A Preliminary Report on Estuarine Macrobenthos of the Edisto and Santee River Systems, South Carolina

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by

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INTRODUCTION

Sound management practices will be necessary to ensure that the estuarine resources of coastal South Carolina are protected in the face of increasing population pressures and industrial development. Background information is essential if detrimental changes in water quality and estuarine ecology are to be detected and corrected. Accordingly, the South Carolina Estuarine Survey Program was initiated in 1973 by the South Carolina Wildlife and Marine Resources Department to monitor benthic, nektonic, and planktonic assemblages at a series of stations in major estuaries across the state. Basic hydrographic and meteorological observations have been made concurrent with these studies. The primary goal of this program is to establish a base line of information on each of several different estuaries in South Carolina for intelligent planning and management purposes.

Reports have already been completed on several phases of the research, including bottom fishes (Shealy, 1974; Shealy, Miglarese, and Joseph, 1974), mid-water trawl catches (Shealy, 1975), penaeid shrimp (Bishop and Shealy, 1977) and benthos (Calder, 1976; Calder and Boothe, 1977a, b; Shealy and Boothe, 1975). In addition, two masters theses have been written by students at the Grice Marine Biological Laboratory of the College of Charleston on animals collected by the survey. Hester (1976) examined the hydromedusae from a series of plankton tows, and Harder (1976) studied the polychaetes from a number of benthic grab samples.

Benthic studies were included as part of the Estuarine Survey Program because the bottom-dwelling invertebrates constitute an important segment of the food web that sustains a variety of consumers including a number of commercially and recreationally important species. Benthic ecology was firmly established as a branch of marine biology through the studies of Petersen (1911, 1913, 1915, 1918) and others during the first part of the twentieth century. Most of these early investigations were designed to determine the productivity and distribution of bottom dwelling invertebrates. Recently, the study of benthic community ecology has increasingly been applied to surveys characterizing environmental quality. Benthic macrofaunal communities are useful indicators because of their sedentary nature, long life span, and diverse taxonomic composition. Mathematical analyses of benthic community structure provide a method of assessing perturbations to an ecosystem in meaningful quantitative terms. Species diversity indices are considered by many ecologists to represent one of the better ways to assess environmental change. However, such indices cannot validly be used alone for environmental assessment. Some indication of species composition and abundance must also be given. Two entirely different communities could display identical values of species diversity, species richness, and evenness or equitability.

Few studies of macrobenthic community ecology have been conducted in South Carolina. Parrish (1972) provided a brief outline of the benthos found in Port Royal Sound, and the macrofauna of intertidal sand and mud bars in North Inlet have been described in several papers (Holland, 1974; Holland and Polgar, 1976; Holland and Dean, 1977a, b). Coull (1975) described the macrobenthos of several habitats adjacent to Kiawah Island. Several short-term studies based on collections from a single season have been conducted for the U. S. Army Corps of Engineers, including surveys at Hunting Island and Fripp Inlet (Shealy, Boothe, and Bearden, 1975). Murrells Inlet (Calder, Bearden, and Boothe, 1976), and Little River Inlet (Calder, Bearden, Boothe, and Tiner, 1977). Each of these latter three studies were limited in scope and were conducted to provide a brief assessment of environmental conditions in each of the areas prior to proposed construction activities.

Studies of estuarine benthos in South Carolina were initiated at the Marine Resources Center during the summer of 1973. The purpose of this report is to quantitatively characterize the structure of benthic infaunal communities, as well as to qualitatively describe the epifaunal

invertebrate assemblages, occurring at 18 subtidal Estuarine Survey stations in the Santee and Edisto River systems of South Carolina.

MATERIALS AND METHODS

This study was conducted largely within estuarine portions of the Santee and Edisto River systems, South Carolina. Sampling was conducted during July and October of 1973 and January and April of 1974 at eight stations on the North Edisto River and four stations on the South Edisto River (Fig. 1, Table 1). Three stations each were sampled in the North and South Santee Rivers during January, April, August and October of 1975. In addition, collections were made at station SS04 on the South Santee during July and October of 1973, and January, April, and August of 1974.

Qualitative and quantitative sampling was conducted at each of the 18 stations to determine benthic community structure. Qualitative epifaunal samples were taken using a 30 kg modified oyster dredge. Tows of three minutes were made at each station during early flood tide. The dredge used during this study consisted of a rectangular steel frame measuring 80 cm across the mouth, with a 1.5 m long bag of 2.5 cm stretch mesh polypropylene. A skirt of interlacing metal rings protected the bag from chafing. After preliminary sorting of the catch on station, unidentified epifaunal invertebrates and a representative sample of firm substrates were preserved in 10% neutralized formaldehyde solution and returned to the laboratory for microscopic examination. Quantitative samples were collected with a 0.13 m^2 modified Petersen grab having a capacity of 10.5 liters. Three replicate samples were taken at each station. After measuring the volume of the sample, estimating the depth of penetration, and obtaining a sediment sample (Table 2), the material was washed through a series of sieves having mesh sizes of 2.0, 1.0, and 0.5 mm (Shealy and Boothe, 1975). Organisms and sediment remaining on the sieves after washing were preserved in 10% seawater formaldehyde, stained with rose bengal, and returned to the laboratory for sorting, identification, and enumeration.

Bottom salinity samples were taken prior to benthic sampling with a 6-liter Van Dorn bottle, and analyzed in the laboratory with a Beckman RS7-B induction salinometer. Depth was recorded using a Raytheon DE-275B recording fathometer.

Community structure was analyzed on the basis of several equations from information theory. Species diversity was measured using Shannon's formula (Pielou, 1975):

$$H' = -\Sigma pi \log_2 pi$$

where H' is the diversity in bits of information per individual, and pi equals $\frac{ni}{N}$ or the proportion of the sample belonging to the i^{th} species. Species richness was calculated on the basis of the formula:

$$SR = \frac{S-1}{\ln N}$$

where S is the number of species and lnN is the natural logarithm of the total number of individuals of all species in the sample. Evenness or equitability, the distribution of individuals among the various species, was measured by:

$$J' = \frac{H'}{\log_2 S}$$

where H' is the species diversity in bits of information per individual and S is the number of species.

Faunal homogeneity between any given pair of stations was measured from both qualitative dredge samples and quantitative grab samples. The qualitative measure of similarity used was the Dice coefficient (Czekanowski or Sorensen Index):

$$S_1 = \frac{2c}{(a+b)}$$

where a and b are the numbers of species obtained at each of two stations and c is the number common to both. The quantitative measure of similarity employed was the commonly used Bray-Curtis measure (Clifford and Stephenson, 1975):

$$S_2 = 1 - \frac{\Sigma X_i1 - X_i2}{\Sigma (X_i1 + X_i2)}$$

where X_i1 and X_i2 are the numbers of individuals of the i^{th} species in two collections under comparison.

ESTUARINE ZONES AND ECOLOGICAL CATEGORIES

Biotic change is not uniform along the estuarine salinity gradient; discontinuities in the distribution of organisms occur at several locations along the halocline. A number of classifications categorizing different estuarine zones have been proposed. The Venice System (Symposium on the Classification of Brackish Waters, 1958) is the most widely adopted of these (Fig. 2). The following categories were established in this classification:

1. Limnetic	< 0.5°/oo
2. Mixohaline	0.5-30°/oo
2.1. Oligohaline	0.5-5°/oo
2.1.1. Miooligohaline	0.5-3°/oo

2.1.2. Pliooligohaline	3-5°/oo
2.2. Mesohaline	5-18°/oo
2.2.1. Miomesohaline	5-10°/oo
2.2.2. Pliomesohaline	10-18°/oo
2.3. Polyhaline	18-30°/oo
3. Euhaline	30-40°/oo
4. Hyperhaline	> 40°/oo

The geographic limits of Venice System zones are impossible to precisely define because of salinity oscillations. Zones shift regularly over daily and lunar tidal cycles, and less regularly in response to variations in salt water intrusion and fresh water discharge. Estuaries may be referred to as either homoiohaline or poikilohaline, depending upon the magnitude of these oscillations. The Venice System Classification may not readily apply at all to decidedly poikilohaline estuaries, where minimum salinities exercise greater control over the benthic coenocline than do average conditions (Boesch, 1977).

A classification of the physical regions of a typical estuary, outlined by Day (1951, 1964) and modified by Carriker (1967), is also summarized in Fig. 2. Carriker observed that the boundaries between these zones do not have precise limits because of the diversity of estuarine types and the inherent variability within a given estuary. Another noteworthy classification of estuarine and coastal areas is based on energy flow (Copeland, 1970; Odum and Copeland, 1972, 1974). A total of 48 coastal ecological types within six major categories were recognized in the United States by Odum and Copeland.

Aquatic organisms themselves have been classified by Remane (1971) under a number of ecological categories based on their distribution in relation to salinity (Fig. 1). The biota of fresh water is typically intolerant of even low salinities, and estuarine areas are populated largely by euryhaline marine species (Percival, 1929; Gunter, 1950). Further details on these ecological categories are provided by Carriker (1967), Kinne (1971) and Remane (1971). Information on the effects of salinity on various taxa has been reviewed in various publications, including those of Remane (1971) and Gunter, Ballard, and Venkataramiah (1974).

I. Oligohaline Zone

Following the Venice System of salinity classification, the oligohaline zone at the head of an estuary extends over a salinity range from 0.5°/oo to 5°/oo. In the upper estuary the unidirectional flow characteristic of the limnetic region changes to slow circulation, and waters are characteristically turbid (Copeland, Tenore, and Horton, 1974). The number of species within an estuary typically reaches a minimum toward the oligohaline region. Organisms in this zone must be tolerant not only of low salinity but of fresh water, at least for brief intervals. A number of animals found there are also either sessile or infaunal to avoid being carried away during periods of high river discharge (Copeland, Tenore, and Horton, 1974; Roberts, 1974). In addition to fluctuations between fresh and brackish conditions, the relative scarcity of suitable firm substrates limits the abundance and number of species of epibenthos in sub-tidal waters of this zone in South Carolina. Bottom types at Estuarine Survey stations in this zone consisted primarily of mud or sand. Oyster shells, a major substrate in areas of moderate to high salinity, were scarce.

The oligohaline zone is an important nursery ground area for a variety of animals, including such major sport and commercial resources as shrimp, blue crabs, and a number of finfish species. In a study of one such area in the York-Pamunkey River system of Virginia, Van Engel and Joseph (1968) concluded that the region provided an abundant, acceptable food supply, protection from predators, and physiological suitability, all of which are necessary for a successful nursery ground.

II. Mesohaline Zone

The mesohaline zone, encompassing salinities from 5-18°/oo, is vitally important in most east coast estuaries because it provides support for such commercially important species as shrimp, oysters, blue crabs, and a number of species of fishes. In lower salinity waters, the biota of the southeast is very similar to that of the middle Atlantic states (Roberts, 1974; Watling, Lindsay, Smith, and Maurer, 1974), although relative abundances may vary considerably between the two regions. As noted by Bellis (1974), a number of rivers in South Carolina and Georgia empty directly into the ocean rather than flowing into larger bays or sounds such as Delaware Bay, Chesapeake Bay, Albemarle Sound, and Pamlico Sound. As a result, mesohaline areas of this state are rather restricted in area.

Economically, and perhaps ecologically, the most important sessile benthic animal in estuaries of South Carolina is the American oyster, Crassostrea virginica. Shells of this commercially valuable mollusk provide the primary substrate for a number of marine invertebrates, including sponges, cnidarians, flatworms, bryozoans, polychaetes, mollusks, crustaceans, and ascidians. The biota associated with oysters and oyster shells at a given location within the estuary depends in large part upon salinity, with greater

TABLE 1. LIST OF STATIONS SAMPLED IN THE SANTEE AND EDISTO RIVER ESTUARINE SYSTEMS OF SOUTH CAROLINA. SALINITY REGIMES ARE BASED ON BOTTOM SALINITY SAMPLES TAKEN AT EACH STATION DURING BENTHIC STUDIES.

STATION	LOCATION	N	W	DEPTH	SALINITY REGIME
North Santee River					
NS01	Cane Island	33°08.2'	79°14.8'	3	Limnetic-euhaline
NS04	AIWW Intersection	33°10.2'	79°17.5'	3	Limnetic-mesohaline
NS07	3 mi. above AIWW	33°10.6'	79°20.7'	5	Limnetic-oligohaline
South Santee River					
SS01	Grace Island	33°07.9'	79°16.4'	3	Meso-euhaline
SS04	AIWW Intersection	33°08.8'	79°19.2'	4	Limnetic-polyhaline
SS07	3 mi. above AIWW	33°09.8'	79°22.3'	3	Limnetic-oligohaline
North Edisto River					
E001	Yonges Island	32°41.2'	80°13.4'	7	Meso-polyhaline
E002	Toogoodoo Creek	32°41.3'	80°17.3'	4	Polyhaline
E003	Bears Bluff	32°38.8'	80°15.7'	6	Poly-euhaline
E004	Dawho River	32°37.9'	80°18.6'	6	Meso-polyhaline
E005	Steamboat Creek	32°36.2'	80°17.7'	8	Polyhaline
E006	Wadmalaw Island	32°36.5'	80°14.8'	6	Poly-euhaline
E007	Point of Pines	32°35.0'	80°13.5'	6	Poly-euhaline
E008	DeVeaux Bank	32°33.6'	80°10.7'	11	Poly-euhaline
South Edisto River					
D001	Snuggedy Swamp	32°39.7'	80°24.8'	3	Limnetic-oligohaline
D002	Sampson Island	32°36.3'	80°25.4'	9	Limnetic-oligohaline
D003	Fenwick Island	32°33.7'	80°23.7'	5	Mesohaline
D004	Bay Point	32°29.7'	80°21.2'	5	Poly-euhaline

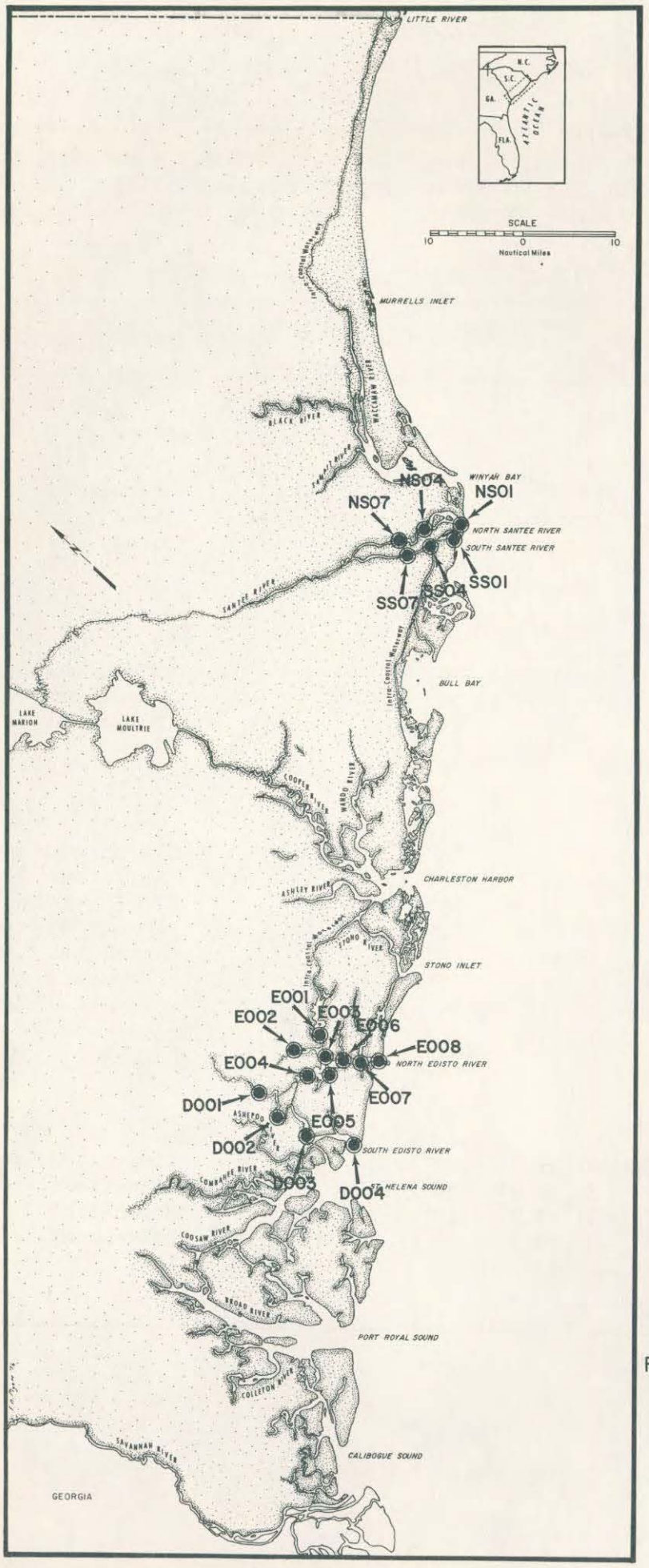

Figure I.
Benthic sampling stations in the Santee and Edisto estuarine systems.

