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SECOND POST-CONSTRUCTION REPORT: 1992 BIOLOGICAL MONITORING OF THE HOLLYWOOD - HALLANDALE BEACH RENOURISHMENT

Prepared for:

Broward County Board of County Commissioners
Broward County Department of
Natural Resources Protection

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1.0 INTRODUCTION

1.1 Project Background

In 1990, Nova University (Contractor) with Coral Reef Associates and ERM South (Subcontractors) was awarded a contract to provide biological monitoring services for the Hollywood Hallandale Beach Renourishment Project. A notice to proceed for the initial biological monitoring (Pre-construction) was issued in September, 1990. Pre-construction field monitoring took place in October, 1990. Renourishment dredging began in April and ended August, 1991. Approximately 1.2 million cubic yards of sediment were removed and subsequently emplaced on 5 miles of shoreline. The first post-construction monitoring took place in October, 1991. On August 24, 1992 the eye of Hurricane Andrew passed some 30 miles to the south of the project area. High winds and heavy seas affected Broward County reefs. The second post-construction monitoring began in October, 1992.

1.2 Project Overview

1.2.1 Contracted Scope of Services

Biological Analytical Services contracted for in the Hollywood - Hallandale Beach Renourishment Monitoring are organized in four separate evaluation periods:

(a) Once during Summer or early Fall before construction begins.

(b) Once approximately one (1) year after (a).

(c) Once approximately two (2) years after (a).

(d) Once approximately four (4) years after (a).

The scope of analytical services consisted of three tasks as described below.

Task 1, - Transects: Contractor shall at reef areas adjacent to each of fifteen coral community stations conduct transects of a method to allow an assessment of the density of scleractinian (stony) coral colonies in each area (corals/square meter).

Task 2 - Quadrats: Contractor shall conduct an *in situ* qualitative (species identification) and quantitative (species counts) inventory of all sessile flora and fauna found within fifteen 2 x 2 meter (m) pre-established, coral community monitoring stations.

Task 3 - Cores: Contractor shall sort and identify to the taxon as low as reasonably achievable, within any time constraints that may be imposed by Florida Department of Environmental Regulation, all specimens larger than 0.5 mm (millimeters) stained with Rose Bengal contained in sand core samples obtained from offshore soft bottom sites.

The offshore soft bottom sand coring infaunal study sites will be located and conducted as follows. Infauna at the fill site shall be collected from four transects from the fill area at least three hundred (300) meters apart. One station shall be established along each transect at an elevation of -5 to -7 feet MLW. Control site infauna shall be collected from four (4) transects

offshore J.U. Lloyd Beach as control sites. Fifteen (15) replicates shall be taken at each elevation along each transect. Infauna at the borrow sites shall be collected from five (5) randomly spaced stations from portions of the borrow area that are used for the project. For the pre-construction samples, the stations should be placed in areas that are expected to be excavated. The stations must be at least twenty (20) meters apart. Three (3) samples shall be taken at each station. In addition, triplicate samples shall also be taken at five (5) stations in a comparable area that is not affected by the project. There will be a total not to exceed on hundred fifty (150) samples.

1.2.2 Permit requirements: Grain Size & Organics

Broward County's permit for this project requires the following: "The grain-size distribution and organic content of the sediments shall be monitored at the same times and in the same locations indicated ... One sample shall be collected per station and each sample shall include the top 15 cm of sediment. The method used to determine the grain-size distribution and organic content can be any scientifically viable method. The results of this monitoring shall be submitted to the Department ... These reports shall include grain-size distribution curves for each sample and a table that lists the organic content of each sample."

Broward County personnel conducted the above sediment study. Methodology and results are reported here for convenience.

2.0 METHODS AND MATERIALS

2.1 Field Assessments

2.1.1 Sites

2.1.1.1 Transects and Quadrats

Fifteen Broward County reef sites were selected for detailed biological monitoring of the stony coral community. Figure 1 shows monitoring sites off the beach fill area and sites near the borrow area. Six (6) previously existing sites offshore of John U. Lloyd Park were chosen as control sites (JUL5 & JUL6 - First Reef, JUL7 & JUL10 - Second Reef, and JUL8 & JUL9 - Third Reef). Three sites were established on the First reef adjacent to the Construction Beach (sites HH1, HH2, and HH3). Three sites were chosen on the Second Reef adjacent to and west of the primary and secondary borrow areas (JUL1, HH4, and HH5) (JUL1 was a prior J.U. Lloyd assessment site. Three sites were chosen on the Third Reef adjacent to and east of the primary and secondary borrow areas (JUL2, HH6, and HH7) (JUL2 was a prior J.U. Lloyd assessment site). Depths of stations at each reef were approximately as follows: First reef 10-20'; Second Reef 30-50'; Third Reef 45-75'.

2.1.1.2 Cores

Ten stations were selected for monitoring the effects of dredging and beach renourishment

on infaunal communities inhabiting unconsolidated substrates. Each station consists of 15 replicate core samples. Eight stations were chosen approximately 100m seaward of the current shoreline in about 2.5m depth. Four of these span the fill site at approximately 5000' intervals just beyond the anticipated "toe-of-fill" at the beach discharge offshore of state plane coordinate benchmarks R106 (Sheridan Street), T111 (north of Johnson Street), R116 (Hollywood Blvd.), and R120. Four stations that will serve as controls are located at a similar depth and distance offshore of state plane coordinate benchmarks spanning the northern half of John U. Lloyd State Recreation Area (T88, R90, R92, R94).

Two stations were chosen in the vicinity of the Borrow Area to monitor the direct effects of dredging on these infaunal communities. Station HHBA is located near the center of the northern Borrow Area. The pre-dredging depth is approximately 20m. Station HHBAC (Borrow Area Control) is located about 1 mile due north of the northern borrow area on an unconsolidated substrate between the second and third reefs in approximately 18m depth. At these two stations, the 15 replicate cores were taken as five sets of three cores with each set collected 20m apart. All sampling methods and locations were in accordance with permit requirements.

2.1.1.3 Sediments

Two sediment samples were taken at each infaunal core site by SCUBA divers using hand-driven core samplers. Sediment samples were collected and analyses were carried out by Broward County Erosion Control District scientists and engineers.

2.1.2 Field Methods

2.1.2.1 Belt Quadrat Transects

Following an initial cross-section survey of each site with a recording fathometer, a 2 by 2 m weighted PVC frame was deployed over the side of the survey vessel at the crest of the reef in the survey area. Broward County SCUBA divers drove metal stakes (rebar) into the reef to define 2 x 2 m square quadrats and a transect of 20 m length along the reef surface. One corner stake of the 2x2 m quadrat was used as the start stake of each transect. Another stake was placed at 10 m and a final stake at 20 m. Transects were oriented in an approximate north-south direction by securing a tape measure (graduated in centimeters (cm)) between the 10 m interval metal stakes.

Each reef site transect was assessed by use of a 0.75 m^2 quadrat sequentially along first one side and then the other of the 20 m transect line. Consequently, a total area of 30 m^2 was inspected. The stony corals within each frame were identified to species and sized (either approximate diameter for hemispherical or length and width for subrectangular colonies). Corals with diameters less than 1 cm were omitted from analysis. The species *Siderastrea siderea* and *Siderastrea radians* were grouped as *Siderastrea* spp. because of difficulties with precise field identification. The hydrozoan *Millepora alcicornis* also was included in the as-

sessment. Corals, if bleached, were so noted.

Shannon-Weaver Diversity Indices for stony corals (including *Millepora alcicornis*) were calculated for each transect. Two indices were calculated, one based on numerical abundance, H'N, and one based on coverage abundance, H'C. The calculation procedure for H is given below under 2.2.1 for cores.

2.1.2.2 Quadrats

At each of the fifteen quadrat stations, four metal stakes, previously implanted by hand, defined the corners of a 4 m^2 quadrat. Initial examination by SCUBA divers indicated if any stakes were dislocated or lost. Following replacement of stakes where necessary, SCUBA divers tied a length of yellow polypropylene line around the stakes to define the quadrat perimeter. Macroepibenthic organisms were identified and counted *in situ*. When specific identifications could not be made, samples from outside the quadrat were collected, transferred to plastic bags, preserved in 70% ethanol or fixed in 10% borate-buffered formalin, and transported to the laboratory for subsequent identification. A series of color photographs were taken of each quadrat. Underwater photographs were taken using a Nikonos V camera with 28 mm or 20 mm lens affixed to a tripod.

Certain taxa, notably algae, encrusting alcyonarians, and zoanthideans, were difficult to enumerate because, in many cases, it was not clear whether a single colony or cluster of separate colonies was present. Similarly, it sometimes was difficult to assess if loose associates of ascidians represented colonies or isolated zooids. In these cases, the level of abundance was noted as numerous.

The major taxonomic groups of organisms identified are as follows: Porifera, Cnidaria (Alcyonaria, Scleractinia, Zoanthidea) and algae. Minor components included Ascidiacea, Hydrozoa, and Polychaeta.

2.2 Laboratory Assessment Methods

2.2.1 Cores

Unconsolidated sediment samples were diver-collected with a hand-held coring apparatus. Each sediment sample was transferred underwater to a plastic bag and fixed on ship in 10% borate-buffered formalin solution containing Rose bengal.

At the laboratory, each core sample was separately washed with sea water through a 0.5 mm mesh Nalgene screen. Organisms and sediment retained on the screen were decanted into a 70% ethanol solution and stored in glass jars for sorting.

Organisms were sorted initially to phylum or general morphological form (e.g., Mollusca, Crustacea, "worm", "other") and subsequently to lowest recognizably distinct taxa. Only organisms apparently alive at the time of collection were counted (i.e., dead mollusc shells were not considered). Specimen identifications were undertaken by Nova University staff and various

taxonomic specialists recognized as authorities for the specific taxa they were asked to identify (Appendix 4).

Shannon-Weaver Diversity Indices were calculated for each core site using the following equation:

$$H' = -\sum_{i=1} p_i \ln p_i$$

where p_i is the relative abundance of species *i*. H' increases with increasing number of species *S*. For any given *S*, H' reaches a maximum value (H'_{max}) when all values of *p* are equal ($p_1 = p_2 = p_3$...), and H' equals ln *S*. Because H' is primarily affected by species number rather than by abundances of common or rare species or by species of moderate abundance, Evenness (J') also has been calculated for each core site at each period using the equation:

$$J' = H'/H'_{max} = H'/\ln S.$$

As a ratio between the Diversity Index (H') for a given station and the maximum possible diversity index (H'_{max}) for the number of species and specimens at that station, Evenness (J') gives an indication of how close the data come to maximum possible diversity.

2.2.2 Sediments

Grain Size Analysis: Samples were washed once in tap water and allowed to settle for 24-48 h. The colloidal suspension was siphoned off and the remaining sediment dried at 100°C. Samples were then split in a standard Humboldt splitter until representative samples of 30-70 g were obtained. Each sample was then shaken in a standard sieve series for 15 min. Each fraction was weighed to the nearest 10 mg and average grain sizes for each core were determined by the moment method. The average value for each site is the mean of the values of the two samples taken at each site.

Organic Content Analysis: Two sediment samples per infaunal core site were incinerated at 500°C for 10 min before and after weighing to the nearest milligram. The percentage of organic matter in the sample was calculated by dividing the difference between pre- and post-incineration weights by the pre-incineration weight and multiplying by 100. The average value for the site is the mean of the two samples taken at each site.

3.0 RESULTS

3.1 Transect Results

General Ecology

A relatively large bottom area of 30 m^2 was assessed at each reef site. Figure 2a,b,c,d,e shows the species-area curves calculated from the 15 pre-construction Belt-Quadrat transects at each site in the pre-construction assessment. These curves plot the cumulative number of

coral species encountered versus the cumulative number of square meters of reef sampled. When the curve shows pronounced leveling, a sufficient area of reef has been assessed to obtain a representative sample. The fifteen curves are grouped by a set of First, Second, and Third Reefs within a Control or Dredging designation. The curves of each site show pronounced leveling by approximately 20 m^2, confirming that the 30 m^2 area is sufficient for assessment.

Figures 3a,b,c,d,e,f depict population parameters versus depth of each individual station for the pre-construction data. Data points are identified with a station abbreviation. Coral coverage (3a) is generally positively correlated with increasing station depth, although some deeper stations have low coverage (e.g., HH6). Coral density (3b) is more variable with depth, showing no clear pattern. There is a general trend of increasing diversity (H'C -3c, H'N -3d) and increasing Evenness (H'C/HMAX -3e, H'N/HMAX -3f) with depth, although variability is high.

Figure 4 shows the mean of pre-construction parameters over the five stations on each "reef". Variability within the means is very high. Mean coral cover (4a) and mean density (4b) are lowest on the First Reef and roughly equal on the Second and Third Reefs. Diversity indices (H'C -4c and H'N -4d) are lowest on the First Reef and roughly equal on the Second and Third Reefs. A similar pattern is evident for Evenness (4e,4f).

Comparison: Pre-, 1st Post-, 2nd Post-construction

Table 1-1 (Appendix 1) provides summary statistics from the belt-quadrats transects describing the coral community for the Pre-construction, the First Post-contruction Assessment, and the Second Post-construction assessments. Included are total number of corals sampled, percent coral coverage, density, and diversity. Diversity statistics included both number of species and the Shannon-Weaver Diversity Index (calculated both on coral abundance, H'N, and coral coverage, H'C) as well as Evenness, using the two methods. The averages and standard deviations for stations grouped by control and dredged classification are provided as well.

To visualize the changes of stony coral population parameters between pre-construction and post-construction assessments, bar charts were constructed for the averaged parameters of coverage, density, species richness, and the diversity indices of H'C and H'N. These are presented in Figures 5a, b, c, d, and e. From inspection of these figures and data in Table 1-1, it is obvious that there were some changes between assessment periods in all parameters. However, it is not immediately obvious that changes are significant or whether they are dredging or hurricane related. To formally address the issue of significant change, repeated measures analysis of variance (ANOVA) was performed on the data set for each of the above 5 parameters. These results are provided in Table 1-2.

For stony coral coverage (Fig. 5b), ANOVA (Table 1-2a) shows no significant difference among treatments, time periods, or reefs. It should be noted that the factor of time was close to being significant ($p<.054$).

For stony coral density (Fig. 5a), ANOVA (Table 1-2b) shows no significant difference among treatments, time periods, or reefs.

For stony coral species richness (Fig. 5c), ANOVA (Table 1-2c) shows no significant difference among treatments or time periods. There was a significant difference among reefs. First reef sites had lower species richness in comparison to Second and Third reef sites.

For stony coral Shannon-Weaver coverage diversity (H'C) (Fig. 5d), ANOVA (Table 1-2d) shows no significant difference among treatments or time periods. There was a significant difference among reefs.

For stony coral Shannon-Weaver abundance diversity (H'N) (Fig. 5e), ANOVA (Table 1-2e) shows no significant difference among treatments or time periods. There was a significant difference among reefs.

Variability among sites and reefs was high and the statistical tests employed did not detect significant differences related to treatment (dredging - control) or time (Pre-construction, First and Second Post-construction) differences. An additional assessment in Oct., 1993 could be useful to clarify results and to avoid a year gap in the sequential survey data.

3.2 Quadrat Results

Detailed Quadrat data are presented in Table 2-1 giving numbers of each species counted during each survey year (1990, 1991, and 1992). Table 2-2 is a list of species with abundance of individuals for each year and the numbers of stations in which these taxa were found. Table 2-3 gives numbers of total sponges, gorgonians, and scleractinians at each station for each survey year.

There are changes in 1992 in a number of taxonomic categories of Table 2-2. Among the algae for example, there were no stations having the brown alga *Dictyota bartayresii* compared with seven stations last year. The hard bottom in the vicinity of the restored beach continues to be dominated by sponges. As in the previous surveys, 34 species were identified from the $60m^2$ of hard bottom examined by quadrat analysis. The most abundant and widespread species were *Niphates erecta, Haliclona compressa* and *Iotrochota birotulata.* The purple rope sponge *Aplysina cauliformis* was locally abundant, as was the yellow ball sponge *Cinachyra alloclada.* In all, 403 sponges were found in 1992 (Table 2-3) compared to 544 individuals in 1991 and 481 in 1990. The 1991-1992 decrease in the sponge population was about 25%.

A number of sponge species appeared to have suffered population declines in 1992. These include *Aplysina cauliformis, Dasychalina cyathina, Iotrochota birotulata, Desmapsamma anchorata, Dysidea etheria* and *Ulosa reutzleri.* The latter two species displayed the most marked population decreases of 23 to 2 individuals and 53 to 6 individuals, respectively. Interestingly, populations of *Ulosa reutzleri* more than tripled in 1991 and occurred at many more stations.

Twenty one species of gorgonians occurred in all the quadrats. As in previous years the most widespread and abundant species were *Briareum asbestinum* and *Plexaura flexuosa*. *Eunicea succinea* and *Muricea muricata* were the dominant species in the shallower stations. A total of 327 gorgonian colonies were counted in 1992 (excluding *B. asbestinum*), compared with 312 colonies in 1991 and 341 colonies in 1990 (Table 2-3). Among gorgonian taxa three species exhibited population declines in 1992, including *Eunicea palmeri* (3 stations to 1 and 16 to 2 colonies), *Muricea muricata* (6 stations to 4 and 51 to 34 colonies) and *Plexaura flexuosa* (no change in number of stations but a decline from 46 to 27 colonies).

Colonial anemones decreased in 1992 from 5 stations to 1, and nine colonies to 1, compared to 1991.

Nineteen scleractinian species were documented in the quadrats, an increase of one (*Scolymia sp.*) over the 1991. The most abundant species in 1992 were as in previous years, *Siderastrea siderea, Montastrea cavernosa, Stephanocoenia michelini* and *Dichocoenia stokesi* in that order. Scleractinians appeared not to decline as a group. *Stephanocoenia michelini* increased by 5 colonies in 1992 compared with 1991. This species has been noted previously as one that appears to be susceptible to environmental change (Goldberg, 1981). A number of species exhibited population increases, especially *Siderastrea siderea* (36 to 51 colonies) and *Montastrea cavernosa* (12 to 21 colonies).

The typical square meter in the study area contained 9 sponges, 5 gorgonians and 2 small scleractinian colonies in 1991. For 1992 the typical square meter contained 2 fewer sponges, and about the same number of gorgonians and scleractinians.

An analysis of populations station by station (Table 2-3) reveals a mixed pattern. Sponge populations declined at both HH and JUL sites by 16% and 29% respectively. Gorgonian and scleractinian populations exhibited modest (4-5%) increases on most JUL and HH sites, but scleractinians increased by 19% at HH sites primarily due to a large recruitment of Siderastrea siderea at HH 3. At this station the number of individuals increased from 4 in 1991 to 29 individuals in 1992. Similarly, *S. siderea* and *D. stokesii* increased at JUL 10 from zero in 1992 to 6 and 3 individuals, respectively. Conversely, *S. siderea* populations fell from 10 to 1 colonies at HH 1 and from 12 to 3 colonies at HH2. If *S. siderea* contributions and losses are ignored, the population of scleractinians at all JUL and HH sites are virtually identical between years. In 1991 there were 39 colonies at HH stations excluding *S. siderea*; the same number was found in 1992. At JUL stations 70 colonies excluding *S. siderea* were found in 1991; 71 colonies were found in 1992.

Other notable changes by station include considerable decreases in the sponge populations at HH 2,6 and 7, as well as in JUL 9 and 10. In most cases the sponge species in decline were those listed above. In the case of HH 6 *Desmapsamma anchorata* declined from 11 to 0,

among declines of other species. At HH 7 this species declined from 6 to 2, but *Dysidea etheria* declined from 11 to 2 individuals. In particular at this station, we noted a number sponges (and gorgonians) had been dislodged from the substrate at this station and had accumulated in depressions on the reef. At JUL 9 *Ulosa reutzlei* declined from 17 to 1, among other less drastic decreases. At JUL 10 *U. reutzleri* populations decreased from 8 to 1.

Similarly there were declines in the gorgonian populations at HH 3 and 4 as well as a lesser decline at JUL9. At HH3 the decrease was due to losses of *Muricea muricata*. This species was represented by 34 colonies in 1991 but only 24 remained in 1992, and 9 of these were damaged at the time of the survey. The losses at HH4 were more generalized. As noted above, gorgonians were found dislodged from the reef around HH7. This is not reflected in the numbers of colonies because the number of Briareum colonies increased from 8 to 16. However, if this encrusting species is eliminated from consideration, the number of arborescent gorgonians declined from 10 colonies in 1992 to only 5 in 1992.

Considering the population changes at all stations and the evidence of debris, Hurricane Andrew was responsible for a complicated pattern of disruption to the reef ecosytem. However, the distribution and quantification of damage is not easily accomplished from the data available. A survey in Oct. 1993 would be useful to provide continuing monitoring and comparison data.

The abundance of scleractinians, gorgonians, and sponges by Control and Dredging designation is presented for each reef and each assessment period in Figures 6a, b, and c. Significance of differences were assessed by repeated measures ANOVA and results are included in Table 2-4. There were no significant differences for Scleractinian abundance among reefs, treatment groups, or time periods. Gorgonians showed a significant difference among treatment groups, among reefs, and the interaction of reefs and groups. Dredging reefs were slightly more abundant in gorgonians and the First Reef had greater abundance than the other two. Sponges showed a significant difference among time and among reefs. Abundance of sponges was generally higher on the Third Reef for either treatment group. Sponge abundance was generally decreased in the 1992, Second Post-construction period.

3.3 Cores Results

Table 3-1 lists contents of all core samples summarized by station for the pre-dredging (1990), 30-day post-dredging (1991) and one-year post-dredging (1992) monitoring surveys. Species numbers, diversity indices and evenness values are included at the end of the table. Table 3-2 lists raw data by replicate for the 1992 monitoring survey. As in previous reports, diversity and evenness measurements do not include the following categories of organisms: 1) nematodes and harpacticoid copepods, normally treated as meiofauna, 2) organisms normally treated as members of sessile communities (e.g., most hydroids, bryozoans and sponges), 3) planktonic

organisms (e.g., calanoid and cyclopoid copepods and chaetognaths), and 4) specimens (probably fragments) unassignable to phylum ("Unknowns"). The second and third categories, omitted from percentage abundance calculations in the previous two surveys, are included in those calculations here, but represent an insignificant contribution.

Table 3-3 and Figure 7 show numerical abundances of major taxonomic groups of organisms by station and survey. Table 3-4 and Figure 8 give percentages (relative abundances) for the same major taxonomic groups by station and survey. Table 3-5 ranks the five most abundant taxa with their percentage abundances by station and survey.

3.3.1 Comparison of Major Faunal Groups

In the pre-dredge and fill survey (1990), nematodes dominate the fauna (44.2% of organisms in all samples), followed by polychaetes (24.3%), peracarid crustaceans (13.2%), bivalves (6.9%) and nemerteans (2.6%), with no other group accounting for more than 2% of the fauna. The first post-dredging survey (1991) exhibits a 30% increase in organisms overall, dominated by an almost five-fold increase in bivalve molluscs (chiefly *Tivela floridana* and *Strigilla mirabilis*), and an increase in nematodes at one station (R90) accounting for almost a quarter of all organisms collected. Thus, nematodes (28.6%) and bivalves (25.4%) dominate, followed by polychaetes (22.0%) and peracarid crustaceans (12.4%). Despite their relative decreases, both polychaetes and peracarid crustaceans increase in absolute numbers. Three less abundant groups exhibit both absolute and relative increases: harpacticoid copepods (1.5 to 4.6%), nemerteans (2.6 to 3.5%) and turbellarians (0.7 to 1.6%). Oligochaetes and bryozoans decline in numbers and gastropod molluscs disappear.

In the 1992 survey, a year following dredge and fill operations, the total number of organisms collected declines to about pre-dredging levels. However, if the chiefly meiofaunal nematodes and harpacticoids are omitted, as they are from diversity and evenness calculations, overall organism abundance increases from the first through the third surveys. Polychaetes (68%; chiefly Spionidae) exhibit a major increase in both absolute and relative numbers in 1992 and now dominate the fauna. The nematode peak at station R90 has disappeared so that, despite modest increases at several stations, nematodes now contribute only 9.3% of the fauna. Peracarids (7.8%) continue an overall decline, due largely to decreases at the two offshore sites. Bivalves drop in absolute and relative numbers by an order of magnitude from 1991 (to 2.9%), and harpacticoid copepods and turbellarians return to low pre-dredging levels. Only gastropods and bryozoans exhibit increases following immediately post-dredging (1991) declines, but both remain minor components of the fauna.

3.3.2 Variations within Major Faunal Groups

Substantial changes occur from survey to survey among the most abundant taxa in each major group; a few suggest movement toward pre-dredging conditions.

Among nemertine worms, *Cephalothrix* sp. 114 increases in numbers from 1990 to 1991 at all inshore control sites and declines in 1992. *Hubrechtella dubia*, by contrast, declines from the first to the second survey and disappears in the third from both offshore stations (BAC and BA).

The five dominant polychaete species at the inshore stations (*Paraonis fulgens, Dispio uncinata, Scolelepis texana, Spio pettiboneae* and *Armandia agilis*) exhibit, with minor local variations, substantial increases in numbers throughout this study. Of these, *D. uncinata* suggests a trend toward pre-fill conditions in that it is among the five most abundant taxa at four inshore stations (two treatment and two control) before filling, is not among the dominants immediately post-fill, and returns to dominance at all four stations a year later. It is now the most abundant organism at seven inshore stations and ranks second at the eighth.

At the two offshore stations, the polychaetes *Prionospio cristata* and *Chone* cf. *americana* appear throughout, *Armandia maculata* and *Fabriciola trilobata* decline and disappear, while *Pseudopolydora* sp. and *Paraprionospio pinnata* occur in numbers for the first time in 1992.

The gastropod *Caecum pulchellum* occurs at three inshore stations before filling (1990). It disappears from the survey immediately following (1991) and has since returned at all three as well as at two additional stations, albeit in minimal numbers.

The bryozoan *Cupuladria* sp. exhibits a similar post-dredging decline (1991) and resurgence (1992), although it occurs in numbers throughout the study at both offshore stations. By contrast, harpacticoid copepods generally increase from 1990 to 1991 and subsequently decrease to pre-dredging levels.

The two most abundant bivalves, *Tivela floridana* and *Strigilla mirabilis* follow the harpacticoid pattern, but it is not clear whether or how their variations are related to fill operations. *T. floridana* is abundant inshore in 1990 and increases substantially in the 1991 survey at one control (R94) and three treatment (R106, R116, R120) sites. *S. mirabilis*, by contrast, appears for the first time at seven inshore sites following filling in 1991, but in large numbers only at three of the four control sites (T88, R92, R94). Both species decline substantially in the 1992 survey.

