A COMPARISON OF SPECIES COMPOSITION AND ABUNDANCE OF DECAPOD CRUSTACEANS AND FISHES FROM THE NORTH AND SOUTH EDISTO RIVERS IN SOUTH CAROLINA

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Abstract

Fluctuations in the distribution and abundance of fishes and decapod crustaceans collected by a 6-m otter trawl from the North and South Edisto Rivers were examined over a two-year period. Ten species which accounted for >90% of the total number of specimens and >70% of the total fish biomass in both rivers were: *Stellifer lanceolatus*, *Micropogonias undulatus*, *Ictalurus catus*, *Anchoa mitchilli*, *Leiostomus xanthurus*, *Chloroscombrus chrysurus*, *Urophycis regia*, *Brevoortia tyrannus*, *Cynoscion regalis*, and *Trinectes maculatus*. In both rivers, *Stellifer lanceolatus* was the most abundant fish species. The dominant decapod species, *Penaeus setiferus*, *P. aztecus*, *Callinectes sapidus*, and *Xiphopenaeus kroyeri*, comprised almost 94% by number and >97% of weight of the total decapod catch. *Penaeus setiferus* dominated the catch throughout the two-year period.

The two rivers differed in both salinity structure and faunal composition. The North Edisto, which lacked a distinct halocline, had a fairly uniform distribution of species among stations. Species assemblages in the North Edisto lacked a strong endemic estuarine component. Assemblages were composed of stenohaline marine species, which were generally seasonal in their appearance and not very abundant, and euryhaline transients, which were abundant but temporary inhabitants of the estuary as adults. In the South Edisto, the faunal gradient was controlled primarily by salinity, with a change in composition between the limnetic upestuary areas and the meso-euhaline areas.

Introduction

Few investigators of estuarine systems have examined species composition and abundance in hydrographically dissimilar systems. Boesch (1977) examined zonation of benthos within a relatively homiohaline tributary of Chesapeake Bay and compared results with a seasonally-poikilohaline estuary in eastern Australia. Tagatz and Dudley (1961) studied seasonality of marine fishes in four coastal habitats near Beaufort, North Carolina, while Miller and Jorgenson (1969) studied the seasonal abundance and length-frequency distribution of fishes collected from a beach habitat and two high marsh habitats in Georgia. In other Georgia studies, Dahlberg and Odum (1970) compared species occurrence, abundance, and diversity of estuarine fish populations from three ecological habitats which were separable according to amount of tidal waters; and Dahlberg (1972) compared composition and diversity of fish species collected from nine aquatic habitats along the Georgia coast. Wenner et al. (1982) examined fishes and decapod crustaceans from the North and South Santee Rivers. Similarities were found between the rivers in terms of species distribution, probably because of their hydrographic similarity. In this paper, we present information on species assemblages, abundance, and selected life history aspects of fishes and decapod crustaceans collected from a poikilohaline and a homiohaline river in coastal South Carolina.

Study Sites

The North and South Edisto Rivers are contiguous but differ considerably hydrographically. Both rivers empty into the Atlantic Ocean at their mouths. The South Edisto, which has a drainage basin that encompasses 7.7 x 10^3 sq. kilometers receives considerable freshwater inflow with runoff approximating 75 m^3s^{-1}. The upper half of the South Edisto River estuary is characteristically limnetic to mixo-oligohaline (Venice System of Salinity Classification, Symposium on the Classification of Brackish Waters, 1958), while the seaward half is mixo-mesohaline. Salt marshes of smooth cordgrass dominate the lower portion of the South Edisto while the central and upper regions at Sampson Island and Snuggedy Swamps are characterized by brackish and freshwater marshes. Tidal action and velocity are strong in this river and cause vertical mixing. The South Edisto is subject to spring freshets and floods and carries a heavy sediment load (Mathews and Shealy, 1978). Due to variations in freshwater flow, the South Edisto is a moderately fluctuating or poikilohaline estuary. Sediment composition consists of shell, coarse sand, clay, and mud, with sand predominant throughout most of the river.

