ACCESS NUMBER: 30470

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

REPORT TITLE: Potential for Enhancement of Fisheries Habitat by Infilling OCS Pipeline Canals

CONTRACT NUMBER: 14-35-0001-30470

SPONSORING OCS REGION: Gulf of Mexico

APPLICABLE PLANNING AREAS: Central Gulf

FISCAL YEARS OF PROJECT FUNDING: 1990-1993

COMPLETION DATE OF REPORT: July 1994

COSTS: FY 90: $43,982; FY 91: $37,714; FY 92: $ 49,333

CUMULATIVE PROJECT COSTS: $131,029

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KEYWORDS: Pipeline canals, fisheries habitat, habitat restoration, Louisiana marshes

BACKGROUND: The aerial coverage by canals and associated dredged-material levees is approximately 10% of total marsh area in coastal Louisiana, which is about the same coverage as natural channels In addition to the direct loss of marsh habitat caused by the canals; the indirect effect of dredge material placement in levees has been associated with marsh deterioration. The restoration of productive fisheries habitat by infilling pipeline canals depends upon maximizing the area of shallow water in the canals and restoring as much of the adjacent marsh habitat as possible by removing dredged-material levees. The degree to which the canal can be milled depends upon the amount of dredged material available and the bathymetry of the canal at the tame of backfilling.

OBJECTIVES: The overall goal of this project was to assess the feasibility of infilling OCS pipeline canals with their original dredged material and evaluate the resulting increase in fisheries habitat. The specific objectives were:

(1) Determine the relationship between pipeline canal depth and fisheries nursery use.
(2) Determine the degree to which fisheries habitat can be restored by backfilling pipeline canals.
(3) Estimate the potential increase in area of marsh surface habitat accessible to fisheries species resulting from spoil bank removal.
(4) Evaluate the effect of plugging on a) fisheries usage of canals, and b) maintaining the integrity of canal margins and dredged material levees.

DESCRIPTION: The study was conducted in brackish and saline marshes in coastal Louisiana between the Atchafalaya River and Bayou Lafourche. This is the Terrebonne hydrologic basin of the Mississippi delta plain, and as such is relatively homogenous with respect to geological history and substrate character (Penland et al. 1988). Our study was restricted to pipeline canals which support Outer Continental Shelf (OCS) oil and gas activities. These pipelines usually extend from the Cuff of Mexico shoreline across the entire coastal zone. Our study area included a number of pipeline canals which cross both saline and brackish marsh zones.

In order to conduct our field sampling on a representative number of canals we compiled a database of all OCS pipeline canals within our study area. Seven canals were identified in the database which carried OCS materials and which crossed both saline and brackish marsh types. One additional canal, which only crosses saline marshes, was included in initial site selection (Tennessee #3). Each pipeline canal was divided into 1 km sections using quad maps. These sections were designated as saline/brackish and plugged/unplugged Random numbers were used to select three sections of canal of each of the four types. In this manner, 30 canal segments were selected for study.

SIGNIFICANT CONCLUSIONS:

1. There is frequently sufficient material available in dredged material levees to produce shallow water habitat less than 1 m deep if all the material were backfilled to the canal. The efficiency of this infilling increases with tame after the canal dredging. No significant differences were found between plugged and unplugged canals.
2. Dewatering of sediments and decomposition of organic material is most rapid after levee placement. Decrease in canal cross-section (i.e., natural infilling) continues through the life of the canal.
3. Backfilling would increase shallow sub-tidal areas of the canal at the expense of deep areas.
4. Backfilling would enhance the value of the canal area as nursery habitat for some species of fishes and macrocrustaceans. This impact would he greater in brackish areas than in saline areas because of the anticipated increase in submerged aquatic vegetation.
5. Dredged material levees are rarely overtopped by high tides. Removal of the levees would increase the opportunity for access by fishes and

macrocrustaceans to marsh surface habitat. Conversion of levee areas to marsh would also increase the amount of marsh edge habitat available to these animals.

RESULTS: Geomorphic survey and analysis was used to evaluate the potential result of infilling canals and the type of habitat which may result. Comparison of data for saline and brackish canal segments indicates that for both plugged and unplugged canals, canals in brackish areas have greater potential for infilling than those in saline areas. However, older brackish canals have a greater potential for the creation of shallow-water habitat than younger canals suggesting that changes in canal cross-section may be of a greater magnitude than changes in levee material. Our analysis demonstrated that simple survey techniques can be used to indicate the potential efficiency of canal infilling.

Subtidal habitats of pipeline canals in Louisiana brackish and saline marshes were sampled seasonally (fall, spring and summer) between October 1991 and March 1993. In addition, we used topographic and tide gauge data collected in a saline pipeline canal to evaluate the potential change in marsh-surface habitat availability resulting from removing dredged material levees and backfilling canals. Daggerblade grass shrimp *Palaemonetes pugio*, bay anchovy *Anchoa mitchilli*, blue crab *Callinectes sapidus*, brown shrimp *Penaeus aztecus*, and gulf menhaden *Brevoortia patronus* were numerically dominant in both brackish and saline canals. Naked goby *Gobiosoma bosci*, rainwater killifish *Lucania parva*, and gulf pipefish *Syngnathus scovelli* were dominant only in brackish canals, whereas white shrimp *Penaeus setiferus* and Atlantic croaker *Micropogonias undulatus* were dominant in saline canals only. Variation in the abundance of numerically dominant species could not be related to maximum canal depth. However, the distribution of some species within pipeline canals was influenced by habitat depth. The degree of habitat segregation with depth was most pronounced in brackish canals during late spring and summer (May and June) when densities of both total fishes and total decapod crustaceans were significantly greater in shallow water. Naked goby, rainwater killifish, gulf pipefish, blue crab, and daggerblade grass shrimp were significantly more abundant in shallow water at this time. In saline canals, blue crabs selected shallow habitats in March and June, and daggerblade grass shrimp selected this habitat in March. Bay anchovy exhibited greater abundance in deep water seasonally in both brackish and saline canals. Selection of shallow subtidal habitats was greater m brackish canals where submerged aquatic vegetation (SAV) was present. Salinity may have affected the distribution of freshwater species (e.g., centrarchids) and limited their occurrence in saline canals.

STUDY PRODUCTS: Reed, D.J. and L.P. Rozas, 1994. Potential for Enhancement of Fisheries Habitat by Infilling OCS Pipeline Canals. A final report submitted by Louisiana Universities Marine Consortium for the U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico Region, OCS Office, New Orleans, La. MMS Contract 14-35-0001-30470, OCS Study number MMS 93-0061. 48pp.

Reed, D.J. and L.P. Rozas. Restoring Louisiana coastal habitats through infilling existing pipeline canals: a geomorphological evaluation. Wetlands (submitted).

L.P. Rozas and D,J. Reed. Comparing nekton assemblages of subtidal habitats in pipeline canals traversing brackish and saline marshes in coastal Louisiana. Wetlands (accepted).

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