Among inshore amphipods, *Metharpinia floridana, Haustorius* sp. and *Eudevanopus honduranus* occur in numbers throughout the three surveys, but only *M. floridana* exhibits an immediately post-fill peak. Several offshore species have disappeared since the last survey (*Ampelisca bicarinata, Bemlos unifasciatus reductus, Amphideutopus dolichocephalus*) while three others have appeared for the first time, although in minimal numbers.

Cumaceans increase substantially in numbers in 1991 and decline again in 1992, but difficulties with their taxonomy prevent accurate assessment of faunal changes. The tanaidacean, *Cirratodactylus floridensis*, an offshore dominant before dredging, shows a sign of recovery in

its reappearance at the borrow area (BA) site, but it has not returned to pre-dredging levels. By contrast, the isopod, *Xenanthura brevitelson*, the second most numerous offshore species in 1990 (apart from nematodes), continues a steep post-dredging decline at both borrow (BA) and control (BAC) sites.

3.3.3 Comparison of Faunal Changes by Location

3.3.3.1 Inshore Sites

Seven of eight inshore sites exhibit overall increases in organism abundance over the course of the three surveys: numbers either increase progressively from 1990 to 1992 (T88, R90), increase from 1990 to 1991 and remain about the same in 1992 (R92, R116), or increase from 1990 to 1991 and decline somewhat in 1992 but remain well above 1990 levels (R94, R106, R120). The only exception is treatment station T111 which exhibits a decrease in organism abundance through the three surveys. This is an anomalous site in several ways, however, and will be discussed below in greater detail.

Species richness values also generally increase at the inshore sites. Two treatment and two control sites (R92, R106, R116 and R120) increase in numbers of species in each successive survey; two others (T88, R94) show two-fold increases immediately post-fill with partial declines in 1992. Species richness declines greatly at control site R90 and treatment site T111 following fill operations and remains similarly low in 1992. The pre-fill communities at both of these sites differ substantially in species composition, richness and diversity from those at all other inshore sites. Community composition and structure at both are now far more similar to the other inshore sites than they were before fill operations commenced.

On a group-by-group basis, polychaete abundances increase at all inshore stations through the three surveys while nematodes generally decrease. The immediately post-fill increase of bivalves at three control and two treatment sites has already been mentioned. In terms of species richness, nemertean, polychaete, oligochaete, bivalve and peracarid species richness values are generally similar at inshore control and treatment sites before filling, with the two exceptions noted above. Specifically, T111 and R90 exhibit anomalously high polychaete, nemertean and bivalve richness values relative to other sites. T111 supports 39 polychaete, 6 nemertean and 7 bivalve species; R90 exhibits 12, 6 and 5, respectively. By contrast, the other inshore sites support only 3-7 polychaete, 0-3 nemertean, and one bivalve species each in the pre-fill survey.

Following fill operations, numbers of polychaete species increase at five sites, remain about the same at two and drop precipitously at station T111. A year later, richness values remain roughly the same, dropping to or below pre-fill levels only at T88 and R90. Despite substantial variations in organism abundances, peracarid crustaceans maintain roughly the same richness levels at all inshore sites throughout the study. Eighteen of the 24 samples (3 surveys of

8 sites) include 5-6 taxa (to which the great majority of specimens belong).
Shannon-Weaver diversity indices (H') show no trend referrable to the effects of fill operations. Values increase through the three surveys at R92 and R120, increase immediately following filling and decline a year later at T88 and R116, decrease following filling and increase a year later at R90 and R106, decrease following filling without a resurgence (T111) or remain essentially unchanged throughout (R94). Interestingly, each pair of stations that shows the same trend includes one control and one treatment site.

3.3.3.2 Offshore Sites

The two offshore sites show consistent parallel variations in organism abundances, diversity and species richness values, dropping from high pre-dredging levels to low immediately post-dredging values, and approaching or exceeding pre-dredging levels a year later for all three parameters. Although this return to pre-dredging values carries over to a few major taxonomic groups (e.g., polychaete abundance and richness; numbers of nematodes and bryozoans), several pre-dredging dominants have not recovered (tanaidaceans and isopods) and, as mentioned above, species composition has altered substantially. For example, both borrow area (BA) and control site (BAC) each have about 50 polychaete species in both pre- and one year post-dredging surveys. However, fewer than a third (26-29%) of the species are common to both 1990 and 1992 surveys at either station. Similar compositional variations exist across surveys for peracarid crustaceans.

3.3.4 Core Discussion

Of the differences that exist in benthic communities between surveys, some display patterns that may be attributable to dredging and filling while others do not. The declines in richness at R90 and T111, and the corresponding general increases in richness and organism abundance at the other inshore stations, for example, do not appear to be related to fill operations because the trends affect control and treatment sites similarly. Likewise, polychaetes exhibit major increases in absolute and relative abundances while nematodes decline at all inshore sites in 1992 relative to both earlier surveys (with the exception of the 1991 nematode peak at R90). Diversity indices exhibit no recognizable trend over the course of the three surveys relative to inshore treatment or control areas.

Several important taxa (i.e., the polychaetes *Dispio uncinata, Paraonis fulgens, Scolelepis texana* and *Spio pettiboneae*) increase at most or all inshore sites whether control or fill. Several others, however, vary with location, possibly relative to fill operations. Thus, the polychaete *Armandia agilis* occurs in greater abundance at seven of eight sites immediately following filling (1991), but continues to increase in numbers (1992) only at control sites while declining at three of four treatment sites. The amphipod *Metharpinia floridana* shows a similar pattern.

Species abundances, richness, diversity and evenness all decline from 1990 to 1991 and

then rebound at both offshore sites. Both stations display the same dominant species in the pre-dredging survey, but species composition changes following dredging and remains substantially different a year later. Parallel variations in all major parameters at both sites suggests that the control site may also be affected by the dredging, although more regional-scale changes unrelated to dredging cannot be ruled out.

The dominant inshore taxa in both pre-fill and one year post-fill surveys are also among the dominant taxa at the Dania Beach station (DB) during the initial survey for the John U. Lloyd Renourishment in 1989 (i.e., the polychaetes *Dispio uncinata, Paraonis fulgens, Scolelepis texana, Spio pettiboneae*, the bivalve *Tivela floridana* and the amphipod *Metharpinia floridana*), suggesting that these taxa may represent something of a baseline fauna. Similarly, both the current stations and DB of the previous project exhibited immediately post-dredging increases in numbers of the polychaetes *Paraonis fulgens, Spio pettiboneae* and *Scolelepis texana*. These similarities must be carefully weighed because important differences do exist. All three just mentioned polychaetes, for example, continued to increase in numbers a year following filling in the current study, but declined again over the same period during the previous project. Nematodes dominate the pre-dredging fauna in the current study and decline following dredging. By contrast, they were absent before dredging at DB and increased substantially afterward. Likewise, the current project does not exhibit the important inshore increases in oligochaetes and harpacticoids that followed filling at John U. Lloyd.

Clearly an additional sampling in Oct., 1993 would be valuable to continue the time series.

4.0 SUMMARY

4.1 Summary of assessments to date

All work concerned with transects and quadrats has been completed for the pre-construction, the first post-construction, and the second post-construction investigations. All work concerned with cores has been completed for the pre-construction, first post-construction, and second post-construction investigation.

4.2 Summary of Work Pending

There is no work pending at the present time.

We do recommend that at least a subset of the assessment be continued in Oct., 1993 in order to collect useful data for interpreting effects of dredging and hurricane related impacts.

FIGURES

Figure 1: Biological monitoring site locations.

Figure 2: Species-Area curves for Belt-Quadrat transects at each site.

Figure 3: Belt-Quadrat transect parameters versus depth.

Figure 4: Mean station assessment parameters by First, Second, and Third Reefs.

Figure 5a: Stony Coral Density at Control and Dredging sites for the Pre-construction, First Post-construction, and Second Post-construction periods (transect data).

Figure 5b: Stony Coral Coverage Density at Control and Dredging sites for the Pre-construction, First Post-construction, and Second Post-construction periods (transect data).

Figure 5c: Stony Coral Species Richness at Control and Dredging sites for the Pre-construction, First Post-construction, and Second Post-construction periods (transect data).

Figure 5d: Stony Coral Shannon Weaver Diversity H'C at Control and Dredging sites for the Pre-construction, First Post-construction, and Second Post-construction periods (transect data).

Figure 5e: Stony Coral Shannon Weaver Diversity H'N at Control and Dredging sites for the Pre-construction, First Post-construction, and Second Post-construction periods (transect data).

Figure 6a: Gorgonian abundance in quadrats.

Figure 6b: Sponge abundance in quadrats.

Figure 6c: Scleractinian abundance in quadrats.

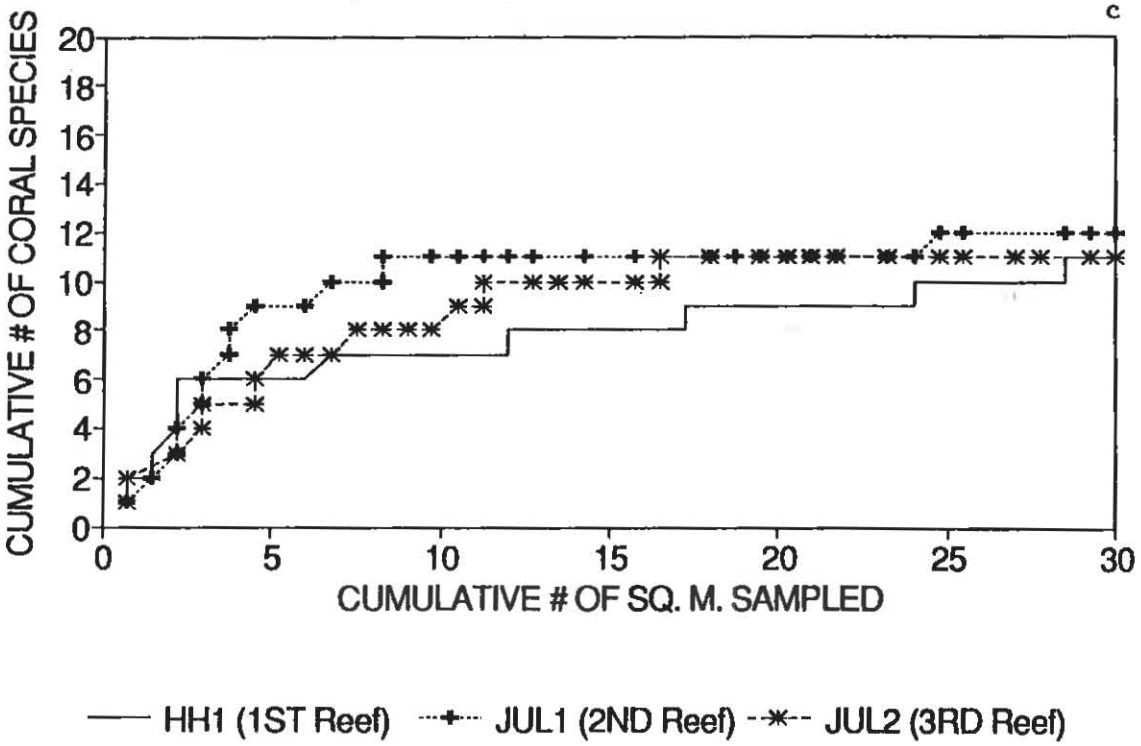
Figure 7: Percentage occurrences of major taxonomic groups by station and survey.

Figure 8: Numerical abundances of major taxonomic groups by station and survey.

DREDGING SITES - OCT., 1990

SPECIES-AREA CURVES

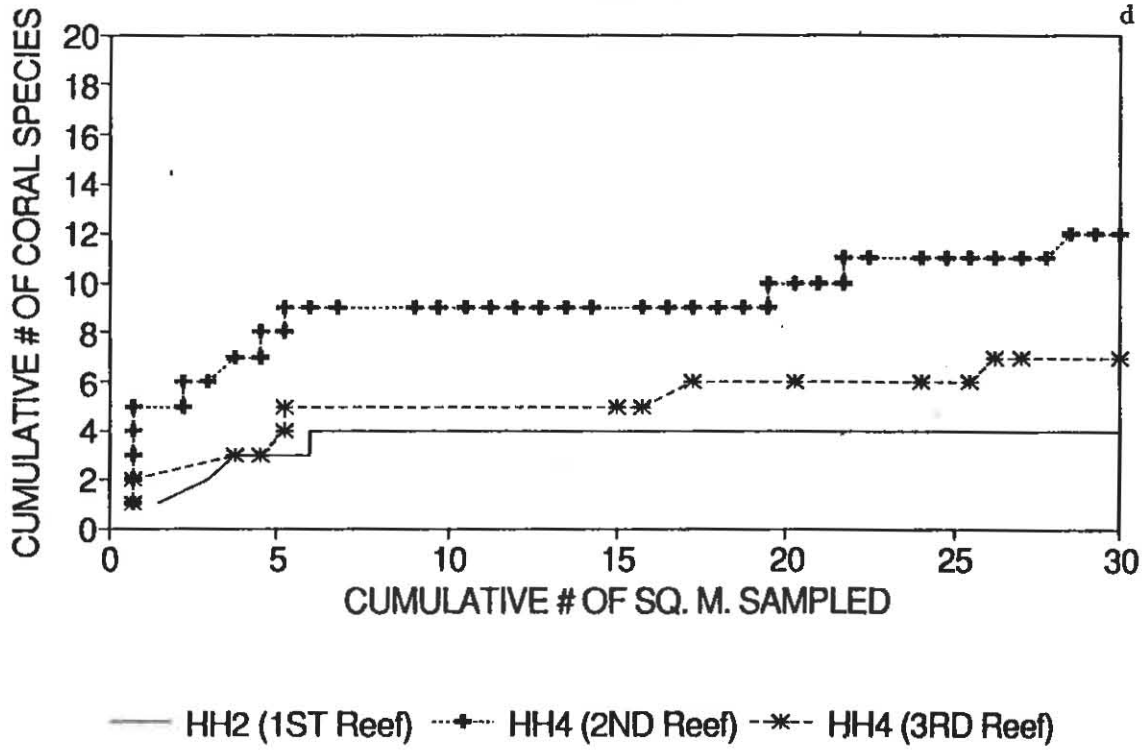
Figure 2 c

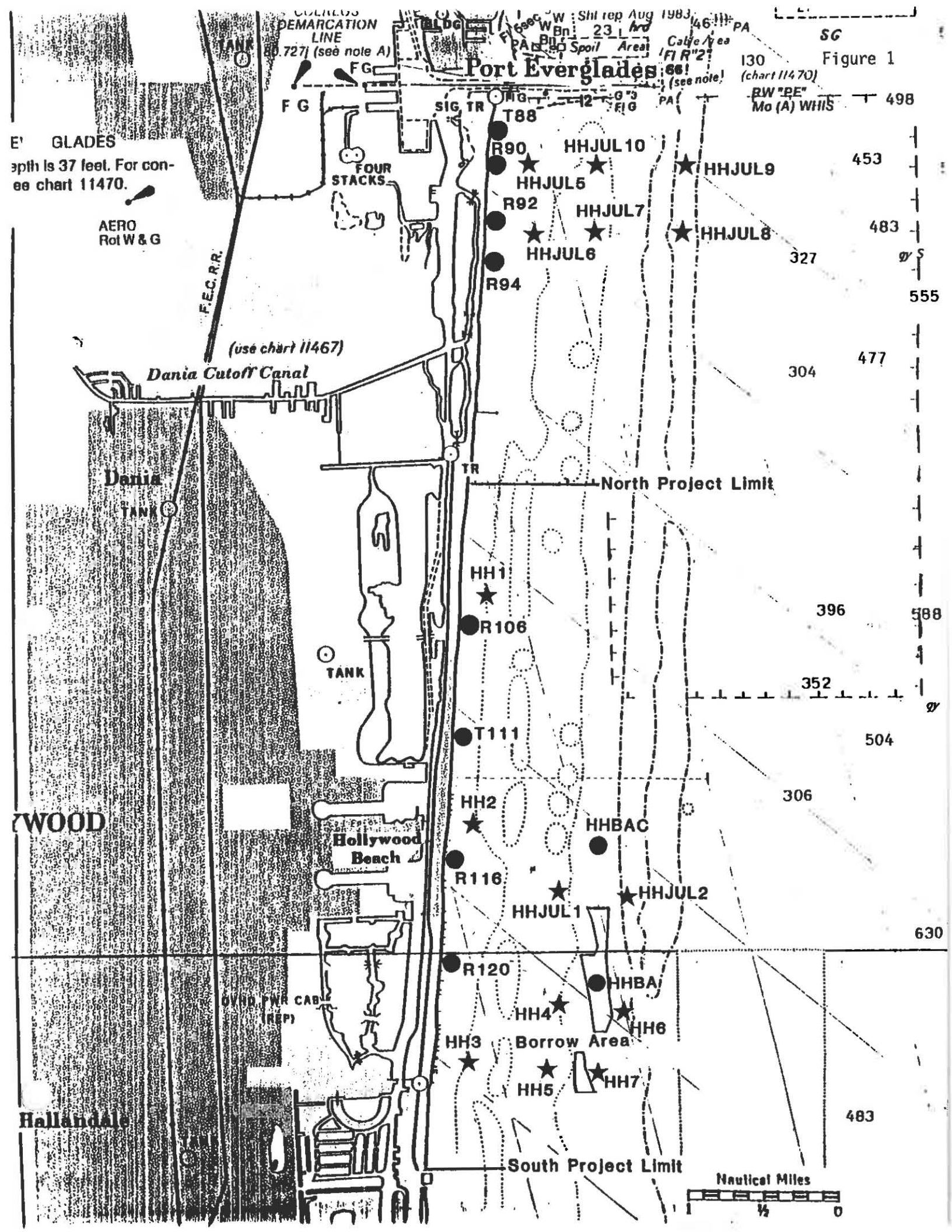


DREDGING SITES - OCT., 1990

SPECIES-AREA CURVES

Figure 2 d

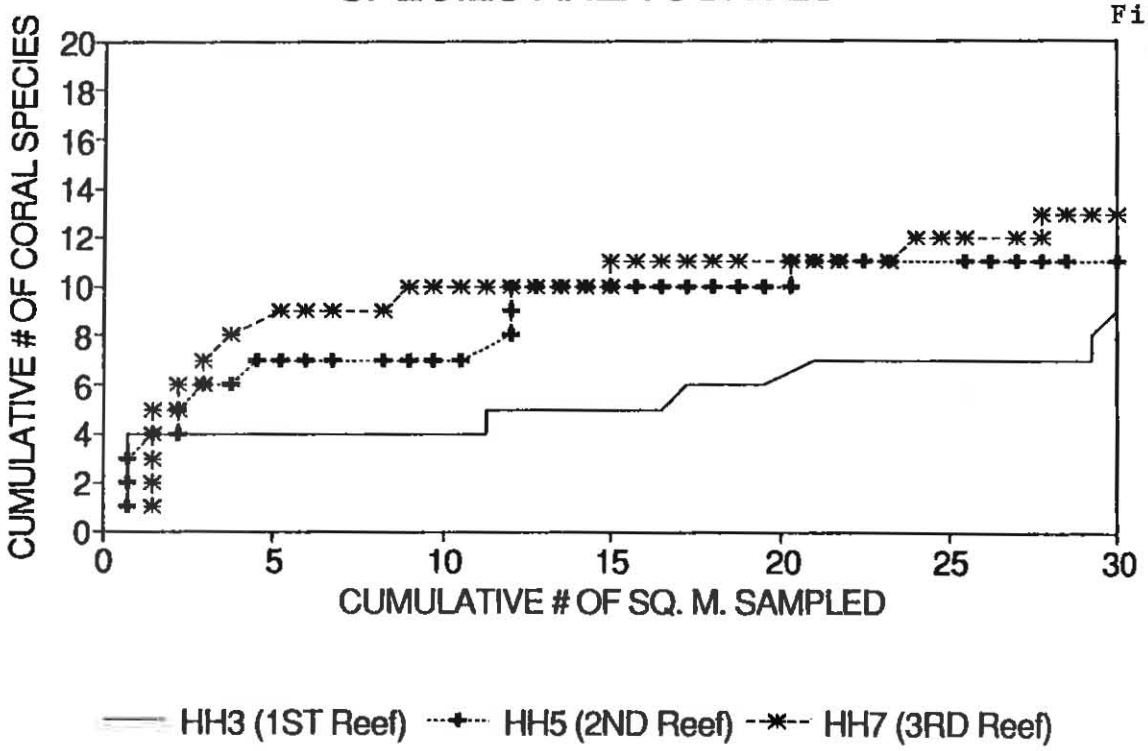



Port Everglades
Dania Cutoff Canal
(use chart 11467)
Dania
Hollywood Beach
Hallandale
F.E.C.R.R.
TANK
FOUR STACKS
AERO
Rot W & G
SIG TR
T88
R90
R92
R94
HHJUL10
HHJUL9
HHJUL5
HHJUL7
HHJUL8
HHJUL6
TR
North Project Limit
HH1
R106
T111
HH2
HHBAC
R116
HHJUL2
HHJUL1
R120
HHBA
HH4
HH6
HH3
Borrow Area
HH5
HH7
South Project Limit
Nautical Miles
Figure 1