The North Edisto River is a relatively short, deep estuary with a small amount of freshwater inflow which is principally the result of local upland runoff. The greatest brackish water inflow is via the Atlantic Intracoastal Waterway to the west. A number of tributaries enter the North Edisto River along its course, but water flow in these creeks is generally tidal with negligible freshwater input. Because of the absence of a significant freshwater source, waters of the North Edisto are characteristically mixo-polyhaline with no well-defined halocline present (Mathews and Shealy, 1978). Over 93 sq. kilometers of Spartina-dominated salt marsh are found along the shoreline of the North Edisto, while brackish marshes include only 1.56 sq. kilometers (Tiner, 1977). Bottom sediment composition ranges from coarse sand and shell to finer sand, clay, and mud, with sand the predominant sediment (Calder, et al, 1977).

Methods and Materials

Data Collection

Samples were collected from eight fixed stations located in the channel and representative tributaries of the North Edisto River and four fixed stations in the channel of the South Edisto River (Figure 1). The location and bottom characterization of these stations, as described by Calder et al. (1977), are as follows:

South Edisto -- D001 (Snuggedy Swamp, sand and mud); D002 (Sampson Island, mud and sand with heavy siltation); D003 (Fenwick Island, sand and shell); and D004 (Bay Point, sand with mud and clay).

North Edisto -- E001 (Yonges Island, sand with heterogeneous mixture of shells, rocks, clay, and wood debris, epifaunal community of sponges, hydroids and bryozoans); E002 (Toogoodoo Creek, sand with mud and shell); E003 (Bears Bluff, shell and mud); E004 (Dawho River, sand and mud); E005 (Steamboat Creek, sand and mud with much Leptogorgia and other sessile invertebrates); E006 (Wadmalaw Island, sand and mud); E007 (Point of Pines, sand and mud with some shell); and E008 (DeVeaux Bank, sand with shell, epifaunal invertebrate community of Leptogorgia, hydroids, and bryozoans).

Stations were sampled on a monthly basis during a two-year cycle from February 1973 through January 1975. In order to assess complete annual and seasonal trends in our data, we have grouped January 1974 data with that collected during 1973 and January 1975 data with that collected during 1974.

All collections were made with a 6-m (20-ft.) semi-balloon otter trawl composed of 2.5-cm (1-inch) stretch mesh throughout. Wenner et al. (1982) discussed the bias of this net toward selective capture of juvenile fishes. Twenty-minute tows were made against flood tide during daylight hours at a speed of 1.3 m sec^{-1} (2.5 knots), which resulted in a coverage of 1.5 $\pm$ 0.4 km during a tow.

Prior to trawling, bottom-water samples were collected at each station with 6-liter capacity Van Dorn bottles positioned 0.3 m above the bottom. Water temperature was read from stem thermometers mounted within the Van Dorn bottles, while salinity was measured with a Beckman RS7B induction salinometer in the laboratory. Dissolved oxygen was determined by the Winkler-Carpenter method (Strickland and Parsons, 1968). Turbidity was determined with a Hach Model 2100A turbidimeter. For consistency with our previous paper (Wenner et al., 1982), we defined winter as January, February, and March; spring as April, May, and June; summer as July, August, and September; and fall as October, November, and December.

Specimens collected were either processed in the field or preserved in 10% formalin and returned to the laboratory where they were identified, counted, measured (total length for fishes, carapace width measured as distance between tips of final anterolateral spines for crabs, and total length from tip of rostrum to tip of telson for shrimp) and weighed to the nearest 0.1 g. We recorded measurements for all species numbering $\leq$50 specimens per tow. At stations where the trawl caught larger numbers of organisms, we subsampled each species in the catch as follows: if $\geq$50 to $\leq$250 individuals were collected, then a minimum of 50 randomly-selected specimens were measured; if >250 to <500 individuals were caught, then a minimum of 20% were measured; when >500 were caught, a minimum of 10% were measured. Total weight and total number were recorded for all species caught during a tow, except for extremely large catches in which total number was estimated by counting specimens in a weighed subsample and extrapolating.