TABLE 2. BOTTOM TYPE AT EACH OF THE STATIONS ON THE SANTEE AND EDISTO ESTUARIES.

STATION LOCATION		BOTTOM TYPE
North Santee River		
NS01	Cane Island	Sand, mud, shell
NS04	AIWW Intersection	Sand, mud
NS07	3 mi. above AIWW	Sand, mud
South Santee River		
SS01	Grace Island	Shell, sand, mud
SS04	AIWW Intersection	Sand, mud, shell
SS07	3 mi. above AIWW	Mud, sand
North Edisto River		
E001	Yonges Island	Clay, sand, mud
E002	Toogoodoo Creek	Sand, mud, shell
E003	Bears Bluff	Sand, shell
E004	Dawho River	Sand, mud
E005	Steamboat Creek	Sand, mud
E006	Wadmalaw Island	Sand, mud
E007	Point of Pines	Sand, mud
E008	DeVeaux Bank	Sand, shell
South Edisto River		
D001	Snuggedy Swamp	Sand, mud
D002	Sampson Island	Mud, sand
D003	Fenwick Island	Sand, shell
D004	Bay Point	Sand, mud, clay

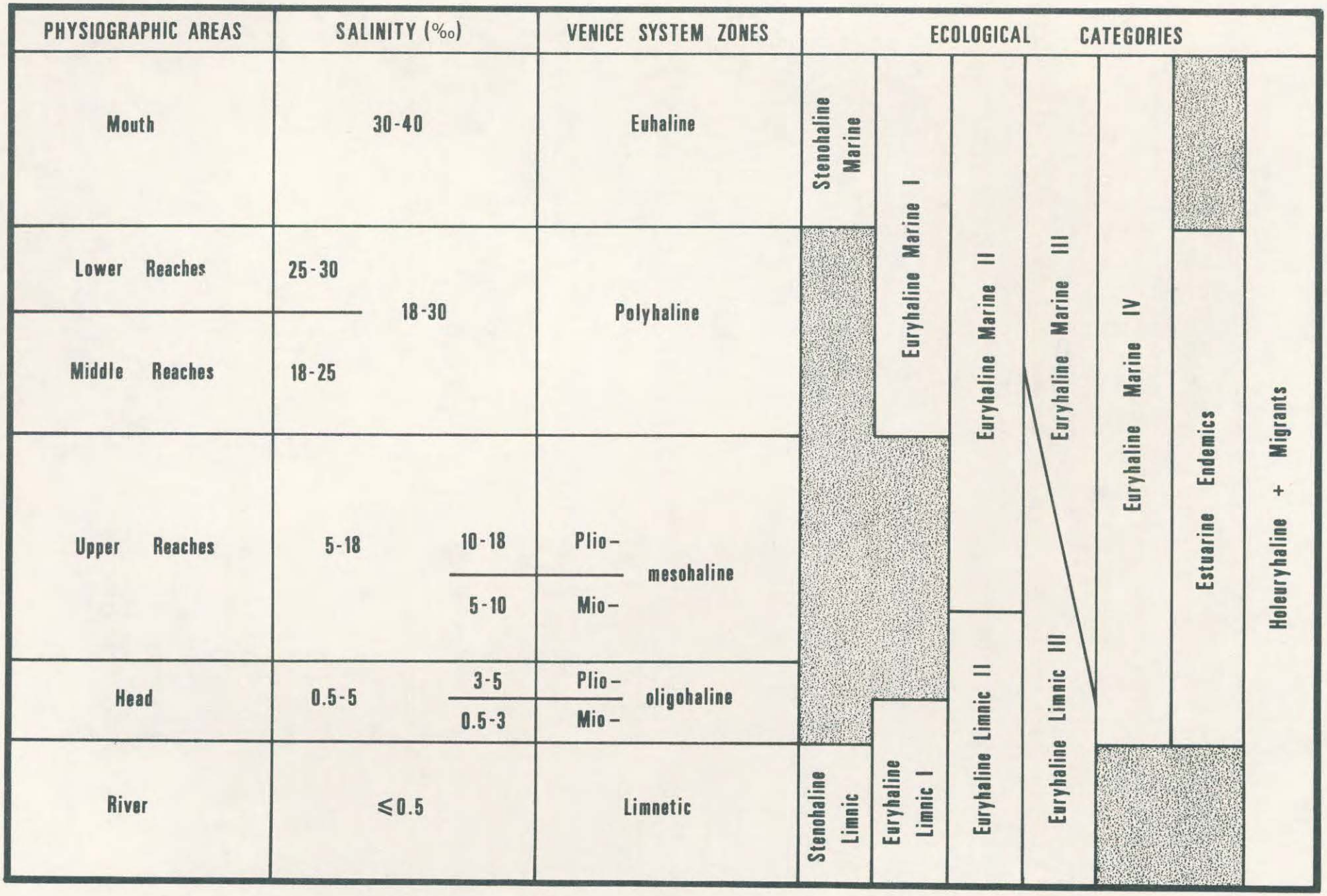

Figure 2. Estuarine zones and ecological categories.

numbers of species in higher salinities (Wells, 1961). In addition to the direct economic value of the oyster, the oyster community is an important source of food for fish and crustaceans (Roberts, 1974). The productivity of this community is governed by the interaction of such factors as bottom character, water movements, salinity, temperature, food, sedimentation, pollution, competition, predation, and disease (Galtsoff, 1964). Galtsoff also noted that oysters developing on soft bottoms may convert the area into a firm substrate as shells accumulate.

Although oyster beds in higher salinities are largely restricted to the intertidal zone in South Carolina, a number occur subtidally, particularly in mesohaline regions. Due to their size and condition these subtidal oysters are best suited for the commercial fishery in this state. Nevertheless, efforts are also made to utilize the smaller and poorer grade intertidal oysters.

III. Polyhaline Zone

Most of the rivers in the coastal zone of South Carolina have relatively small watersheds. Only the Pee Dee, Santee, Edisto, and Savannah watersheds reach to the Piedmont area or beyond (Hopkins, 1956). With the exception of the Cooper, which presently receives fresh water diverted from the Santee, the remainder are largely restricted to drainage from the coastal plain. As a result, fresh water discharge is generally low in these rivers and salinities are typically high toward the mouths. The polyhaline zone, bounded by salinities from 18-30°/oo, occurs in the lower portions of these rivers, as well as various bays, creeks, and sounds behind the barrier islands (Roberts, 1974).

The entire coastal area of the state is very low, and bordering the intracoastal waters behind the barrier islands is a broad expanse of wetlands totalling over 500,000 acres (Spinner, 1969). Mud flats occur in relatively sheltered areas behind the barrier islands. Extensive intertidal beds of the American oyster (Crassostrea virginica) are common on these flats and along the margins of the estuaries in polyhaline as well as euhaline regions. Despite the limited acreage of subtidal oysters in higher salinity areas, shells were common to abundant subtidally in most polyhaline and euhaline areas, providing ample substrate for the epibenthos. The central axis of dead sea whips (Leptogorgia virgulata) was also an important substrate for epifaunal invertebrates in this zone.

Species diversity and species richness are both typically high in this zone (Boesch, 1972), with a large number of Euryhaline Marine I species being represented.

IV. Euhaline Zone

This zone, characterized by salinities of 30-40°/oo, is largely restricted in the intracoastal waters of South Carolina to inlets and bays receiving negligible freshwater discharge and to the area near the mouth of a number of rivers and sounds. Bottom types are variable in intracoastal euhaline regions of South Carolina. Sand predominates near the mouth of most inlets and estuaries, with some shell being present. The amount of shell is substantial in many areas within the estuary, while varying amounts of mud are present in sheltered areas. The assemblages of benthic animals in euhaline areas vary widely in the state depending upon the nature of the substrate (Calder, Bearden, and Boothe, 1976). The number of species is typically high in euhaline areas (Wells, 1961; Remane, 1971). None of the stations sampled during this study were strictly euhaline, although salinities at DeVeaux Bank (E008) were generally in or near this regime. The large number of epibenthic taxa present at that location reflected the high and relatively stable salinity regime, coupled with the presence of suitable firm substrates.

RESULTS AND DISCUSSION

The Santee System

Salinities in the North and South Santee estuaries undergo wide fluctuations, both tidally and in response to variations in salt water intrusion and fresh water discharge (Cummings, 1970; Stephens, VanNieuwenhuise, Kanes, and Davies, 1975; Calder, 1976; Kjerfve, 1976; Nelson, 1976; Burrell, 1977). Both estuaries were subjected to two major freshets during 1975. Flow of fresh water into the head of the Santee River at Wilson Dam is normally controlled at 14.2 m^3/sec, but discharge averaged 679.3 m^3/sec between mid-March and mid-April, and 238.5 m^3/sec from mid-May until late June due to heavy rainfall over the Santee watershed (Burrell, 1977). These two estuaries are typically poikilohaline under normal conditions, and salinity fluctuations during 1975 were extreme.

The effects of poikilohaline conditions in the Santee estuaries were evident during this study in the structure of macrobenthic communities (Tables 3-10). Changes in species diversity with decreasing salinity, such as those described in the homoiohaline Chesapeake-York-Pamunkey estuary by Boesch (1972), were not readily evident, especially after January. This was attributed largely to the lack of a stable, uniform halocline in the Santee system and to the two periods during the study when extreme reductions in salinity occurred. The possible impact of the Atlantic Intracoastal Waterway and its effect on the hydrography of the middle reaches of each estuary, where stations NS04 and SS04 were located, may also have added a complicating factor. The number of

species collected at a given location was generally much lower in both dredge and grab samples than for a comparable site in the more homoiohaline North Edisto River. Faunal similarity between Santee and North Edisto dredge collections never exceeded 0.5, and in most cases was much lower. Likewise, similarity of the fauna in grab samples from these areas was low. Most of the organisms represented in samples from the Santee, including those from the lower reaches of each estuary, were eurytopic. Even in January, before any drastic salinity reductions were observed, the fauna at stations NS01 and SS01 near the river mouths consisted largely of Euryhaline Marine II and III species (Tables 3, 6). This conforms with observations by Boesch (1977) on benthic communities of the Brisbane River estuary, Australia. He observed that low salinity conditions govern the distribution of species in a poikilohaline estuary, and that in these environments marine species are displaced downestuary. Consequently, much of the estuarine zone under such conditions is populated by estuarine endemics and euryhaline species. This was recently shown to be the case for an epifaunal group studied in estuarine portions of the Santee system. All of the nine species of hydroids collected in these estuaries by Calder (1976) were found to be either estuarine endemics or Euryhaline Marine II, III, and IV species. Stenohaline Marine and Euryhaline Marine I species were lacking in samples even from locations near the river mouths. Despite the wide fluctuations in salinity, the overall number of epifaunal species in dredge collections declined from stations NS01 to NS07 on the North Santee, and from SS01 to SS07 on the South Santee (Table 10). Species numbers and richness were also highest in grab samples near the mouths of the estuaries. Salinities were low throughout the year at stations NS07 and SS07, and both epifaunal and infaunal organisms in these areas were distinctly those of an oligohaline-limnetic border area (Tables 5, 9, 10).

Changes in benthic community structure reflected the effects of the floods. Alterations were clearly apparent in the species composition and density, both of which were modified significantly, particularly in the lower reaches of each estuary. Many species were eliminated after January; by April, the samples were dominated by euryhaline opportunists, estuarine endemics, and freshwater species. For example, insect larvae, indicative of limnetic conditions, were common during April at both NS04 and SS04 (Tables 4, 8). A few chironomids were even encountered at NS01 (Table 3), although these had probably been swept into the area from regions further upstream. Faunal similarity between samples from January and April was low at all stations, but especially so (less than 0.2) at stations NS01, NS04, and SS04. Unfortunately, no sample was available for April from station SS01. Faunal density declined from 1903 to 224 organisms m^{-2} during the interval from January to April at station NS01. Over the same period, declines were also noted at NS04 and SS04 (Tables 4, 8), but an increase in density was observed at stations NS07 and SS07 in the upper reaches of the estuaries (Tables 5, 9). Alterations to benthic communities were attributed to the direct or indirect effects of reduced salinity and not to low dissolved oxygen levels. There was no evidence of oxygen depletion at any of the stations in either estuary during the study.

Data from this study suggest that the impact of flooding on the benthos of the Santee system was highest in the lower reaches of each estuary. The effects would probably have been greater, especially in areas of high salinity, if these estuaries had been more homoiohaline before the freshets. Wells (1961), studying the oyster communities of the Newport River, North Carolina, observed that the effects of reduced salinities following three hurricanes were greatest in areas of high salinity. Data from several studies following floods caused by Tropical Storm Agnes in the Chesapeake Bay area during 1972 indicate that the most severe effects occurred in areas of high salinity downestuary (Andrews, 1973; Larsen, 1974; Orth, 1974; Boesch, Diaz and Virnstein, 1976).

The magnitude of the changes that occurred in benthic assemblages between January and April was not reflected in a consistent decrease in species diversity. Values of H' either remained essentially the same or actually increased at stations NS01, SS04, and SS07 in April (Tables 3, 8, 9), due at least in part to an increase in evenness. Boesch, Diaz and Virnstein (1976) observed a similar increase in species diversity in normally mesohaline areas of the James River, Virginia, following passage of Tropical Storm Agnes. They found that few species in such regions had apparently been eliminated, and that species normally found in oligohaline and limnetic areas became common.

Oysters are largely restricted to the intertidal zone in most areas of high or moderately high salinity in South Carolina, but subtidal reefs of these commercially important bivalves occur in abundance in the lower reaches of both the North and South Santee Rivers. The only significant beds of subtidal oysters elsewhere in this state occur in low salinity areas of the Wando River and the Ashepoo River (Keith and Cochran, 1968). Presence of subtidal reefs of Crassostrea virginica near the mouths of these two rivers is probably attributable to the wide salinity fluctuations typical of these areas and the limiting effects of such conditions on oyster predators and competitors.

In addition to subtidal reefs of oysters, large concentrations of hard clams (Mercenaria mercenaria) are also

present in the lower Santee region. Special surveys in this area have revealed concentrations averaging 6.5-9.5 hard clams m^{-2}, with maximum densities of 22-27 m^{-2} in sand-shell substrates (Rhodes et al, 1977). These animals are therefore an ecologically as well as economically important element of the benthos in the North and South Santee estuaries and in North Santee Bay.

The Edisto System

The North and South Edisto Rivers provide an ideal opportunity for assessing the attributes of natural estuarine environments because both are relatively unpolluted and unaltered. Despite their proximity, these two estuaries differ significantly in hydrography and in benthic community structure. Salinities were low in the South Edisto except at the mouth because most of the freshwater from the system is discharged through this tributary. In contrast, little fresh water enters the North Edisto and salinities were polyhaline for the most part throughout the entire river. Due to variations in freshwater flow, the South Edisto is a moderately fluctuating or poikilohaline estuary, although salinities are much less variable than in the Santee. Only minor fluctuations of salinity were observed in the North Edisto, and the estuary is regarded as relatively homoiohaline.

Because of the absence of a significant freshwater source, a well defined halocline from the mouth to the head of the North Edisto River was generally lacking during this study. Differences were noted in the benthos from one location to another in this estuary (Tables 11-19), but these were largely attributable to dissimilarities in substrate type rather than to a salinity gradient. Similar circumstances were recently observed in Murrells Inlet by Calder, Bearden and Boothe (1976), where salinities were relatively homogeneous throughout. Major differences in the benthos among various stations in the inlet were due primarily to substrate. Likewise, a sharp break in bottom type from sand to shell along the inner channel of Little River Inlet was accompanied by a pronounced change in the benthic assemblage (Calder, Bearden, Boothe and Tiner, 1977).

A distinct salinity gradient was evident on the South Edisto River. Salinities varied from polyhaline or euhaline at the mouth to essentially limnetic at Snuggedy Swamp. As expected for a gradient estuary, the combined number of species in dredge and grab samples declined from a maximum at the highest salinity station (D004) to a minimum at the station having the lowest salinity (D001) (Tables 20-24). Dissimilarities in species composition among stations on this estuary were due partly to substrate differences, but salinity was considered to be the factor of prime importance.

Under conditions of high and relatively uniform salinity, the number of species observed in the North Edisto was much greater overall in both dredge and grab samples than for any other estuary included in this study. A total of 126 species of epifaunal invertebrates were identified in dredge collections from this estuary compared with 71 from the South Edisto and 41 from the entire Santee estuarine area. The number of species was also highest in grab samples from the North Edisto; more than 70 taxa each were identified at stations E001, E003, E005, E007, and E008. By comparison, the greatest number of species on the South Edisto was 32 at station D004 while the maximum number at a given station on the Santee was 51 at station NS01. The mean number of species per collection (three grabs) at stations on the North Edisto was 27, compared with 11 from the South Edisto and 13 from the Santee estuaries. Samples taken in the Santee area before the spring floods of 1975 had a mean of 16 species per collection. The mean number of animals m^{-2} was 908 on the North Edisto, 561 on the South Edisto, 591 on the Santee overall, and 851 on the Santee before the 1975 spring floods. Thus, the difference in number of species among these estuarine areas was greater than the difference in number of organisms per unit area of bottom. A comparison of H' values in Tables 3-9, 11-18, and 20-24 reveals that species diversity was consistently higher in collections from the North Edisto, where environmental constancy was relatively high, than in those from either the South Edisto or Santee, where stresses were higher and environmental constancy was lower.