DREDGING SITES - OCT., 1990

SPECIES-AREA CURVES

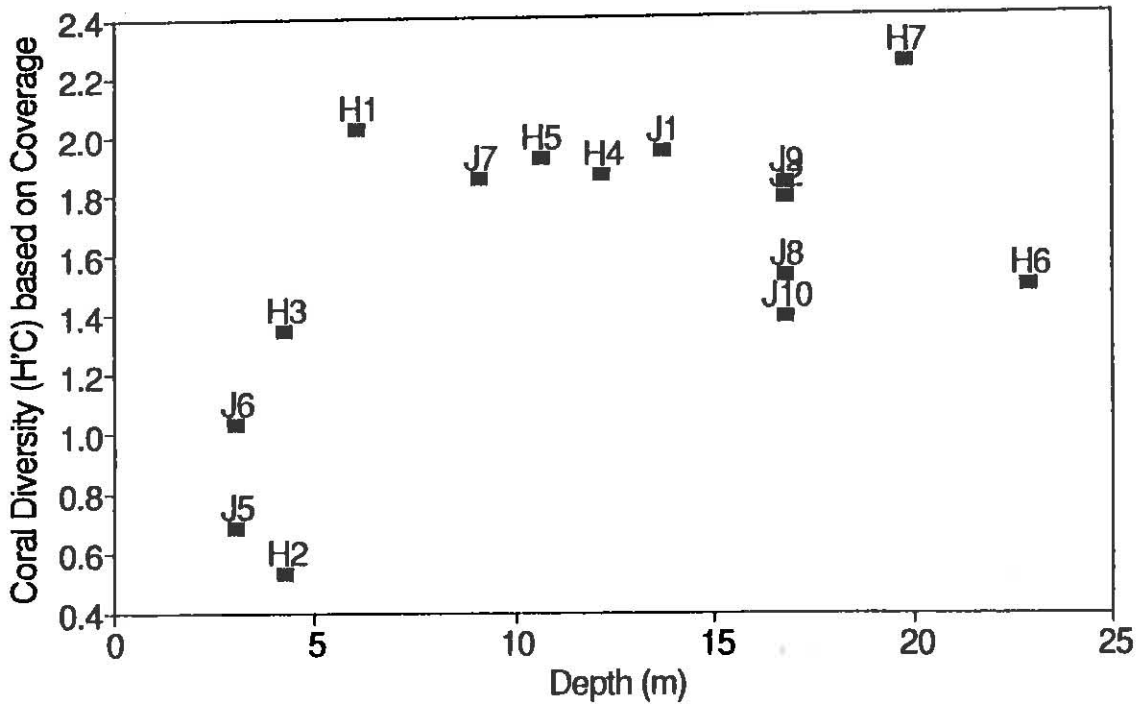
Figure 2
e



Coral H'C DIVERSITY Vs. Depth

Preconstruction Data

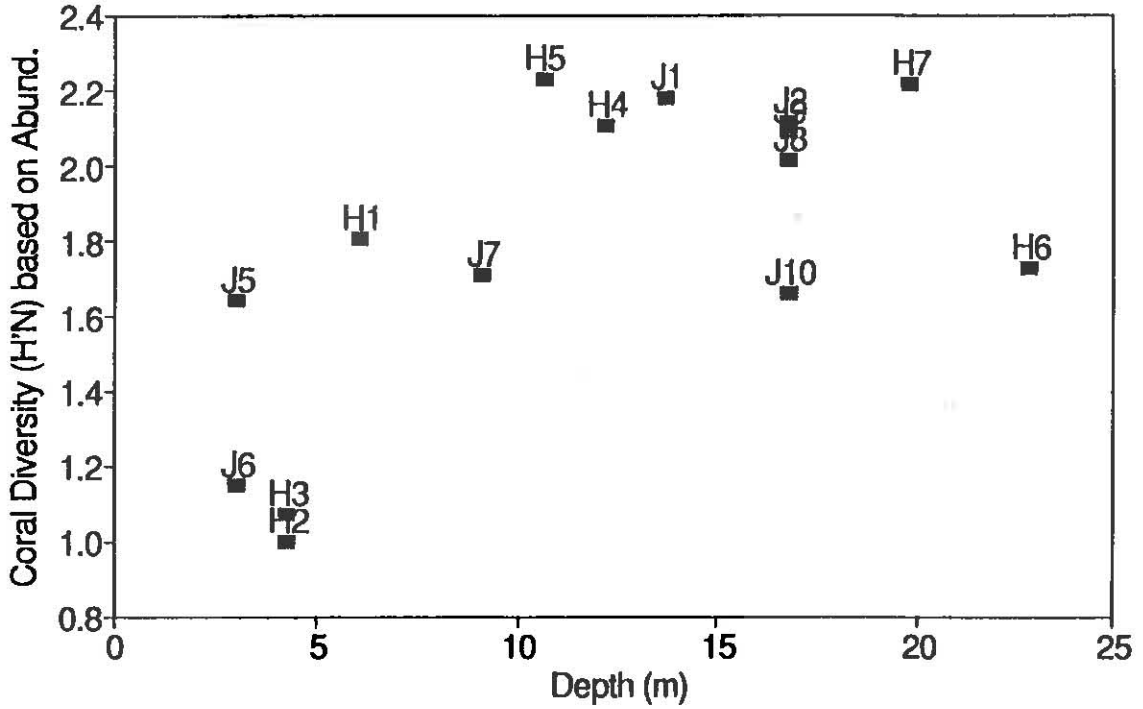
Fig. 3c



Coral H'N DIVERSITY Vs. Depth

Preconstruction Data

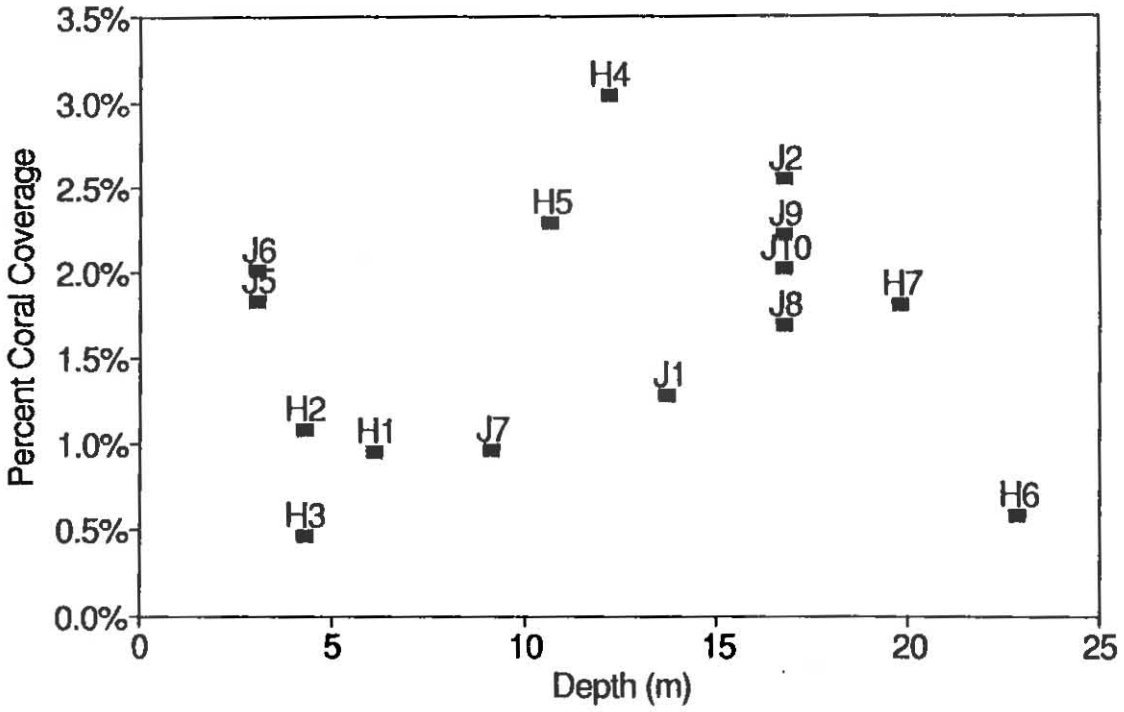
Fig 3d



Stony Coral COVERAGE Vs. Depth

Preconstruction Data

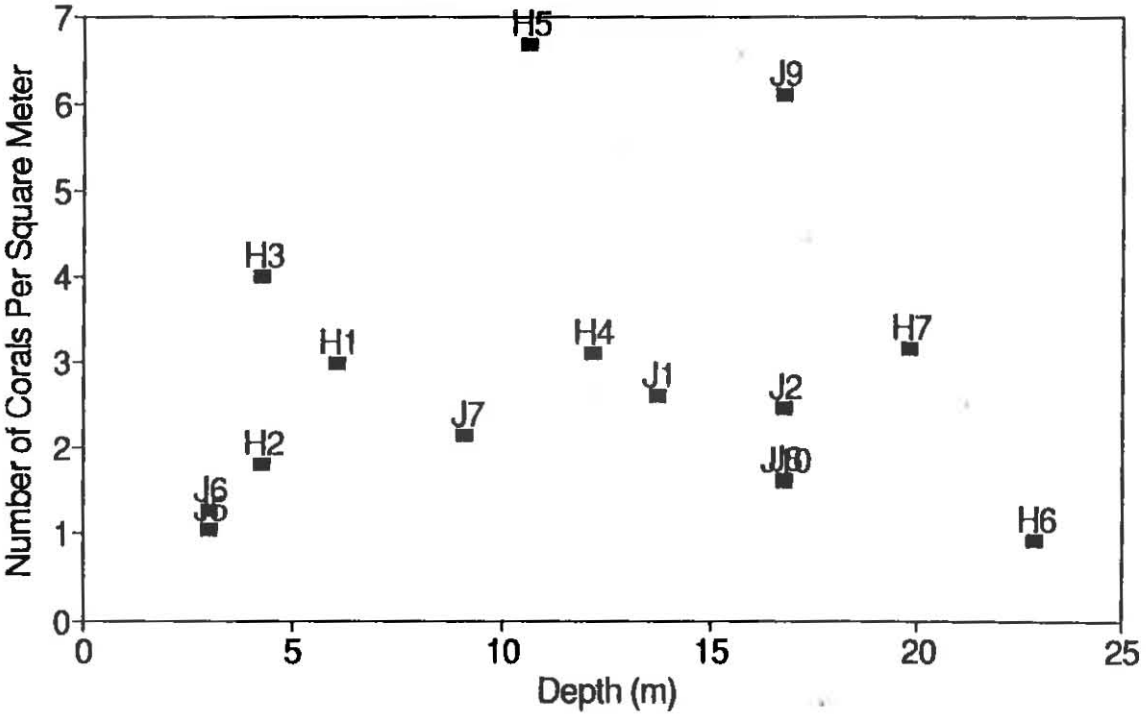
Figure 3 a



Stony Coral DENSITY Vs. Depth

Preconstruction Data

Fig. 3b



H'C/HMAX EVENNESS Vs. Depth

Preconstruction Data

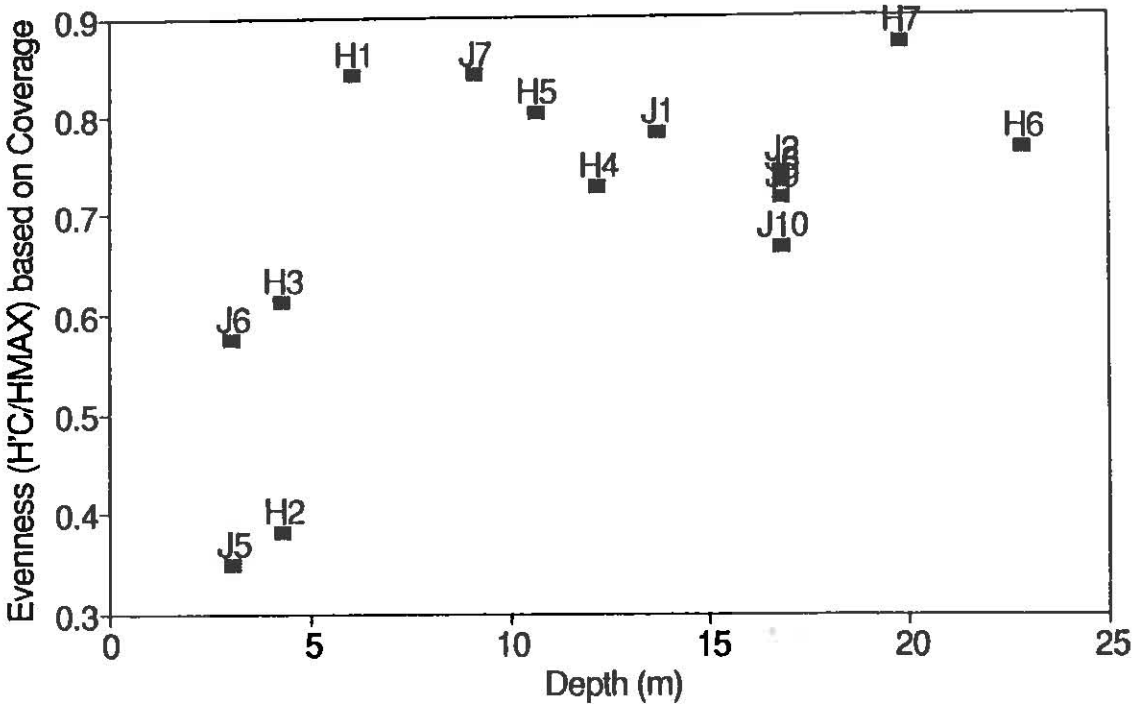


Fig. 3e

H'N/HMAX EVENNESS Vs. Depth

Preconstruction Data

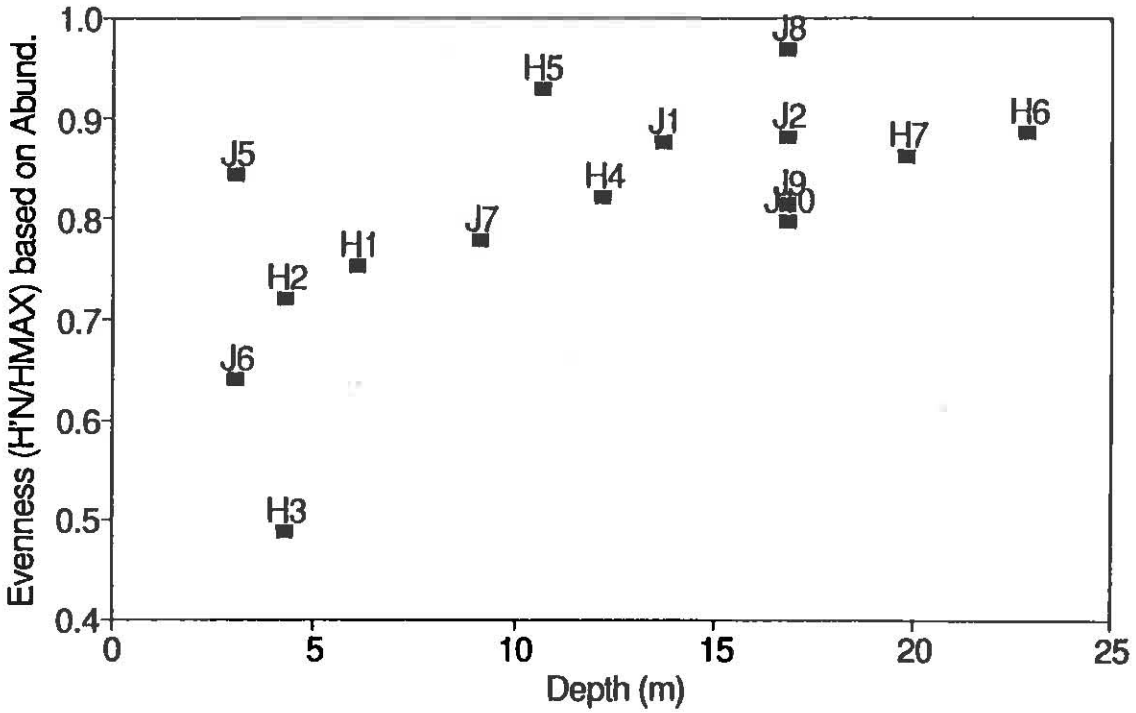


Fig. 3f

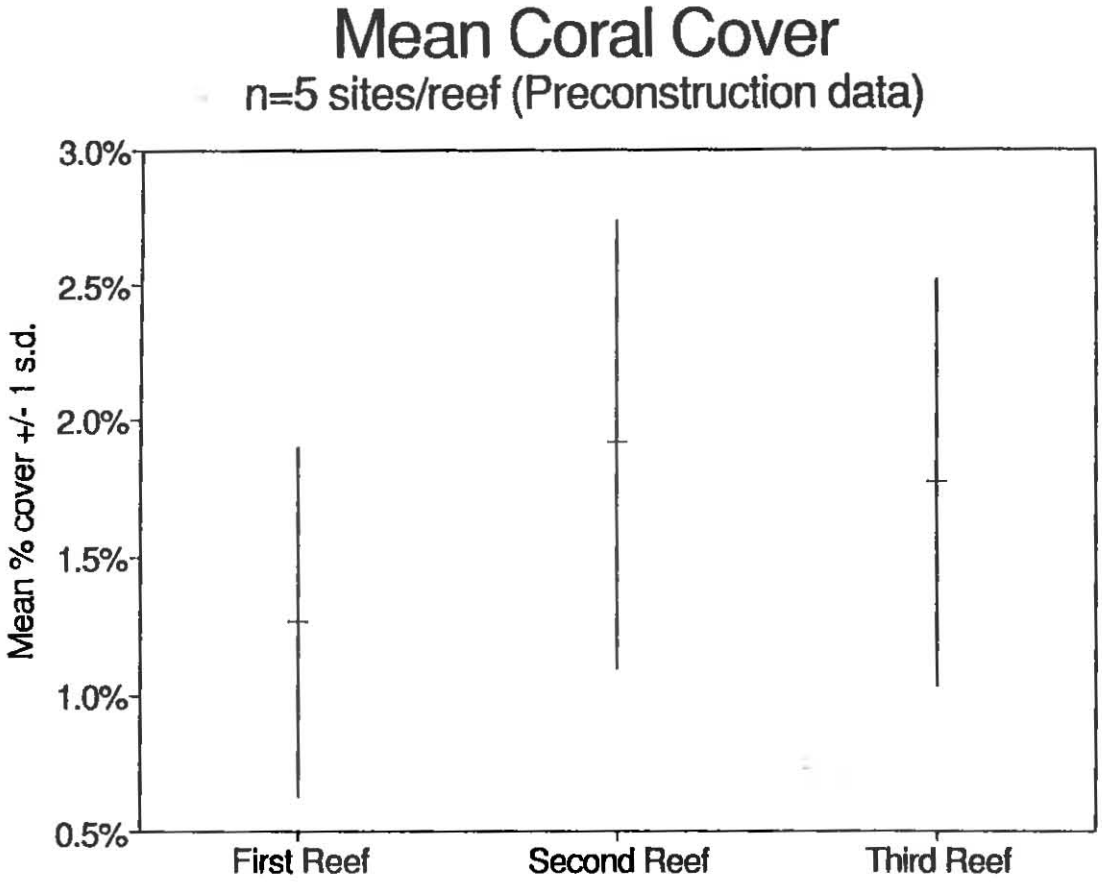

Mean Coral Cover
n=5 sites/reef (Preconstruction data)
Mean % cover +/- 1 s.d.
3.0%
2.5%
2.0%
1.5%
1.0%
0.5%
First Reef
Second Reef
Third Reef

Fig. 4a

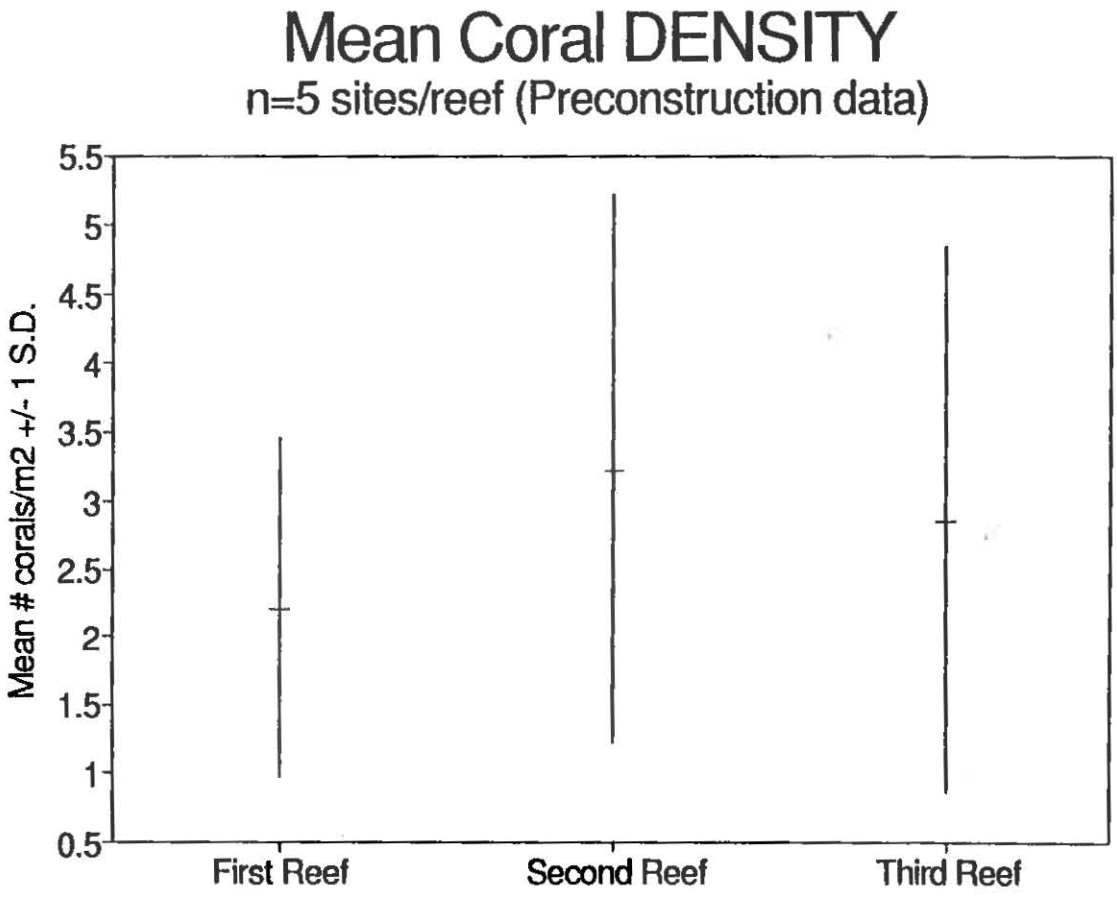
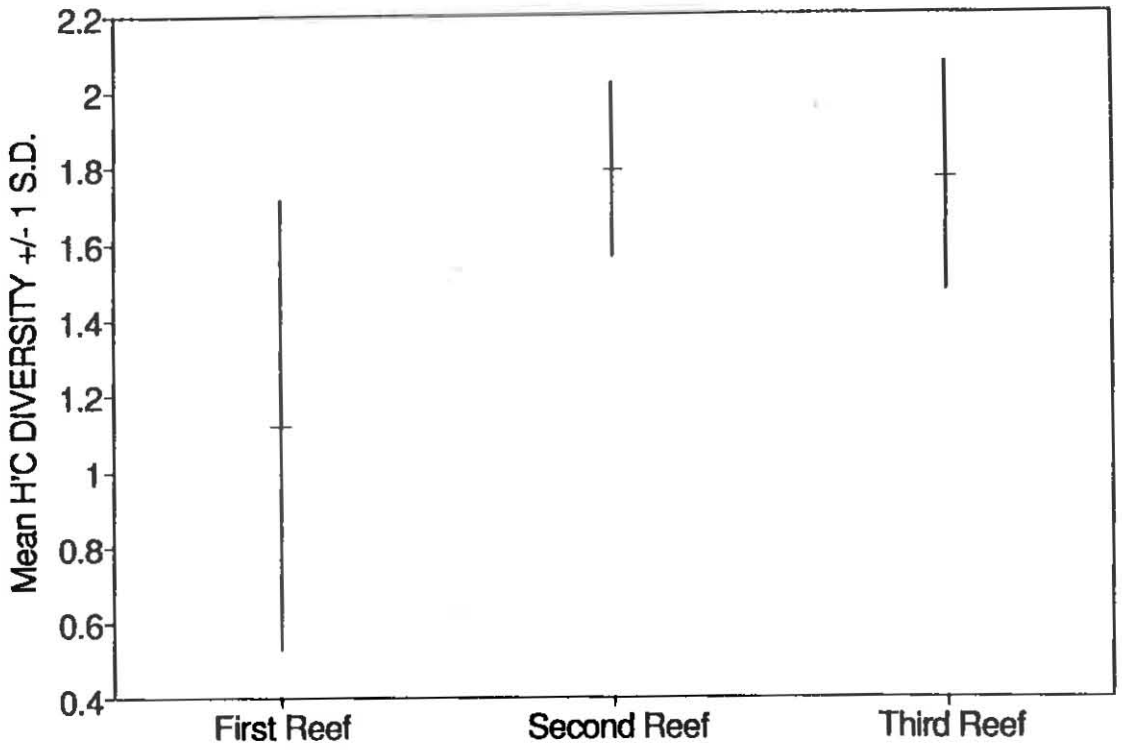

Mean Coral DENSITY
n=5 sites/reef (Preconstruction data)
Mean # corals/m2 +/- 1 S.D.
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
First Reef
Second Reef
Third Reef

Fig. 4b

Mean Coral DIVERSITY (H'C)

n=5 sites/reef (Preconstruction data)

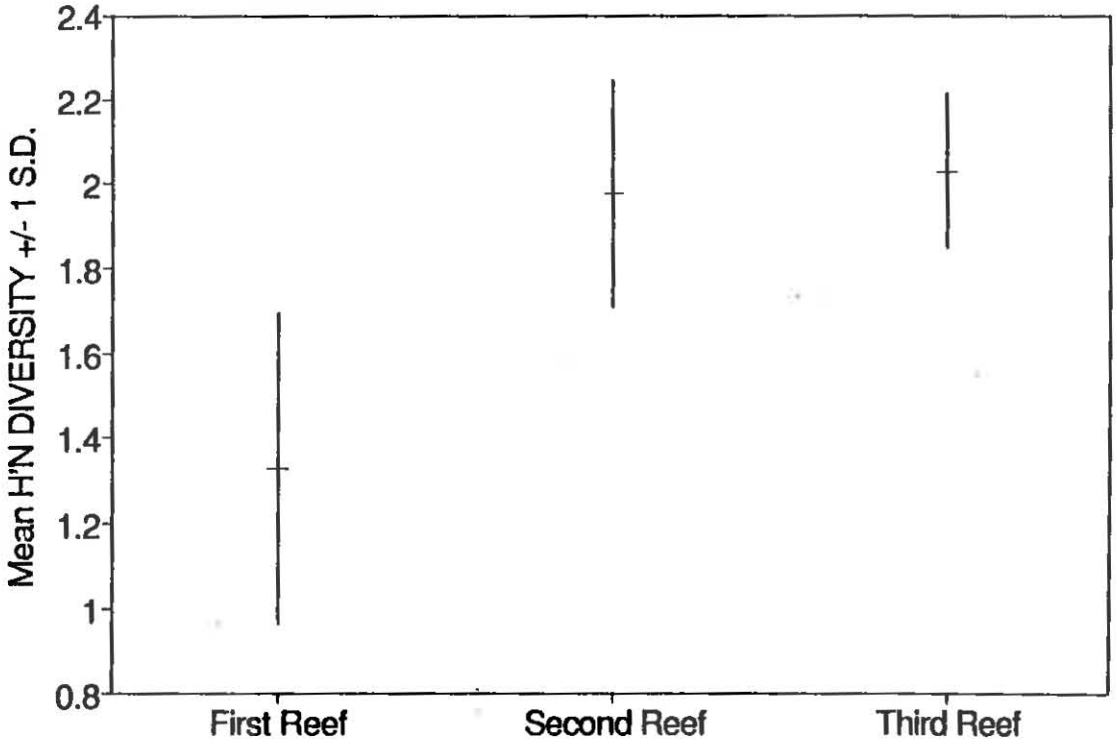
Fig. 4c



Mean Coral DIVERSITY (H'N)

n=5 sites/reef (Preconstruction data)

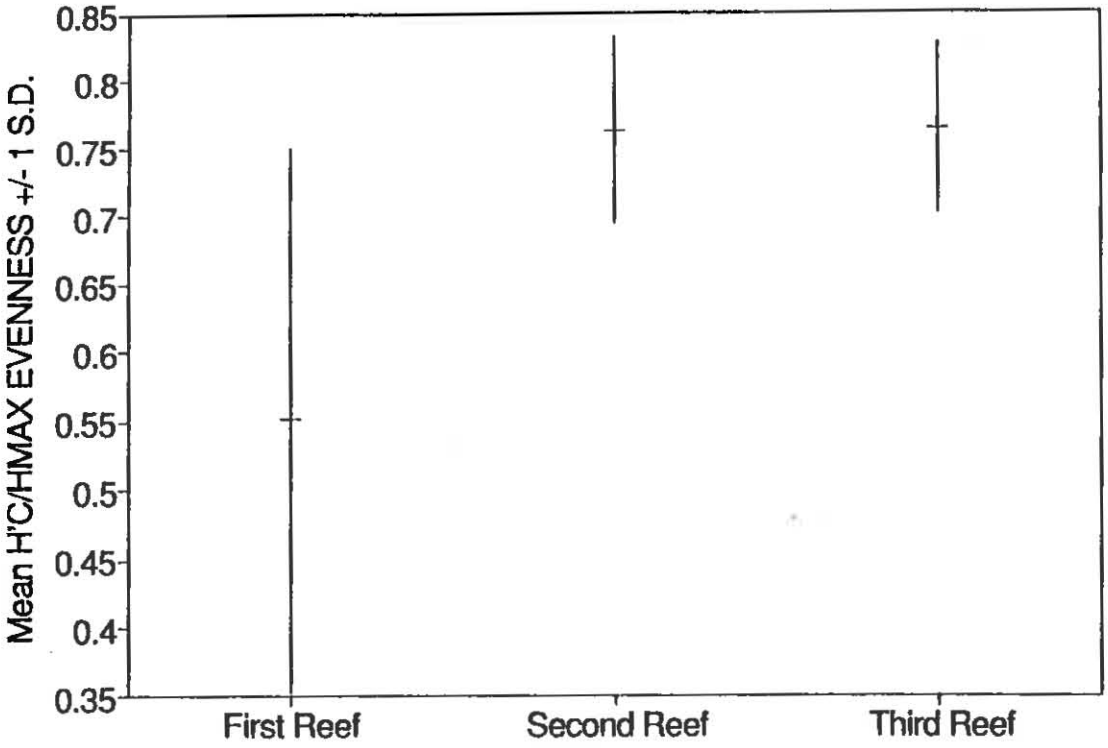
Fig. 4d



Mean Coral H'C/HMAX (EVENNESS)

n=5 sites/reef (Preconstruction data)