Data Analysis

The degree of similarity among collections and among species was determined by using the Bray-Curtis similarity coefficient (Clifford and Stephenson,

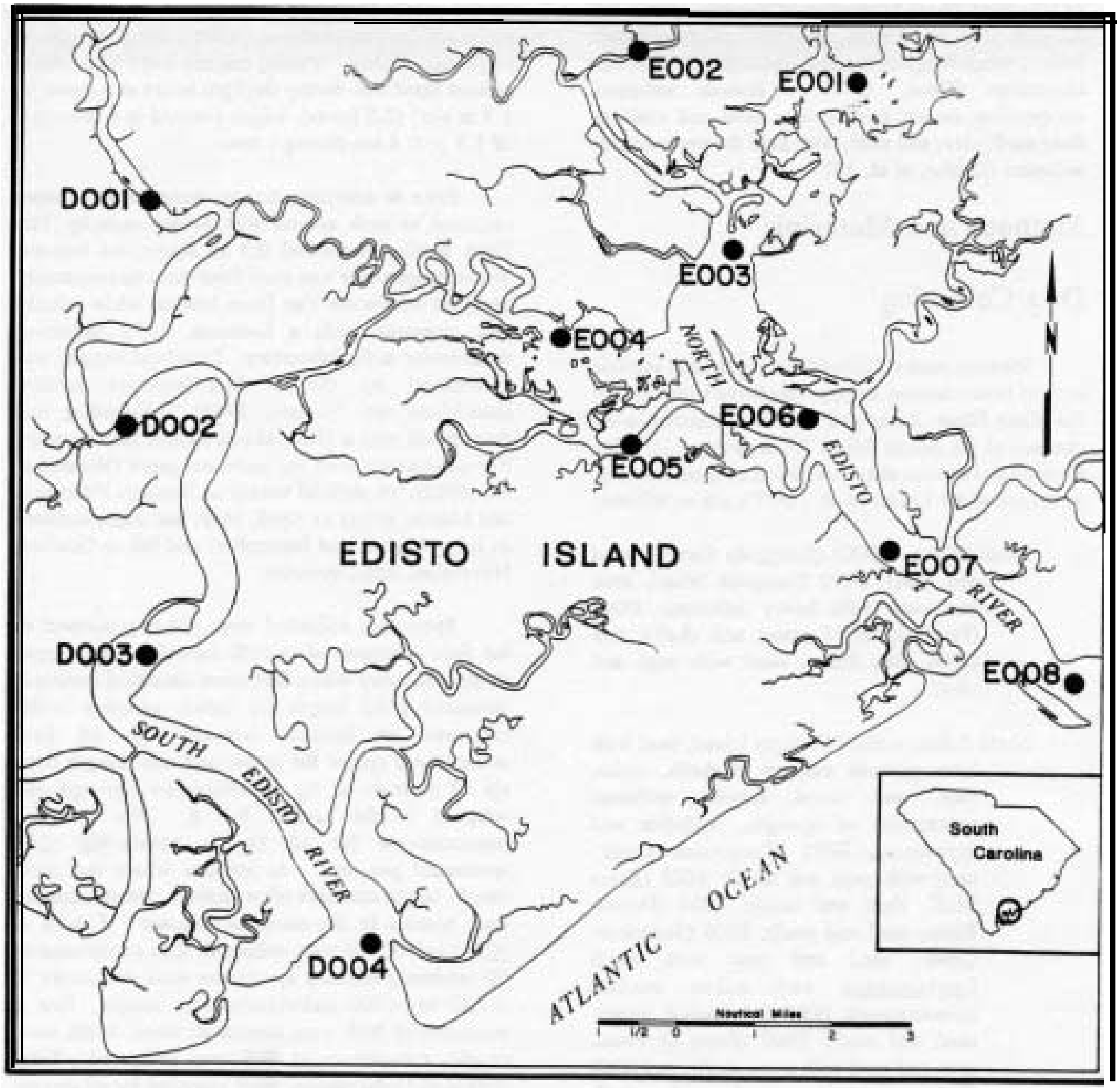

Figure 1. Location of fixed sampling locations in the North and South Edisto Rivers. click here to continue