In which of the estuaries studied would a given environmental perturbation be expected to have the most severe impact? It has been a generally accepted premise in ecology that diverse systems are more stable and are therefore better able to resist stresses of a given magnitude than ecosystems of lower diversity. However, this belief as it applies to estuaries has recently been challenged by Copeland (1970) and Boesch (1972, 1974), and the reverse appears to be true. Boesch observed that benthic organisms in the typically low diversity mesohaline and oligohaline zones of an estuary are more resistent to perturbations, including salinity fluctuations and multiple pollution stress, than those restricted to areas of higher salinity. He also stated that species found in areas of low salinity have high resilience following disturbance because of their typically high fecundity and rapid growth. Polluted areas in the polyhaline zone of Hampton Roads, Virginia, were found to be populated by eurytopic macrobenthic species typical of lower salinity regions (Boesch, 1973). Similarly, the effects of flooding during Tropical Storm AGNES in the

Chesapeake Bay system had less impact on the benthos of the upper estuarine regions than in higher salinity areas (Boesch, Diaz and Virnstein, 1976). These observations, plus our own data on the effects of floods on the Santee, suggest that the impact of a given stress would therefore have a greater impact on estuarine biota where environmental constancy is high, where larger numbers of relatively stenotopic species are present, and where diversity is therefore typically high. We conclude that a given stress would have a greater impact on the North Edisto than either the South Edisto, North Santee or South Santee estuaries. At the same time, the vulnerability of the entire estuarine habitat to human disturbance should not be underestimated. Careful and thoughtful management will be necessary if the environmental integrity of these biologically, economically, and aesthetically valuable areas is to be maintained.

NS01 (Cane Island)

An estimated 85% of the freshwater discharge through the Santee system occurs through the North Santee River (Cummings, 1970), and the impact of flooding during 1975 was probably greatest in the lower reaches of this estuary. Bottom salinity at station NS01 during sampling in January was 31.25°/oo, but in April it had dropped to 0.21% because of extensive freshwater outflow. Species numbers in grab samples declined from 30 to 14 between the two sampling dates, and only five of the taxa recorded in January were found in April (Table 3). Most of the species present in April were tolerant of either very low salinity or freshwater.

Sampling at station NS01, situated one mile from the mouth of the North Santee River, was conducted on a subtidal oyster reef. The dredge typically became filled with shells and live oysters during a three minute tow at this station. Satisfactory grab samples were difficult to obtain because of the shelly and sandy substrate. In addition to living oysters and empty shells, common brackish water oyster associates such as Molgula manhattensis, Balanus improvisus, Brachidontes exustus, Membranipora tenuis, Conopeum tenuissimum, and xanthid crabs were well represented in dredge collections from the area (Table 10). Conspicuously lacking among the oyster fouling assemblage were species typical of the polyhaline zone such as Leptogorgia virgulata, Schizoporella errata, Parasmittina nitida, and Eudendrium carneum, suggesting that salinities are periodically too low for these organisms to survive.

NS04 (AIWW Intersection)

Oysters were also dominant in dredge collections from station NS04, although they were much less abundant in the samples than at station NS01. The substrate was also somewhat muddier at this site and the presence of submerged logs made dredging difficult. The epibenthic assemblage was typical of the upper reaches of most South Carolina estuaries, with Crassostrea virginica, Molgula manhattensis, Balanus improvisus, Brachidontes exustus, Diadumene leucolena, and mud crabs being common. The estuarine hydroid Garveia franciscana appeared in larger numbers than at station NS01, probably due to the lower salinity regime. Species numbers and the number of individuals in grab samples were both low each of the four seasons at this station. The community of estuarine animals present in January was noticably disrupted by the spring floods, and insect larvae and the oligochaete Peloscolex heterochaetus were still present in the area in August (Table 4). Benthic infaunal organisms were extremely scarce in October; freshwater elements introduced during limnetic conditions were lacking due to a return of saline waters to the area, while little recruitment of the brackish water fauna typical of this region had occurred.

NS07 (3 mi. above AIWW)

Station NS07 was located in an area of the North Santee River that is normally estuarine, but it was limnetic during a considerable part of 1975 due to freshwater discharge. Moderately large numbers of estuarine species were present in grab samples from the site during January (Table 5). By April, nearly half of these species had been eliminated, and the number of polychaete taxa had declined from 15 to two. However, an increase in the total number of individuals was observed, due largely to increased numbers of the oligochaete Peloscolex heterochaetus and the appearance of dipteran larvae. The bottom of the channel at this station was mostly sand, with little available shell. The epifauna was impoverished (Table 10), consisting largely of such species as Balanus improvisus, Cordylophora caspia, and Mytilopsis leucophaeata found on logs and tree limbs.

SS01 (Grace Island)

An oyster-dominated community similar to that observed near the mouth of the North Santee River was present at station SS01 on the South Santee (Tables 6, 10). Although salinities were less variable at this location than at station NS01, a range from 29.80°/oo in January to 9.61°/oo in August was observed during 1975. Variations in salinity of several parts per thousand were also noted over a tidal cycle at this station. As a result, the number of species represented in the benthos was low, and the assemblage was made up largely of eurytopic species, particularly after January. Predominant organisms in dredge collections besides Crassostrea virginica were Balanus improvisus,

TABLE 3. SPECIES OF MACROINVERTEBRATES COLLECTED EACH SEASON AT STATION NS01, AND THEIR ESTIMATED DENSITIES IN NUMBERS m^{-2}. PERCENT OF TOTAL FAUNA, CUMULATIVE PERCENT, AND RANK BY NUMBER ARE GIVEN FOR EACH SPECIES. P= polychaete, B= bivalve, A= amphipod, D= decapod, O= oligochaete, I= isopod, C= cumacean, G= gastropod, In= insect larva, Ba= barnacle.

SPECIES	JAN.	APR.	AUG.	OCT.	% OF FAUNA	CUMUL. %	RANK BY NUMBER
Streblospio benedicti (P)	407		340	82	26.49	26.49	1
Brachidontes exustus (B)	704	28	51		25.02	51.51	2
Oligochaeta (undet.)	322	74	67	23	15.53	67.04	3
Polychaeta (undet.)	69	5		72	4.67	71.71	4
Sabellaria vulgaris (P)	79			3	2.62	74.33	5
Paraprionospio pinnata (P)	36			38	2.36	76.69	6
Corophium sp. (A)	5	8	41		1.73	78.42	7
Ogyrides limicola (D)				54	1.73	80.15	7
Glycera dibranchiata (P)	38		13		1.63	81.78	8
Peloscolex gabriellae (O)		15	36		1.63	83.41	8
Monoculodes sp. (A)		44	3		1.50	84.91	9
Rhynchocoela (undet.)	28		13		1.31	86.22	10
Mulinia lateralis (B)	33		8		1.31	87.53	10
Melita nitida (A)	28	5	5		1.21	88.74	11
Notomastus hemipodus (P)	20		8	8	1.15	89.89	12
Nereis succinea (P)	15		5	13	1.05	90.94	13
Syllis sp. (P)	8		8	13	0.93	91.87	14
Glycera sp. (P)	28				0.89	92.76	15
Heteromastus filiformis (P)	18		5		0.74	93.50	16
Spionidae (undet.) (P)				23	0.74	94.24	16
Peloscolex heterochaeta (O)		13	8		0.67	94.91	17
Crassostrea virginica (B)	15				0.48	95.39	18
Eteone sp. (P)			13		0.42	95.81	19
Edotea montosa (I)	3		10		0.42	96.23	19
Gammarus daiberi (A)		10			0.32	96.55	20
Glycera americana (P)				8	0.26	96.81	21
Scolecolepides viridis (P)		8			0.26	97.07	21
Pelecypoda (undet.)	8				0.26	97.33	21
Cyclaspis varians (C)				8	0.26	97.59	21
Chaetozone setosa (P)	5				0.16	97.75	22
Ilyanassa obsoleta (G)	5				0.16	97.91	22
Corbula sp. (B)			5		0.16	98.07	22
Clibanarius vittatus (D)	5				0.16	98.23	22
Chironomidae (undet.) (In)		5			0.16	98.39	22
Podarke obscura (P)	3				0.10	98.49	23
Nereidae (undet.) (P)	3				0.10	98.59	23
Arabella iricolor (P)				3	0.10	98.69	23
Tharyx setigera (P)			3		0.10	98.79	23
Armandia maculata (P)	3				0.10	98.89	23
Capitellidae (undet.) (P)			3		0.10	98.99	23
Pectinaria gouldii (P)	3				0.10	99.09	23
Ampharete sp. (P)	3				0.10	99.19	23
Pista sp. (P)	3				0.10	99.29	23
Hirudinea (undet.)		3			0.10	99.39	23
Eupleura caudata (G)		3			0.10	99.49	23

TABLE 3. (continued)

SPECIES	JAN.	APR.	AUG.	OCT.	% OF FAUNA	CUMUL. %	RANK BY NUMBER
Mercenaria mercenaria (B)			3		0.10	99.59	23
Balanus improvisus (Ba)	3				0.10	99.69	23
Erichthonius brasiliensis (A)	3				0.10	99.79	23
Neohaustorius schmitzi (A)		3			0.10	99.89	23
Alpheus sp. (D)			3		0.10	99.99	23
Neopanope sayi (D)			3		0.10	100.09	23
No. Individuals	1903	224	654	348			
No. Species	30	14	23	13			
Species Diversity (H')	2.93	3.02	2.76	3.09			
Species Richness	3.84	2.40	3.39	2.05			
Evenness (J')	0.60	0.79	0.61	0.84			

TABLE 4. SPECIES OF MACROINVERTEBRATES COLLECTED EACH SEASON AT STATION NS04, AND THEIR ESTIMATED DENSITIES IN NUMBERS m^{-2}. PERCENT OF TOTAL FAUNA, CUMULATIVE PERCENT, AND RANK BY NUMBER ARE GIVEN FOR EACH SPECIES. P= polychaete, In= insect larvae, O= oligochaete, I= isopod, A= amphipod, B= bivalve.

SPECIES	JAN.	APR.	AUG.	OCT.	% OF FAUNA	CUMUL. %	RANK BY NUMBER
Scolecolepides viridis (P)		118	10		15.57	15.57	1
Chironomidae (undet.) (In)		97	23		14.60	30.17	2
Polychaeta (undet.)	84			3	10.58	40.75	3
Peloscolex heterochaeta (O)			77		9.37	50.12	4
Nereis succinea (P)	69		3		8.76	58.88	5
Oligochaeta (undet.)	18	46		5	8.39	67.27	6
Streblospio benedicti (P)	61			5	8.03	75.30	7
Rhynchocoela (undet.)	15	8	13		4.38	79.68	8
Notomastus hemipodus (P)			36		4.38	84.06	8
Cyathura polita (I)	15	3	3		2.55	86.61	9
Chiridotea sp. (I)	3	10		3	1.95	88.56	10
Monoculodes sp. (A)	3		13		1.95	90.51	10
Corophium lacustre (A)	15				1.82	92.33	11
Scoloplos sp. (P)	13				1.58	93.91	12
Coelotanypus sp. (O)			13		1.58	95.49	12
Polypedilum sp. (In)			13		1.58	97.07	12
Laeonereis culveri (P)		3			0.36	97.43	13
Mulinia lateralis (B)				3	0.36	97.79	13
Melita appendiculata (A)	3				0.36	98.15	13
Lepidactylus dytiscus (A)				3	0.36	98.51	13
Haustoriidae (undet.) (A)	3				0.36	98.87	13
Lembos sp. (A)	3				0.36	99.23	13
Erichthonius brasiliensis (A)	3				0.36	99.59	13
Ceratopogonidae (undet.) (In)		3			0.36	99.95	13
No. Individuals	308	288	204	22			
No. Species	14	8	10	6			
Species Diversity (H')	2.92	2.00	2.73	2.54			
Species Richness	2.27	1.24	1.69	1.62			
Evenness (J')	0.77	0.67	0.82	0.98			

TABLE 5. SPECIES OF MACROINVERTEBRATES COLLECTED EACH SEASON AT STATION NS07, AND THEIR ESTIMATED DENSITIES IN NUMBERS m^{-2}. PERCENT OF TOTAL FAUNA, CUMULATIVE PERCENT, AND RANK BY NUMBER ARE GIVEN FOR EACH SPECIES.
O= oligochaete, P= polychaete, A= amphipod, I= isopod, In= insect larva.

SPECIES	JAN.	APR.	AUG.	OCT.	% OF FAUNA	CUMUL. %	RANK BY NUMBER
Peloscolex heterochaetus (O)	415	1692	5		49.50	49.50	1
Streblospio benedicti (P)	648				15.19	64.69	2
Oligochaeta (undet.)	292	31	28	20	8.69	73.38	3
Lepidactylus dytiscus (A)		15	220	18	5.93	79.31	4
Cyathura polita (I)	5	5	23	102	3.16	82.47	5
Scolecolepides viridis (P)	3	87	26	15	3.07	85.54	6
Chironomidae (undet.) (In)		118	5		2.88	88.42	7
Polypedilum sp. (In)		118			2.77	91.19	8
Polychaeta (undet.)	23	13	3	38	1.80	92.99	9
Rhynchocoela (undet.)	26	5		23	1.27	94.26	10
Chiridotea sp. (I)			20	8	0.66	94.92	11
Peloscolex gabriellae (O)	3		18		0.49	95.41	12
Ceratopogonidae (undet.) (In)	13	3	3		0.45	95.86	13
Eteone lactea (P)	15				0.35	96.21	14
Gammarus daiberi (A)			15		0.35	96.56	14
Cryptochironomus sp. (In)	8		5		0.30	96.86	15
Turbellaria (undet.)		10			0.23	97.09	16
Polydora ligni (P)	10				0.23	97.32	16
Sigambra bassi (P)	8				0.19	97.51	17
Glycera dibranchiata (P)	8				0.19	97.70	17
Paraprionospio pinnata (P)	8				0.19	97.89	17
Tharyx setigera (P)	8				0.19	98.08	17
Capitellidae (undet.) (P)	8				0.19	98.27	17
Limnodrilus sp. (O)		8			0.19	98.46	17
Monoculodes sp. (A)			8		0.19	98.65	17
Pseudochironomus sp. (In)			8		0.19	98.84	17
Spionidae (undet.) (P)	5				0.12	98.96	18
Cirratulidae (undet.) (P)	5				0.12	99.08	18
Heteromastus filiformis (P)	5				0.12	99.20	18
Pelecypoda (undet.)				5	0.12	99.32	18
Nephtys sp. (P)	3				0.07	99.39	19
Amphicteis gunneri (P)	3				0.07	99.46	19
Coelotanypus sp. (O)	3				0.07	99.53	19
Melita nitida (A)		3			0.07	99.60	19
Batea catharinensis (A)	3				0.07	99.67	19
Stenothoe sp. (A)	3				0.07	99.74	19
Haustoriidae (undet.) (A)		3			0.07	99.81	19
Lembos sp. (A)			3		0.07	99.88	19
Corophium lacustre (A)		3			0.07	99.95	19
Corophium sp. (A)	3				0.07	100.02	19
No. Individuals	1534	2114	390	229			
No. Species	26	15	15	8			
Species Diversity (H')	2.34	1.26	2.48	2.43			
Species Richness	3.41	1.83	2.35	1.29			
Evenness (J')	0.50	0.32	0.63	0.81			

TABLE 6. SPECIES OF MACROINVERTEBRATES COLLECTED DURING THREE SEASONS AT STATION SS01, AND THEIR ESTIMATED DENSITIES IN NUMBERS m^{-2}. PERCENT OF TOTAL FAUNA, CUMULATIVE PERCENT, AND RANK BY NUMBER ARE GIVEN FOR EACH SPECIES. B= bivalve, A= amphipod, P= polychaete, D= decapod, G= gastropod, Ba= barnacle, I= isopod.