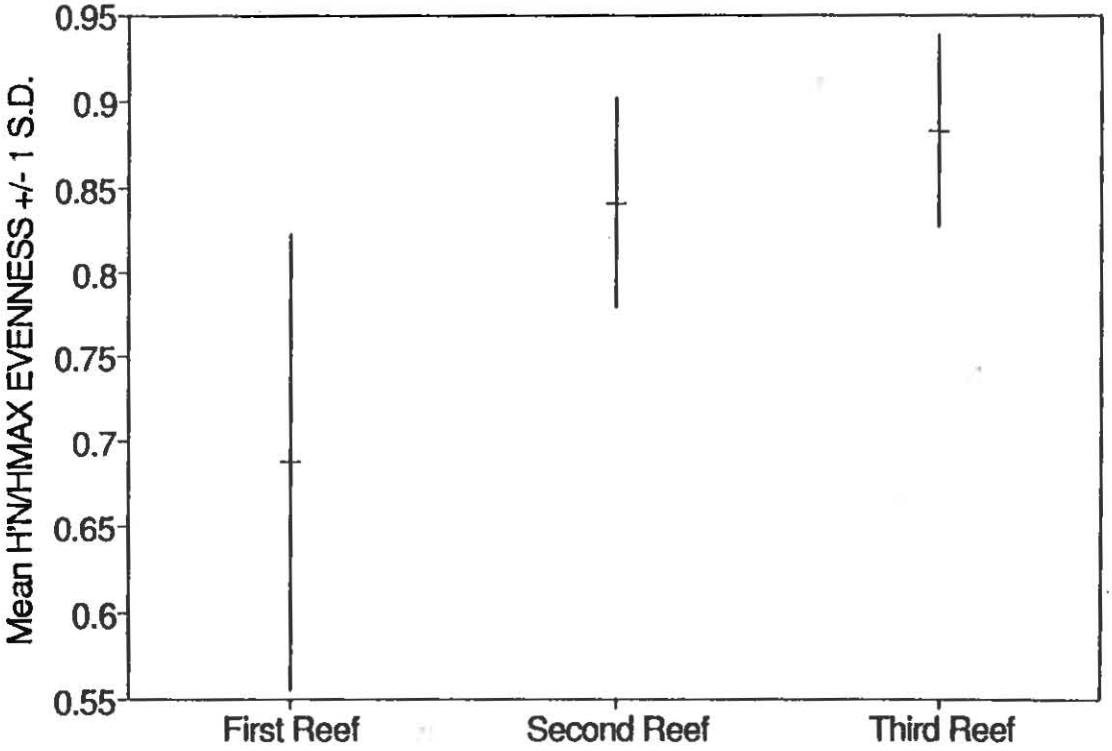
Fig 4e



Mean Coral H'N/HMAX (EVENNESS)

n=5 sites/reef (Preconstruction data)

Fig 4f



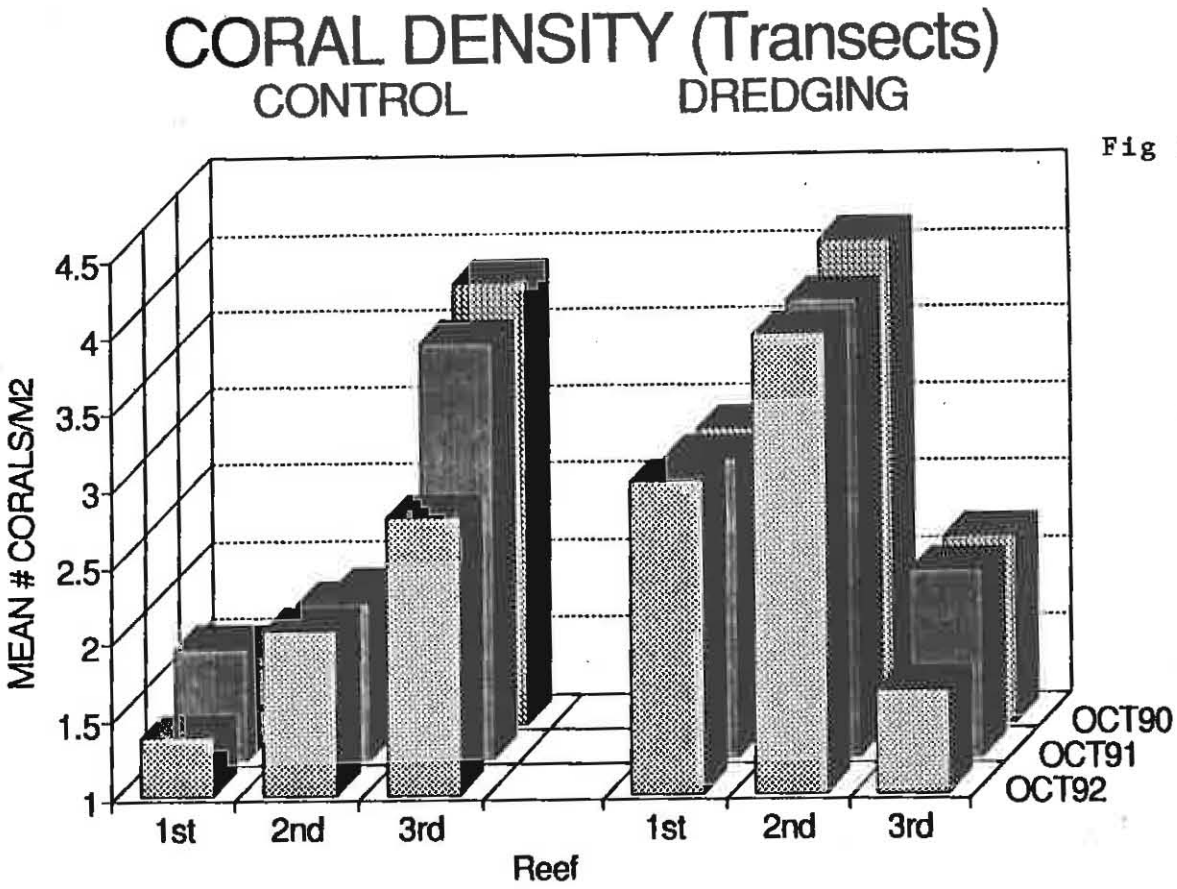

CORAL DENSITY (Transects)
CONTROL
DREDGING
MEAN # CORALS/M2
4.5
4
3.5
3
2.5
2
1.5
1
1st
2nd
3rd
1st
2nd
3rd
Reef
OCT90
OCT91
OCT92

Fig 5a

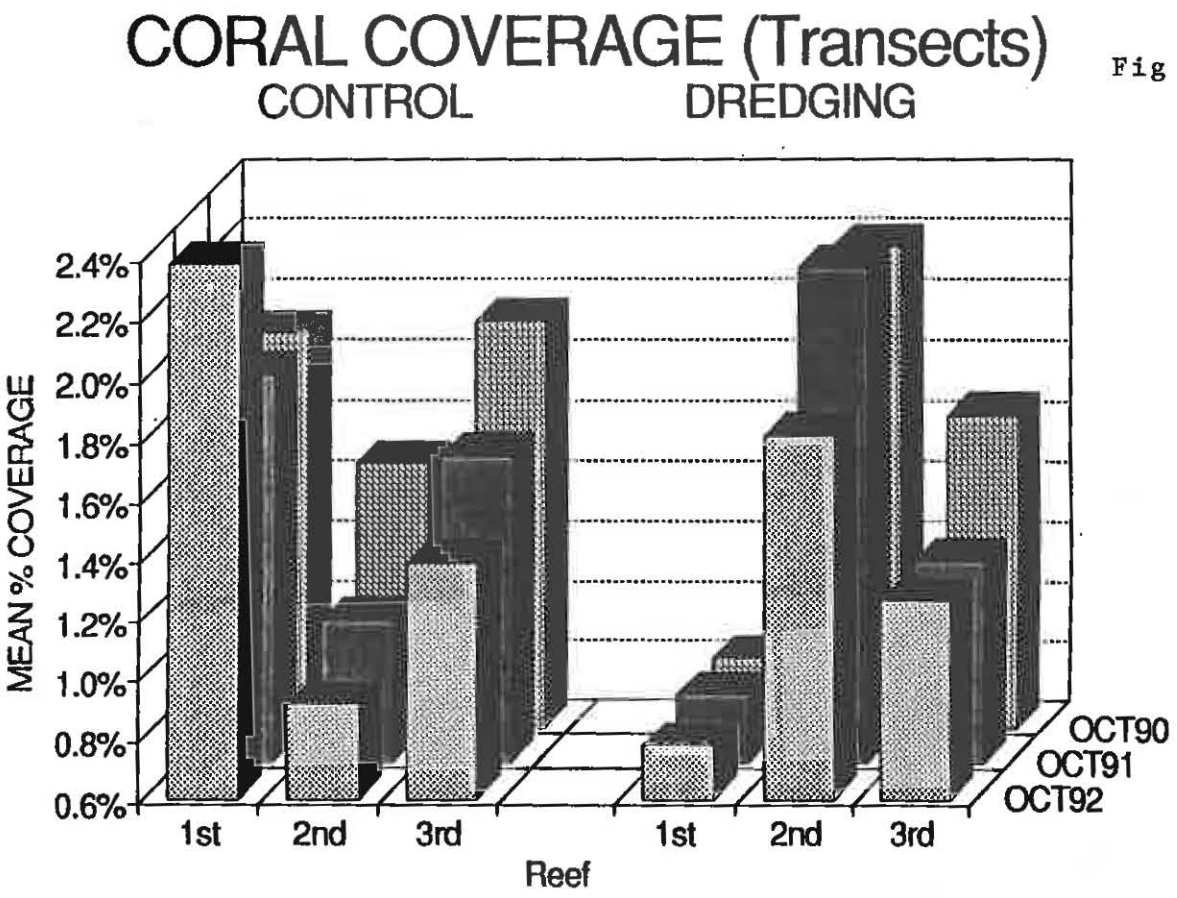
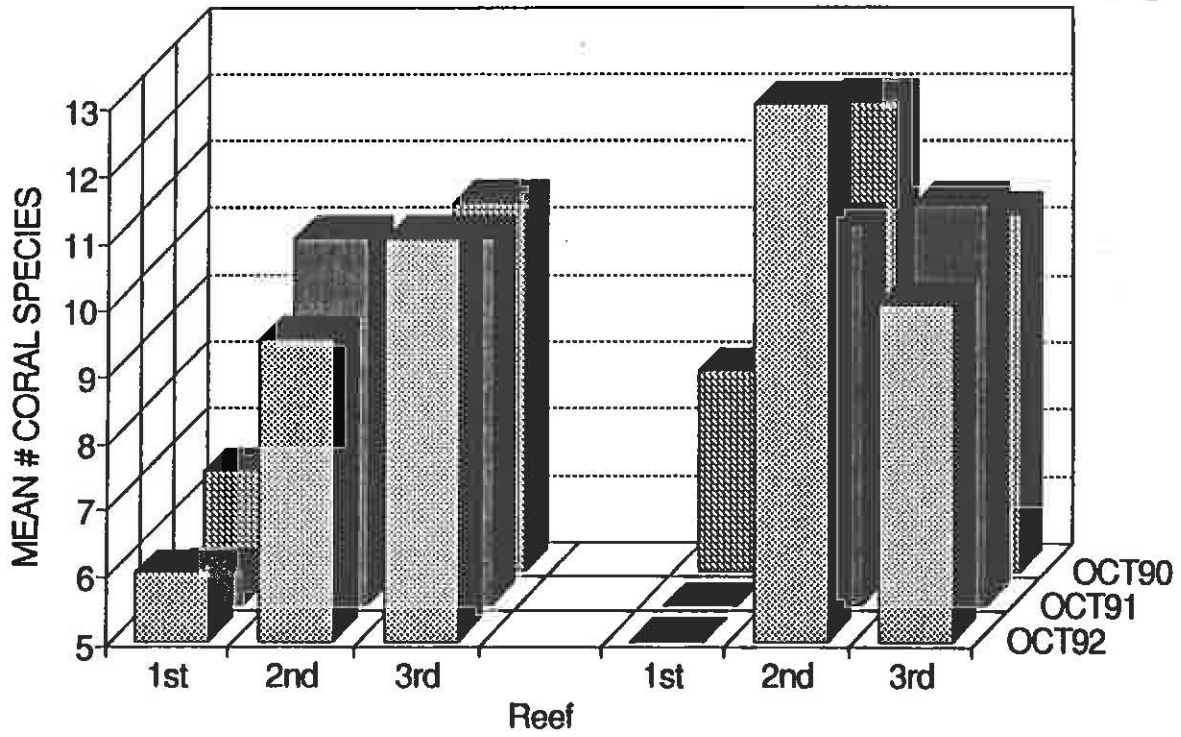

CORAL COVERAGE (Transects)
CONTROL
DREDGING
MEAN % COVERAGE
2.4%
2.2%
2.0%
1.8%
1.6%
1.4%
1.2%
1.0%
0.8%
0.6%
1st
2nd
3rd
1st
2nd
3rd
Reef
OCT90
OCT91
OCT92

Fig 5b

CORAL SPECIES

CONTROL DREDGING

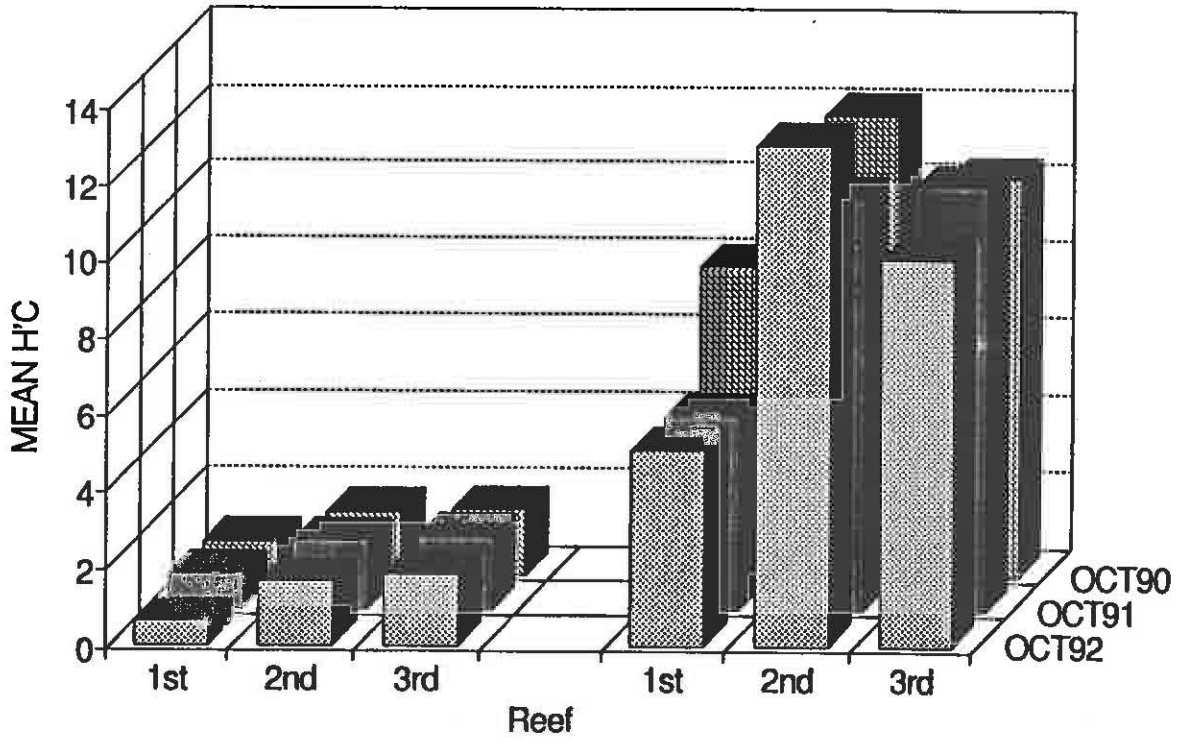
Fig 5c



H'C CORAL DIVERSITY

CONTROL DREDGING

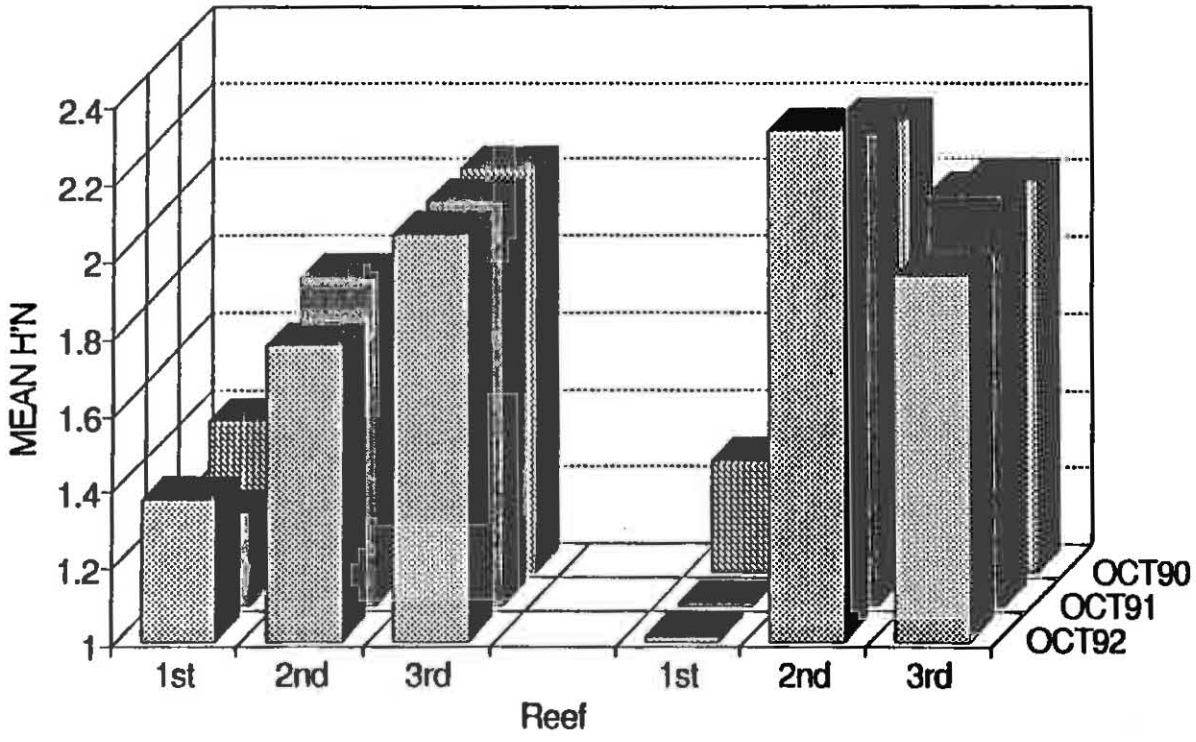
Fig. 5d



H'N CORAL DIVERSITY

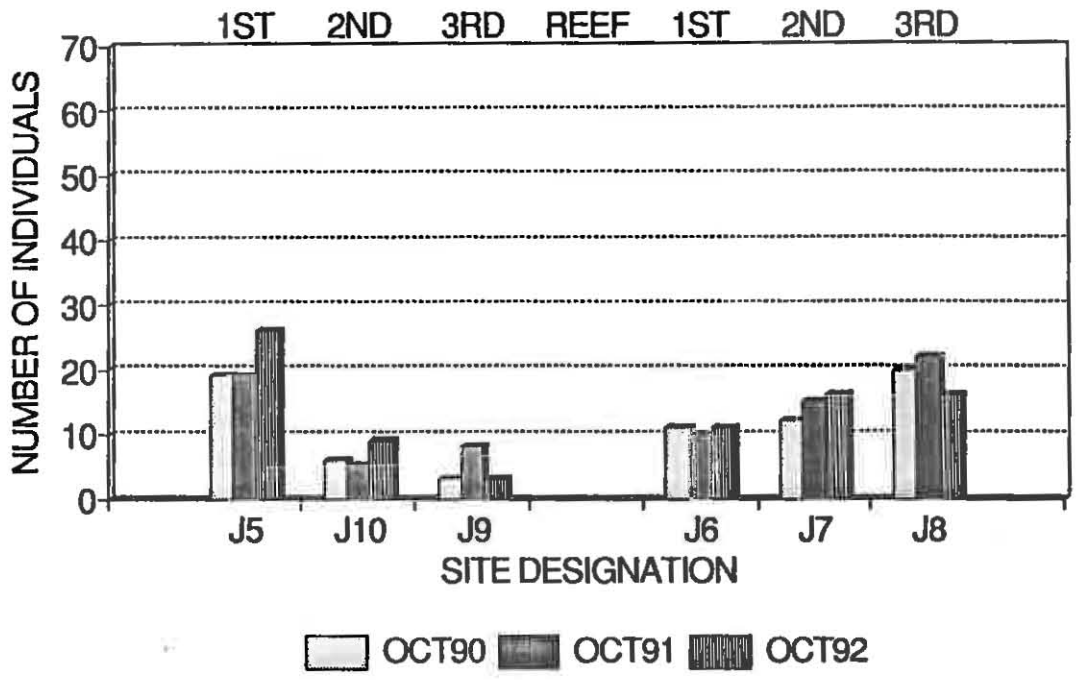
CONTROL DREDGING

Fig 5e



OF GORGONIANS
CONTROL SITES: QUADRATS

Fig. 6a



OF GORGONIANS
DREDGING SITES: QUADRATS

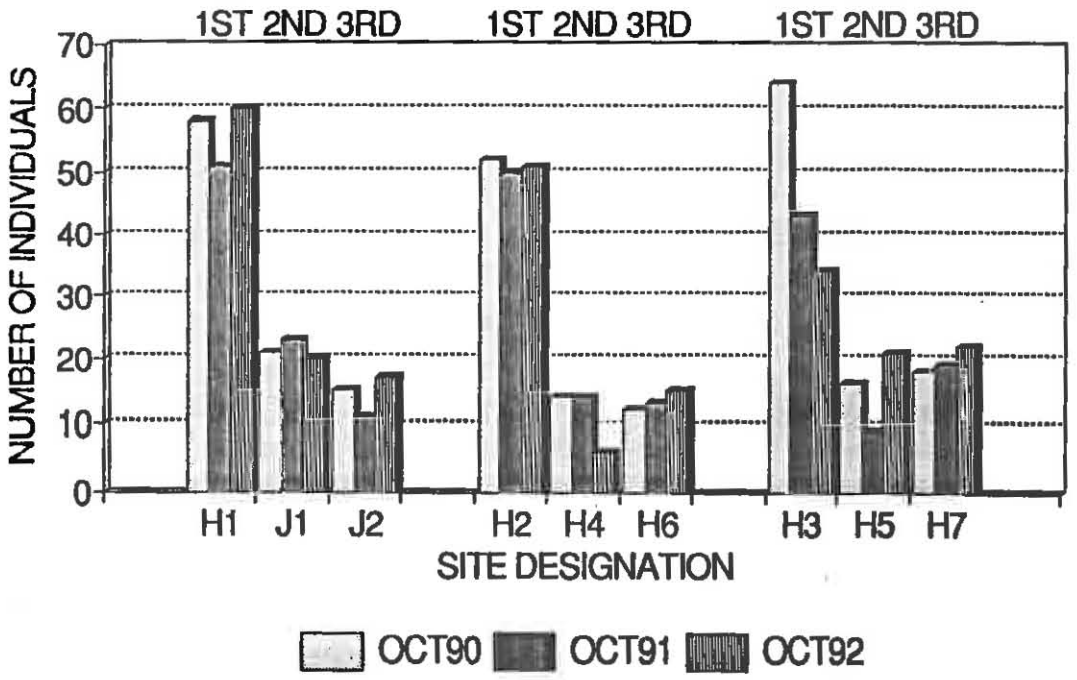
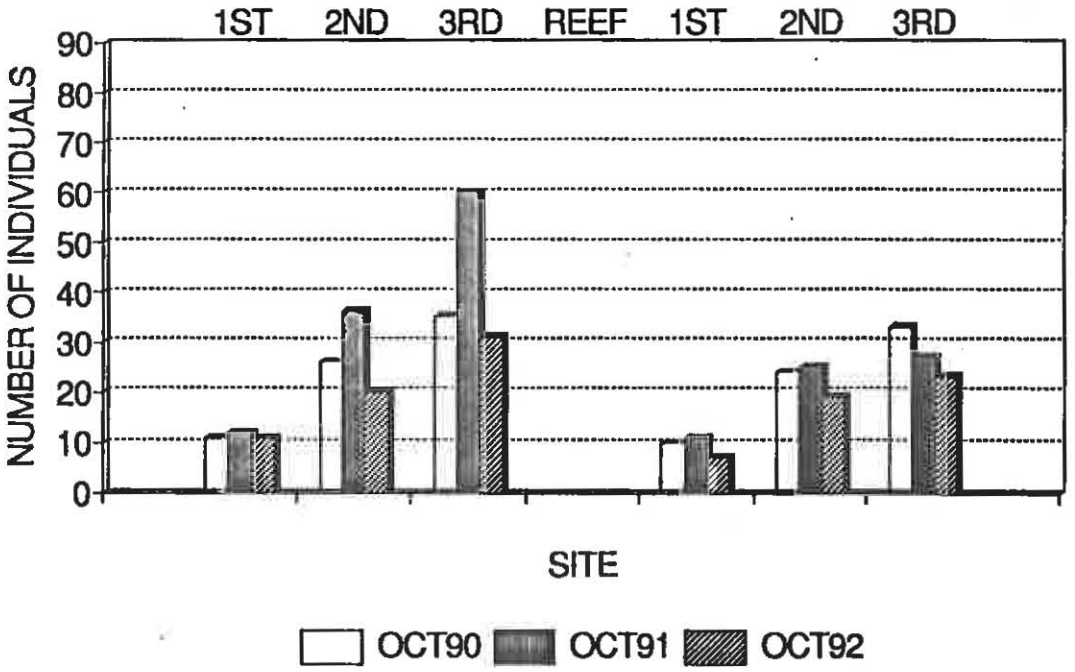
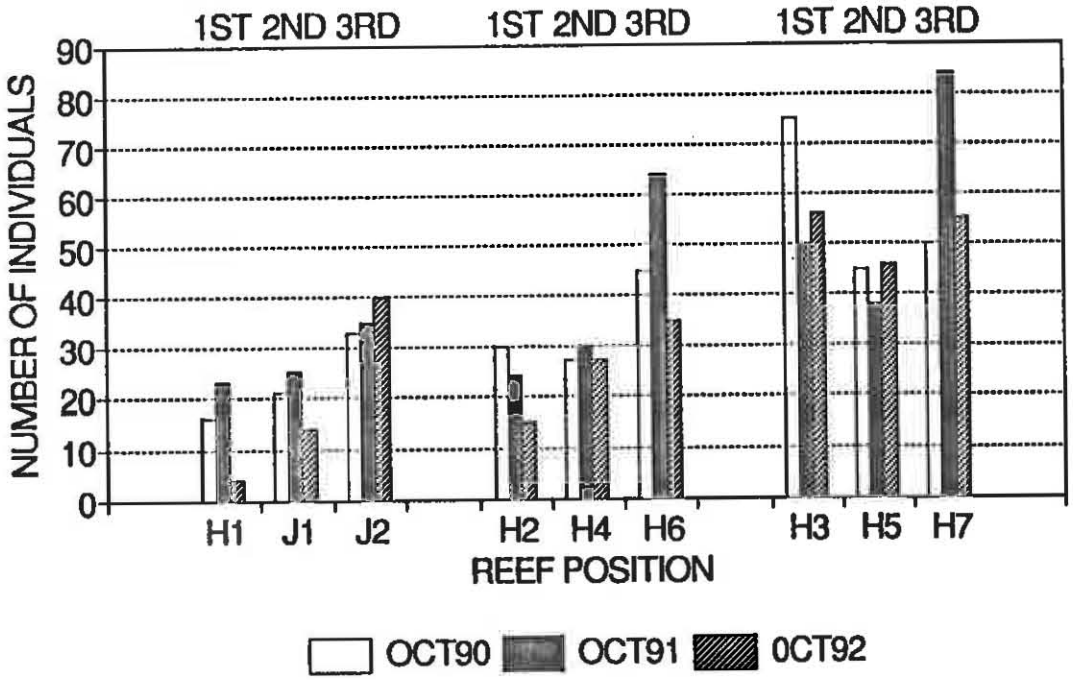


