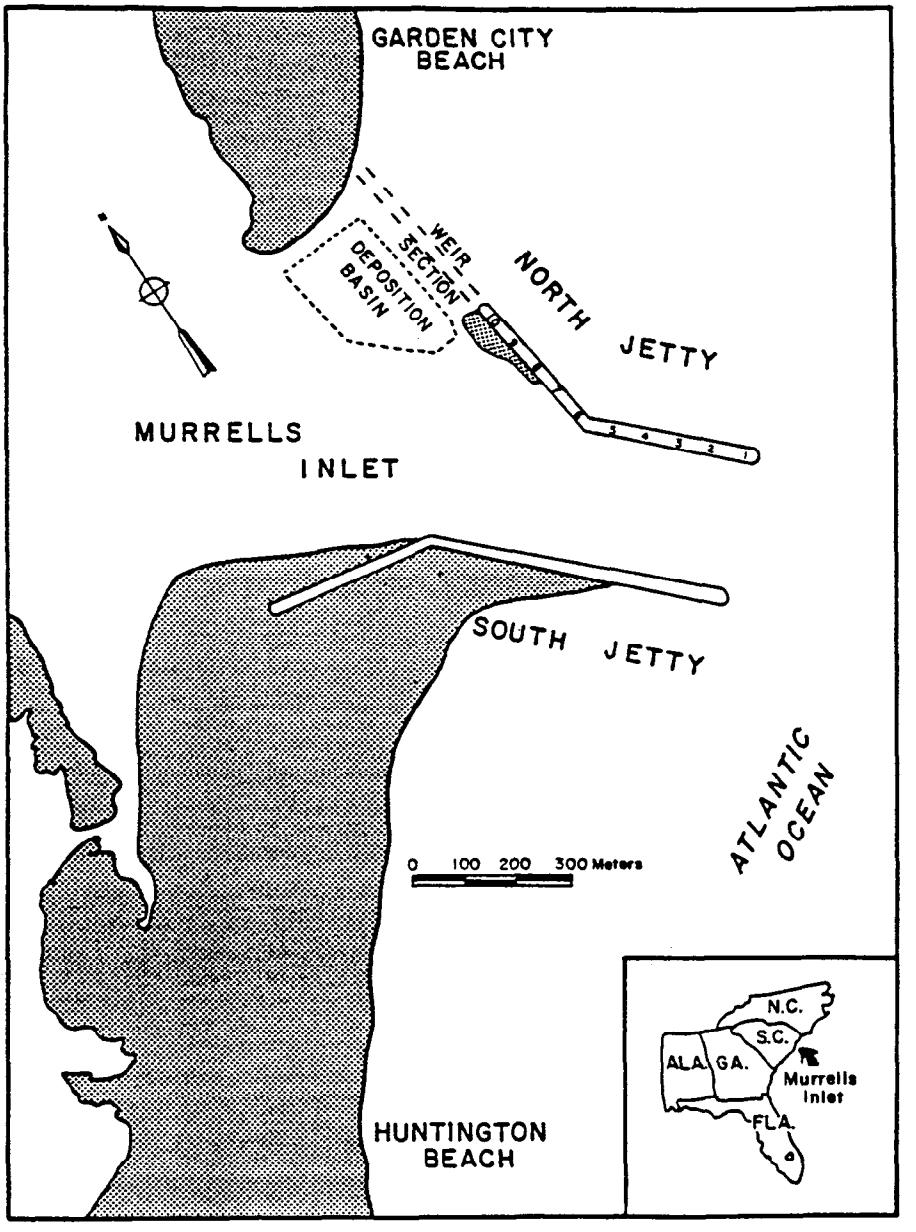

Figure 1. Map of the Murrells Inlet jetties with the locations of benchmarks (1-10) shown on the north jetty. Shaded areas represent beach exposed at low tide periods.