SPECIES	JAN.	AUG.	OCT.	% OF FAUNA	CUMUL. %	RANK BY NUMBER
Brachidontes exustus (B)	358		67	25.46	25.46	1
Melita nitida (A)	338	33		22.23	47.69	2
Corophium sp. (A)	36	125	5	9.95	57.64	3
Paracaprella tenuis (A)	128		18	8.75	66.39	4
Nereis succinea (P)	51	26	20	5.81	72.20	5
Polychaeta (undet.)	38		13	3.06	75.26	6
Crassostrea virginica (B)	18	31		2.94	78.20	7
Phyllodoce sp. (P)	46			2.76	80.96	8
Sabellaria vulgaris (P)	23		21	2.64	83.60	9
Streblospio benedicti (P)	5		36	2.46	86.06	10
Martesia sp. (B)		41		2.46	88.52	10
Gammarus daiberi (A)			38	2.28	90.80	11
Pleustidae (undet.) (A)	31			1.86	92.66	12
Autolytus fasciatus (P)	18			1.08	93.74	13
Oligochaeta (undet.)		8	10	1.08	94.82	13
Neopanope sayi (D)	3	10		0.78	95.60	14
Rhynchocoela (undet.)	10			0.60	96.20	15
Polydora sp. (P)		8		0.48	96.68	16
Mercenaria mercenaria (B)		8		0.48	97.16	16
Clibanarius vittatus (D)	8			0.48	97.64	16
Syllis sp. (P)			5	0.30	97.94	17
Pelecypoda (undet.)	5			0.30	98.24	17
Lepidametria commensalis (P)	3			0.18	98.42	18
Podarke obscura (P)			3	0.18	98.60	18
Crepidula plana (G)	3			0.18	98.78	18
Urosalpinx cinerea (G)	3			0.18	98.96	18
Nudibranch (undet.)			3	0.18	99.14	18
Balanus improvisus (Ba)		3		0.18	99.32	18
Cyathura sp. (I)	3			0.18	99.50	18
Edotea montosa (I)	3			0.18	99.68	18
Batea catharinensis (A)	3			0.18	99.86	18
Panopeus herbstii (D)	3			0.18	100.04	18
No. Individuals	1137	293	239			
No. Species	23	10	12			
Species Diversity (H')	2.91	2.59	3.05			
Species Richness	3.13	1.58	2.01			
Evenness (J')	0.64	0.78	0.85			

TABLE 7. SPECIES OF MACROINVERTEBRATES COLLECTED DURING JULY AND OCTOBER OF 1973 AND JANUARY, APRIL AND AUGUST OF 1974 AT STATION SS04, AND THEIR ESTIMATED DENSITIES IN NUMBERS m^{-2}. PERCENT OF TOTAL FAUNA, CUMULATIVE PERCENT, AND RANK BY NUMBER ARE GIVEN FOR EACH SPECIES. B= bivalve, P= polychaete, D= decapod, I= isopod, A= amphipod, C= cumacean.

SPECIES	JULY	OCT.	JAN.	APR.	AUG.	% OF FAUNA	CUMUL. %	RANK BY NUMBER
Rhynchocoela (undet.)	10	23	20	18	1393	51.73	51.73	1
Polychaeta (undet.)	125		95	84	131	15.37	67.10	2
Mulinia lateralis (B)	10	18	189			7.67	74.77	3
Heteromastus filiformis (P)	5	28	10	10	84	4.84	79.61	4
Notomastus hemipodus (P)			28	92		4.24	83.85	5
Streblospio benedicti (P)		13	20		72	3.71	87.56	6
Nereis succinea (P)		49	8	10	3	2.47	90.03	7
Scolecolepides viridis (P)	5	61				2.33	92.36	8
Palaemonetes sp. (D)	56					1.98	94.34	9
Chiridotea sp. (I)	31		3	3		1.31	95.65	10
Melita nitida (A)					20	0.71	96.36	11
Gammaridae (undet.) (A)	3			10		0.46	96.82	12
Monoculodes sp. (A)			3	10		0.46	97.28	12
Polydora ligni (P)	3	8				0.39	97.67	13
Paracaprella tenuis (A)	3			8		0.39	98.06	13
Capitellidae (undet.) (P)		10				0.35	98.41	14
Oligochaeta (undet.)	10					0.35	98.76	14
Cyclaspis varians (C)			3	3	3	0.32	99.08	15
Glycera dibranchiata (P)					5	0.18	99.26	16
Orbinia americana (P)			5			0.18	99.44	16
Cyathura sp. (I)					5	0.18	99.62	16
Orbiniidae (undet.) (P)					3	0.11	99.73	17
Pelecypoda (undet.)					3	0.11	99.84	17
Ampelisca sp. (A)		3				0.11	99.95	17
Unidentified Taxon			3			0.11	100.06	17
No. Individuals	261	213	387	248	1722			
No. Species	11	9	12	10	11			
Species Diversity (H')	2.33	2.75	2.27	2.40	1.12			
Species Richness	1.80	1.49	1.85	1.63	1.34			
Evenness (J')	0.67	0.87	0.63	0.72	0.32			

TABLE 8. SPECIES OF MACROINVERTEBRATES COLLECTED EACH SEASON AT STATION SS04 IN 1975, AND THEIR ESTIMATED DENSITIES IN NUMBERS m^{-2}. PERCENT OF TOTAL FAUNA, CUMULATIVE PERCENT, AND RANK BY NUMBER ARE GIVEN FOR EACH SPECIES. P= polychaete, In= insect larva, A= amphipod, B= bivalve, I= isopod, C= cumacean, D= decapod.

SPECIES	JAN.	APR.	AUG.	OCT.	% OF FAUNA	CUMUL. %	RANK BY NUMBER
Streblospio benedicti (P)	1329				64.83	64.83	1
Nereis succinea (P)	56	51	3	15	6.10	70.93	2
Scolecolepides viridis (P)		100	5		5.12	76.05	3
Notomastus hemipodus (P)	3	18	51		3.51	79.56	4
Oligochaeta (undet.)		46	20		3.22	82.78	5
Rhynchocoela (undet.)	18	28	3	5	2.63	85.41	6
Chironomidae (undet.) (In)		51			2.49	87.90	7
Monoculodes intermedius (A)		36			1.76	89.66	8
Polychaeta A (undet.)	8	10	10	3	1.51	91.17	9
Gammarus daiberi (A)		26			1.27	92.44	10
Glycera dibranchiata (P)	20				0.98	93.42	11
Nereis sp. (P)		15			0.73	94.15	12
Macoma balthica (B)		15			0.73	94.88	12
Melita nitida (A)	13				0.63	95.51	13
Polydora ligni (P)	10				0.49	96.00	14
Cyathura polita (I)		10			0.49	96.49	14
Edotea montosa (I)	3	3	3		0.44	96.93	15
Gammarus duebeni (A)			8		0.39	97.32	16
Monoculodes sp. (A)	8				0.39	97.71	16
Mulinia lateralis (B)	3			3	0.29	98.00	17
Paracaprella tenuis (A)		3		3	0.29	98.29	17
Ceratopogonidae (undet.) (In)		5			0.24	98.53	18
Eteone heteropoda (P)	3				0.15	98.68	19
Eteone sp. (P)	3				0.15	98.83	19
Paraprionospio pinnata (P)		3			0.15	98.98	19
Polychaeta B (undet.)	3				0.15	99.13	19
Sabellaria vulgaris (P)	3				0.15	99.28	19
Pelecypoda (undet.)	3				0.15	99.43	19
Cyclaspis varians (C)	3				0.15	99.58	19
Pleustidae (undet.) (A)	3				0.15	99.73	19
Corophium lacustre (A)			3		0.15	99.88	19
Palaemonetes vulgaris (D)			3		0.15	100.03	19
No. Individuals	1492	420	109	29			
No. Species	18	16	10	5			
Species Diversity (H')	0.86	3.42	2.47	1.94			
Species Richness	2.33	2.48	1.92	1.19			
Evenness (J')	0.21	0.86	0.74	0.84			

TABLE 9. SPECIES OF MACROINVERTEBRATES COLLECTED EACH SEASON AT STATION SS07, AND THEIR ESTIMATED DENSITIES IN NUMBERS m^{-2}. PERCENT OF TOTAL FAUNA, CUMULATIVE PERCENT, AND RANK BY NUMBER ARE GIVEN FOR EACH SPECIES. In= insect larva, P= polychaete, B= bivalve, D= decapod, I= isopod.

SPECIES	JAN.	APR.	AUG.	OCT.	% OF FAUNA	CUMUL. %	RANK BY NUMBER
Oligochaeta (undet.)	87	509	33	44	37.53	37.53	1
Chironomidae (undet.) (In)		294	59		19.69	57.22	2
Scolecolepides viridis (P)		197	59		14.28	71.50	3
Tellina sp. (B)	31	84	3	3	6.75	78.25	4
Rhynchocoela (undet.)	23	72		23	6.58	84.83	5
Laeonereis culveri (P)		51	36		4.85	89.68	6
Penaeid larvae (D)				54	3.01	92.69	7
Notomastus hemipodus (P)	3	28		5	2.01	94.70	8
Cyathura polita (I)	3	8	13	5	1.62	96.32	9
Nereis succinea (P)	10			5	0.84	97.16	10
Monoculodes sp. (A)			15		0.84	98.00	10
Polychaeta (undet.)				8	0.45	98.45	11
Macoma balthica (B)		8			0.45	98.90	11
Lepidactylus dytiscus (A)			8		0.45	99.35	11
Cymothoidae (undet.) (I)			3		0.17	99.52	12
Melita nitida (A)	3				0.17	99.69	12
Xanthidae (undet.) (D)			3		0.17	99.86	12
Ceratopogonidae (undet.) (In)		3			0.17	100.03	12
No. Individuals	160	1254	232	147			
No. Species	7	10	10	8			
Species Diversity (H')	1.91	2.36	2.72	2.31			
Species Richness	1.18	1.26	1.65	1.40			
Evenness (J')	0.68	0.71	0.82	0.77			

TABLE 10. EPIFAUNAL INVERTEBRATES IN MODIFIED OYSTER DREDGE COLLECTIONS FROM THE NORTH AND SOUTH SANTEE RIVERS, SOUTH CAROLINA. SS04a=1974, SS04b=1975.

SPECIES	NS01	NS04	NS07	SS01	SS04a	SS04b	SS07
Phylum Cnidaria							
Cyanea capillata (polyp)	+						
Cordylophora caspia		+	+				
Bougainvillia rugosa				+			
Garveia franciscana		+			+	+	
Campanulina sp.	+	+			+		+
Clytia kincaidi				+			
Obelia bidentata		+			+		
Obelia dichotoma				+			
Diadumene leucolena		+					
Phylum Platyhelminthes							
Stylochus ellipticus				+			
Phylum Bryozoa							
Alcyonidium mammillatum					+		
Alcyonidium polyoum				+			
Anguinella palmata					+		
Bowerbankia gracilis		+		+	+		
Aeverrillia setigera					+		
Membranipora tenuis	+			+	+	+	
Conopeum tenuissimum	+		+	+	+	+	
Electra monostachys	+						
Phylum Annelida							
Nereis succinea				+	+	+	
Sabellaria vulgaris	+			+	+		
Hydroides dianthus	+						
Phylum Mollusca							
Crepidula plana	+			+			
Brachidontes exustus	+	+		+	+	+	
Crassostrea virginica	+	+		+	+	+	
Mytilopsis leucophaeata		+	+				
Phylum Arthropoda							
Tanystylum orbiculare					+		
Balanus amphitrite niveus	+						
Balanus eburneus				+	+	+	
Balanus improvisus	+	+	+	+	+	+	+
Paracaprella tenuis					+		
Penaeus aztecus aztecus	+				+		
Penaeus setiferus	+	+		+	+	+	+
Xiphopenaeus kroyeri	+			+			
Palaemonetes pugio		+		+			
Palaemonetes vulgaris					+		
Clibanarius vittatus	+			+			
Callinectes sapidus	+	+	+	+	+	+	+
Rhithropanopeus harrisii			+				
Eurypanopeus depressus						+	

TABLE 10. (continued)

SPECIES	NS01	NS04	NS07	SS01	SS04a	SS04b	SS07
Panopeus herbstii	+	+		+	+		
Phylum Chordata							
Molgula manhattensis	+	+		+	+	+	
No. Species	19	15	6	22	23	12	4

Molgula manhattensis, Brachidontes exustus, Sabellaria vulgaris, Membranipora tenuis, and xanthid crabs. Epifaunal organisms were also numerically dominant in Petersen grab samples. While the fauna in January included a number of species (e.g. Urosalpinx cinerea, Clibanarius vittatus) that are infrequent below 18 °/oo, most others were euryhaline. No sample was available for April from this station, but the effects of lowered salinity on the biota of the area was evident from the collections taken in August and October. Numbers of taxa were reduced significantly, and most species represented after January were those normally tolerant of a wide range of salinity.

SS04 (AIWW Intersection)

Oysters were also frequent in collections at station SS04, although they were generally less abundant than at SS01. Other species common in dredge hauls included such euryhaline species as Balanus improvisus, Brachidontes exustus, Sabellaria vulgaris, Molgula manhattensis, Membranipora tenuis, and Garveia franciscana. The polychaete Nereis succinea and the xanthid crabs Panopeus herbstii and Eurypanopeus depressus were also common to abundant in most collections. A total of nine sets of grab collections were taken at SS04 between July 1973 and October 1975 (Tables 7, 8). Over the interval covered, the number of species in grab samples during a given year was highest in January and lowest in October. A modest number of taxa was represented in collections from this poikilohaline location; most were euryhaline species known from the middle and upper reaches of several other east coast estuaries. Except for an abundance of rhynchocoels in samples from August, 1974, the community was dominated largely by polychaetes. The effects of the 1975 floods appeared to be less pronounced on the fauna of this station than at the sampling sites on the North Santee River. However, extensive freshwater discharge was indicated by the presence of several oligohaline and limnetic organisms such as chironomids and ceratopogonids in April.

SS07 (3 mi. above AIWW)

The fewest number of motile species occurring at any sampling location included in this study were present at station SS07. The bottom consisted of muddy sand with little hard substrate, and the area alternated between oligohaline and limnetic conditions during 1975. Only four species were collected in the dredge, two of which were the migratory euryhaline decapods Penaeus setiferus and Callinectes sapidus (Table 10). The only sessile epibenthic species found at this location were Balanus improvisus and Campanulina sp., neither of which were common. The scarcity of organisms was attributed primarily to the stress of fluctuations between fresh and brackish water conditions. Neither a limnetic nor an estuarine fauna was able to become well established here. The seven species of organisms identified in January grab samples were predominantly estuarine species (Table 9). In April and August, several of these species were still present, but a number of freshwater organisms had been introduced to the community during the interval when limnetic conditions prevailed. By October, brackish water had re-invaded the area and the fauna consisted predominantly of estuarine endemic and euryhaline marine species, and was remarkably similar to the assemblage observed in January. The effects of flooding during the year appeared to have a minimal impact on the biota of the site, probably because the region is not infrequently subjected to periodic freshwater incursions.

Station E008 (DeVeaux Bank)

Conditions of high and stable salinity, combined with the presence of a suitable substrate, are generally conducive to the development of rich communities of epifaunal organisms. The most diverse assemblage of epibenthos found at any of the stations included in this study was observed at station E008 near the mouth of the North Edisto River (Table 19). Salinities at this station varied only from 28.31°/oo to 31.35°/oo during the study, and ample substrate was available in the form of empty shells of the American oyster (Crassostrea virginica) and whip corals (Leptogorgia virgulata). Besides the abundance of Leptogorgia, sessile forms such as hydroids and bryozoans were well represented in the dredge collections. Epibenthic elements were also frequent in the grab, particularly in the series of samples from April (Table 11). The estimated number of individuals m^{-2} was not high except in April, when a large number of species commonly associated with epifaunal communities and shelly bottoms were represented. Most of the samples that were strictly sand had fewer individuals and species; an unidentified haustoriid amphipod ranked second in abundance at this station in grab samples. Species diversity was high at E008, varying from 2.57 in the June 1973 samples to 4.51 in those from April of 1974. The observed high diversity, combined with the relatively large number of stenotopic forms represented in the samples, reflects the environmental stability of this area as compared with any of the locations sampled on the Santee.

Station E007 (Point of Pines)

Although the salinity regime at station E007 was similar to that at E008, the bottom type was different and there were obvious differences in the benthos. Instead of sand and shell, the sediment was mostly muddy sand with only a small amount of large shell or other hard substrate. Although a moderately large number of

species were identified from dredge tows (Table 19), most of the catches were very small compared with those at DeVeaux Bank. Polychaetes and ophiuroids accounted for nearly half of the total number of species and over 75% of the total number of individuals in grab samples (Table 12). Again, the number of individuals and species was highest in the April samples, due at least in part to recruitment of juveniles. This difference was not attributable solely to the amount of sediment recovered. The volumes retrieved from three grabs in April sampling totalled 11 liters, compared with 11 liters in June, 30 liters in October, and 12 liters in January. Species diversity was again quite high in samples from each of the four seasons, ranging from 2.65 in June to 4.05 in April.

Station E006 (Wadmalaw Island)

While salinity is of major importance in determining the species composition of benthic communities in estuarine environments, substrate is also a factor of great significance. Despite the relatively high and stable salinity regime observed at station E006 off Wadmalaw Island (24.66-30.44°/oo), relatively few taxa were present in either dredge or grab collections from this location (Tables 13, 19). The small number of species represented at this location was attributable to the bottom type, which consisted almost entirely of sand. Half of the invertebrates observed in dredge tows were motile arthropods, reflecting the virtual absence of suitable substrates for most sessile species. In grab samples, the sand-dwelling amphipod Lepidactylus dytiscus accounted for nearly half of the animals collected at this location, with the bivalve Tellina sp. second in abundance. The estimated number of individuals m^{-2} was also low at this station, particularly in comparison with areas such as Steamboat Creek (E005) which had a more heterogeneous bottom type.