Fig. 6b

SPONGES IN QUADRATS
CONTROL SITES

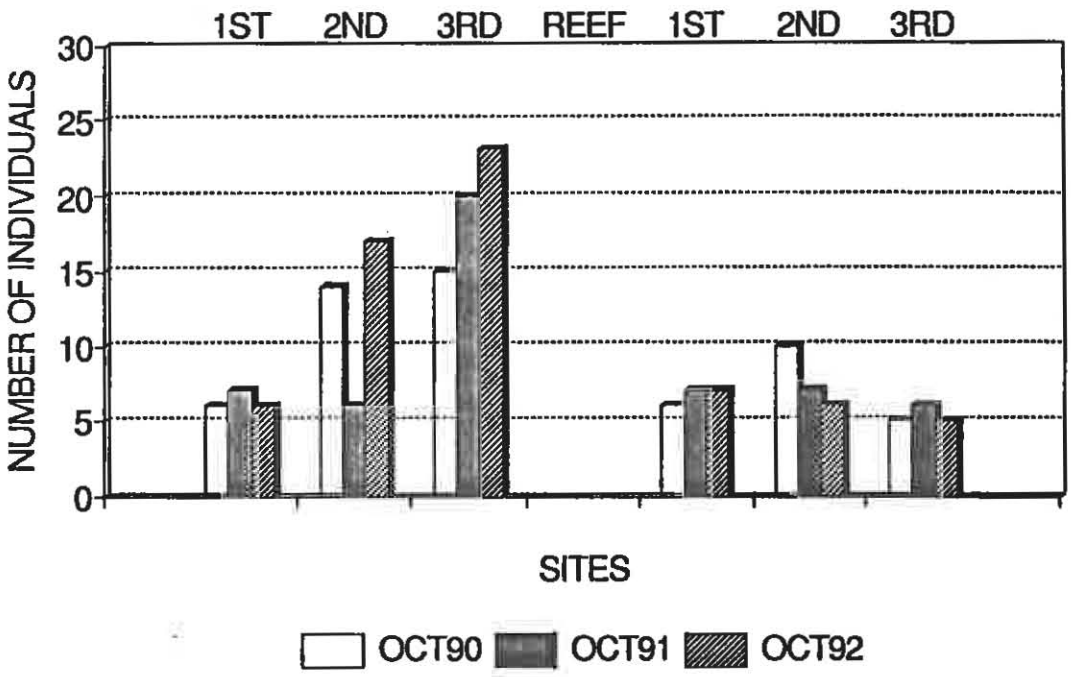


SPONGES IN QUADRATS
DREDGING SITES

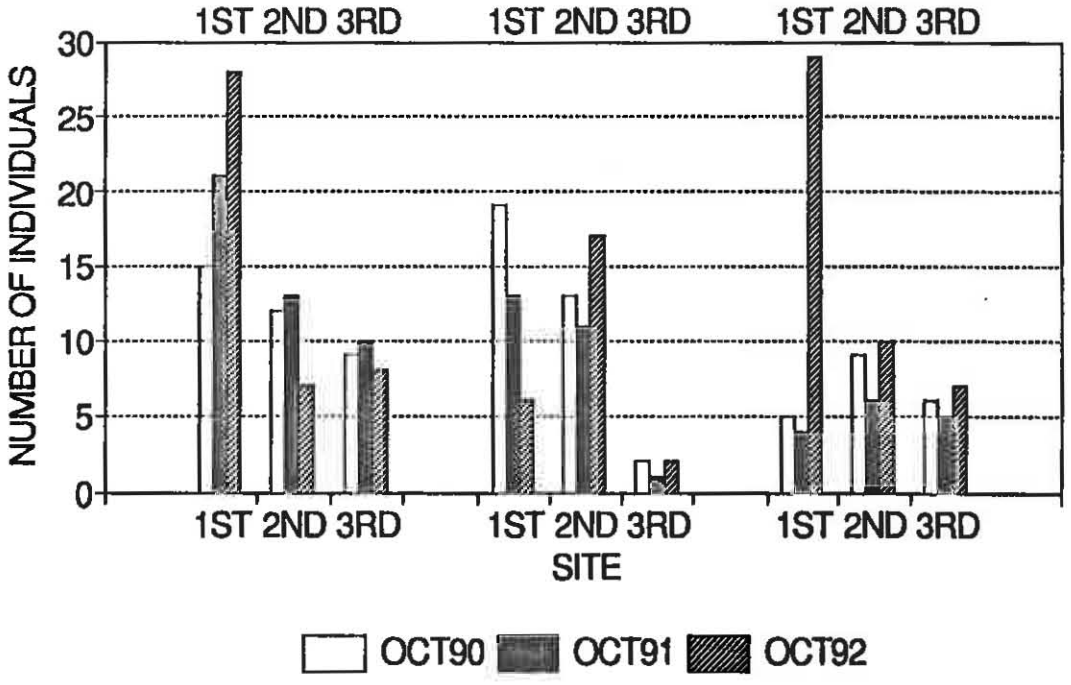


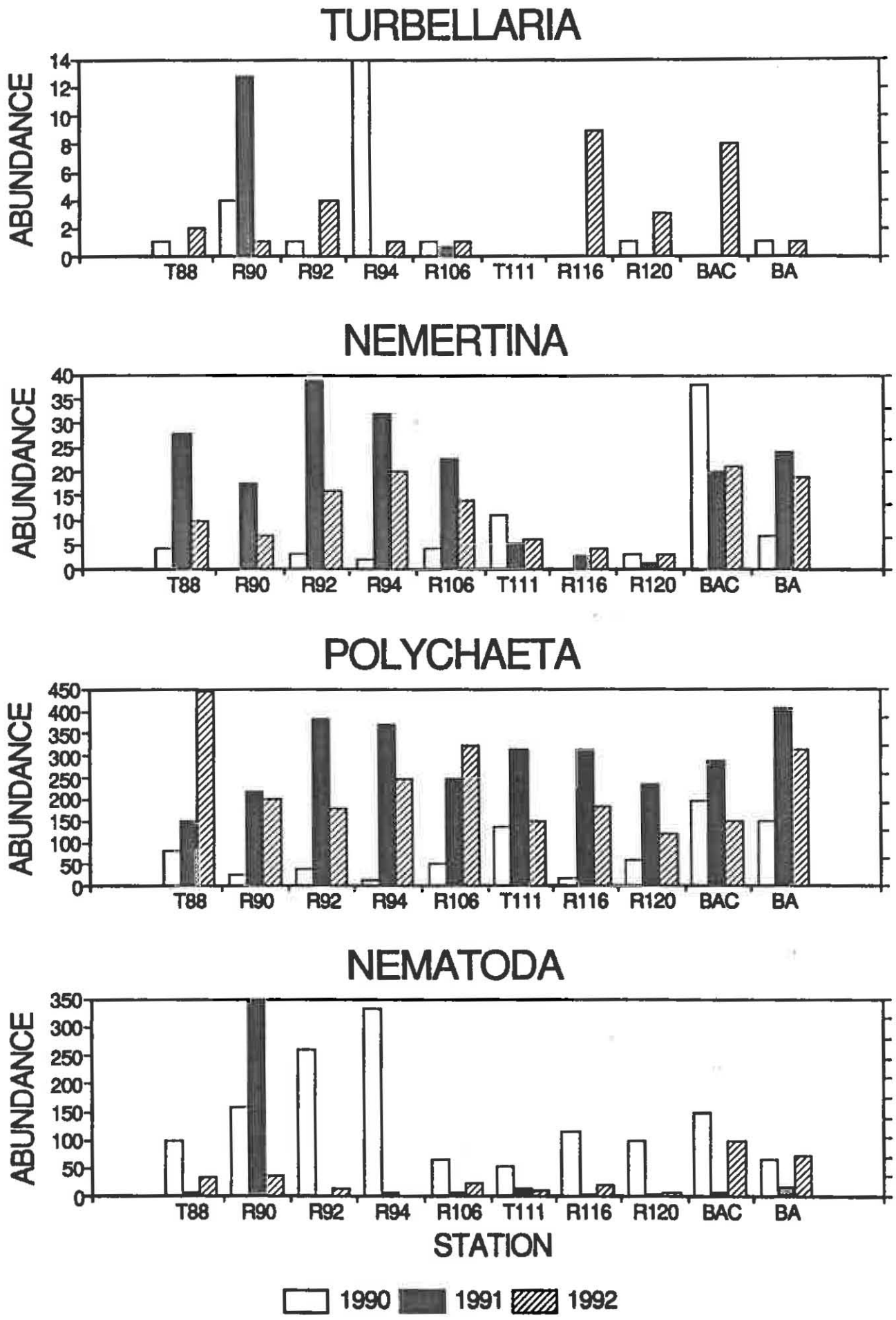
SCLERACTINIANS IN QUADRATS
CONTROL SITES

Fig. 6c



SCLERACTINIANS IN QUADRATS
DREDGING SITES

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4
6
8
10
12
14
T88
R90
R92
R94
R106
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R116
R120
BAC
BA
NEMERTINA
ABUNDANCE
0
5
10
15
20
25
30
35
40
T88
R90
R92
R94
R106
T111
R116
R120
BAC
BA
POLYCHAETA
ABUNDANCE
0
50
100
150
200
250
300
350
400
450
T88
R90
R92
R94
R106
T111
R116
R120
BAC
BA
NEMATODA
ABUNDANCE
0
50
100
150
200
250
300
350
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R90
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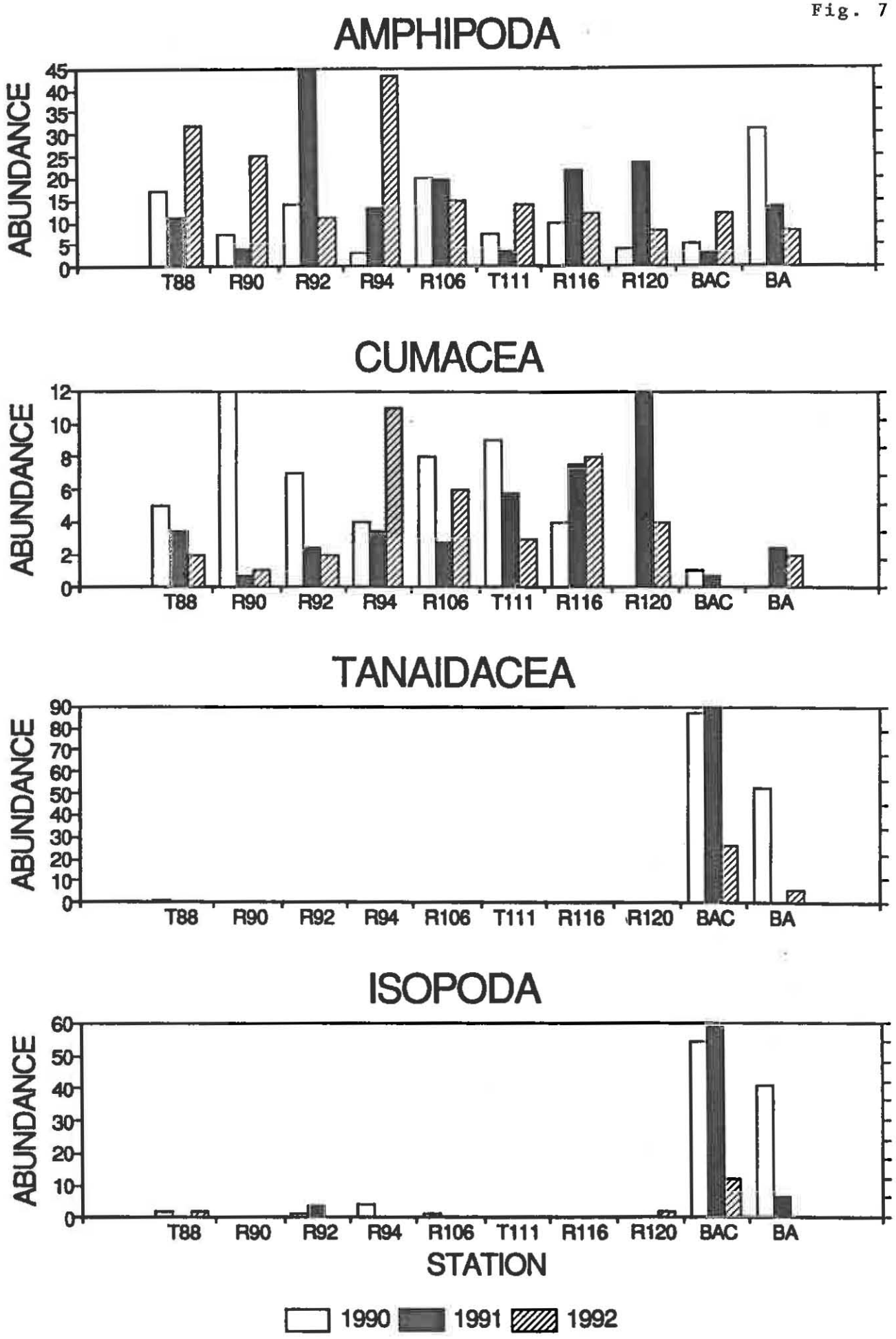
R120
BAC
BA
STATION
1990
1991
1992

Fig. 7 cont.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T111
R116
R120
BAC
BA
CUMACEA
ABUNDANCE
0
2
4
6
8
10
12
T88
R90
R92
R94
R106
T111
R116
R120
BAC
BA
TANAIDACEA
ABUNDANCE
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20
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40
50
60
70
80
90
T88
R90
R92
R94
R106
T111
R116
R120
BAC
BA
ISOPODA
ABUNDANCE
0
10
20
30
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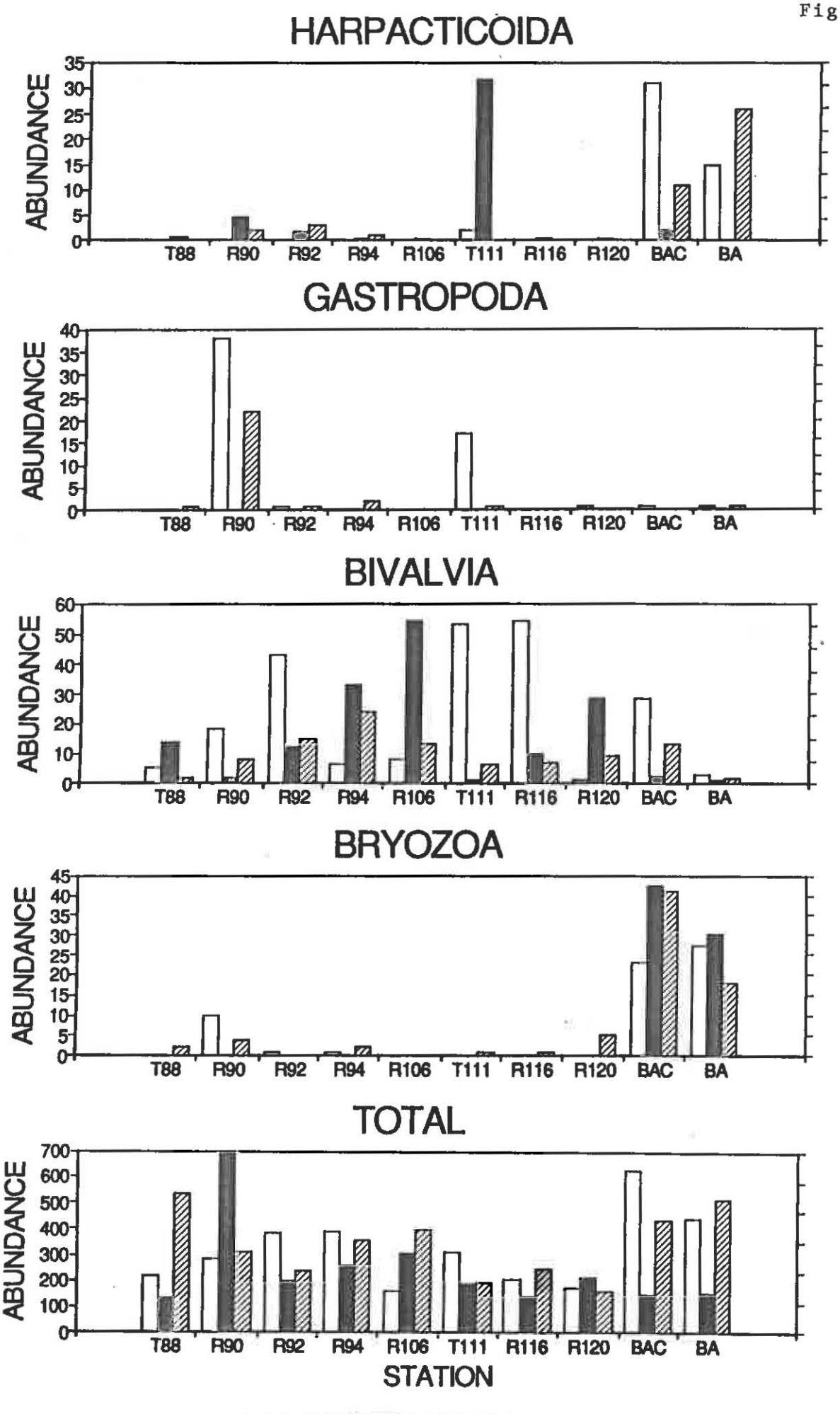
STATION
1990
1991
1992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35
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R90
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T111
R116
R120
BAC
BA
GASTROPODA
ABUNDANCE
0
5
10
15
20
25
30
35
40
T88
R90
R92
R94
R106
T111
R116
R120
BAC
BA
BIVALVIA
ABUNDANCE
0
10
20
30
40
50
60
T88
R90
R92
R94
R106
T111
R116
R120
BAC
BA
BRYOZOA
ABUNDANCE
0
5
10
15
20
25
30
35
40
45
T88
R90
R92
R94
R106
T111
R116
R120
BAC
BA
TOTAL
ABUNDANCE
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200
300
400
500
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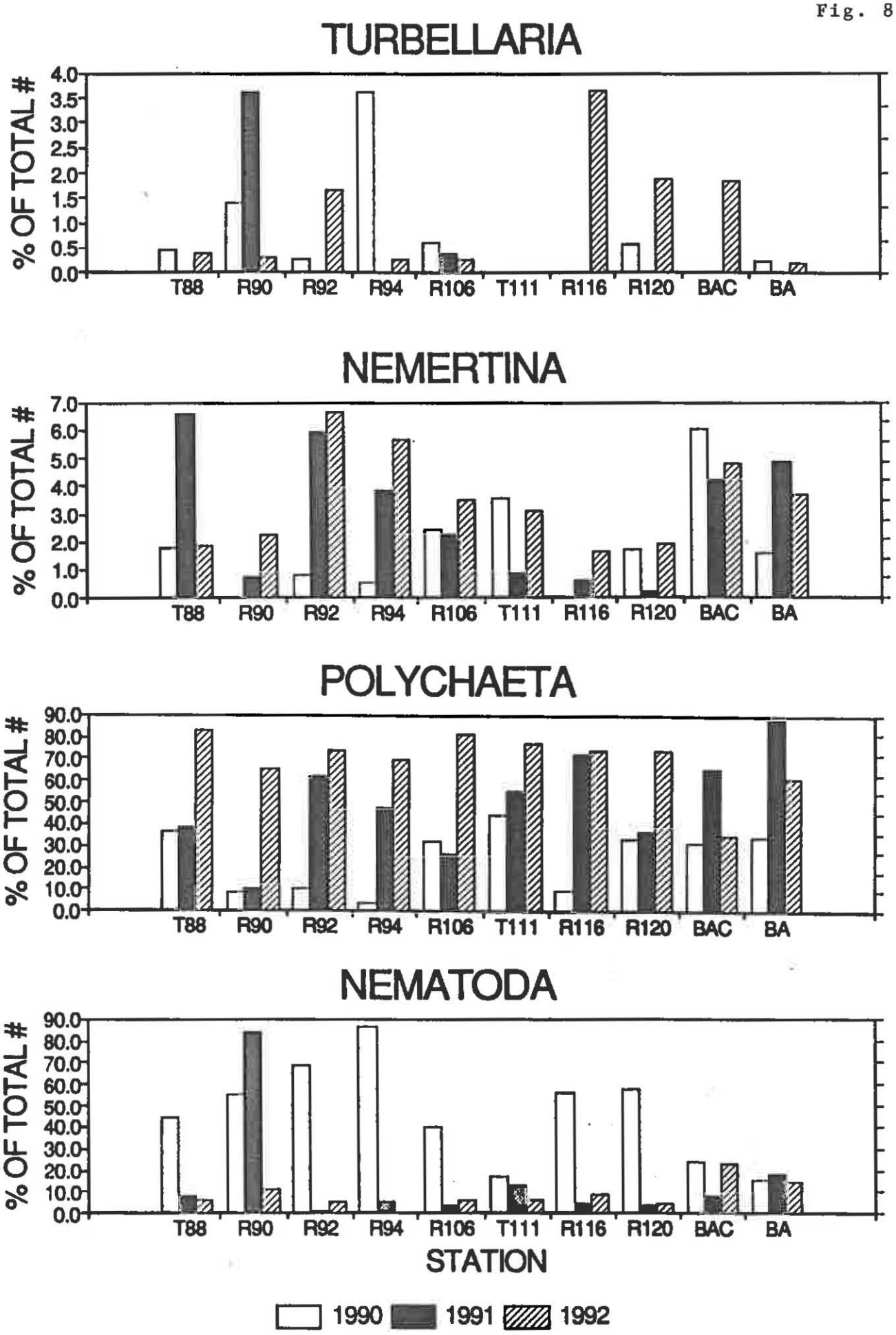
R90
R92
R94
R106
T111
R116
R120
BAC
BA
STATION
1990
1991
1992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% OF TOTAL #
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3.0
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1.5
1.0
0.5
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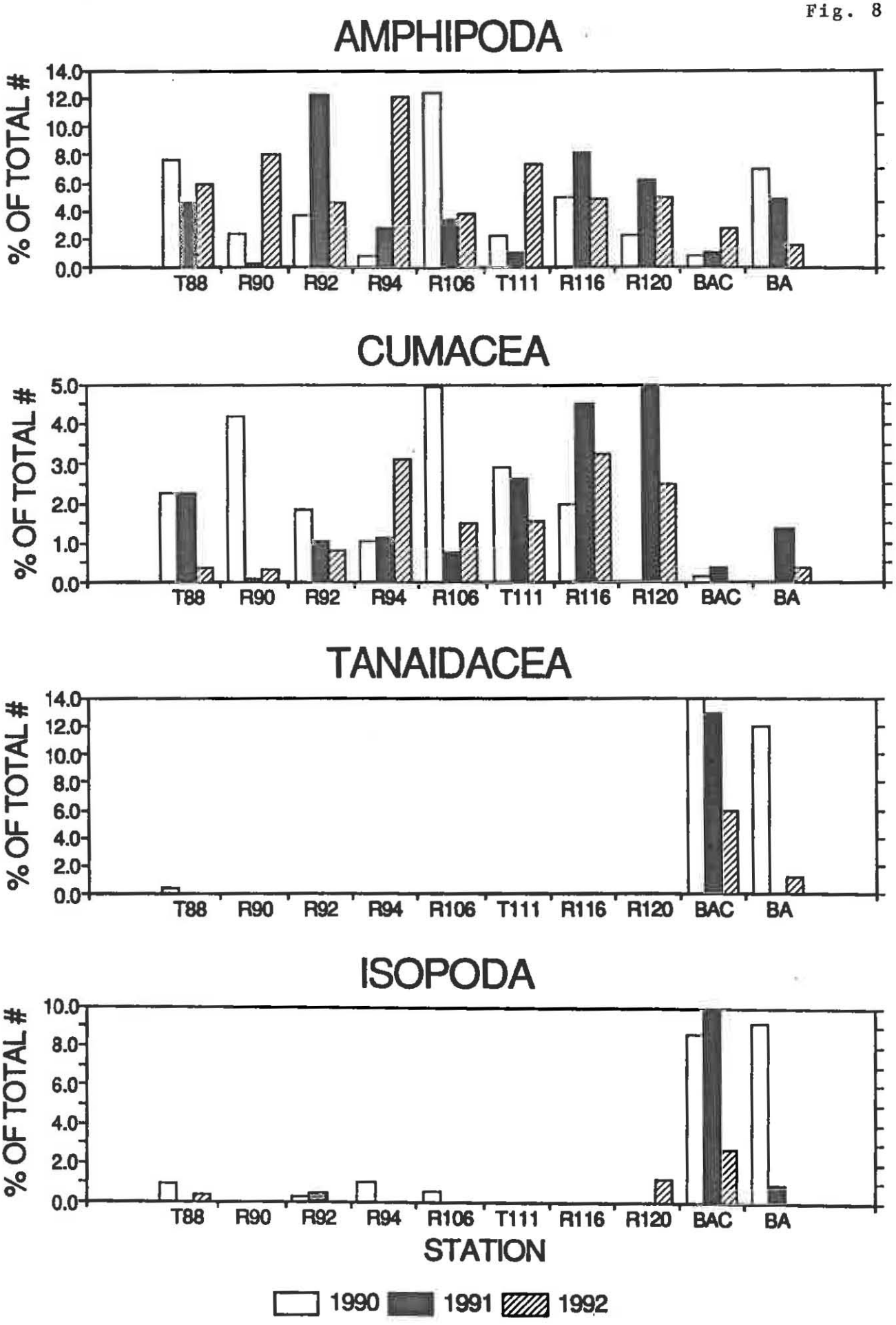
T88 R90 R92 R94 R106 T111 R116 R120 BAC BA
NEMERTINA
% OF TOTAL #
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
T88 R90 R92 R94 R106 T111 R116 R120 BAC BA
POLYCHAETA
% OF TOTAL #
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
T88 R90 R92 R94 R106 T111 R116 R120 BAC BA
NEMATODA
% OF TOTAL #
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
T88 R90 R92 R94 R106 T111 R116 R120 BAC BA
STATION
1990 1991 1992


