Effects of Marina Proximity on Certain Aspects of the Biology of Oysters and Other Benthic Macrofauna in a South Carolina Estuary

P.H. Wendt, R.F. Van Dolah, M.Y. Bobo and J.J. Manzi

South Carolina Marine Resources Center
Technical Report Number 74
December, 1990

South Carolina Wildlife and
Marine Resources Department

EFFECTS OF MARINA PROXIMITY ON CERTAIN ASPECTS OF THE BIOLOGY OF OYSTERS AND OTHER BENTHIC MACROFAUNA IN A SOUTH CAROLINA ESTUARY

by

Priscilla H. Wendt
Robert F. Van Dolah
M. Yvonne Bobo
John J. Manzi

Marine Resources Center
South Carolina Wildlife and Marine Resources Department
PO Box 12559
Charleston, SC 29412

Technical Report No. 74
South Carolina Marine Resources Center

December 1990

List of Figures

Table of Contents

List of Figures

List of Appendices

Introduction

The tremendous influx of people to coastal areas of the United States has been accompanied by proliferation of commercial marinas designed to serve the growing number of recreational boaters. In South Carolina, boat ownership is among the highest of any state on the east coast. In 1984, South Carolina was second only to Maine in the number of boats per person and ranked fourth, behind Florida, Georgia and New York, in the total number of registered boats (Vismor, McGill and Bell, Inc., 1984).

In response to both the increasing demand for boating facilities and a growing concern for the protection of our estuarine environment, numerous documents have been prepared by various governmental agencies, marine advisory services and independent consulting firms, describing the potential environmental impacts of marinas and providing guidelines for their construction, maintenance and use (U.S. Department of Commerce, 1976; Chmura and Ross, 1978; South Carolina Coastal Council, 1984; Vismor, Mcgill and Bell Inc., 1984; U.S. Environmental Protection Agency, 1985).

Generally speaking, the construction of a marina may affect the ecology of an estuary by changing local shoreline configuration, bottom type and hydrographic regime. The operation of a marina may result in the introduction of various pollutants into the estuary, including fecal wastes, heavy metals and petroleum hydrocarbons (Chmura and Ross, 1978; Marcus and Stokes, 1985; Voudrias and Smith, 1986; Marcus et al., 1988). Although the potential effects of marinas are generally well known, few studies have documented their actual effects in the field (Reish 1961, 1963; Nixon et al., 1973; Soule and Oguri, 1977; Holmes et al., 1985). Because of this paucity of information, regulatory and advisory bodies charged with reviewing marina permit applications frequently have insufficient data regarding the ecological effects of marinas on which to base their decisions.

In order to address this problem, a study was undertaken by the South Carolina Marine Resources Research Institute to evaluate various methods for analyzing marina effects. Specific objectives of this study were to compare a marina and three control sites with respect to four criteria: 1) levels of selected aromatic hydrocarbons and heavy metals in samples of water, sediments, and the American oyster (Crassostrea virginica); 2) recruitment and survival of oyster spat; 3) physiological condition and gametogenesis of oysters; and 4) community structure, faunal abundance and species diversity of benthic macrofauna.

Study Sites

The Skull Creek Marina, on the island of Hilton Head, South Carolina, was chosen as an example of a moderate-size marina having no other obvious sources of pollution nearby (Figure 1). At the time of this study (1986 and 1987), the marina had been in operation for 8 years and had 100 boat slips. Because the marina is located in a well-flushed tidal creek, dredging is not required to maintain the appropriate bottom depths. Like most marinas, the Skull Creek marina provides its customers (who typically live aboard their boats for periods of two to four days at a time) with fuel and sewage pump-out facilities for marine sanitation devices.

Three closely spaced control sites, located in an undeveloped area about three kilometers northwest of the marina on Mackay Creek, were chosen to represent an area similar to the Skull Creek site prior to construction of the marina. The marina and control sites are approximately equidistant from Port Royal Sound, and are located within or adjacent to extensive salt marshes that are characterized by numerous intertidal oyster banks and large stands of smooth cord grass (Spartina alterniflora). The northwest shore of Pinckney Island in Mackay Creek (Figure 1A) served as the control site for oyster spat recruitment studies. Sediments and adult oysters were collected from another site on the opposite shore of Mackay Creek (Figure 1B) for contaminant, gametogenesis and condition index analyses. Finally, grab samples were collected from a shallow subtidal area near the mouth of a small tributary of Mackay Creek (Figure 1C) for benthic macrofaunal and sediment composition analyses.