E005 (Steamboat Creek)

Salinities at station E005 were polyhaline throughout the study, and the sediments were a mixture of sand and mud with some shell. More species were collected in the grab at this site (98) than at any other location included in the present study (Table 14). Species diversity (H') was also high in samples from each of the four seasons. Polychaetes accounted for more than half of the total number of species and nearly two-thirds of the total number of individuals collected at this station. Streblospio benedicti ranked first numerically, although this spionid displayed seasonal variations in abundance and only an estimated $44/m^2$ were collected in January. Dredge tows yielded moderate to large catches of sessile invertebrates, although the number of species identified from the area (42) was not especially high (Table 19). Leptogorgia virgulata typically dominated in these samples.

E004 (Dawho River)

In terms of the epibenthos, the least productive station in the North Edisto estuary was E004 on the Dawho River. During the entire study, only four species were collected in the dredge at this site (Table 19). These included a hydroid (Obelia hyalina), a bryozoan (Conopeum tenuissimum), and two migratory decapods (Penaeus setiferus and Callinectes sapidus). Although salinities were more variable at this location than at any other station on the North Edisto (13.14-28.17°/oo), the paucity of sessile invertebrates was attributed primarily to a lack of hard substrates. The bottom at E004 consisted largely of sand, with some mud. The assemblage in grab samples was somewhat less impoverished, although the number of species (41) and estimated mean number of individuals m^{-2} (387) were rather low (Table 15). The assemblage at this station bore a greater resemblance to that of Fenwick Island (station D003) on the South Edisto than to any of the areas sampled elsewhere on the North Edisto.

Station E003 (Bears Bluff)

Station E003 was located offshore from the pier at Bears Bluff Laboratories on Wadmalaw Island. Salinities varied between 18.81-30.76°/oo, and the bottom sediments consisted of coarse sand and shell. Large quantities of old and badly eroded oyster shells were usually present in dredge tows. Although the number of species in dredge samples at this station (Table 19) was relatively high (51), most of the shells collected were devoid of fouling organisms and few of the sessile species were ever present in large quantities. Nearly 60% of the organisms in grab samples were polychaetes, and an unidentified syllid ranked first numerically (Table 16). Despite the sandy bottom, no haustoriid amphipods were represented in collections from E003. The most abundant amphipod at this station was an epifaunal corophiid, Cerapus tubularis. This station ranked second among stations on the North Edisto behind E005 in total number of species identified from grab samples, but was fourth in the average estimated number of individuals m^{-2}, behind E005, E001, and E007, respectively. Species diversity (H') was high at this station each of the four seasons, although January samples were impoverished both in species and numbers of individuals.

Station E002 (Toogoodoo Creek)

The bottom-dwelling invertebrates at station E002 consisted of species normally found in the middle reaches of an estuarine system, reflecting the observed salinities at this site (20.95-25.83°/oo). Considering the nature of the substrate (mud and sand mixed with shell) and the lower polyhaline salinities, it was somewhat surprising that the benthic communities of the creek were not more diverse.

TABLE 11. SPECIES OF MACROINVERTEBRATES COLLECTED EACH SEASON AT STATION E008, AND THEIR ESTIMATED DENSITIES IN NUMBERS m^{-2}. PERCENT OF TOTAL FAUNA, CUMULATIVE PERCENT, AND RANK BY NUMBER ARE GIVEN FOR EACH SPECIES. A= amphipod, P= polychaete, B= bivalve, E= echinoderm, I= isopod, G= gastropod, D= decapod, An= anthozoan, Am= amphineuran.

SPECIES	JUNE	OCT.	JAN.	APR.	% OF FAUNA	CUMUL. %	RANK BY NUMBER
Batea catharinensis (A)			3	392	13.75	13.75	1
Haustoriidae (undet.) (A)	223	8	64	8	10.55	24.30	2
Autolytus sp. (P)		5		243	8.64	32.94	3
Notomastus sp. (P)				202	7.03	39.97	4
Syllidae (undet.) (P)		5		164	5.88	45.85	5
Polychaeta A (undet.)	26	18		110	5.36	51.21	6
Unciola serrata			5	131	4.74	55.95	7
Pelecypoda A (undet.)	13		28	84	4.35	60.30	8
Paracaprella tenuis (A)			10	74	2.93	63.23	9
Nereis succinea (P)		5	3	74	2.86	66.09	10
Sigambra bassi (P)				64	2.23	68.32	11
Heteromastus filiformis (P)				64	2.23	70.55	11
Melita nitida (A)			3	51	1.88	72.43	12
Spiophanes bombyx (P)				49	1.71	74.14	13
Maldanidae (undet.) (P)				44	1.53	75.67	14
Orbiniidae (undet.) (P)	38				1.32	76.99	15
Spionidae (undet.) (P)				36	1.25	78.24	16
Rhynchocoela (undet.) (P)	8	5	3	18	1.18	79.42	17
Terebellidae (undet.) (P)		3		31	1.18	80.60	17
Oligochaeta (undet.)				31	1.08	81.68	18
Exogone sp. (P)				28	0.98	82.66	19
Tellinidae (undet.) (B)	3	13	5	5	0.91	83.57	20
Hemipholis elongata (E)	23	3			0.91	84.48	20
Corophium sp. (A)	3	3	8	10	0.84	85.32	21
Polychaeta B (undet.)				23	0.80	86.12	22
Paraphoxus spinosus (A)			5	15	0.70	86.82	23
Ophiuroidea (undet.)				20	0.70	87.52	23
Pelecypoda (undet.) (B)				18	0.63	88.15	24
Chiridotea sp. (I)	18				0.63	88.78	24
Lembos websteri (A)				18	0.63	89.41	24
Paraprionospio pinnata (P)				15	0.52	89.93	25
Nephtys picta (P)		10		3	0.45	90.38	26
Mitrella lunata (G)				13	0.45	90.83	26
Lysianopsis alba (A)			3	8	0.38	91.21	27
Glycera dibranchiata (P)				10	0.35	91.56	28
Nucula proxima (B)				10	0.35	91.91	28
Martesia sp. (B)				10	0.35	92.26	28
Gammaridae (undet.) (A)	10				0.35	92.61	28
Stenothoe minuta (A)			10		0.35	92.96	28
Sabellaria vulgaris (P)				8	0.28	93.24	29
Gammarus mucronatus (A)		8			0.28	93.52	29
Oedicerotidae (undet.) (A)		8			0.28	93.80	29
Trichophoxus epistomus (A)	8				0.28	94.08	29
Neopanope sayi (D)				8	0.28	94.36	29
Undetermined A	8				0.28	94.64	29
Undetermined B				8	0.28	94.92	29
Ancinus depressus (I)	3	3			0.21	95.13	30

TABLE 11. (continued)

SPECIES	JUNE	OCT.	JAN.	APR.	% OF FAUNA	CUMUL. %	RANK BY NUMBER
Actiniaria (undet.) (An)				5	0.17	95.30	31
Sipunculida (undet.)		5			0.17	95.47	31
Podarke obscura (P)				5	0.17	95.64	31
Diopatra cuprea (P)				5	0.17	95.81	31
Scoloplos sp. (P)		5			0.17	95.98	31
Polychaeta C (undet.)	5				0.17	96.15	31
Urosalpinx cinerea (G)				5	0.17	96.32	31
Anadara ovalis (B)				5	0.17	96.49	31
Cyathura burbancki (I)		5			0.17	96.66	31
Maera sp. (A)				5	0.17	96.83	31
Cerapus tubularis (A)				5	0.17	97.00	31
Undetermined C				5	0.17	97.17	31
Haliplanella luciae (An)				3	0.10	97.27	32
Lepidonotus sublevis (P)				3	0.10	97.37	32
Syllidae B (undet.) (P)	3				0.10	97.47	32
Nephtys sp. (P)	3				0.10	97.57	32
Glycera sp. (P)			3		0.10	97.67	32
Arabella iricolor (P)				3	0.10	97.77	32
Spiochaetopterus costarum oculatus	3				0.10	97.87	32
Cirratulidae (undet.) (P)				3	0.10	97.97	32
Capitellidae (undet.) (P)			3		0.10	98.07	32
Chaetopleura apiculata (Am)				3	0.10	98.17	32
Turbonilla interrupta (G)				3	0.10	98.27	32
Doridella sp. (G)				3	0.10	98.37	32
Mercenaria mercenaria (B)		3			0.10	98.47	32
Tagelus sp. (B)				3	0.10	98.57	32
Pelecypoda C (undet.)			3		0.10	98.67	32
Listriella sp. (A)				3	0.10	98.77	32
Monoculodes sp. (A)		3			0.10	98.87	32
Microprotopus sp. (A)		3			0.10	98.97	32
Ischyroceridae (undet.) (A)		3			0.10	99.07	32
Erichthonius brasiliensis (A)				3	0.10	99.17	32
Alpheus normanni (D)				3	0.10	99.27	32
Pagurus longicarpus (D)				3	0.10	99.37	32
Pagurus sp. (D)			3		0.10	99.47	32
Xanthidae (undet.) (D)				3	0.10	99.57	32
Asterias forbesi (E)				3	0.10	99.67	32
Ophiothrix angulata (E)				3	0.10	99.77	32
Mellita quinquesperforata (E)	3				0.10	99.87	32

No. Individuals	401	124	162	2185
No. Species	18	21	17	60
Species Diversity (H')	2.57	4.15	3.10	4.51
Species Richness	2.84	4.15	3.14	7.67
Evenness (J')	0.62	0.95	0.76	0.76

TABLE 12. SPECIES OF MACROINVERTEBRATES COLLECTED EACH SEASON AT STATION E007, AND THEIR ESTIMATED DENSITIES IN NUMBERS m^{-2}. PERCENT OF TOTAL FAUNA, CUMULATIVE PERCENT, AND RANK BY NUMBER ARE GIVEN FOR EACH SPECIES. E= echinoderm, P= polychaete, A= amphipod, C= cumacean, B= bivalve, T= tunicate, G= gastropod, I= isopod, Ph= phoronid, An= anthozoan, D= decapod.

SPECIES	JUNE	OCT.	JAN.	APR.	% OF FAUNA	CUMUL. %	RANK BY NUMBER
Polychaeta (undet.)	195	31		668	18.46	18.46	1
Hemipholis elongata (E)	320	225	8	113	13.75	32.21	2
Oligochaeta (undet.)		397		136	11.01	43.22	3
Notomastus hemipodus (P)			3	425	8.84	52.06	4
Tharyx setigera (P)		28		253	5.80	57.86	5
Ophiuroidea (undet.) (E)			8	266	5.66	63.52	6
Spiophanes bombyx (P)				207	4.28	67.80	7
Syllis sp. (P)				166	3.43	71.23	8
Paraprionospio pinnata (P)		10		138	3.06	74.29	9
Haploscoloplos fragilis (P)			5	108	2.33	76.62	10
Streblospio benedicti (P)		92		18	2.27	78.89	11
Lepidactylus dytiscus (A)	41		33	3	1.59	80.48	12
Rhynchocoela A (undet.)	15			49	1.32	81.80	13
Capitellidae (undet.) (P)		61			1.26	83.06	14
Pectinaria gouldii (P)	38			8	.95	84.01	15
Oxyurostylus smithi (C)	8			38	.95	84.96	15
Tellina sp. A (B)	15			31	.95	85.91	15
Mulinia lateralis (B)	8	13	5	13	.81	86.72	16
Rhynchocoela B (undet.)				38	.78	87.50	17
Cyrtopleura costata (B)	38				.78	88.28	17
Sipunculida (undet.)		36			.74	89.02	18
Corophium sp. (A)		5		31	.74	89.76	18
Sigambra bassi (P)		15		20	.72	90.48	19
Ampelisca sp. (A)	28		3		.64	91.12	20
Monoculodes sp. (A)				26	.54	91.66	21
Exogone dispar (P)				20	.41	92.07	22
Glycera dibranchiata (P)				20	.41	92.48	22
Aricidea sp. (P)				20	.41	92.89	22
Lumbrineridae (undet.) (P)	13	5			.37	93.26	23
Magelona sp. (P)		3	3	10	.33	93.59	24
Syllidae (undet.) (P)		5		10	.31	93.90	25
Opheliidae (undet.) (P)				15	.31	94.21	25
Phyllodoce arenae (P)				13	.27	94.48	26
Podarke obscura (P)		5		8	.27	94.75	26
Nephtys bucera (P)				13	.27	95.02	26
Glycera sp. (P)		10	3		.27	95.29	26
Lumbrineris tenuis (P)		13			.27	95.56	26
Paraphoxus spinosus (A)				13	.27	95.83	26
Paracaprella tenuis (A)			13		.27	96.10	26
Nereis succinea (P)		5	3	3	.23	96.33	27
Oedicerotidae (undet.) (A)			3	8	.23	96.56	27
Molgula manhattensis (T)	8			3	.23	96.79	27
Abra lioica (B)				10	.21	97.00	28
Batea catharinensis (A)	3		3	3	.19	97.19	29

TABLE 12. (continued)

SPECIES	JUNE	OCT.	JAN.	APR.	% OF FAUNA	CUMUL. %	RANK BY NUMBER
Polydora sp. (P)				8	.17	97.36	30
Polychaeta B (undet.)	8				.17	97.53	30
Polinices duplicatus (G)				8	.17	97.70	30
Pelecypoda A (undet.)	8				.17	97.87	30
Pelecypoda B (undet.)			8		.17	98.04	30
Cyclaspis varians (C)				8	.17	98.21	30
Edotea sp. (I)				8	.17	98.38	30
Trichophoxus epistomus (A)			3	5	.17	98.55	30
Phoronis architecta (Ph)				5	.10	98.65	31
Acteocina canaliculata (G)				5	.10	98.75	31
Bullidae (undet.) (G)		5			.10	98.85	31
Tellina sp. B (undet.)	5				.10	98.95	31
Parahaustorius longimerus (A)				5	.10	99.05	31
Photidae (undet.) (A)				5	.10	99.15	31
Actiniaria (undet.) (An)				3	.06	99.21	32
Glycinde solitaria (P)				3	.06	99.27	32
Goniadidae (undet.) (P)			3		.06	99.33	32
Diopatra cuprea (P)				3	.06	99.39	32
Arabella iricolor (P)				3	.06	99.45	32
Orbiniidae (undet.) (P)				3	.06	99.51	32
Sabellaria vulgaris (P)			3		.06	99.57	32
Anadara ovalis (B)				3	.06	99.63	32
Ensis directus (B)	3				.06	99.69	32
Melita nitida (A)			3		.06	99.75	32
Cerapus tubularis (A)		3			.06	99.81	32
Pagurus sp. (D)				3	.06	99.87	32
Neopanope sayi (D)		3			.06	99.93	32
Holothuroidea (undet.) (E)				3	.06	99.99	32

No. Individuals	754	970	113	3005
No. Species	17	21	18	53
Species Diversity (H')	2.65	2.78	3.62	4.05
Species Richness	2.41	2.91	3.60	6.49
Evenness (J')	0.65	0.63	0.87	0.71

TABLE 13. SPECIES OF MACROINVERTEBRATES COLLECTED DURING FOUR SEASONS AT STATION E006, AND THEIR ESTIMATED DENSITIES IN NUMBERS m^{-2}. PERCENT OF TOTAL FAUNA, CUMULATIVE PERCENT, AND RANK BY NUMBER ARE GIVEN FOR EACH SPECIES. A= amphipod, B= bivalve, P= polychaete, I= isopod, Ph= phoronid, D= decapod.

SPECIES	JUNE	OCT.	JAN.	APR.	% OF FAUNA	CUMUL. %	RANK BY NUMBER
Lepidactylus dytiscus (A)	125	23	82	161	46.16	46.16	1
Tellina sp. (B)			141		16.65	62.81	2
Polychaeta (undet.)	33	13	5	13	7.56	70.37	3
Cumacea (undet.)	3		3	41	5.55	75.92	4
Nephtys picta (P)		13		18	3.66	79.58	5
Orbiniidae (undet.) (P)		8	3	3	1.65	81.23	6
Chiridotea sp. (I)		8	5		1.53	82.76	7
Monoculodes edwardsi (A)			13		1.53	84.29	7
Oligochaeta (undet.)	3	8			1.30	85.59	8
Spionidae (undet.) (P)	10				1.18	86.77	9
Mulinia lateralis (B)				10	1.18	87.95	9
Rhynchocoela (undet.)	3	5			.94	88.89	10
Syllidae (undet.) (P)	3			5	.94	89.83	10
Nephtys bucera (P)			8		.94	90.77	10
Edotea sp. (I)	8				.94	91.71	10
Syllis sp. (P)	3			3	.71	92.42	11
Oxyurostylus smithi (C)	3			3	.71	93.13	11
Phoronis architecta (Ph)				5	.59	93.72	12
Batea catharinensis (A)				5	.59	94.31	12
Phyllodoce sp. (P)	3				.35	94.66	13
Nereis succinea (P)				3	.35	95.01	13
Glycera sp. (P)	3				.35	95.36	13
Spiophanes bombyx (P)		3			.35	95.71	13
Paraprionospio pinnata (P)				3	.35	96.06	13
Cirratulus sp. (P)	3				.35	96.41	13
Haploscoloplos fragilis (P)			3		.35	96.76	13
Brachidontes exustus (B)		3			.35	97.11	13
Cyathura burbancki (I)			3		.35	97.46	13
Elasmopus levis (A)			3		.35	97.81	13
Melita nitida (A)				3	.35	98.16	13
Oedicerotidae (undet.) (A)				3	.35	98.51	13
Ampelisca sp. (A)				3	.35	98.86	13
Amphipod (undescribed sp.)				3	.35	99.21	13
Paracaprella tenuis (A)				3	.35	99.56	13
Lepidopa websteri (D)			3		.35	99.91	13

No. Individuals	203	84	272	288
No. Species	13	9	12	18
Species Diversity (H')	2.06	2.90	2.01	2.48
Species Richness	2.26	1.81	1.96	3.00
Evenness (J')	0.56	0.92	0.56	0.59

TABLE 14. SPECIES OF MACROINVERTEBRATES COLLECTED EACH SEASON AT STATION E005, AND THEIR ESTIMATED DENSITIES IN NUMBERS m^{-2}. PERCENT OF TOTAL FAUNA, CUMULATIVE PERCENT, AND RANK BY NUMBER ARE GIVEN FOR EACH SPECIES.
P= polychaete, Ph=phoronid, An= anthozoan, I= isopod, E= echinoderm, C= cumacean, Py= pycnogonid, G= gastropod, D= decapod.