AMPHIPODA
% OF TOTAL #
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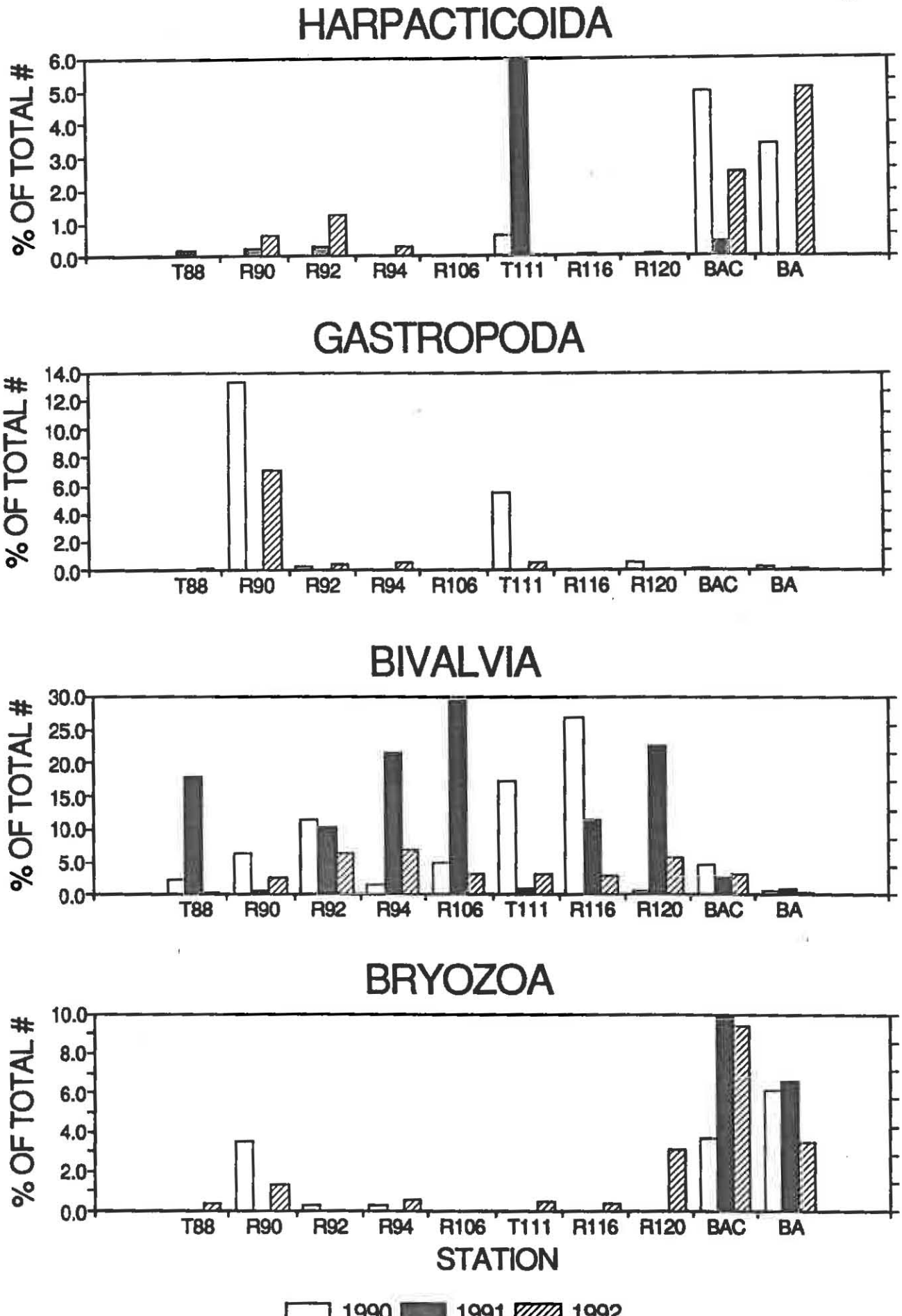
10.0
8.0
6.0
4.0
2.0
0.0
T88 R90 R92 R94 R106 T111 R116 R120 BAC BA
CUMACEA
% OF TOTAL #
5.0
4.0
3.0
2.0
1.0
0.0
T88 R90 R92 R94 R106 T111 R116 R120 BAC BA
TANAIDACEA
% OF TOTAL #
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
T88 R90 R92 R94 R106 T111 R116 R120 BAC BA
ISOPODA
% OF TOTAL #
10.0
8.0
6.0
4.0
2.0
0.0
T88 R90 R92 R94 R106 T111 R116 R120 BAC BA
STATION
1990 1991 1992


HARPACTICOIDA
% OF TOTAL #
6.0
5.0
4.0
3.0
2.0
1.0
0.0
T88 R90 R92 R94 R106 T111 R116 R120 BAC BA
GASTROPODA
% OF TOTAL #
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
T88 R90 R92 R94 R106 T111 R116 R120 BAC BA
BIVALVIA
% OF TOTAL #
30.0
25.0
20.0
15.0
10.0
5.0
0.0
T88 R90 R92 R94 R106 T111 R116 R120 BAC BA
BRYOZOA
% OF TOTAL #
10.0
8.0
6.0
4.0
2.0
0.0
T88 R90 R92 R94 R106 T111 R116 R120 BAC BA
STATION
1990 1991 1992

APPENDIX 1

BELT QUADRAT TRANSECT DATA

Table 1-1: Site population parameters for pre-construction and post-construction assessments. (6pp)

a: Pre-construction Data Summary, Control Reefs

b: Pre-construction Data Summary, Dredged Reefs

c: First Post-construction Data Summary, Control Reefs

d: First Post-construction Data Summary, Dredged Reefs

e: Second Post-construction Data Summary, Control Reefs

f: Second Post-construction Data Summary, Dredged Reefs

Table 1-2: Repeated measures ANOVA results comparing transect parameters between assessment periods, treatment, and reef position.

(2pp)

a: Density,

b: Coverage,

c: Richness,

d: H'C,

e: H'N

Table 1-1a

PRECONSTRUCTION TRANSECT DATA SUMMARY: CONTROL REEFS, OCTOBER, 1990

Reef	1ST	2ND	3RD	1ST	2ND	3RD		
SITE	J5	J10	J9	J6	J7	J8		
DATE	Oct-90	Oct-90	Oct-90	Oct-90	Oct-90	Oct-90		
DEPTH	10'	35'	55'	10'	30'	55'	AVG	SD
TOTAL # CORALS SAMPLED	31	48	183	38	64	49	69	57.0
TOTAL REEF AREA SAMPLED (M2)	30	30	30	30	30	30	30	0.0
TOTAL CORAL COVERAGE (CM2)	5,477	6,046	6,664	6,011	2,879	5,083	5,360	1330
# CORALS/M2	1.0	1.6	6.1	1.3	2.1	1.6	2.3	1.9
% CORAL COVERAGE	1.83%	2.02%	2.22%	2.00%	0.96%	1.69%	1.79%	0.44%
# BLEACHED CORALS	1	8	11	0	10	1	5.2	5.0
% # BLEACHED CORALS	3.2%	16.7%	6.0%	0.0%	15.6%	2.0%	7.3%	7.16%
AREA BLEACHED CORALS (CM2)	0.0	50.3	369.4	50.3	536.6	19.6	171.0	225.5
% AREA BLEACHED CORALS	0.0%	0.8%	5.5%	0.8%	18.6%	0.4%	4.4%	7.28%
DIVERSITY								
# SPECIES	7	8	13	6	9	8	9	2.4
H'C	0.68	1.38	1.83	1.03	1.85	1.52	1.38	0.46
H'N	1.64	1.66	2.09	1.15	1.71	2.01	1.71	0.33
HMAX	1.95	2.08	2.56	1.79	2.20	2.08	2.11	0.26
H'C/HMAX	0.35	0.67	0.71	0.57	0.84	0.73	0.65	0.17
H'N/HMAX	0.84	0.80	0.81	0.64	0.78	0.97	0.81	0.11

Table 1-1b

PRECONSTRUCTION TRANSECT DATA SUMMARY: DREDGING REEFS, OCTOBER, 1990

Reef	1ST	2ND	3RD	1ST	2ND	3RD	1ST	2ND	3RD		
SITE	H1	J1	J2	H2	H4	H6	H3	H5	H7		
DATE	Oct-90	Oct-90	Oct-90	Oct-90	Oct-90	Oct-90	Oct-90	Oct-90	Oct-90		
DEPTH	20'	45'	55'	14'	40'	75'	14'	35'	65'	AVG	SD
TOTAL # CORALS SAMPLED	89	78	74	54	93	28	120	200	95	92.3	48.1
TOTAL REEF AREA SAMPLED (M2)	30	30	30	30	30	30	30	30	30	30	0.0
TOTAL CORAL COVERAGE (CM2)	2,856	3,850	7,656	3,253	9,099	1,746	1,403	6,873	5,449	4,687	2,719.8
# CORALS/M2	3.0	2.6	2.5	1.8	3.1	0.9	4.0	6.7	3.2	3.1	1.6
% CORAL COVERAGE	0.95%	1.28%	2.55%	1.08%	3.03%	0.58%	0.47%	2.29%	1.82%	1.56%	0.91%
# BLEACHED CORALS	5	3	3	1	4	0	0	2	5	2.6	1.9
% # BLEACHED CORALS	5.6%	3.8%	4.1%	1.9%	4.3%	0.0%	0.0%	1.0%	5.3%	2.88%	2.20%
AREA BLEACHED CORALS (CM2)	146.7	289.8	235.5	360.0	186.9	0.0	0.0	59.5	389.2	185.29	146.43
% AREA BLEACHED CORALS	5.1%	7.5%	3.1%	11.1%	2.1%	0.0%	0.0%	0.9%	7.1%	4.10%	3.87%
DIVERSITY											
# SPECIES	11	12	11	4	13	7	9	11	13	10.1	2.98
H'C	2.02	1.94	1.78	0.53	1.86	1.49	1.34	1.92	2.24	1.68	0.51
H'N	1.80	2.18	2.11	1.00	2.11	1.73	1.07	2.23	2.21	1.83	0.48
HMAX	2.40	2.48	2.40	1.39	2.56	1.95	2.20	2.40	2.56	2.26	0.38
H'C/HMAX	0.84	0.78	0.74	0.38	0.73	0.76	0.61	0.80	0.87	0.72	0.15
H'N/HMAX	0.75	0.88	0.88	0.72	0.82	0.89	0.49	0.93	0.86	0.80	0.14

Table 1-1c

FIRST POST CONSTRUCTION TRANSECT DATA SUMMARY: CONTROL REEFS, OCTOBER, 1991

Reef	1ST	2ND	3RD	1ST	2ND	3RD		
SITE	J5	J10	J9	J6	J7	J8		
DATE	Oct-91	Oct-91	Oct-91	Oct-91	Oct-91	Oct-91		
DEPTH	10'	35'	55'	10'	30'	55'	avg	SD
TOTAL # CORALS SAMPLED	50	56	169	53	64	53	74	46.7
TOTAL REEF AREA SAMPLED (M2)	30	30	30	30	30	30	30	0.0
TOTAL CORAL COVERAGE (CM2)	4,868	3,918	5,812	6,506	2,549	3,954	4,601	1433
# CORALS/M2	1.7	1.9	5.6	1.8	2.1	1.8	2.5	1.6
% CORAL COVERAGE	1.62%	1.31%	1.94%	2.17%	0.85%	1.32%	1.53%	0.48%
# BLEACHED CORALS	0	9	12	0	3	3	4.5	4.9
% # BLEACHED CORALS	0.0%	16.1%	7.1%	0.0%	4.7%	5.7%	5.6%	5.92%
AREA BLEACHED CORALS (CM2)	0.0	557.4	336.2	0.0	329.9	180.6	234.0	217.5
% AREA BLEACHED CORALS	0.0%	14.2%	5.8%	0.0%	12.9%	4.6%	6.3%	6.16%
DIVERSITY								
# SPECIES	6	10	12	5	11	9	9	2.8
H'C	1.07	1.63	1.83	0.80	1.94	1.94	1.53	0.49
H'N	1.44	1.80	2.05	1.04	1.91	2.06	1.72	0.40
HMAX	1.79	2.30	2.48	1.61	2.40	2.20	2.13	0.35
H'C/HMAX	0.59	0.71	0.74	0.49	0.81	0.88	0.70	0.14
H'N/HMAX	0.81	0.78	0.83	0.65	0.80	0.94	0.80	0.09

Table 1-1d

FIRST POST CONSTRUCTION TRANSECT DATA SUMMARY: DREDGING REEFS, OCTOBER, 1991

Reef	1ST	2ND	3RD	1ST	2ND	3RD	1ST	2ND	3RD		
SITE	HH1	JUL1	JUL2	HH2	HH4	HH6	HH3	HH5	HH7		
DATE	Oct-91	Oct-91	Oct-91	Oct-91	Oct-91	Oct-91	Oct-91	Oct-91	Oct-91		
DEPTH	20'	45'	55'	14'	40'	75'	14'	35'	65'	AVG	SD
TOTAL # CORALS SAMPLED	63	104	95	108	95	33	93	158	70	91.0	34.6
TOTAL REEF AREA SAMPLED (M2)	30	30	30	30	30	30	30	30	30	30	0.0
TOTAL CORAL COVERAGE (CM2)	2,987	4,815	6,091	2,896	8,896	1,362	1,568	6,532	4,067	4,357	2,484.8
# CORALS/M2	2.1	3.5	3.2	3.6	3.2	1.1	3.1	5.3	2.3	3.0	1.2
% CORAL COVERAGE	1.00%	1.61%	2.03%	0.97%	2.97%	0.45%	0.52%	2.18%	1.36%	1.45%	0.83%
# BLEACHED CORALS	2	5	1	3	2	1	1	10	0	2.8	3.1
% # BLEACHED CORALS	3.2%	4.8%	1.1%	2.8%	2.1%	3.0%	1.1%	6.3%	0.0%	2.71%	1.97%
AREA BLEACHED CORALS (CM2)	6.3	625.2	113.1	7.1	35.3	38.5	3.1	310.09	0.0	126.52	211.70
% AREA BLEACHED CORALS	0.2%	13.0%	1.9%	0.2%	0.4%	2.8%	0.2%	4.7%	0.0%	2.61%	4.21%
DIVERSITY											
# SPECIES	9	8	13	3	12	8	3	12	12	8.9	3.82
H'C	1.84	1.96	1.87	0.40	1.78	1.82	0.60	1.68	2.04	1.55	0.61
H'N	1.74	1.95	2.15	0.68	2.13	1.90	0.60	2.61	2.17	1.77	0.68
HMAX	2.20	2.08	2.56	1.10	2.48	2.08	1.10	2.48	2.48	2.06	0.58
H'C/HMAX	0.84	0.94	0.73	0.36	0.72	0.88	0.55	0.68	0.82	0.72	0.18
H'N/HMAX	0.79	0.94	0.84	0.62	0.86	0.91	0.55	1.05	0.87	0.83	0.16

Table 1-1e

SECOND POST CONSTRUCTION TRANSECT DATA SUMMARY: CONTROL REEFS, OCTOBER, 1992

Reef	1ST	2ND	3RD	REE 1ST	2ND	3RD		
SITE	J5	J10	J9	J6	J7	J8		
DATE	Oct-92	Oct-92	Oct-92	Oct-92	Oct-92	Oct-92		
DEPTH	10'	35'	55'	10'	30'	55'	avg	SD
TOTAL # CORALS SAMPLED	39	48	99	43	75	68	62	23.1
TOTAL REEF AREA SAMPLED (M2)	30	30	30	30	30	30	30	0.0
TOTAL CORAL COVERAGE (CM2)	8,838	2,460	2,717	5,431	2,988	5,614	4,675	2465
# CORALS/M2	1.3	1.6	3.3	1.4	2.5	2.3	2.1	0.8
% CORAL COVERAGE	2.95%	0.82%	0.91%	1.81%	1.00%	1.87%	1.56%	0.82%
# BLEACHED CORALS	0	2	1	0	0	5	1.3	2.0
% # BLEACHED CORALS	0.0%	4.2%	1.0%	0.0%	0.0%	7.4%	2.1%	3.04%
AREA BLEACHED CORALS (CM2)	0.0	43.1	38.5	0.0	0.0	45.6	21.2	23.3
% AREA BLEACHED CORALS	0.0%	1.8%	1.4%	0.0%	0.0%	0.8%	0.7%	0.79%
DIVERSITY								
# SPECIES	7	9	10	5	10	12	9	2.5
H'C	0.38	1.37	1.78	0.77	1.89	1.85	1.34	0.63
H'N	1.78	1.77	2.00	0.96	1.77	2.12	1.73	0.41
HMAX	1.95	2.20	2.30	1.61	2.30	2.48	2.14	0.31
H'C/HMAX	0.20	0.62	0.77	0.48	0.82	0.74	0.61	0.24
H'N/HMAX	0.91	0.81	0.87	0.59	0.77	0.85	0.80	0.11

Table 1-1f

SECOND POST CONSTRUCTION TRANSECT DATA SUMMARY: DREDGING REEFS, OCTOBER, 1992

Reef	1ST	2ND	3RD	1ST	2ND	3RD	1ST	2ND	3RD		
SITE	HH1	JUL1	JUL2	HH2	HH4	HH6	HH3	HH5	HH7		
DATE	Oct-92	Oct-92	Oct-92	Oct-92	Oct-92	Oct-92	Oct-92	Oct-92	Oct-92		
DEPTH	20'	45'	55'	14'	40'	75'	14'	35'	65'	AVG	SD
TOTAL # CORALS SAMPLED	84	74	69	90	93	20	97	190	60	86.3	45.4
TOTAL REEF AREA SAMPLED (M2)	30	30	30	30	30	30	30	30	30	30	0.0
TOTAL CORAL COVERAGE (CM2)	2,571	2,735	6,676	2,971	5,726	1,390	1,432	7,841	3,278	3,847	2327
# CORALS/M2	2.8	2.5	2.3	3.0	3.1	0.7	3.2	6.3	2.0	2.9	1.5
% CORAL COVERAGE	0.86%	0.91%	2.23%	0.99%	1.91%	0.46%	0.48%	2.61%	1.09%	1.28%	0.78%
# BLEACHED CORALS	3	2	4	2	3	1	2	1	0	2.0	1.2
% # BLEACHED CORALS	3.6%	2.7%	5.8%	2.2%	3.2%	5.0%	2.1%	0.5%	0.0%	2.79%	1.89%
AREA BLEACHED CORALS (CM2)	60.3	148.8	1166.3	22.8	180.6	19.6	81.7	19.63	0.0	188.87	371.76
% AREA BLEACHED CORALS	2.3%	5.4%	17.5%	0.8%	3.2%	1.4%	5.7%	0.3%	0.0%	4.06%	5.44%
DIVERSITY											
# SPECIES	8	13	12	3	15	4	4	11	14	9.3	4.69
H'C	1.66	2.21	1.80	0.42	1.78	1.08	0.54	1.48	1.93	1.43	0.62
H'N	1.72	2.21	2.24	0.67	2.28	1.32	0.64	2.51	2.29	1.76	0.72
HMAX	2.08	2.56	2.48	1.10	2.71	1.39	1.39	2.40	2.64	2.08	0.63
H'C/HMAX	0.80	0.86	0.72	0.38	0.66	0.78	0.39	0.62	0.73	0.66	0.17
H'N/HMAX	0.83	0.86	0.90	0.61	0.84	0.95	0.46	1.05	0.87	0.82	0.18

Table 1-2

a) DENSITY (TRANSECTS)

css/3: Summary of all Effects; design: ANOVA
1-TREATMEN, 2-TIME, 3-REEF

Effect	df Effect	MS Effect	df Error	MS Error	F	p-level
1	1	5.57570	3	5.871193	.949671	.401677
2	2	.30937	6	.651749	.474677	.643606
3	2	2.47209	6	3.946399	.626416	.566149
12	2	.06759	6	.651749	.103710	.903068
13	2	12.75046	6	3.946399	3.230909	.111612
23	4	.37309	12	.366029	1.019282	.436025
123	4	.08435	12	.366029	.230435	.915985

*Marked effects significant at p .0500

b) COVERAGE (TRANSECTS)

css/3: Summary of all Effects; design: ANOVA
1-TREATMEN, 2-TIME, 3-REEF

Effect	df Effect	MS Effect	df Error	MS Error	F	p-level
1	1	.000041	3	.000009	4.697305	.118754
2	2	.000025	6	.000005	4.899235	.054778
3	2	.000012	6	.000140	.088139	.916798
12	2	.000004	6	.000005	.726353	.521809
13	2	.000429	6	.000140	3.065576	.120990
23	4	.000020	12	.000022	.944631	.471537
123	4	.000008	12	.000022	.360482	.831995

*Marked effects significant at p .0500

c) SPECIES RICHNESS (TRANSECTS)

css/3: Summary of all Effects; design: ANOVA
1-TREATMEN, 2-TIME, 3-REEF

Effect	df Effect	MS Effect	df Error	MS Error	F	p-level
1	1	5.6333	3	16.31482	.345289	.598092
2	2	.7111	6	1.00000	.711111	.528265
*3	2	102.7444	6	17.38889	5.908626	.038188
12	2	2.3111	6	1.00000	2.311111	.180222
13	2	7.5444	6	17.38889	.433866	.666828
23	4	3.1889	12	3.12963	1.018935	.436184
123	4	2.4556	12	3.12963	.784615	.556674

*Marked effects significant at p .0500

d) H'C (TRANSECTS)

css/3: Summary of all Effects; design: ANOVA
1-TREATMEN, 2-TIME, 3-REEF

Effect	df Effect	MS Effect	df Error	MS Error	F	p-level
1	1	.206108	3	.699379	.29470	.624959
2	2	.111168	6	.053917	2.06184	.208180
*3	2	3.568234	6	.342428	10.42039	.011170
12	2	.074327	6	.053917	1.37855	.321641
13	2	.064282	6	.342428	.18772	.833530
23	4	.046204	12	.029347	1.57437	.243878
123	4	.023582	12	.029347	.80356	.545947

*Marked effects significant at p .0500

e) H'N (TRANSECTS)

css/3: Summary of all Effects; design: ANOVA
1-TREATMEN, 2-TIME, 3-REEF

Effect	df Effect	MS Effect	df Error	MS Error	F	p-level
1	1	.048106	3	.384767	.125027	.747034
2	2	.002492	6	.012655	.196896	.826377
*3	2	3.086655	6	.340797	9.057177	.015404
12	2	.007094	6	.012655	.560584	.598136
13	2	.480531	6	.340797	1.410022	.314805
23	4	.042344	12	.025250	1.676993	.219496
123	4	.013718	12	.025250	.543296	.707263

*Marked effects significant at p .0500

APPENDIX 2

QUADRAT DATA

Appendix 2: Quadrat Data

Tables 2-1 Macroepibenthos abundances for each station for the pre-construction sampling period. (26pp)

Table 2-2: Cumulative species list: Hollywood/Hallandale. (3pp)

Table 2-3: Summary of variations in quadrat abundance. (1pp)

Table 2-4: Repeated measures ANOVA results comparing Quadrat abundances of various organisms between assessment periods, treatment, and reef position. (1pp)

a: Gorgonians,

b: Scleractinians,

c: Sponges

Table 2-1

STATION HH 1 20 feet	1990	1991	1992
Phylum Porifera	16+	23	28
Class Demospongia			
Order Keratosa			
Family Spongiidae			
Ircinia felix	2	1	0
Ircinia campana	2	1	0
Family Dysideidae			
Dysidea etheria	0	1	0
Order Haplosclerida			
Family Haliclonidae			
Haliclona compressa	1	1	2
Niphates erecta	0	1	0
Order Poecilosclerida			
Family Esperiopsidae			
Desmapsamma anchorata	0	1	1
Family Mycalidae			
Ulosa reutzleri	0	3	0
Order Hadromerida			
Family Spirastrellidae			
Anthosigmella varians	3	5	7
Order Axinellida			
Family Axinellidae			
Teichaxinella morchella	0	3	2
Pseudaxinella lunaecharta	0	0	2
Order Choristida			
Family Craniellidae			
Cinachyra alloclada	7	5	12
Family Chondrillidae			
Chondrosia reniformis	N	1a	2
Phylum Coelenterata			
Class Anthozoa			
Order Gorgonacea	58+	51	60
Family Briaeridae			
Briareum asbestinum	N	1	1
Family Plexauridae			
Eunicea succinea	10	10	20
Eunicea sp.	6	8	3
Muricea muricata	4	5	4
Plexaurella fusifera	11	10	12
Plexaurella grisea	4	2	0
Plexaura flexuosa	4	1	2
Family Gorgoniidae			
Pseudopterogorgia acerosa	3	2	4
Pseudopterogorgia americana	1	1	2
Pterogorgia guadalupensis	14	11	11
Pterogorgia citrina	0	0	1
Order Zoanthidea (colonial anemones)			
Palythoa caribea	1	0	0
Zoanthus sociatus	0	1	0

Order Scleractinia			
Dichocoenia stokesi	0	3*	0
Porites astreoides	2	3	1
Siderastrea siderea	12*	10*	1*
Solenastrea bournoni	1	1	1
Stephanocoenia micheleni	0	4*	0
Meandrina meandrites	0	0	1*

* colonies less than 3 cm in diameter
N= numerous colonies, unable to distinguish individuals
a Apparent individuals had fused into one large colony in 1991.