Contaminants Analyses

Methods

Samples of surface sediments, water and oysters were collected intertidally during two or more seasons at both the marina and control sites. Each oyster sample consisted of the soft tissue from a composite of 30 oysters, all having a minimum shell

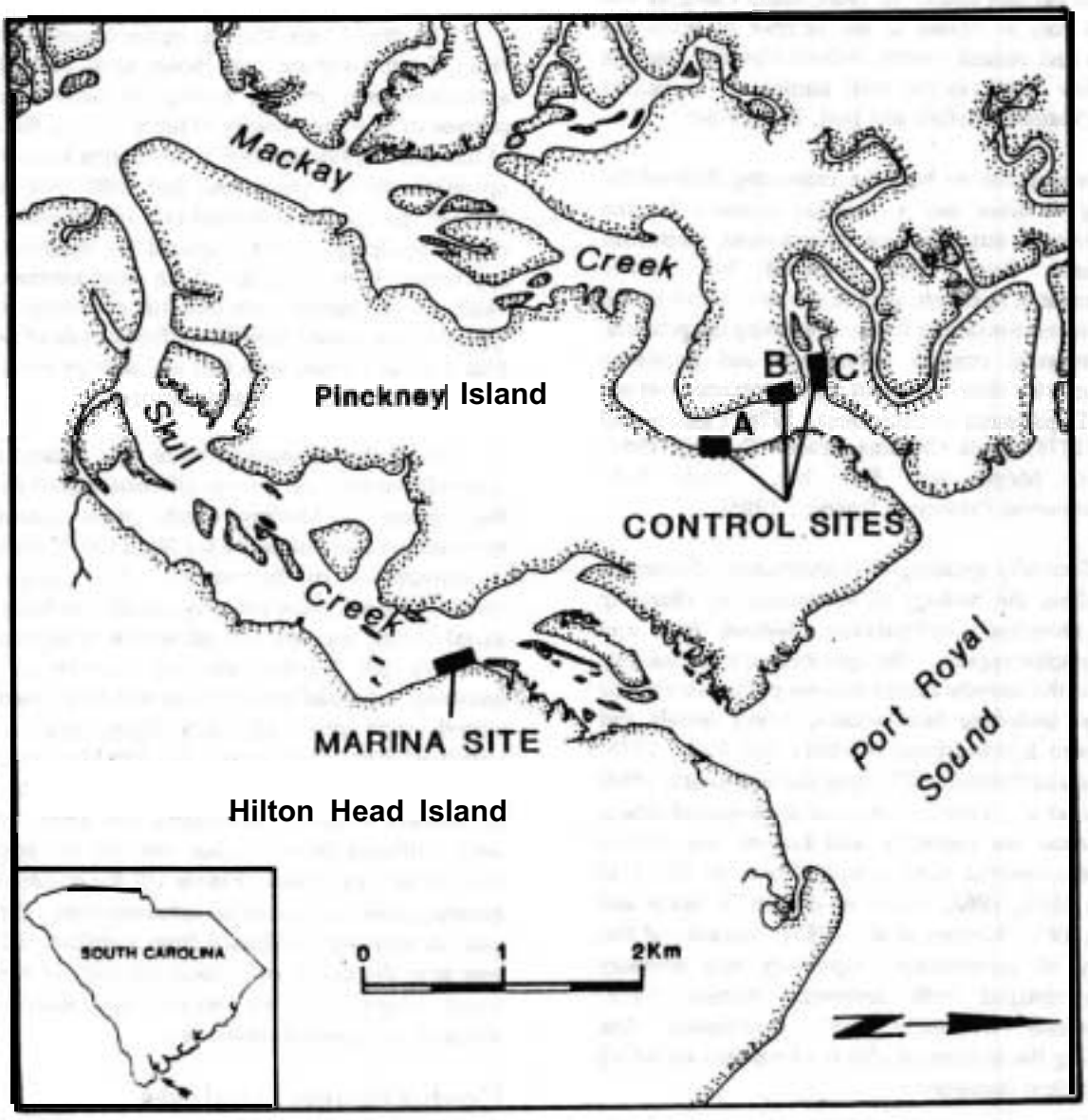

Figure 1. Location of marina and control situ. Control site (A) was used fot the recruitment studies; control site (B) was used for the oyster condition index and gametogenesis studies; and control Rite (C) was used for the benthic community study.

click here to continue