SPECIES	JUNE	OCT.	JAN.	APR.	% OF FAUNA	CUMUL. %	RANK BY NUMBER
Streblospio benedicti (P)	133	210	44	827	16.38	16.38	1
Polychaeta A (undet.)	259	315	95	212	11.89	28.27	2
Oligochaeta (undet.)	90	422		310	11.09	39.36	3
Tharyx setigera (P)	5	36		425	6.29	45.65	4
Phoronis architecta (Ph)		340		49	5.25	50.90	5
Actiniaria (undet.) (An)	26	307	15	3	4.74	55.64	6
Notomastus hemipodus (P)		84	13	202	4.03	59.67	7
Paracaprella tenuis (A)	59	90	64	46	3.49	63.16	8
Orbiniidae (undet.) (P)	5	5	72	141	3.01	66.17	9
Polydora ligni (P)	169	3	3		2.36	68.53	10
Spionidae A (undet.) (P)		161			2.17	70.70	11
Lumbrineris tenuis (P)	31	69	18	18	1.84	72.54	12
Paraprionospio pinnata (P)		69	31	36	1.84	74.38	12
Rhynchocoela (undet.)	18	77	13	23	1.77	76.15	13
Tellinidae (undet.) (B)	28	90	8		1.70	77.85	14
Edotea sp. (I)	69	13		8	1.21	79.06	15
Corophium sp. A (A)	5	10	67	5	1.17	80.23	16
Mulinia lateralis (B)	10	41	5	23	1.07	81.30	17
Sabellaria vulgaris (P)	3	64	3	8	1.05	82.35	18
Paraonidae (undet.) (P)		53	5	13	.96	83.31	19
Sipunculida (undet.)	23	36	5		.86	84.17	20
Erichthonius brasiliensis (A)	18	20	20	5	.85	85.02	21
Sigambra bassi (P)		5		56	.82	85.84	22
Spionidae B (undet.) (P)	54	3			.77	86.61	23
Hemipholis elongata (E)	10	28		15	.72	87.33	24
Batea catharinensis (A)		10	38	3	.69	88.02	25
Leucon americanus (C)	46			3	.66	88.68	26
Pelecypoda (undet.)		41			.55	89.23	27
Lembos websteri (A)			26	8	.46	89.69	28
Glycinde solitaria (P)	3	20		10	.45	90.14	29
Ampelisca vadorum (A)	13	15		5	.45	90.59	29
Nudibranch (undet.) (G)	10	10		11	.42	91.01	30
Lumbrinereidae (undet.) (P)	28				.38	91.39	31
Polychaeta B (undet.)		28			.38	91.77	31
Cirratulidae (undet.) (P)	26				.35	92.12	32
Caprella equilibra (A)	26				.35	92.47	32
Spiophanes bombyx (P)		3		20	.31	92.78	33
Melita nitida (A)	3	8	8	3	.30	93.08	34
Arabella iricolor (P)	5	13		3	.28	93.36	35
Glycera sp. A (P)	8	13			.28	93.64	35
Amphipoda (undet.)	20				.27	93.91	36
Cyclaspis varians (C)		3		16	.26	94.17	37
Eteone heteropoda (P)	3			15	.24	94.41	38
Nereis succinea (P)		15		3	.24	94.65	38
Diopatra cuprea (P)	10	5		3	.24	94.89	38
Heteromastus filiformis (P)		3		15	.24	95.13	38
Syllidae (undet.) (P)		3		13	.22	95.35	39

TABLE 14. (continued)

SPECIES	JUNE	OCT.	JAN.	APR.	% OF FAUNA	CUMUL. %	RANK BY NUMBER
Polychaeta C (undet.)	15				.20	95.55	40
Polychaeta D (undet.)	15				.20	95.75	40
Podarke obscura (P)				13	.18	95.93	41
Polychaeta E (undet.)	13				.18	96.11	41
Tanystylum orbiculare (Py)		5	5	3	.18	96.29	41
Oedicerotidae (undet.) (A)			3	10	.18	96.47	41
Unciola serrata (A)				13	.18	96.65	41
Corophium simile (A)	8	5			.18	96.83	41
Ophiothrix angulata (E)		13			.18	97.01	41
Magelona sp. (P)		8		3	.15	97.16	42
Glycera sp. B (P)			5	5	.13	97.29	43
Polychaeta F (undet.)		10			.13	97.42	43
Cyathura burbancki (I)	5	5			.13	97.55	43
Lepidonotus sublevis (P)	3	3	3		.12	97.67	44
Eteone lactea (P)	5		3		.11	97.78	45
Autolytus sp. (P)	3	5			.11	97.89	45
Glycera dibranchiata (P)				8	.11	98.00	45
Haploscoloplos sp. (P)	3	5			.11	98.11	45
Nassarius vibex (G)		5		3	.11	98.22	45
Listriella barnardi (A)				8	.11	98.33	45
Pleustidae (undet.) (A)	5		3		.11	98.44	45
Corophium acherusicum (A)		8			.11	98.55	45
Glycera sp. C (P)		3		3	.08	98.63	46
Lepidactylus dytiscus (A)	3		3		.08	98.71	46
Cerapus sp. (A)	3	3			.08	98.79	46
Glyceridae (undet.) (P)	5				.07	98.86	47
Drilonereis longa (P)		5			.07	98.93	47
Dorvillea rudolphi (P)				5	.07	99.00	47
Capitellidae (undet.) (P)		5			.07	99.07	47
Oxyurostylus smithi (C)				5	.07	99.14	47
Haustoriidae (undet.) (A)	5				.07	99.21	47
Ophiuroidea (undet.) (E)				5	.07	99.28	47
Turbellaria (undet.)			3		.04	99.32	48
Echiurida (undet.)		3			.04	99.36	48
Nephtys picta (P)				3	.04	99.40	48
Goniadidae (undet.) (P)	3				.04	99.44	48
Marphysa sanguinea (P)				3	.04	99.48	48
Onuphidae (undet.) (P)				3	.04	99.52	48
Cirriformia sp. (P)				3	.04	99.56	48
Ampharete sp. (P)	3				.04	99.60	48
Pista sp. (P)		3			.04	99.64	48
Sabellaridae (undet.) (P)	3				.04	99.68	48
Anachis avara (G)	3				.04	99.72	48
Noetia ponderosa (B)		3			.04	99.76	48
Abra lioica (B)			3		.04	99.80	48
Anoplodactylus lentus (Py)		3			.04	99.84	48
Cymothoidae (undet.) (I)	3				.04	99.88	48
Paraphoxus spinosus (A)			3		.04	99.92	48
Neopanope sayi (D)		3			.04	99.96	48
Xanthidae (undet.) (D)	3				.04	100.00	48
Pentamera pulcherrima (E)			3		.04	100.04	48

TABLE 14. (continued)

SPECIES	JUNE	OCT.	JAN.	APR.	% OF FAUNA	CUMUL. %	RANK BY NUMBER
No. Individuals	1325	2844	590	2652			
No. Species	52	60	31	52			
Species Diversity (H')	4.42	4.38	4.04	3.57			
Species Richness	7.09	7.42	4.70	6.47			
Evenness (J')	0.78	0.74	0.82	0.63			

TABLE 15. SPECIES OF MACROINVERTEBRATES COLLECTED EACH SEASON AT STATION E004, AND THEIR ESTIMATED DENSITIES IN NUMBERS m^{-2}. PERCENT OF TOTAL FAUNA, CUMULATIVE PERCENT, AND RANK BY NUMBER ARE GIVEN FOR EACH SPECIES. P= polychaete, B= bivalve, I= isopod, Ph= phoronid, C= cumacean, E= echinoderm.

SPECIES	JUNE	OCT.	JAN.	APR.	% OF FAUNA	CUMUL. %	RANK BY NUMBER
Paraprionospio pinnata (P)				392	25.36	25.36	1
Polychaeta (undet.)	77	20	44	148	18.69	44.05	2
Mulinia lateralis (B)			61	82	9.25	53.30	3
Notomastus hemipodus (P)				110	7.12	60.42	4
Oligochaeta (undet.)		10		99	7.05	67.47	5
Streblospio benedicti (P)	10	3		92	6.79	74.26	6
Lepidactylus dytiscus (A)	35	5	3	5	3.10	77.36	7
Rhynchocoela (undet.)		3		41	2.85	80.21	8
Diopatra cuprea (P)			36		2.33	82.54	9
Chiridotea sp. (I)	8	5	23		2.33	84.87	9
Tharyx setigera (P)				33	2.13	87.00	10
Syllidae (undet.) (P)				15	.97	87.97	11
Capitellidae (undet.) (P)		15			.97	88.94	11
Phoronis architecta (Ph)		13			.84	89.78	12
Monoculodes edwardsi (A)	13				.84	90.62	12
Polydora ligni (P)	10				.65	91.27	13
Tharyx setigera (P)	10				.65	91.92	13
Leucon americanus (C)				10	.65	92.57	13
Sipunculida (undet.)	3	5			.52	93.09	14
Orbiniidae (undet.) (P)				8	.52	93.61	14
Cyclaspis varians (C)	8				.52	94.13	14
Batea catharinensis (A)				8	.52	94.65	14
Ampelisca sp. (A)				8	.52	95.17	14
Neopanope sayi (D)			5	3	.52	95.69	14
Hemipholis elongata (E)	3		5		.52	96.21	14
Paracaprella tenuis (A)	3			3	.39	96.60	15
Eteone sp. A (P)				5	.32	96.92	16
Glycera sp. A (P)				5	.32	97.24	16
Orbiniidae A (undet.) (P)	5				.32	97.56	16
Nuculanidae (undet.) (B)			5		.32	97.88	16
Eteone sp. B (P)				3	.19	98.07	17
Glycera sp. B (P)	3				.19	98.26	17
Nephtyidae (undet.) (P)	3				.19	98.45	17
Orbiniidae B (undet.) (P)			3		.19	98.64	17
Capitellidae B (undet.) (P)		3			.19	98.83	17
Anadara ovalis (B)			3		.19	99.02	17
Cumacea (undet.)				3	.19	99.21	17
Cyathura burbancki (I)		3			.19	99.40	17
Edotea sp. (I)			3		.19	99.59	17
Oedicerotidae (undet.) (A)				3	.19	99.78	17
Erichthonius brasiliensis (A)				3	.19	99.97	17
No. Individuals	191	85	191	1079			
No. Species	14	11	11	22			
Species Diversity (H')	2.90	3.11	2.62	3.05			
Species Richness	2.48	2.25	1.90	3.01			
Evenness (J')	0.76	0.90	0.76	0.68			

TABLE 16. SPECIES OF MACROINVERTEBRATES COLLECTED DURING FOUR SEASONS AT STATION E003, AND THEIR ESTIMATED DENSITIES IN NUMBERS m^{-2}. PERCENT OF TOTAL FAUNA, CUMULATIVE PERCENT, AND RANK BY NUMBER ARE GIVEN FOR EACH SPECIES. P= polychaete, A= amphipod, I= isopod, An= anthozoan, B= bivalve, E= echinoderm, Ph= phoronid, C= cumacean, T= tunicate, Py= pycnogonid, D= decapod, G= gastropod.

SPECIES	JUNE	OCT.	JAN.	APR.	% OF FAUNA	CUMUL. %	RANK BY NUMBER
Syllidae A (undet.) (P)	13	110	5	525	15.81	15.81	1
Polychaeta A (undet.)	300	105	5	113	12.66	28.47	2
Streblospio benedicti (P)	320	108		59	11.79	40.26	3
Cerapus tubularis (A)				333	8.06	48.32	4
Oligochaeta (undet.)	36	10		197	5.88	54.20	5
Polydora ligni (P)	220	3			5.40	59.60	6
Sipunculida (undet.)	184				4.46	64.06	7
Corophiidae (undet.) (A)	77	33			2.66	66.72	8
Capitellidae (undet.) (P)			3	102	2.54	69.26	9
Ampelisca sp. (A)	73			20	2.25	71.51	10
Uniciola serrata (A)	10	8		74	2.23	73.74	11
Cyathura burbancki (I)	26	46		3	1.82	75.56	12
Cirratulidae (undet.) (P)	72				1.74	77.30	13
Melita nitida (A)	8	59	5		1.74	79.04	13
Microprotopus raneyi (A)				59	1.43	80.47	14
Microprotopus sp. (A)				56	1.36	81.83	15
Rhynchocoela (undet.)	20	10		20	1.21	83.04	16
Amphipoda (undet.)				38	.92	83.96	17
Actiniaria (undet.) (An)	20	5		10	.85	84.81	18
Polychaeta B (undet.)	31				.75	85.56	19
Microprotopus shoemakeri (A)				31	.75	86.31	19
Paracaprella tenuis (A)	8			23	.75	87.06	19
Pelecypoda A (undet.)	28				.68	87.74	20
Nephtys bucera (P)	13		3	10	.63	88.37	21
Glycera sp. (P)	23			3	.63	89.00	21
Notomastus hemipodus (P)				26	.63	89.63	21
Autolytus sp. (P)	23				.56	90.19	22
Polychaeta C (undet.)	23				.56	90.75	22
Polychaeta D (undet.)	23				.56	91.31	22
Sigambra bassi (P)				20	.48	91.79	23
Nereis succinea (P)	15			5	.48	92.27	23
Podarke obscura (P)	8			8	.39	92.66	24
Mulinia lateralis (B)	3	5	3	5	.39	93.05	24
Polychaeta E (undet.)		13			.31	93.36	25
Brachidontes exustus (B)				13	.31	93.67	25
Gammaridae (undet.) (A)				13	.31	93.98	25
Sabellaria vulgaris (P)	8			3	.27	94.25	26
Diopatra cuprea (P)	10				.24	94.49	27
Barnea truncata (B)	10				.24	94.73	27
Martesia cuneiformis (B)	10				.24	94.97	27
Edotea montosa (I)	5			5	.24	95.21	27
Haliplanella luciae (An)				8	.19	95.40	28
Turbellaria (undet.)	8				.19	95.59	28
Tellina sp. (B)	5		3		.19	95.78	28
Caprella equilibra (A)	8				.19	95.97	28
Hemipholis elongata (E)	8				.19	96.16	28
Pelecypoda B (undet.)	3		3		.15	96.31	29

TABLE 16. (continued)

SPECIES	JUNE	OCT.	JAN.	APR.	% OF FAUNA	CUMUL. %	RANK BY NUMBER
Cyclaspis varians (C)	3			3	.15	96.46	29
Phoronis architecta (Ph)		5			.12	96.58	30
Phyllodocidae (undet.) (P)	5				.12	96.70	30
Syllidae B (undet.) (P)	5				.12	96.82	30
Nephtys picta (P)		5			.12	96.94	30
Aricidea sp. (P)		5			.12	97.06	30
Polychaeta F (undet.)	5				.12	97.18	30
Chiridotea sp. A (I)				5	.12	97.30	30
Maera sp. (A)	5				.12	97.42	30
Listriella clymenellae (A)				5	.12	97.54	30
Paraphoxus spinosus (A)	5				.12	97.66	30
Molgula manhattensis (T)	5				.12	97.78	30
Lepidonotus sublevis (P)	3				.07	97.85	31
Eteone sp. (P)				3	.07	97.92	31
Syllidae C (undet.) (P)	3				.07	97.99	31
Syllidae D (undet.) (P)	3				.07	98.06	31
Goniadidae (undet.) (P)	3				.07	98.13	31
Arabella iricolor (P)				3	.07	98.20	31
Spionidae A (undet.) (P)	3				.07	98.27	31
Spionidae B (undet.) (P)				3	.07	98.34	31
Pectinaria gouldii (P)	3				.07	98.41	31
Polychaeta G (undet.)	3				.07	98.48	31
Polychaeta H (undet.)	3				.07	98.55	31
Polychaeta I (undet.)	3				.07	98.62	31
Polychaeta J (undet.)	3				.07	98.69	31
Nudibranch (undet.) (G)	3				.07	98.76	31
Nucula proxima (B)	3				.07	98.83	31
Nuculanidae (undet.) (B)				3	.07	98.90	31
Lucina sp. (B)	3				.07	98.97	31
Macoma tenta (B)	3				.07	99.04	31
Mercenaria mercenaria (B)	3				.07	99.11	31
Tanystylum orbiculare (Py)				3	.07	99.18	31
Oxyurostylus smithi (C)				3	.07	99.25	31
Chiridotea sp. B (I)				3	.07	99.32	31
Gammarus sp. (A)				3	.07	99.39	31
Pleustidae (undet.) (A)			3		.07	99.46	31
Parametopella cypris (A)				3	.07	99.53	31
Oedicerotidae (undet.) (A)				3	.07	99.60	31
Lembos smithi (A)	3				.07	99.67	31
Erichthonius brasiliensis (A)			3		.07	99.74	31
Xanthidae (undet.) (D)				3	.07	99.81	31
Sclerodactyla briareus (E)				3	.07	99.88	31
No. Individuals	1733	530	36	1831			
No. Species	58	16	10	43			
Species Diversity (H')	4.16	3.11	3.28	3.66			
Species Richness	7.64	2.39	2.51	5.59			
Evenness (J')	0.71	0.78	0.99	0.67			

TABLE 17. SPECIES OF MACROINVERTEBRATES COLLECTED DURING FOUR SEASONS AT STATION E002, AND THEIR ESTIMATED DENSITIES IN NUMBERS m^{-2}. PERCENT OF TOTAL FAUNA, CUMULATIVE PERCENT, AND RANK BY NUMBER ARE GIVEN FOR EACH SPECIES. P= polychaete, B= bivalve, A= amphipod, An= anthozoan, C= cumacean, I= isopod, D= decapod, T= tunicate.