STATION HH 2 12-15 Feet	1990	1991	1992
Phylum Chlorophyta			
Udotea flabellum	1	0	0
Halimeda tuna	N	N	N
Phylum Rhodophyta			
Unidentified sp.	0	0	N
Phylum Porifera	30	24	15
Class Demospongia			
Order Keratosa			
Family Spongiidae			
Ircinia campana	1	1	0
Family Dysideidae			
Dysidea etheria	5*	0	0
Order Haplosclerida			
Family Haliclonidae			
Haliclona compressa	0	2	0
Niphates erecta	3	2	0
Order Hadromerida			
Family Spirastrellidae			
Anthosigmella varians	4	5	4
Order Axinellida			
Family Axinellidae			
Pseudaxinella lunaecharta	0	0	1
Order Choristida			
Family Craniellidae			
Cinachyra alloclada	15	14	10
Family Chondrillidae			
Chondrilla nucula	2	0	0
Phylum Coelenterata			
Class Anthozoa			
Order Gorgonacea	52	51	51
Family Briareidae			
Briareum asbestinum	2	1	0
Family Plexauridae			
Eunicea succinea	32	34	35
Eunicea asperula	4	3	5
Muricea muricata	6	4	5
Plexaurella fusifera	7	6	6
Plexaura flexuosa	0	2	0
Family Gorgoniidae			
Pseudopterogorgia acerosa	1	1	1
Order Zoantharia			
Zoanthus sociatus	0	1	0
Order Scleractinia			
Siderastrea siderea	17*	12*	3*
Solenastrea bournoni	1	1	2
Stephanocoenia michelini	1	0	0
Porites cf. P. branneri	0	0	1
Phylum Echinodermata			
Eucidaris tribuloides	0	5	0

N= numerous clumps
*= colonies less than 3 cm in diameter

STATION HH #3 15-18 Feet 1990	1991	1992	
Phylum Rhodophyta			
Ceramium sp	3	1	0
Unidentified sp.	0	0	15
Phylum Chlorophyta			
Udotea occidentalis	0	1	4
Phylum Porifera	75	50	56
Class Demospongia			
Order Keratosa			
Family Spongiidae			
Ircinia sp.	3	2	2
Family Dyseidae			
Dysidea etheria	6	0	0
Order Haplosclerida			
Family Haliclonidae			
Haliclona sp.	2	2	1
Niphates erecta	0	0	1
Order Poecilosclerida			
Family Esperiopsidae			
Iotrochota birotulata	1	0	0
Order Hadromerida			
Family Spirastrellidae			
Anthosigmella varians	1	1	1
Order Choristida			
Family Craniellidae			
Cinachyra alloclada	62	44	51
Family Chondrillidae			
Chondrilla nucula	0	1	0
Phylum Coelenterata			
Class Anthozoa			
Order Gorgonacea	64	43	34#
Family Plexauridae			
Eunicea fusca	7	4	1
Eunicea succinea	1	1	5
Muricea muricata	51	34*	24##
Plexaurella fusifera	1	1	1
Family Gorgoniidae			
Pseudopterogorgia acerosa	3	2	2
Pterogorgia guadalupensis	1	1**	1
Order Zoanthidea			
Palythoa caribea	1	0	0
Zoanthus sociatus	0	1	1
Order Scleractinia			
Astrangia solitaria	2	0	2
Siderastrea siderea	3***	4***	26###

*= 11 colonies damaged in 1991
**= colony damaged
*** = colonies less than 3 cm in diameter
# = 12 gorgonian colonies dead
= 9 colonies damaged in 1992
= 25/26 colonies are new recruits 1-2 cm diameter

STATION HH 4 37-40 Feet	1990	1991	1992
Phylum Phaeophyta			
Dictyota bartayresii			
er Keratosa			
Family Spongiidae			
Ircinia strobilina	0	1	0
Aplysina cauliformis	6	7	7
Family Dysideidae			
Dysidea etheria	1	0	0
Order Haplosclerida			
Family Haliclonidae			
Haliclona compressa	3	2	4
Haliclona sp.	3	2	2
Callyspongia vaginalis	1	0	1
Niphates erecta	2	2	2
Dasychalina cyathina	0	0	1
Family Nepheliospongiidae			
Xestospongia muta	1	1	0
Order Poecilosclerida			
Family Esperiopsidae			
Iotrochota birotulata	1	1	1
Desmapsamma anchorata	1	2	2
Family Microcionidae			
Thalysias juniperina	1	2	1
Family Mycalidae			
Ulosa reutzleri	1	5	0
Order Hadromerina			
Family Spirastrellidae			
Anthosigmella varians	0	3	0
Spirastrella coccinea	0	0	1
Order Axinellida			
Family Axinellidae			
Teichaxinella morchella	1	1	0
Pseudaxinella lunaecharta	0	0	2
Phylum Coelenterata			
Class Hydrozoa			
Order Milleporina			
Millepora alcicornis	4	2	3
Class Anthozoa			
Order Gorgonacea	14+	14	6+
Family Briareidae			
Briareum asbestinum	N	4	N
Family Plexauridae			
Eunicea fusca	5	4	2
Eunicea calyculata	1	1	1
Eunicea knighti	1	0	0
Muricea muricata	1	1	0
Plexaura flexuosa	3	2	2
Plexaurella fusifera	1	1	0
Family Gorgoniidae			
Gorgonia ventalina	1	1	0
Order Scleractinia			
Dichocoenia stokesi	1	1	2
Diploria labyrinthiformis	1	1	0
Porites branneri	1	1	1

Montastrea cavernosa	3	2	1
Montastrea annularis	1*	1	1
Siderastrea siderea	3**	2**	3#
Stephanocoenia michelini	3***	3	4##
Solenastrea bournoni	0	0	1
Dichoecoenia stokesi	0	0	2
Scolymia sp.	0	0	1##
Meandrina meandrites	0	0	1##

N= numerous colonies, unable to distinguish individuals

*= Small colony missed in first survey
**= colony less than 3 cm diameter
***= damaged by abrasion at time of observation
= 2 colonies less than 3 cm
= 1 colony with deads spots

STATION HH # 5 32-35 Feet	1990	1991	1992	
Phylum Phaeophyta				
Dictyota bartayresii	0	N	0	
Phylum Porifera	45	38	46	
Class Demospongia				
Order Keratosa				
Family Spongiidae				
Ircinia strobilina	1	1	1	
Ircinia felix	0	0	1	
Aplysina cauliformis	8	7	6	
Aplysina sp.	1	0	1	
Family Dysideidae				
Dysidea etheria	1	0	0	
Order Haplosclerida				
Family Haliclonidae				
Haliclona compressa	12	7	13	
Niphates erecta	9	7	9	
Dasychalina cyathina	2	4	3	
Callyspongia plicifera	1	0	1	
Family Nepheliospongiidae				
Xestospongia muta	1	1	1	
Order Poecilosclerida				
Family Esperiopsidae				
Iotrochota birotulata	7	5	6	
Desmapsamma anchorata	2	2	0	
Family Mycalidae				
Ulosa reutzleri	0	1	1	
Family Microcionidae				
Thalysias juniperina	0	1	1	
Order Hadromerida				
Family Spirastrellidae				
Anthosigmella varians	2	2	2	
Phylum Coelenterata				
Class Anthozoa				
Order Gorgonacea	16	9	21	
Family Briareidae				
Briareum asbestinum				
icea tourneforti	1	0	0	
Eunicea knighti	1	1	0	
Eunicea fusca	1	1	4	
Muricea sp.	0	1*	1	
Plexaura flexuosa	2*	1	3	
Plexaurella fusifera	2	0	0	
Family Gorgoniidae				
Pseudopterogorgia acerosa	2	2	1	
Order Zoanthidea				
Palythoa caribea	1	2	3	
Order Scleractinia				
Agaricia sp.	0	1**	0	
Dichocoenia stokesi	2**	1	3#	
Meandrina meandrites	1	0	1 (12 cm colony	

bleached)			
Montastrea cavernosa	3**	2	2
Siderastrea siderea	2**	1	2
Stephanocoenia michelini	1**	1	1
Porites cf., P. branneri	0	0	1

*= colonies 5 cm in length or less in diameter
**= number includes one colony 3 cm or less in diameter
= 1 colony 1/3 dead; 1 colony 3 cm or less in diameter

STATION HH #6 75-77 Feet	1990	1991	1992
Phylum Porifera	45	64	35
Class Demospongia			
Order Keratosa			
Family Spongiidae			
Ircinia campana	1	3	3
Ircinia strobilina	2	1	1
Ircinia felix	0	0	1
Aplysina cauliformis	12	18	12
Pseudoceratina crassa	3	2	2
Family Dysideidae			
Dysidea etheria	2	8	0
Order Haplosclerida			
Family Haliclonidae			
Haliclona sp.	1	1	0
Callyspongia plicifera	0	0	1
Callyspongia vaginalis	3	1	2
Niphates erecta	5	6	3
Callyspongia plicifera	2	2	0
Family Nepheliospongiidae			
Xestospongia muta	1	1	1
Order Poecilosclerida			
Family Esperiopsidae			
Iotrochota birotulata	2	4	1
Desmapsamma anchorata	6	11	0
Family Mycalidae			
Ulosa reutzleri	0	1	1
Family Microcionidae			
Thalysias juniperina	0	0	1
Order Axinellida			
Family Agelasidae			
Agelas conifera	0	0	1
Family Axinellidae			
Pseudaxinella lunaecharta	0	0	1
Homaxinella rudis	2	2	2
Teichaxinella morchella	1	2	1
Didiscus sp.	1	1	0
Order Choristida			
Family Craniellidae			
Cinachyra alloclada	1	0	1
Phylum Coelenterata			
Class Hydrozoa			
Order Milleporina			
Millepora alcicornis	0	0	2#
Class Anthozoa			
Order Gorgonacea	12+	13+	15+
Family Briareidae			
Briareum asbestinum	N	N	N
Family Plexauridae			
Eunicea palmeri	5	3a	2
Eunicea calyculata	1	0	1
Eunicea asperula	0	0	2
Eunicea fusca	0	2	0

Muricea elongata	3	2	0
Plexaura flexuosa	2	2	1
Muriceopsis petila	0	0	4
Pseudoplexaura sp.	0	1	2
Family Gorgoniidae			
Pseudopterogoriga americana	0	1	1
Pseudopterogorgia acerosa	0	1	1
Order Scleractinia			
Meandrina meandrites	1*	1	1
Montastrea annularis	1**	1**	1**

= growing on too dead gorgonians

a This species tends to anastomose with nearby colonies of the same species, possibly accounting for the apparent decrease.

*= Colony 3 cm in diameter or less

**= Colony dead at the top

N= Numerous colonies, unable to distinguish individual colonies

Note: The bottom in this area, approximately 200m from the borrow area,was covered with silt at the time of the 1991 survey.

STATION HH #7 60-65 Feet	1990	1991	1992
Phylum Chlorophyta			
Halimeda goreauii	N	N	N
Phylum Porifera	50	84	55
Class Demospongia			
Order Keratosa			
Family Spongiidae			
Ircinia strobilina	2	2	1
Ircinia felix	0	2	4
Aplysina cauliformis	13	18	11
Aplysina fistularis	0	1	4
Pseudoceratina crassa	5	5	1
Family Dysideidae			
Dysidea etheria	0	11	2
Order Haplosclerida			
Family Haliclonidae			
Haliclona sp.	1	1	1
Haliclona compressa	1	1	2
Callyspongia vaginalis	1	0	0
Niphates erecta	7	12	10
Dascyhalina cyathina	3	2	3
Family Nepheliospongiidae			
Xestospongia muta	0	1	1
Order Hadromeridae			
Family Spirastrellidae			
Spirastrella coccinea	0	0	1
Order Poecilosclerida			
Family Esperiopsiade			
Iotrochota birotulata	7	10	5
Desmapsamma anchorata	5	6	2
Family Mycalidae			
Mycale sp.(undescribed)	3	4	0
Ulosa reutzleri	1	4	0
Family Microcionidae			
Thalysias juniperina	0	0	2
Order Axinellida			
Family Axinellidae			
Teichaxinella morchella	1	1	2
Pseudaxinella lunaecharta	0	3	2
Phylum Coelenterata			
Class Hydrozoa			
Order Milleporina			
Millepora alcicornis	0	4	0
Class Anthozoa			
Order Gorgonacea	18	19	22
Family Briareidae			
Briareum asbestinum	8	8	16
Family Plexauridae			
Eunicea calyculata	1	1	2
Eunicea knighti	1	1	0
Eunicea succinea	1	1	0

Eunicea fusca	3	4	2
Plexaura flexuosa	3	3	1
Family Gorgoniidae			
Pseudopterogorgia americana	1	1	1
Order Scleractinia			
Dichocoenia stokesi	1	1	1 (99% dead)
Eusmilia fastigiata	1	0	0
Montastrea cavernosa	2*	2	3
Siderastrea siderea	1	1	1
Stephanocoenia michelini	1	1	1
Porites astreoides	0	0	1

N= Numerous thalli, unable to distinguish individuals
*Includes 1 individual 3 cm in diameter

STATION JUL #1 40 Feet	1990	1991	1992
Phylum Phaeophyta			
Dictyota bartayresii	0	N	0
Phylum Porifera	21	25	14
Class Demospongia			
Order Keratosa			
Family Spongiidae			
Ircinia strobilina	0	1	1
Ircinia campana	1	1	0
Ircinia felix	1	2	2
Aplysina cauliformis	1	1	0
Aplysina fistularis	1	0	1
Aplysina sp.	1	1	1
Order Haplosclerida			
Family Haliclonidae			
Haliclona compressa	1	2	1
Haliclona sp.	1	0	1
Callyspongia vaginalis	1	1	0
Dasychalina cyathina	4	5	0
Niphates erecta	2	2	4
Order Poecilosclerida			
Family Esperiopsidae			
Iotrochota birotulata	1	1	0
Desmapsamma anchorata	1	1	0
Family Mycalidae			
Ulosa reutzleri	0	1	1
Family Microcionidae			
Thalysias juniperina	2	1	0
Order Hadromerida			
Family Spirastrellidae			
Spirastrella coccinea	2a	2	1
Anthosigmella varians	1	0	0
Order Axinellidae			
Family Axinellidae			
Pseudaxinella lunaecharta	0	3	1
Phylum Coelenterata			
Class Hydrozoa			
Millepora alcicornis	0	1	1
Class Anthozoa			
Order Gorgonacea	21+	23	20+
Family Briareidae			
Briareum asbestinum	N	5	N
Family Plexauridae			
Eunicea calyculata	2	2	2
Eunicea asperula	4b	2	2
Eunicea fusca	2	3	3
Plexaura flexuosa	4	4	2
Family Gorgoniidae			
Pseudopterogorgia acerosa	1	1	3 (1 damaged)
Pseudopterogorgia americana	8	6	6
Gorgonia ventalina	0	0	1

Order Scleractinia			
Dichocoenia stokesi	3*	3*	2#
Meandrina meandrites	1*	2*++	0
Montastrea cavernosa	1	1	0
Montastrea annularis	0	1*	1
Porites astreoides	1	0	0
Siderastrea 'radians	1	2*	1
Solenastrea hyades	1	0	0
Stephanocoenia michelini	4**	4**+	3##

N= Numerous colonies, unable to distinguish individuals
a Not reported in 1990; probably overlooked
bNot reported in 1990; erroneously referred to other Eunicea spp.
*= includes one individual less than 3 cm diameter
**= includes one individual 3/4 dead
+ = includes 2 specimens bleached at time of observation
++ = specimen damaged at time of observation
N.B. not included in above totals: 1 colony D. stokesi and 1 colony M. cavernosa completely dead and covered with Briareum.
#= one 3 cm specimen and one 12 cm specimen 1/2 dead
##= One 3 cm individual and one 15 cm individual 1/2 dead

STATION JUL # 2 45-50 feet	1990	1991	1992
Phylum Phaeophyta			
Dictyota bartayresii	N	N	0
Phylum Porifera	33	35	40
Class Demospongia			
Order Keratosa			
Family Spongiidae			
Ircinia felix			
Ircinia strobil	1	0	1
Family Dysideidae			
Dysidea etheria	0	1	0
Order Haplosclerida			
Family Haliclonidae			
Haliclona compressa	9	5	6
Niphates erecta	1	5	5
Dasychalina cyathina	1	1	0
Callyspongia vaginalis	2	2	2
Callyspongia plicifera	3	2	3
Family Nepheliospongiidae			
Xestospongia muta	2	3*	3
Order Hadromerina			
Family Spirastrellidae			
Anthosigmella varians	0	1	0
Spirastrella coccinea	0	0	1
Order Poecilosclerida			
Family Agelasidae			
Agelas clathrodes	1	1	1
Agelas conifera	0	0	2
Family Esperiopsidae			
Iotrochota birotulata	2	1	1
Desmapsamma anchorata	0	1	0
Family Microcionidae			
Thalysias juniperina	1	0	0
Family Mycalidae			
Ulosa reutzleri	1	2	0
Order Axinellida			
Family Axinellidae			
Pseudaxinella lunaecharta	4	4	3
Order Choristida			
Family Craniellidae			
Cinachyra alloclada	0	0	1
Phylum Coelenterata			
Class Hydrozoa			
Millepora alcicornis	0	1	1
Class Anthozoa			
Order Gorgonacea	15+	11+	17
Family Briareidae			
Briareum asbestinum	N	N	8
Family Plexauridae			
Eunicea calyculata	1	1	1

Eunicea fusca	9	5	4
Plexaura flexuosa	1	1	2
Family Gorgoniidae			
Gorgonia ventalina	1	1	0
Pseudopterogorgia americana	2	2	2
Order Zoanthidea			
Palythoa caribea	2	2	2
Order Scleractinia			
Dichocoenia stokesi	2*	0	1 (3 cm)
Diploria clivosa	2**	3*,**	2 (1 specimen 1/2 dead)
Madracis decactis	2	2	2
Montastrea cavernosa	2***	2	2
Montastrea annularis	1+	2*+	1
Stephanocoenia michelini	0	1*	0
Phylum Chordata			
Class Tunicata			
Stolonicus sabulosa	0	0	4

N= Numerous colonies, unable to distinguish individual thalli or colonies
*= specimens less than 3 cm diameter
**= one specimen 2/3 dead
***= does not include 1 specimen dead and encrusted at time of observation. Five other dead and encrusted coral colonies (unidentified) were also noted in the quadrat
+= specimen 2/3 dead

STATION JUL # 5 12 Feet	1990	1991	1992	
Phylum Porifera	11	12	11	
Class Demospongia				
Order Keratosa				
Family Spongiidae				
Ircinia campana	3	3	3	
Aplysina fistularis	2*	1	2	
Aplysina sp.	0	1	1	
Dysidea etheria	0	1	0	
Order Haplosclerida				
Family Haliclonidae				
Niphates erecta	2	4	5	
Haliclona compressa	1	0	0	
Order Poecilosclerida				
Family Mycalidae				
Ulosa reutzleri	2	2	0	
Order Choristida				
Family Chondrillidae				
Chondrilla nucula	1	0	0	
Phylum Coelenterata				
Class Hydrozoa				
Order Milleporina				
Millepora alcicornis	1	2	0	
Class Anthozoa				
Order Gorgonacea	19+	19+	26	
Family Briareidae				
Briareum asbestinum	N	N	6	
Family Plexauridae				
Eunicea succinea	7	5	6	
Eunicea tourneforti	1	1	1	
Plexaura flexuosa	7	9	11	
Family Gorgoniidae				
Pseudopterogorgia acerosa	3	3	2	
Order Zoanthidea (colonial anemones)				
Palythoa caribea	1	1	1	
Zoanthus sociatus	5	5	0	
Order Scleractinia				
Dichocoenia stokesi	1**	1**	1	
Diploria clivosa	1	2	2	
Porites astreoides	2	2	2	
Porites branneri	0	0	1 (2 cm specimen)	
Siderastrea siderea	2*	2*	1*	

N= Numerous colonies,unable to distinguish individuals
*= Both specimens less than 3 cm diameter
**= Specimen with dead spot on upper surface

STATION JUL #6 10-12 FEET	1990	1991	1992
Phylum Phaeophyta			
Dictyota bartayresii	0	N	0
Phylum Porifera	11	10	7
Class Demospongia			
Order Keratosa			
Family Spongiidae			
Ircinia felix	2	1	1
Aplysina fistularis	5	4	5
Family Dysideidae			
Dysidea etheria	1	0	0
Order Haplosclerida			
Family Haliclonidae			
Haliclona compressa	1	3	1
Order Hadromerida			
Family Spirastrellidae			
Spirastrella coccinea	1*	1	0
Order Poecilosclerida			
Family Mycalidae			
Ulosa reutzleri	1	1	0
Phylum Coelenterata			
Class Anthozoa			
Gorgonacea	11	10+	11
Family Briareidae			
Briareum asbestinum	0	N	1
Family Plexauridae			
Eunicea succinea	4	2	2
Eunicea knighti	0	1	1
Eunicea sp.	2	2	2
Muricea muricata	1	1	1
Plexaura flexuosa	1	1	1
Family Gorgoniidae			
Pseudopterogorgia americana	2	2	1
Pterogorgia citrina	1	0	2
Order Zoanthidea			
Palythoa caribea	1	1	1
Zoanthus sociatus	0	1	0
Order Scleractinia			
Acropora cervicornis	0	1**	2
Porites astreoides	5	5	5
Porites branneri	0	0	1
Siderastrea radians	1**	1**	3 (all 3 cm or less diameter)

*= Not reported and probably overlooked in 1990
**= Specimen less than 3 cm diameter

STATION JUL # 7 28-30 Feet	1990	1991	1992
Phylum Phaeophyta			
Dictyota bartayresii	0	N	0
Phylum Porifera	24	25	19
Class Demospongia			
Order Keratosa			
Family Spongiidae			
Ircinia strobilina	1	0	0
Ircinia felix	2	1	1
Aplysina cauliformis	1	4	1
Aplysina fistularis	0	0	2
Family Dysideidae			
Dysidea etheria	2	0	0
Order Haplosclerida			
Family Haliclonidae			
Haliclona compressa	3	4	3
Haliclona sp.	0	0	2
Callyspongia vaginalis	3	2	2
Callyspongia fallax	0	1	0
Niphates erecta	4	3	2
Dasychalina cyathina	3	6	2
Family Nepheliopongiidae			
Xestospongia muta	1	1	1
Order Hadromerina			
Family Spirastrellidae			
Spirastrella coccinea	0	0	1
Anthosigmella varians	0	0	1
Order Poecilosclerida			
Family Esperiopsidae			
Iotrochota birotulata	1	1	0
Family Microcionidae			
Thalysias juniperina	1	0	0
Family Mycalidae			
Ulosa reutzleri	1	1	0
Order Axinellida			
Family Axinellidae			
Pseudaxinella lunaecharta	1	1	1
Phylum Coelenterata			
Class Anthozoa			
Order Corallimorpharia			
Ricordea florida	0	1	0
Order Gorgonacea	12+	15+	16
Family Briareidae			
Briareum asbestinum	N	N	3
Family Plexauridae			
Eunicea fusca	7	8	8
Eunicea calyculata	1	1	1
Eunicea asperula	2*	2	0
Eunicea knighti	0	0	1
Plexaura flexuosa	0	2	1
Pseudoplexaura sp.	0	0	1
Family Gorgoniidae			

Pseudopterogorgia acerosa	1	1	1
Order Zoanthidea			
Palythoa caribea	N	N	6
Order Sclera			
	0	1	0
Siderastrea siderea	10**	2***	5***
Stephanocoenia michelini	0	2	0
Phylum Urochordata			
Distaplia sp.	0	1	0

N= Numerous colonies, unable to distinguish individuals

*= Species mis-identified and lumped with E. calyculata in 1990

**= 9/10 of these colonies were less than 3 cm diameter; easily overlooked

***= colonies less than 3 cm diameter

N.B. Several dead (unidentified) scleractinian colonies were found within and around the quadrat in 1990.

STATION JUL # 8 50-55 Feet	1990	1991	1992
Phylum Chlorophyta			
Halimeda goreauii	N	N	N
Phylum Phaeophyta			
Dictyota bartayresii	0	N	0
Phylum Porifera	33	28	23
Class Demospongia			
Order Keratosa			
Family Spongiidae			
Ircinia felix	2	1	1
Ircinia sp.	1	1	0
Aplysina sp.	0	0	1
Family Dysideidae			
Dysidea etheria	2	0	0
Order Haplosclerida			
Family Haliclonidae			
Haliclona compressa	2	1	2
Niphates erecta	15	11	7
Dasychalina cyathina	2	0	1
Callyspongia plicifera	0	0	1
Order Hadromerina			
Family Spirastrellidae			
Spirastrella coccinea	4a	4	5
Order Pocilosclerida			
Family Agelasidae			
Agelas conifera	1	2*	2
Family Mycalidae			
Ulosa reutzleri	3	4	2
Order Axinellida			
Family Axinellidae			
Pseudaxinella lunaecharta	1	2	1
Teichaxinella morchella	0	1	0
Phylum Coelenterata			
Class Hydrozoa			
Millepora alcicornis	0	1	1
Class Anthozoa			
Order Gorgonacea	20+	22	16+
Family Briareidae			
Briareum asbestinum	N	4	N
Family Plexauridae			
Eunicea fusca	5	5	3
Eunicea calyculata	1	1	0
Eunicea knighti	1	1	1
Plexaura flexuosa	9	8	8
Family Gorgoniidae			
Pseudopterogorgia americana	3	3	3#
Order Scleractinia			
Dichocoenia stokesi	3**	4**	3**
Montastrea annularis	1***	1***	1***
Scolymia sp.	0	1***	0

Stephanocoenia michelini	1**	1**	1**

N= Numerous thalli or colonies, unable to distinguish individuals
a= Species overlooked in 1990 survey
*= Includes one juvenile specimen
**= Colonies all small, 10-15 cm diameter
*** = colony 3 cm diameter
N.B. There were 8 dead and encrusted coral colonies in this quadrat,30-60 cm in diameter, most of which appeared to be M. cavernosa in 1990.
= one specimen damaged, 1992

STATION JUL # 9 50-55 Feet	1990	1991	1992
Phylum Phaeophyta			
Dictyota bartayresii	N	N	0
Phylum Porifera	35	60	31
Class Demospongia			
Order Keratosa			
Family Spongiidae			
Ircinia felix	3	3	1
Ircinia sp.	2	1	3
Aplysina cauliformis	4	5	3
Aplysina lacunosa	2	5a	0
Family Dysideidae			
Dysidea etheria	0	1	0
Order Haplosclerida			
Family Haliclonidae			
Haliclona compressa	3	3	2
Dasychalina cyathina	5	5	2
Niphates erecta	1	3	2
Callyspongia vaginalis	1	1	4 (2 damaged)
Callyspongia plicifera	1	3	2 (1 damaged)
Order Hadromerida			
Family Spirastrellidae			
Spirastrella coccinea	1b	1	1
Order Poecilosclerida			
Family Microcionidae			
Thalysias juniperina	0	0	2
Family Agelasiade			
Agelas conifera	1	2	2
Agelas sp.	0	0	1
Family Esperiopsidae			
Iotrochota birotulata	8	8	6
Family Mycalidae			
Ulosa reutzleri	1	17	1
Order Axinellida			
Family Axinellidae			
Homaxinella rudis	1	1	1
Pseudaxinella lunaecharta	1	1	1
Phylum Coelenterata			
Class Hydrozoa			
Order Milleporina			
Millepora alcicornis	3	2	0
Class Anthozoa			
Order Gorgonacea	3+	8	3
Family Briareidae			
Briareum asbestinum	N	6	1
Family Plexauridae			
Eunicea calyculata	1	1	1
Family Gorgoniidae			
Gorgonia ventalina	1	1	1

Order Scleractinia			
Agaricia lamarcki	1*	1*	1
Dichocoenia stokesi	2*	2**	3 (1 damaged)
Eusmilia fastigiata	1***	0	0
Madracis decactis	1*	1*	3
Meandrina meandrites	1	1	0
Montastrea annularis	2*	1*	0
Montastrea cavernosa	2*	9**	9**
Porites astreoides	2*	2*	2
Siderastrea siderea	1*	2*	4
Stephanocoenia michelini	2*	1*	0
Diploria clivosa	0	0	1**

N= Numerous thalli or colonies, unable to distinguish individuals
a= inclo
cm diameter
**= all colonies less than 6cm diameter
***= colony less than 3 cm diameter

N.B. In 1990 this site has many dead coral colonies outside the quadrat. Except for some scattered colonies of M. cavernosa and M. meanrites attaining 30 cm diameter, most living colonies are much smaller.This pattern is reflected in the quadrat.

