

STUDY TITLE: University Research Initiative on the Effects of Offshore Petroleum Development in the Gulf of Mexico

REPORT TITLE: A Comparison of Shallow-Water and Marsh-Surface Habitat Associated with Pipeline Canals and Natural Channels in Louisiana Salt Marshes

CONTRACT NUMBER: 14-35-0001-30470

SPONSORING OCS REGION: Gulf of Mexico

APPLICABLE PLANNING AREA: Central Gulf of Mexico

FISCAL YEAR OF PROJECT FUNDING: FY 89 - 91

COMPLETION DATE OF REPORT: June 1992

COSTS: FY 89: \$ 27,739, FY 90: \$ 48,935, FY 91: \$ 49,902

CUMULATIVE PROJECT COST: \$126,576

PROJECT MANAGER: Paul W. Sammarco

AFFILIATION: Louisiana Universities Marine Consortium (LUMCON)

ADDRESS: 8124 Highway 56, Chauvin, LA 70344

PRINCIPAL INVESTIGATOR*: Lawrence P. Rozas

KEY WORDS: Pipeline Canals, Fisheries Impact, Marsh Surface, Louisiana

BACKGROUND: The northwestern Gulf of Mexico has experienced most of the oil and gas development that has occurred in the Outer Continental Shelf (OCS) of the United States. Although numerous studies have described environmental conditions prior to OCS development, research aimed at understanding the long-term effects of OCS development is limited. In June, 1989, the Minerals Management Service entered into a cooperative agreement with the Louisiana Universities Marine Consortium to support university-based research on the long-term effects of offshore oil and gas development in the Gulf of Mexico region. One of the major issues identified for study by the cooperative agreement was "effects of channelization of wetlands for pipeline emplacement and navigation on living resources."

OBJECTIVES: The objectives of this study were to (1) determine if and how channelization affects the coupling of nekton between marshes and open water and (2) assess the effect of channelization on the habitat function of coastal marshes.

DESCRIPTION: The degree to which fringing (inside-levee) marshes, which occur between pipeline canals and associated levees, function as nursery habitat was examined by comparing densities of nekton on marshes adjacent to pipeline canals and natural tidal creeks. In addition, shallow subtidal habitats in the two environments (canals and natural channels) were compared by sampling nekton along the marsh edge at low tide and measuring predator encounter rates in both habitats. Nekton was sampled approximately twice monthly between June 1990 and May 1991 on marshes using flume nets and within canals and natural channels with a small trawl pulled by hand. Predator encounter rates were estimated using tethering experiments. The extent to which marsh habitat function is effected by canal levees was examined by comparing densities of nekton on marshes located behind levees (outside-levee marshes) with those on nearby marshes lacking levees. Nekton was sampled on marshes (three with levees, three without levees) six times between January and April 1992 using lift nets.

SIGNIFICANT CONCLUSIONS: Shallow subtidal areas within pipeline canals and adjacent marshes supported nekton in numbers comparable to similar habitats associated with natural channels. Predator encounter rates in canals and natural channels were similar, suggesting that the value of habitat in canals may increase over time as slumping decreases depth and steepness of bottom profiles and creates shallow subtidal refugia along the canal-marsh interface. Inside-levee marshes probably enhance the habitat function of pipeline canals by providing nekton with an expanded area for foraging and finding refuge at high tide. Canal levees did not have a significant effect on the habitat function of outside-marshes in this study. However, in areas where canal levees intersect and marshes are semi-impounded or completely isolated, their habitat function would likely diminish.

STUDY RESULTS: Effect of Canals on Inside-Levee Habitats. Daggerblade grass shrimp *Palaemonetes pugio* Holthuis, blue crabs *Callinectes sapidus* Rathbun, Gulf killifish *Fundulus grandis* Baird and Girard, diamond killifish *Adinia xenica* Jordan and Gilbert, brown shrimp *Penaeus aztecus* Ives, and sheepshead minnows *Cyprinodon variegatus* Lacepede numerically dominated catches on marsh-surface habitats and in shallow-water along canals and natural channels and accounted for over 95% of both flume and trawl samples. These species dominated catches in terms of biomass as well, representing > 92% of the total biomass. Striped mullet *Mugil cephalus* Linnaeus was the only other species that contributed substantially to total biomass.

Although there were differences in densities of dominant species among the various sites sampled (e.g., greatest catches of Gulf killifish and diamond killifish were taken in creek tributaries), no clear differences emerged between natural habitats and those associated with canals. Nekton occupied narrow strips of marsh along canals at high tide in densities similar to those found on natural marshes.

Average water depths along the marsh edge were greater in canals than in nearby natural channels (deep canal=69 cm, shallow canal=54 cm, natural channels=38 cm).

However, predator encounter rates in the two habitats (canal, natural channel) were not significantly different ($T=0.20$, $p<0.425$).

Effect of Levees on Outside-Levee Habitat. Daggerblade grass shrimp, Gulf killifish, sheepshead minnows, bayou killifish *Fundulus pulvereus* (Evermann), diamond killifish, striped mullet, longnose killifish *Fundulus similis* (Baird and Girard), and blue crabs numerically dominated catches and accounted for over 99% of lift net samples. Three other species, freshwater goby *Gobionellus shufeldti* (Jordan & Eigenmann), sailfin molly *Poecilia latipinna* (Lesueur), and red drum *Sciaenops ocellatus* (Linnaeus) were rarely collected. Average catches of numerically dominant species collected on outside-levee marshes were not significantly different from those taken on marshes lacking levees.

STUDY PRODUCTS: Rozas, L. P. 1992. A Comparison of Shallow-Water and Marsh-Surface Habitats Associated with Pipeline Canals and Natural Channels in Louisiana Salt Marshes. A final report by the Louisiana Universities Marine Consortium for the U.S. Department of Interior, Minerals Management Service, Gulf of Mexico Region, OCS Office, New Orleans, Louisiana. Contract No. 14-35-0001-30470 OCS Study MMS 92-0066. 25 pp.

Rozas, L. P. 1992. Comparison of Nekton Habitats Associated With Pipeline Canals and Natural Channels in Louisiana Salt Marshes. *Wetlands* 12:136-146.

*P.I.'s affiliation may be different than that listed for Project Manager.