SPECIES	JUNE	OCT.	JAN.	APR.	% OF FAUNA	CUMUL. %	RANK BY NUMBER
Streblospio benedicti (P)		136	146	202	40.50	40.50	1
Rhynchocoela (undet.)		31	3	33	5.61	46.11	2
Mulinia lateralis (B)		8	54	3	5.44	51.55	3
Paraprionospio pinnata (P)		10	13	23	3.85	55.40	4
Notomastus hemipodus (P)			13	33	3.85	59.25	4
Corophium lacustre (A)			3	41	3.68	62.93	5
Polydora ligni (P)	28	10	5		3.60	66.53	6
Haploscoloplos fragilis (P)				41	3.43	69.96	7
Polychaeta (undet.)		28		13	3.43	73.39	7
Actiniaria (undet.) (An)		10	13	8	2.59	75.98	8
Syllidae (undet.) (P)	5	5		20	2.51	78.49	9
Oligochaeta (undet.)		5		23	2.34	80.83	10
Orbiniidae A (undet.) (P)				26	2.18	83.01	11
Tellina sp. (B)	3	5	8	8	2.01	85.02	12
Orbiniidae B (undet.) (P)			23		1.92	86.94	13
Eteone lactea (P)			8	15	1.92	88.86	13
Melita nitida (A)		10	10	3	1.92	90.78	13
Oedicerotidae (undet.) (A)				18	1.51	92.29	14
Pelecypoda (undet.)		13			1.09	93.38	15
Cyclaspis varians (C)	3			8	.92	94.30	16
Podarke obscura (P)		5		3	.67	94.97	17
Diopatra cuprea (P)		8			.67	95.64	17
Tagelus divisus (B)				8	.67	96.31	17
Glycera sp. (P)			5		.42	96.73	18
Tharyx setigera (P)				5	.42	97.15	18
Cyathura burbancki (I)			5		.42	97.57	18
Erichthonius brasiliensis (A)				5	.42	97.99	18
Autolytus sp. (P)				3	.25	98.24	19
Aricidea sp. (P)		3			.25	98.49	19
Clymenella torquata (P)				3	.25	98.74	19
Sabellaria vulgaris (P)				3	.25	98.99	19
Mercenaria mercenaria (B)	3				.25	99.24	19
Lembos websteri (A)			3		.25	99.49	19
Neopanope sayi (D)			3		.25	99.74	19
Molgula manhattensis (T)			3		.25	99.99	19

No. Individuals	42	287	318	548
No. Species	5	15	17	24
Species Diversity (H')	1.57	2.83	2.81	3.50
Species Richness	1.07	2.47	2.78	3.65
Evenness (J')	0.68	0.72	0.69	0.76

TABLE 18. SPECIES OF MACROINVERTEBRATES COLLECTED DURING FOUR SEASONS AT STATION E001, AND THEIR ESTIMATED DENSITIES IN NUMBERS M^{-2}. PERCENT OF TOTAL FAUNA, CUMULATIVE PERCENT, AND RANK BY NUMBER ARE GIVEN FOR EACH SPECIES. A= amphipod, P= polychaete, AN= anthozoan, D= decapod, I= isopod, B= bivalve, T= tunicate, PY= pycnogonid, E= echinoderm.

SPECIES	JUNE	OCT.	JAN.	APR.	% OF FAUNA	CUMUL. %	RANK BY NUMBER
Corophium lacustre (A)	184	691	873	561	37.22	37.22	1
Melita nitida (A)	740	31	110	67	15.28	52.50	2
Nereis succinea (P)	72	192	156	108	8.51	61.01	3
Actiniaria (undet.) (An)	179		26	3	3.35	64.36	4
Unciola serrata (A)	3		18	182	3.27	67.63	5
Sabellaria vulgaris (P)	8		110	41	2.56	70.19	6
Exogone dispar (P)	38	5	67	44	2.48	72.67	7
Glycera sp. (P)		125	3		2.06	74.73	8
Neopanope sayi (D)	5	69	31	15	1.93	76.66	9
Pleustidae (undet.) (A)	61		3	54	1.90	78.56	10
Pelecypoda (undet.)		51	56		1.72	80.28	11
Lembos websteri (A)	5	26	44	31	1.71	81.99	12
Cyrtopleura costata (B)		44	18	23	1.37	83.36	13
Paracaprella tenuis (A)	10	44	15	13	1.32	84.68	14
Corophium sp. B (A)		77			1.24	85.92	15
Edotea montosa (I)	38	3		23	1.03	86.95	16
Erichthonius brasiliensis (A)	10	5	49		1.03	87.98	16
Streblospio benedicti (P)	38	3	13	5	.95	88.93	17
Syllidae A (undet.) (P)	26	31			.92	89.85	18
Marphysa sanguinea (P)	38	5	8	5	.90	90.75	19
Ampelisca vadorum (A)	33		3	15	.82	91.57	20
Batea catharinensis (A)		8	15	18	.66	92.23	21
Caprella equilibra (A)	31			8	.63	92.86	22
Polychaeta (undet.)	20	13	5		.61	93.47	23
Autolytus fasciatus (P)		5	3	26	.55	94.02	24
Leucothoe sp. (A)			26		.42	94.44	25
Lepidactylus dytiscus (A)	26				.42	94.86	25
Cyathura burbancki (I)	8	15			.37	95.23	26
Monoculodes sp. (A)		23			.37	95.60	26
Paraphoxus spinosus (A)		10	5	8	.37	95.97	26
Sabellidae A (undet.) (P)	13		3	5	.34	96.31	27
Molgula manhattensis (T)			18		.29	96.60	28
Renilla reniformis (An)			15		.24	96.84	29
Polydora ligni (P)	10	5			.24	97.08	29
Rhynchocoela (undet.)		5	8		.21	97.29	30
Podarke obscura (P)			3	8	.18	97.47	31
Tellina sp. (B)	10				.16	97.63	32
Tanystylum orbiculare (Py)	5		5		.16	97.79	32
Orbiniidae (undet.) (P)		3	5		.13	97.92	33
Pista sp. (P)			8		.13	98.05	33
Sabellidae B (undet.)(P)	8				.13	98.18	33
Arabella iricolor (P)			3	3	.10	98.28	34
Oligochaeta (undet.)			3	3	.10	98.38	34
Hemipholis elongata (E)	3			3	.10	98.48	34
Odontosyllis sp. (P)			5		.08	98.56	35
Sabella microphthalma (P)			5		.08	98.64	35
Syllis gracilis (P)				5	.08	98.72	35

TABLE 18. (continued)

SPECIES	JUNE	OCT.	JAN.	APR.	% OF FAUNA	CUMUL. %	RANK BY NUMBER
Corophium acherusicum (A)				5	.08	98.80	35
Stenothoe minuta (A)	5				.08	98.88	35
Brachyura (undet.) (D)	5				.08	98.96	35
Turbellaria (undet.)	3				.05	99.01	36
Lepidonotus sublevis (P)				3	.05	99.06	36
Eteone heteropoda (P)			3		.05	99.11	36
Eteone lactea (P)		3			.05	99.16	36
Phyllodoce sp. (P)				3	.05	99.21	36
Syllidae B (undet.) (P)		3			.05	99.26	36
Autolytus sp. (P)	3				.05	99.31	36
Glycinde solitaria (P)				3	.05	99.36	36
Notocirrus spiniferus (P)	3				.05	99.41	36
Spionidae (undet.) (P)	3				.05	99.46	36
Cirratulidae (undet.) (P)				3	.05	99.51	36
Tharyx (?) sp.	3				.05	99.56	36
Pherusa (?) sp. (P)	3				.05	99.61	36
Potamilla neglecta (P)			3		.05	99.66	36
Nudibranch (undet.)	3				.05	99.71	36
Mulinia lateralis (B)			3		.05	99.76	36
Ampelisca sp. (A)		3			.05	99.81	36
Melita sp. (A)			3		.05	99.86	36
Amphipoda (undet.)		3			.05	99.91	36
Alpheus armillatus (D)		3			.05	99.96	36
Panopeus herbstii (D)	3				.05	100.01	36
No. Individuals	1656	1504	1750	1294			
No. Species	37	30	39	31			
Species Diversity (H')	3.21	3.03	3.09	3.16			
Species Richness	4.86	3.96	5.09	4.19			
Evenness (J')	0.62	0.62	0.58	0.64			

TABLE 19. EPIFAUNAL INVERTEBRATES IN MODIFIED OYSTER DREDGE COLLECTIONS FROM THE NORTH EDISTO RIVER, SOUTH CAROLINA.

SPECIES	E001	E002	E003	E004	E005	E006	E007	E008
Phylum Porifera								
Lissodendoryx carolinensis	+		+		+			
Microciona prolifera	+	+	+		+	+	+	
Hemectyon pearsei	+							
Ciocalypta penicillus								+
Craniella laminaris		+			+			
Phylum Cnidaria								
Ectopleura dumortieri	+	+	+		+		+	+
Tubularia crocea							+	
Linvillea agassizi	+		+					+
Zanclea costata								+
Turritopsis nutricula	+				+		+	+
Bougainvillia rugosa	+		+		+		+	+
Garveia franciscana	+	+	+					+
Amphinema dinema								+
Eudendrium album								+
Eudendrium carneum			+				+	+
Cuspidella humilis			+				+	
Campanulina sp.		+	+		+		+	+
Lovenella gracilis							+	+
Hebella scandens		+				+	+	+
Clytia kincaidi	+	+	+		+		+	+
Gonothyraea loveni	+							
Obelia bidentata	+	+	+		+		+	+
Obelia dichotoma	+	+	+		+		+	+
Obelia hyalina	+	+		+			+	+
Dynamena cornicina								+
Sertularia stookeyi		+	+		+	+	+	+
Schizotricha tenella	+		+					+
Plumularia floridana			+		+		+	
Leptogorgia virgulata			+		+		+	+
Renilla reniformis					+		+	
Paranthus rapiformis			+					
Haliplanella luciae		+						
Diadumene leucolena	+							
Astrangia danae							+	+
Phylum Platyhelminthes								
Bdelloura candida							+	
Phylum Entoprocta								
Loxosomella sp.	+							
Pedicellina cernua	+							
Barentsia laxa								+
Phylum Bryozoa								
Alcyonidium hauffi			+					+
Alcyonidium mammillatum	+							+
Alcyonidium polyoum	+	+	+					+
Nolella stipata								+
Anguinella palmata	+	+	+		+		+	+

TABLE 19. (continued)

SPECIES	E001	E002	E003	E004	E005	E006	E007	E008
Amathia distans	+	+	+		+		+	+
Bowerbankia gracilis		+			+	+		+
Aeverrillia armata			+		+			
Aeverrillia setigera	+		+		+		+	+
Membranipora arborescens							+	+
Membranipora tenuis	+		+		+		+	+
Conopeum tenuissimum	+	+		+	+			
Electra monostachys	+		+		+	+	+	+
Bugula neritina								+
Schizoporella errata	+						+	+
Microporella ciliata								+
Parasmittina nitida							+	+
Cryptosula pallasiana								+
Phylum Annelida								
Arabella iricolor	+							
Glycera dibranchiata			+					
Lepidonotus sublevis	+	+						+
Sabellaria vulgaris	+	+	+		+		+	+
Hydroides dianthus							+	+
Phylum Mollusca								
Diodora cayenensis								+
Crepidula fornicata		+						
Crepidula plana							+	+
Neosimnia uniplicata					+			+
Eupleura caudata		+						
Anachis avara								+
Mitrella lunata								+
Busycon carica			+					+
Busycon canaliculatum							+	
Doridella obscura		+						
Chaetopleura apiculata								+
Brachidontes exustus	+							
Anomia simplex			+					
Ostrea equestris							+	+
Phylum Arthropoda								
Limulus polyphemus						+	+	
Nymphopsis duodorsospinosa			+					+
Tanystylum orbiculare	+	+	+		+			+
Callipallene brevirostrum	+							
Balanus amphitrite			+			+	+	+
Balanus galeatus								+
Balanus improvisus	+	+	+		+		+	
Chelonibia patula							+	+
Cleantis planicauda	+	+						
Elasmopus levis			+		+			
Melita dentata	+							
Melita appendiculata	+		+		+			+
Melita nitida	+	+			+			

TABLE 19. (continued)

SPECIES	E001	E002	E003	E004	E005	E006	E007	E008
Batea catharinensis					+			+
Parapleustes aestuarius			+					
Stenothoe minuta								+
Leucothoe spinicarpa	+				+		+	
Lysianassa alba								+
Lembos websteri	+		+		+			+
Microdeutopus sp.					+			+
Unciola serrata	+							
Microprotopus sp.								+
Erichthonius brasiliensis	+		+		+			+
Corophium sp.	+		+				+	
Caprella equilibra								+
Paracaprella tenuis	+	+	+				+	+
Penaeus aztecus	+	+						
Penaeus setiferus	+	+	+	+	+	+	+	+
Alpheus armillatus			+					
Alpheus heterochaelis	+							
Lysmata wurdemanni								+
Clibanarius vittatus					+			+
Pagurus longicarpus	+		+					+
Pagurus pollicaris							+	
Ovalipes ocellatus						+	+	
Cancer irroratus								+
Portunus gibbesii								+
Portunus spinimanus								+
Callinectes ornatus		+	+			+		+
Callinectes sapidus	+	+	+	+	+	+	+	+
Menippe mercenaria	+		+				+	+
Hexapanopeus angustifrons	+							
Neopanope sayi								+
Panopeus herbstii	+		+		+			+
Libinia sp.	+		+					+
Squilla empusa					+	+		
Phylum Echinodermata								
Asterias forbesi							+	+
Luidia clathrata							+	
Hemipholis elongata					+		+	
Ophiothrix angulata			+				+	+
Phylum Chordata								
Perophora viridis			+		+		+	+
Molgula manhattensis	+	+	+		+		+	+
NO. SPECIES	53	32	51	4	42	12	51	82

TABLE 20. SPECIES OF MACROINVERTEBRATES COLLECTED DURING FOUR SEASONS AT STATION D004, AND THEIR ESTIMATED DENSITIES IN NUMBERS M^{-2}. PERCENT OF TOTAL FAUNA, CUMULATIVE PERCENT, AND RANK BY NUMBER ARE GIVEN FOR EACH SPECIES. A= amphipod, B= bivalve, P= polychaete, C= cumacean, I= isopod, D= decapod.

SPECIES	JUNE	OCT.	JAN.	APR.	% OF FAUNA	CUMUL. %	RANK BY NUMBER
Haustoriidae (undet.) (A)	691	328	189	310	68.29	68.29	1
Tellina sp. (B)	123		23	36	8.19	76.48	2
Polychaeta A (undet.)	178			3	8.14	84.62	3
Nephtys picta (P)	3		8	72	3.73	88.35	4
Polychaeta B (undet.)	5	13	3	15	1.62	89.97	5
Glycera sp. (P)	3			28	1.39	91.36	6
Rhynchocoela (undet.)	3	3		20	1.17	92.53	7
Oligochaeta (undet.)	3			20	1.03	93.56	8
Leptocuma minor (C)				20	0.90	94.46	9
Magelona sp. (P)	3	3	5	5	0.72	95.18	10
Turbellaria (undet.)		5	3	3	0.49	95.67	11
Tharyx setigera (P)				8	0.36	96.03	12
Orbiniidae (undet.) (P)		5	3		0.36	96.39	12
Oxyurostylus smithi (C)				8	0.36	96.75	12
Monoculodes edwardsi (A)			5	3	0.36	97.11	12
Amphipoda (undet.)			3	3	0.27	97.38	13
Aricidea sp. (P)				5	0.22	97.60	14
Notomastus sp. (P)				5	0.22	97.82	14
Cyclaspis varians (P)		5			0.22	98.04	14
Isopoda (undet.)		5			0.22	98.26	14
Batea catharinensis				5	0.22	98.48	14
Eteone sp.(P)				3	0.14	98.62	15
Paraprionospio pinnata (P)		3			0.14	98.76	15
Haploscoloplos robustus (P)				3	0.14	98.90	15
Cyathura burbancki (I)			3		0.14	99.04	15
Ancinus depressus (I)				3	0.14	99.18	15
Melita nitida (A)			3		0.14	99.32	15
Bathyporeia parkeri (A)				3	0.14	99.46	15
Trichophoxus epistomus (A)				3	0.14	99.60	15
Corophium sp. (A)			3		0.14	99.74	15
Pagurus longicarpus (D)				3	0.14	99.88	15
Lepidopa websteri (D)			3		0.14	100.02	15
No. Individuals	1012	370	254	587			
No. Species	9	9	13	24			
Species Diversity (H')	1.35	0.83	1.62	2.74			
Species Richness	1.16	1.35	2.17	3.61			
Evenness (J')	0.43	0.26	0.44	0.60			

TABLE 21. SPECIES OF MACROINVERTEBRATES COLLECTED DURING FOUR SEASONS AT STATION D003, AND THEIR ESTIMATED DENSITIES IN NUMBERS M^{-2}. PERCENT OF TOTAL FAUNA, CUMULATIVE PERCENT, AND RANK BY NUMBER ARE GIVEN FOR EACH SPECIES. A= amphipod, I= isopod, AN= anthozoan, B= bivalve, D= decapod, T= tunicate, P= polychaete.

SPECIES	JUNE	OCT.	JAN.	APR.	% OF FAUNA	CUMUL. %	RANK BY NUMBER
Lepidactylus dytiscus (A)	84	146	15	54	26.86	26.86	1
Chiridotea sp. (I)	3	95	10	74	16.35	43.21	2
Rhynchocoela A (undet.)		10	5	123	12.40	55.61	3
Melita nitida (A)		10	59		6.20	61.81	4
Monoculodes edwardsi (A)				69	6.20	68.01	4
Polychaeta (undet.)		13	13	41	6.02	74.03	5
Cumacea (undet.)	8	10	5	36	5.30	79.33	6
Turbellaria (undet.)			36		3.23	82.56	7
Actiniaria (undet.) (An)			31		2.79	85.35	8
Haustoriidae (undet.) (A)				31	2.79	88.14	8
Nereis succinea (P)			23		2.07	90.21	9
Corophium lacustre (A)			23		2.07	92.28	9
Haploscoloplos robustus (P)		3		15	1.62	93.90	10
Parapleustes aestuarius (A)			8	5	1.17	95.07	11
Cerapus tubularis (A)		10			0.90	95.97	12
Tellina sp. (B)	3		3		0.54	96.51	13
Streblospio benedicti (P)			5		0.45	96.96	14
Pelecypoda (undet.)			5		0.45	97.41	14
Gammarus tigrinus (A)				5	0.45	97.86	14
Rhynchocoela B (undet.)				3	0.27	98.13	15
Haploscoloplos fragilis (P)	3				0.27	98.40	15
Notomastus sp. (P)		3			0.27	98.67	15
Brachidontes exustus (B)			3		0.27	98.94	15
Cyathura polita (I)			3		0.27	99.21	15
Batea catharinensis (A)		3			0.27	99.48	15
Neopanope sayi (D)				3	0.27	99.75	15
Molgula manhattensis (T)			3		0.27	100.02	15
No. Individuals	101	303	250	459			
No. Species	5	10	17	12			
Species Diversity (H')	0.96	2.07	3.47	2.97			
Species Richness	0.87	1.58	2.90	1.79			
Evenness (J')	0.41	0.62	0.85	0.83			

TABLE 22. SPECIES OF MACROINVERTEBRATES COLLECTED DURING FOUR SEASONS AT STATION D002, AND THEIR ESTIMATED DENSITIES IN NUMBERS M^{-2}. PERCENT OF TOTAL FAUNA, CUMULATIVE PERCENT, AND RANK BY NUMBER ARE GIVEN FOR EACH SPECIES. P= polychaete, A= amphipod, I= isopod, D= decapod, B= bivalve.

SPECIES	JUNE	OCT.	JAN.	APR.	% OF FAUNA	CUMUL. %	RANK BY NUMBER
Scolecolepides viridis (P)			23	919	23.74	23.74	1
Oligochaeta (undet.)	13	630		218	21.70	45.44	2
Polydora ligni (P)		822	8		20.92	66.36	3
Insecta (undet.)				430	10.84	77.20	4
Monoculodes edwardsi (A)		72	3	228	7.64	84.84	5
Cyathura polita (I)	5	64	69	74	5.34	90.18	6
Rhynchocoela (undet.)	8	54	5	26	2.34	92.52	7
Corophium lacustre (A)		3	67		1.76	94.28	8
Paraprionospio pinnata (P)			64		1.61	95.89	9
Gammarus sp. (A)		3	23	15	1.03	96.92	10
Lepidactylus dytiscus (A)	18	3	5	3	0.73	97.65	11
Polychaeta A (undet.)	3	10	5		0.45	98.10	12
Spiophanes bombyx (P)		10			0.25	98.35	13
Xanthidae (undet.) (D)			10		0.25	98.60	13
Cumacea (undet.)	8				0.20	98.80	14
Gammarus daiberi (A)		8			0.20	99.00	14
Edotea montosa (I)	3	3			0.15	99.15	15
Corophiidae (undet.) (A)				5	0.13	99.28	16
Nephtys sp. (P)		5			0.13	99.41	16
Nereis succinea (P)			5		0.13	99.54	16
Polychaeta B (undet.)			3		0.08	99.62	17
Mulinia lateralis (B)	3				0.08	99.70	17
Tellinidae (undet.) (B)	3				0.08	99.78	17
Chiridotea sp. (I)				3	0.08	99.86	17
Gammaridae (undet.) (A)				3	0.08	99.94	17
Palaemonetes sp. (D)			3		0.08	100.02	17
No. Individuals	64	1687	293	1924			
No. Species	9	13	14	11			
Species Diversity (H')	2.85	1.78	2.95	2.10			
Species Richness	1.92	1.61	2.29	1.32			
Evenness (J')	0.90	0.48	0.77	0.61			

TABLE 23. SPECIES OF MACROINVERTEBRATES COLLECTED DURING FOUR SEASONS AT D001, AND THEIR ESTIMATED DENSITIES IN NUMBERS M^{-2}. PERCENT OF TOTAL FAUNA, CUMULATIVE PERCENT, AND RANK BY NUMBER ARE GIVEN FOR EACH SPECIES. A= amphipod, P= polychaete, I= isopod, IN= insect larva, B= bivalve, AN= anthozoan.

SPECIES	JUNE	OCT.	JAN.	APR.	% OF FAUNA	CUMUL. %	RANK BY NUMBER
Lepidactylus dytiscus (A)	59	236	172	87	43.55	43.55	1
Scolecolepides viridis (P)				182	14.31	57.86	2
Polychaeta A (undet.)	102	8	5	41	12.26	70.12	3
Chiridotea sp. (I)	38	38		5	6.37	76.49	4
Polychaeta B (undet.)				72	5.66	82.15	5
Ceratopogonidae (undet.) (In)	5	46	20		5.58	87.73	6
Gammaridae (undet.) (A)		5	18	10	2.59	90.32	7
Parapleustes aestuarius (A)				23	1.81	92.13	8
Corbicula manilensis (B)		5		13	1.42	93.55	9
Gammarus fasciatus (A)	8	8			1.26	94.81	10
Cumacea (undet.)		5		10	1.18	95.99	11
Paraprionospio pinnata (P)		3	8		0.86	96.85	12
Actiniaria (undet.) (An)		10			0.79	97.64	13
Polydora ligni (P)			8		0.63	98.27	14
Cyathura polita (I)	3	5			0.63	98.90	14
Nereis succinea (P)			5		0.39	99.29	15
Oligochaeta (undet.)	3				0.24	99.53	16
Monoculodes edwardsi (A)		3			0.24	99.77	16
Diptera (undet.) (In)		3			0.24	100.01	16
No. Individuals	218	375	236	443			
No. Species	7	13	7	9			
Species Diversity (H')	1.93	2.00	1.48	2.42			
Species Richness	1.11	2.02	1.10	1.31			
Evenness (J')	0.69	0.54	0.53	0.76			

TABLE 24. EPIFAUNAL INVERTEBRATES IN MODIFIED OYSTER DREDGE COLLECTIONS FROM THE SOUTH EDISTO RIVER, SOUTH CAROLINA.

SPECIES	D001	D002	D003	D004
Phylum Porifera				
Microciona prolifera				+
Phylum Cnidaria				
Ectopleura dumortieri			+	
Turritopsis nutricula				+
Bougainvillia rugosa				+
Garveia franciscana			+	+
Amphinema dinema				+
Campanulina sp.				+
Lovenella gracilis				+
Hebella scandens				+
Clytia kincaidi			+	+
Clytia paulensis				+
Obelia bidentata			+	+
Obelia dichotoma			+	+
Obelia hyalina				+
Obelia sp.			+	
Dynamena cornicina				+
Sertularia marginata				+
Sertularia stookeyi				+
Leptogorgia virgulata				+
Diadumene leucolena			+	
Phylum Platyhelminthes				
Coronadena mutabilis			+	
Stylochus ellipticus			+	
Phylum Bryozoa				
Alcyonidium hauffi				+
Alcyonidium mammillatum			+	
Alcyonidium polyoum				+
Anguinella palmata				+
Amathia distans				+
Bowerbankia gracilis				+
Aeverrillia armata				+
Aeverrillia setigera				+
Membranipora arborescens				+
Membranipora tenuis				+
Conopeum tenuissimum			+	
Electra monostachys				+
Bugula neritina				+
Schizoporella errata				+
Microporella ciliata				+
Phylum Annelida				
Nereis succinea			+	+
Sabellaria vulgaris			+	
Phylum Mollusca				
Neosimnia uniplicata				+
Brachidontes exustus			+	

TABLE 24. (continued)

SPECIES	D001	D002	D003	D004
Ostrea equestris				+
Crassostrea virginica			+	
Phylum Arthropoda				
Anoplodactylus lentus				+
Balanus amphitrite				+
Balanus eburneus			+	
Balanus improvisus			+	
Gammarus daiberi	+	+	+	
Elasmopus levis				+
Melita nitida			+	
Crangonyx r. richmondensis			+	+
Batea catharinensis			+	
Parapleustes aestuarius			+	
Stenothoe minuta				+
Leucothoe spinicarpa				+
Microdeutopus sp.				+
Cerapus tubularis				+
Corophium lacustre			+	
Corophium sp.				+
Caprella equilibra				+
Paracaprella tenuis				+
Penaeus setiferus		+	+	+
Xiphopenaeus kroyeri			+	
Palaemonetes sp.			+	
Pagurus longicarpus				+
Callinectes sapidus	+		+	+
Neopanope sayi				+
Panopeus herbstii			+	
Phylum Echinodermata				
Luidia clathrata				+
Mellita quinquesperforata				+
Phylum Chordata				
Molgula manhattensis			+	+
No. Species	2	2	29	51

Only 35 species were identified in grab samples (Table 17) while 32 epibenthic species were obtained in the dredge (Table 19). However, several species of economic value appeared to be common to abundant in the area, including blue crabs (Callinectes sapidus), hard clams (Mercenaria mercenaria), and penaeid shrimp (Penaeus aztecus, Penaeus setiferus). Polychaetes accounted for more than half of the species in quantitative collections, with Streblospio benedicti comprising over 40% of the total number of animals collected. The sponge Craniella laminaris was one of the most abundant epibenthic species at this station except during winter, when this species regresses.

Station E001 (Yonges Island)

Despite its location in the Atlantic Intracoastal Waterway, moderately variable salinity (16.76-27.04°/oo), and possibly altered substrate, the number of species was relatively high in both dredge and grab samples at station E001 (Tables 18, 19) and the estimated number of organisms m^{-2} was second only to station E005 among the areas sampled on the North Edisto. The bottom was typically hard at this site, consisting of a heterogeneous mixture of shells, rocks, clay, and sand, with occasional wood debris. As a result, the benthic community was dominated by epifaunal animals. In grab samples, a species of the genus Corophium ranked first numerically by a wide margin over Melita nitida. Together, these two epifaunal amphipods accounted for over half of the total number of organisms collected in the grab. Also common were other epibenthic species such as actiniarians, the amphipods Lembos websteri and Paracaprella tenuis, and the polychaetes Nereis succinea and Sabellaria vulgaris. Species diversity was relatively uniform in samples from one season to another, varying only from 3.03 (October) to 3.21 (July) during the study. Although collections of invertebrates were never particularly large in the dredge at the Yonges Island location, a total of 53 species were identified in tows from this station, including the hydroid Gonothyraea loveni, not previously reported south of Chesapeake Bay on this coast. Sponges were generally dominant in terms of biomass, particularly during the warmer seasons, although hydroids, bryozoans and the polychaete Sabellaria vulgaris were also well represented.

D004 (Bay Point)

Station D004 was located adjacent to open coastal waters at the confluence of the South Edisto River and St. Helena Sound. Salinities were high at this location during the study and samples were collected in a predominantly sandy bottom area. The abundance of haustoriid amphipods in collections from each of the four seasons reflected the nature of the substrate (Table 20). Grab samples were dominated by relatively few species, and diversity was low except in April when larger numbers of species and more equitable distribution of numbers occurred. Despite a relative paucity of firm substrates, the numbers of species in dredge samples at this station were much higher than at any other sampling site on the South Edisto (Table 24), although catches were typically small. The fauna at this station bore greater similarity to that at a number of locations on the North Edisto River than to the predominantly low salinity tolerant assemblages elsewhere on the South Edisto.

D003 (Fenwick Island)

The bottom of station D003 near Fenwick Island was mostly sandy, although an oyster community existed in the area as well. Salinities were normally mesohaline, and typically euryhaline, mid-estuarine species were represented in the benthic communities. The epibenthic assemblage in particular was similar to that observed in the lower regions of the South Santee River. Live oysters (Crassostrea virginica) and barnacles (Balanus improvisus) were common to abundant, and most of the other 27 species identified in dredge samples were common oyster associates (Table 24). The index of affinity between dredge catches at this station and both SS01 and SS04 on the South Santee was 0.50 or greater. Sediment in grab samples consisted largely of sand with surprisingly little shell, and amphipods rather than polychaetes were the numerically dominant taxon. Lepidactylus dytiscus, a sand-dwelling, infaunal haustoriid, accounted for more than a quarter of the total number of organisms collected (Table 21).

D002 (Sampson Island)

The South Edisto estuary at station D002 fluctuated between fresh and brackish conditions during this study, and the biota of the area was somewhat impoverished. The bottom consisted of mud and sand with varying amounts of Spartina detritus, and hard substrates were generally lacking. This, combined with salinity stress and the possible limiting effects of siltation, effectively eliminated sessile epibenthic invertebrates from the area. Only two species, the migratory white shrimp Penaeus setiferus and the abundant upper estuarine amphipod Gammarus daiberi, were recovered from dredge tows (Table 24). Few sedentary epifaunal species were represented in any of the oligohaline-limnetic border areas of South Carolina examined by us. While some decline in the number of species is also detectable in motile and/or infaunal assemblages at such locations, it is much less drastic. For example, 27 species were collected in grab samples at D002 (Table 22), and the density of animals was moderate to high except in July. Opportunistic species appear to be frequent in grab collections from locations such as this at the head of an estuary.

D001 (Snuggedy Swamp)

Like the previous sampling site, station D001 fluctuated between lower oligohaline and limnetic conditions between June 1973 and April 1974. As might be expected, dredge catches were poor, with Gammarus daiberi and Callinectes sapidus being the only two "epifaunal" species collected (Table 24). The fauna in grab samples consisted of a mixture of euryhaline marine and freshwater species, including the recently introduced Asiatic clam, Corbicula manilensis (Table 23). Given a predominantly sandy substrate and conditions of brackish to freshwater, the number of polychaete species present was low, with Scolecolepides viridis being most prevalent. The most abundant macrobenthic species at this station was the infaunal amphipod Lepidactylus dytiscus, which averaged 139 individuals m^{-2} over the four seasons sampled. Both species diversity and density of benthic invertebrates were moderately low.

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