STATION JUL # 10 25 Feet	1990	1991	1992
Phylum Phaeophyta			
Dictyota bartayresii	0	N	0
Phylum Porifera	26	36	20
Class Demospongia			
Order Keratosa			
Family Spongiidae			
Ircinia felix	1	4	4
Ircinia strobilina	1	2	1 (loose on reef)
Order Haplosclerida			
Family Haliclonidae			
Haliclona compressa	2	3	5
Niphates erecta	7	5	0
Dasychalina cyathina	2	1	1
Callyspongia fallax	2	1	0
Callyspongia vaginalis	0	0	1
Family Nepheliospongiidae			
Xestospongia muta	2	2	0
Order Poecilosclerida			
Family Esperiopsidae			
Iotrochota birotulata	3	3	2
Family Mycalidae			
Ulosa reutzleri	1	8	1
Order Hadromerida			
Family Spirastrellidae			
Anthosigmella varians	2	2	1
Spirastrella coccinea	1a	1	1
Order Axinellida			
Family Axinellidae			
Homaxinella rudis	1	1	0
Pseudaxinella lunaecharta	1	1	1
Order Choristida			
Family Chondrillidae			
Chondrilla nucula	0	2	2
Phylum Coelenterata			
Class Anthozoa			
Order Gorgonacea	6+	5+	9
Family Briareidae			
Briareum asbestinum	N	N	6
Family Plexauridae			
Eunicea calyculata	2	2	2
Eunicea sp.*	1	1	1
Muricea muricata	1	1	0
Plexaura flexuosa*	1	0	0
Order Zoanthidea			
Palythoa caribea	6	N	N
Order Scleractinia			
Agaricia agaricites	1**	0	0
Agaricia lamarcki	1**	0	0
Dichocoenia stokesi	4**	0	3#
Montastrea annularis	1	0	0
Montastrea cavernosa	5***	4	4

Solenastrea bournoni	1	1	1
Stephanocoenia michelini	1	1	3
Siderastrea siderea	0	0	6##

N= Numerous colonies, unable to distinguish individuals
a= Specimen overlooked in 1990
*= colonies damaged
**= specimens all 5 cm diameter or less
***= 3 of 5 specimens are 5 cm or less in diameter
= Specimens less than 4 cm in diameter
= specimens less than 6 cm in diameter

Table 2-2: CUMULATIVE SPECIES LIST:HOLLYWOOD/HALLANDALE

	# 0F STATIONS			#0F INDIVIDUALS		
	1990	1991	1992	1990	1991	1992
Algae						
6 Species:						
Phylum Phaeophyta						
Dictyota bartayresii	2	7	0	N	N	0
Phylum Chlorophyta						
Udotea flabellum	1	0	0	1	0	0
Udotea occidentalis	0	1	1	0	1	4
Halimeda tuna	1	1	1	N	N	N
Halimeda goreauii	2	2	2	N	N	N
Phylum Chlorophyta						
Ceramium sp.	1	1	0	3	1	0
Unidentified red	0	0	2	0	0	N
Phylum Porifera (Sponges)						
35 Species:						
Order Keratosa						
Ircinia campana	5	6	2	8	1O	6
Ircinia strobilina	5	6	7	7	10	11
Ircinia felix	8	8	10	16	15	22
Ircinia sp.	7	5	4	13	7	7
Aplysina cauliformis	7	6	6	45	56	40
Aplysina fistularis	2	2	5	6	5	14
Aplysina lacunosa	1	1	0	2	1	0
Aplysina sp.	2	3	3	2	3	3
Pseudoceratina crassa	2	2	2	8	7	3
Dysidea etheria	7	6	1	15	23	2
Order Haplosclerida						
Haliclona compressa	12	12	11	39	39	41
Haliclona sp.	5	4	5	8	6	7
Niphates erecta	12	13	11	58	64	50
Dasychalina cyathina	9	8	25	29	13	
Callyspongia vaginalis	5	4	6	8	6	12
Calyspongia plicifera	5	3	5	8	7	8
Callyspongia fallax	1	2	0	2	2	0
Xestospongia muta	6	7	5	8	10	7
Order Poecilosclerida						
Iotrochota birotulata	10	9	6	33	39	17
Desmapsamma anchorata	5	7	3	15	24	5
Thalysias juniperina	4	3	4	5	4	6
Ulosa reutzleri	9	13	5	13	53	6
Mycale n.sp.	1	1	0	3	4	0
Agelas clathrodes	1	1	1	1	1	1
Agelas conifera	2	2	4	2	4	7
Agelas sp.	0	0	1	0	0	1
Order Hadromerida						
Anthosigmella varians	6	7	5	13	19	15

Sponges cont'd.

Species	# OF STATIONS			#OF INDIVIDUALS		
	1990	1991	1992	1990	1991	1992
Spirastrella coccinea	5	5	8	9	9	15
Order Axinellida						
Teichaxinella morchella	2	4	3	2	5	5
Homaxinella rudis	3	3	2	4	4	3
Pseudaxinella lunaecharta	6	7	11	9	15	16
Didiscus sp.	1	1	0	1	1	0
Order Choristida						
Cinachyra alloclada	4	3	5	84	63	75
Chondrosia reniformis	1	1	2	N	1	4
Chondrilla nucula	2	2	0	3	3	0
Phylum Coelenterata						
Order Milleporina (Fire coral)						
1 Species:						
Millepora alcicornis	3	6	5	8	9	9
Order Gorgonacea (Gorgonians)						
21 Species:						
Briareum asbestinum (91)	13	14	13	N	N	N
Eunicea calyculata	9	10	8	15	12	12
Eunicea fusca	4	7	8	19	23	27
Eunicea knighti	4	5	2	4	5	2
Eunicea mammosa	1	0	0	1	0	0
Eunicea palmeri	4	3	1	23	16	2
Eunicea succinea	7	5	5	56	53	71
Eunicea tourneforti	4	2	1	8	8	1
Eunicea asperula	3	3	3	10	16	9
Eunicea sp. indet.	3	1	3	5	9	6
Muricea elongata	1	1	1	3	2	1
Muricea muricata	6	6	4	64	51	34
Plexaura flexuosa	10	11	11	35	46	27
Plexaurella fusifera	5	3	3	21	24	19
Plexaurella grisea	1	1	0	4	3	0
Muriceopsis petila	0	0	1	0	0	4
Gorgonia ventalina	3	3	2	3	3	2
Pterogorgia citrina	1	0	2	1	0	3
Pterogorgia guadalupensis	2	2	2	15	12	12
Pseudopterogorgia americana	6	6	7	17	17	16
Pseudopterogorgia acerosa	7	7	8	14	14	15
Colonial Anemones and Corallimorphs						
3 Species:						
Palythoa caribea	8	6	6	13+	8+	23+
Zoanthus sociatus	1	5	1	5	9	1
Ricordea florida	0	1	0	0	1	0

Table 2-2

Order Scleractinia (Stony Corals)
19 Species:

	# 0F STATIONS			#0F INDIVIDUALS		
	1990	1991	1992	1990	1991	1992
Acropora cervicornis	0	1	1	0	1	2
Agaricia agaricites	1	0	0	1	0	0
Agaricia lamarcki	1	1	1	1	1	1
Astrangia solitaria	1	0	1	2	0	1
Dichocoenia stokesi	7	9	10	11	19	21
Diploria clivosa	2	2	2	3	5	3
Diploria labyrinthiformis	1	1	0	1	1	0
Eusmilia fastigiata	1	0	0	12	21	
Porites astreoides	5	4	4	12	12	9
Porites branneri	1	1	4	1	1	4
Siderastrea radians	1	2	2	1	3	4
Siderastrea siderea	4	9	9	4	36	51
Solenastrea hyades	4	3	4	4	3	5
Stephanocoenia michelini	7	10	6	13	19	14
Scolymia sp.	0	1	1	0	1	1

Table 2-2

Table 2-3: Quadrat Station Summary

Control Stations			# Sponges			# Gorgonians			# Scleractinians		
		DEPTH	1990	1991	1992	1990	1991	1992	1990	1991	1992
1st	JUL 5	12	11	12	11	19 +	19 +	26	6	7	6
2nd	JUL 10	25	26	36	20	6 +	5 +	9	14 c	6	17
3rd	JUL 9	50	35	60	31	3 +	8	3	15 c	20 a,c	23
1st	JUL 6	10	10	11	7	11	10 +	11	6	7	7
2nd	JUL 7	30	24	25	19	12 +	15 +	16	10 a	7	6
3rd	JUL 8	55	33	27	23	20 +	22	16 +	5 c	6	5
Total Controls:			139	171	111	71	79	81	56	53	64
Dredging Stations			# Sponges			# Gorgonians			# Scleractinians		
			1990	1991	1992	1990	1991	1992	1990	1991	1992
1st	HH 1	20	16 +	23	4	58 +	51	60	15 a	21	28
2nd	JUL 1	40	21	25	14	21 +	23	20 +	12	13	7
3rd	JUL 2	50	33	35	40	15 +	11 +	17	9 b	10	8
1st	HH 2	15	30	24	15	52	50	51	19 a	13	6
2nd	HH 4	40	27	30	27	14 +	14	6	13	11	17
3rd	HH 6	75	45	64	35	12 +	13 +	15 +	2	1	2
1st	HH 3	12	75	50	56	64	43	34	5 a	4	29
2nd	HH 5	35	45	38	46	16	9	21	9 a	6	10
3rd	HH 7	65	50	84	55	18	19	22	6	5	7
Total Dredging:			342	373	292	270	233	246	90	84	114
Grand Total			481	544	403	341	312	327	146	137	178

Table 2-4

GORGONIANS (QUADRATS)
css/3: Summary of all Effects; design: ANOVA
1-TREATMEN, 2-TIME, 3-REEF

Effect	df Effect	MS Effect	df Error	MS Error	F	p-level
*1	1	2400.093	3	67.8951	35.35003	.009513
2	2	7.126	6	16.6173	.42883	.669773
*3	2	1950.915	6	121.8210	16.01460	.003927
12	2	29.793	6	16.6173	1.79287	.245232
*13	2	1141.448	6	121.8210	9.36988	.014265
23	4	15.698	12	31.2377	.50254	.734761
123	4	28.965	12	31.2377	.92724	.480189

*Marked effects significant at p .0500

SCLERACTINIANS (QUADRATS)
css/3: Summary of all Effects; design: ANOVA
1-TREATMEN, 2-TIME, 3-REEF

Effect	df Effect	MS Effect	df Error	MS Error	F	p-level
1	1	12.0333	3	96.68519	.124459	.747579
2	2	26.4333	6	30.46296	.867720	.466658
3	2	16.6333	6	51.90741	.320442	.737524
12	2	2.4333	6	30.46296	.079878	.924194
13	2	225.7000	6	51.90741	4.348127	.068051
23	4	11.3833	12	29.60185	.384548	.815596
123	4	18.2500	12	29.60185	.616516	.659092

*Marked effects significant at p .0500

SPONGES (QUADRATS)
css/3: Summary of all Effects; design: ANOVA
1-TREATMEN, 2-TIME, 3-REEF

Effect	df Effect	MS Effect	df Error	MS Error	F	p-level
1	1	2088.893	3	1692.562	1.23416	.347627
*2	2	325.526	6	35.210	9.24530	.014705
*3	2	1586.137	6	128.340	12.35892	.007452
12	2	3.215	6	35.210	.09130	.913984
13	2	256.893	6	128.340	2.00166	.215785
23	4	103.909	12	80.182	1.29592	.325908
123	4	54.131	12	80.182	.67511	.621983

*Marked effects significant at p .0500

APPENDIX 3

CORE DATA

Appendix 3: Core Data

Table 3-1: Identification and enumeration of infauna by station, Hollywood-Hallandale Beach Renourishment: Phases I, II, & III. (13pp)

Table 3-2: Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: a) Phase I (Pre-dredging, 1990); b) (30-day Post-dredging, 1991); c) 2nd Post-dredging, 1992. (30pp)

Table 3-3: Numerical abundances of major taxonomic groups by station and survey. (1pp)

Table 3-4: Percentage occurrences of major taxonomic groups by station and survey. (1pp)

Table 3-5: Five most abundant taxa by station and survey with percentage abundance. (1pp)

Table 3-1. Identification and enumeration of infauna, Hollywood-Hallandale Beach Renourishment: 1990-1992.

STATION	T88			R90			R92			R94			R106			T111			R116			R120			BAC			BA			TOTALS		
YEAR	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992
Phylum PORIFERA																																	
unidentified sponge																												1			1		
Phylum CNIDARIA																																	
Subphylum MEDUSOZOA																																	
unidentified hydrozoan																									1		1				1		1
Subphylum ANTHOZOA																																	
Class ZOANTHARIA																																	
Order SCLERACTINIA																																	
Sphenotrochus sp.						1												1			1						20			1			24
Order ACTINIARIA																																	
unidentified actiniarian																1											2			8	1		10
Phylum PLATYHELMINTHES																																	
Class TURBELLARIA																																	
?Coelogynopora sp.									3																					1			4
unidentified bothryoplanid																					1												1
unidentified otoplanid																					1			1									2
unidentified typhloplanid																								1									1
unidentified proseriate				1			1			14				3							4	1		1			2				17	3	7
unidentified turbellarian	1		2	3	64	1			1			1	1		1						3						6	1			6	64	15
Phylum NEMERTINA																																	
Order ARCHINEMERTINA																																	
Family CEPHALOTHRICIDAE																																	
Cephalothrix sp. A			3						1			3			5						2						4			2			20
Cephalothrix sp. 114	4	10	3	3	9	5	1	27	9		17	15		11	6		1	2		1	1			1			2	2	3	1	10	79	45
Procephalothrix spiralis?				1																					4						5		
unidentified cephalothricid		4															1															5	
unidentified archinemertine															1																		1
Order PALEONEMERTINA																																	
Family CARINOMIDAE																																	
Carinoma sp. A			1			1												1									1						4
Carinomella lactea		1							3							2					1			1	1	1	7	2	2	6	5	4	18
Family HUBRECHTIDAE																																	
Hubrechtella dubia		1		1	1		1			1	1			4		5		1							32	11		3	5		43	23	1
Family TUBULANIDAE																																	
Tubulanus pellucidus		2		1										1		1	1										2		5	2	2	9	4
Tubulanus rhabdotus																													1	1		1	1
Tubulanus sp.																														1			1
Paleonemertine sp. 103									2																								2
unident. paleonemertine sp. A					1						1						1															3	
unidentified paleonemertine			1	3		1										1				1						1	1		1		4	3	3
Order HETERONEMERTINA																																	
Family CEREBRATULIDAE																																	

Table 3-1. Identification and enumeration of infauna, Hollywood-Hallandale Beach Renourishment: 1990-1992.

STATION	T88			R90			R92			R94			R106			T111			R116			R120			BAC			BA			TOTALS		
YEAR	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992
?Cerebratulus leucopsis																										1						1	
Cerebratulus lineolatus?																1															1		
Family BASEODISCIDAE																																	
Baseodiscus sp.?																1														1	1		1
Family MICRURIDAE																																	
Micrura sp.		1																												1		1	1
Order HOPLONEMERTINA																																	
Family PROSTOMATELLIDAE																																	
Prostomatella enteroplecta?				2			1			1			4									3									11		
Family TETRASTEMMIDAE																																	
Tetrastemma worki		2	1		2			2			5	1		1									1			1			1			15	2
Family DREPANOPHORIDAE																																	
unident. drepanophorid																											1			1			2
unidentified hoplonemertine			1						1			1			2			1						1		3				1		7
unidentified nemertine															2			1						1						3			7
Phylum NEMATODA	98	17	34	159	989	35	260	4	12	333	24	1	65	17	24	53	41	11	114	10	21	100	11	7	148	19	99	67	46	72	1397	1178	316
Phylum PRIAPULA																																	
Family TUBILUCHIDAE																																	
Tubiluchus corallicola				1																								1			2		
Phylum ANNELIDA																																	
Class POLYCHAETA																																	
Order ORBINIIDA																																	
Family ORBINIIDAE																																	
Orbinia riseri																									1			1			2		
Scoloplos acmeceps																									1						1		
Scoloplos sp. B		1																														1	
Scoloplos sp.																1					1						1				1		2
Naineris bicornis																1															1		
Leitoscoloplos sp.										2					2			1													2		3
Family PARAONIDAE																																	
Aricidea cf. catherinae																1									2						3		
Aricidea cerrutii																											2	1	5	1	1	5	3
Aricidea fragilis																									8	3		2			10	3	
Aricidea philbinae																									1	18					1	18	
Aricidea taylori																1									1	1					2	1	
Aricidea suecica																											2						2
Aricidea sp.									1																		1						2
Cirrophorus lyra					1						2														3						3	3	
Levinsenia gracilis																									1						1		
Paraonis fulgens	5		30	1	13	19	12	29	28	6	18	16	6	15	103			16	5	13	70	48	7	38			1			2	83	95	323
Paraonis pygoenigmatica					34																											34	
Family QUESTIDAE																																	

Table 3-1. Identification and enumeration of infauna, Hollywood-Hallandale Beach Renourishment: 1990-1992.

STATION	T88			R90			R92			R94			R106			T111			R116			R120			BAC			BA			TOTALS		
YEAR	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992
Questa sp.																1															1		
Order CTENODRILIDA																																	
Family CTENODRILIDAE																																	
Raphidrilus nemasoma																									1			1			2		
Ctenodrilus serratus																													1			1	
Ctenodrilus sp. A				1																											1		
Order SPIONIDA																																	
Family SPIONIDAE																																	
Apoprionospio dayi		5						2			1	4	6				1	3							3	1		1	2	1	10	12	8
Apoprionospio pygmaea											2																					2	
Dispio uncinata	69	5	322	5	5	88	19	4	58	2	6	95	18	7	185	4	19	40	9	16	95	1	12	74			2			1	127	74	960
Malacoceros vanderhorstii																										1		1			1	1	
Minuspio sp. A																									1						1		
Paraprionospio pinnata																										1	1		1	19		2	20
Polydora cornuta																8															8		
Polydora tetrabranchia																3															3		
Prionospio cristata		9			3			14			6	1		1		14	6				1				47	17	29	36	39	54	97	95	85
Prionospio heterobranchia																									1						1		
Prionospio steenstrupi																												1			1		
Prionospio sp.																									1		1	1		2	2		3
Pseudopolydora sp.												1													1	1	6	4	1	93	5	2	100
Scoletepis acmeceps				3												1															4		
Scoletepis squamata		2																														2	
Scoletepis texana		2	46			58	6	10	42		30	51	1	22	17	1	40	56		32	8		11	2			1	2	1	2	10	148	283
Spio pettiboneae	3	13	26		5	16	1	50	26	1	34	47	2	17	12	5	20	24		15	5		1	1	3	1	3	2	2	7	17	158	167
unidentified spionid					1	5	1		1						1	3	1								1		2			2	5	2	11
Family MAGELONIDAE																																	
Magelona pettiboneae																									2		1				2		1
Magelona sp. B																													1			1	
Magelona sp. C		1																							3	6			2	1	3	9	1
Magelona sp. G																										1						1	
Magelona sp. H																														1			1
Magelona sp.																														2			2
Family POECILOCHAETIDAE																																	
Poecilochaetus johnsoni				1																						1	2	1			2	1	2
Family CHAETOPTERIDAE																																	
unidentified chaetopterid (juv)																														3			3
Family CIRRATULIDAE																																	
Caulleriella cf. alata																									2						2		
Caulleriella killariensis																											2			1			3
Caulleriella sp. A																									1						1		
Caulleriella sp.																7													1		7	1	

Table 3-1. Identification and enumeration of infauna, Hollywood-Hallandale Beach Renourishment: 1990-1992.

STATION	T86			R90			R92			R94			R106			T111			R116			R120			BAC			BA			TOTALS		
YEAR	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992
Chaetozone setosa																									1						1		
Chaetozone sp. B																											2			1			3
Chaetozone sp.																											2						2
Cirriformia sp.																												2			2		
Dodecaceria sp. A																												1			1		
Tharyx dorsobranchialis																1									2		1	3			6		1
Tharyx marioni																											1						1
Tharyx sp.																											1						1
unidentified cirratulid																											5			2			7
Order CAPITELLIDA																																	
Family CAPITELLIDAE																																	
Capitella capitata					1			1																								2	
Leiocapitella sp. A																												1			1		
Mediomastus californiensis																19															19		
Mediomastus sp.				2														1												1	2		2
Notomastus americanus																										3	1		4	8		7	9
Notomastus latericeus																2												1			3		
Notomastus daueri																									2	1		3			5	1	
Notomastus ?tenuis																									2			8			10		
Notomastus hemipodus																												1			1		
Notomastus sp.																											1	1			1		1
Scyphoproctus platyproctus																2													1		2	1	
unidentified capitellid										2															1		2			1	3		3
Family MALDANIDAE																																	
Axiothella sp. A																												3			3		
Axiothella sp.																												1			1		
unidentified maldanid																														1			1
Family ARENICOLIDAE																																	
Arenicola sp.																1															1		
unidentified arenicolid																												2			2		
Order OPHELIIDA																																	
Family OPHELIIDAE																																	
Armandia agilis	3	4	22		2	13		7	19		13	31	17	14	4	9	11	6	3	17	1	9	41	2			5			35	41	109	138
Armandia maculata																									19	3		13	1		32	4	
Armandia sp. (juv)						1																								3			4
Polyophthalmus sp.																												1			1		
Family SCALIBREGMIDAE																																	
Sclerobregma stenocerum																												1	1	1	1	1	1
unidentified scalibregmid																												1			1		
Order PHYLLODOCIDA																																	
Family PHYLLODOCIDAE																																	
Genetyllis cf. castanea																											2			8			10

Table 3-1. Identification and enumeration of infauna, Hollywood-Hallandale Beach Renourishment: 1990-1992.

STATION	T88			R90			R92			R94			R106			T111			R116			R120			BAC			BA			TOTALS		
YEAR	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992
Genetyllis sp.																													1			1	
Hesionura elongata					1																											1	
Mystides borealis																									1						1		
Phyllodoce arenae		1																												2		1	2
unidentified phyllodocid																														1			1
Family SIGALIONIDAE																																	
Sigalion arenicola																											1			1			2
Sthenelais boa																									1		2	2		1	3		3
Sthenelais sp.																									1				1		1	1	
unidentified sigalionid																														4			4
Family CHRYSOPETALIDAE																																	
Bhawania heteroseta																											1			2			3
Family HESIONIDAE																																	
Gyptis vittata																									2	1					2	1	
Heteropodarke lysoni																									1						1		
Microphthalmus sp. A																			1	1											1	1	
Podarke obscura																													1			1	
Podarkeopsis levifuscina																									5		1	5	1	2	10	1	3
Family PILARGIIDAE																																	
Sigambra tentaculata																									4			1	1		5	1	
Synelmis sp. B		1			1																				7	8	5				7	10	5
Family SYLLIDAE																																	
Brania clavata																									2			1			3		
Brania wellfleetensis																												2		1	2		1
Dentatisyllis carolinae																									1						1		
Ehlersia cornuta				1												2									6			2			11		
Exogone atlantica																1															1		
Exogone dispar																										1			1	3		2	3
Exogone laurei																1															1		
Exogone sp.																1															1		
Haplosyllis spongicola																1												1			2		
Pionosyllis gesae																									4			2	1		6	1	
Sphaerosyllis longicauda																											1			1			2
Sphaerosyllis riseri																									1						1		
Sphaerosyllis taylori																														1			1
Streptosyllis pettiboneae																											4						4
Syllides floridanus																									1						1		
Syllides bansei				1																											1		
Typosyllis cf. lutea																1															1		
Family NEREIDAE																																	
Ceratonereis irritabilis																									1	2		5	1		6	3	
Ceratonereis longicirrata																											3	1	2	5	1	2	8

Table 3-1. Identification and enumeration of infauna, Hollywood-Hallandale Beach Renourishment: 1990-1992.

STATION	T88			R90			R92			R94			R106			T111			R116			R120			BAC			BA			TOTALS		
YEAR	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992
Ceratonereis mirabilis																									4	1		9	2		13	3	
Ceratonereis versipedata																												2			2		
Ceratonereis sp. A																									4			1			5		
Neanthes sp. A																5															5		
Neanthes sp.																2															2		
Nereis falsa																													1			1	
Platynereis dumerilii																														3			3
unidentified nereid									1																		5			1			7
Family GLYCERIDAE																																	
Glycera abranchiata				5				1								5									1	1		2			13	2	
Glycera americana						1																					1		1			1	2
Glycera sp. A																												1			1		
Glycinde solitaria									1																								1
unidentified glycerid																		1							2	1	2			2	2	1	5
Family GONIADIDAE																																	
Goniada littorea																											1						1
Goniada maculata																1															1		
Goniada teres																												3			3		
Family NEPHTYIDAE																																	
Inermonephtys inermis																													1			1	
Order AMPHINOMIDA																																	
Family AMPHINOMIDAE																																	
Chloeia viridis																											1		2			2	1
Paramphinome sp. B		1														2															2	1	
Pseudeurythoe sp.																											1						1
Order EUNICIDA																																	
Family EUNICIDAE																																	
Eunice sp. A																10															10		
Lysidice ninetta																1															1		
Marphysa sp.																1															1		
Nematonereis hebes				2												7															9		
Family ONUPHIDAE																																	
Diopatra cuprea																														1			1
Kinbergonuphis sp.																												3			3		
Mooreonuphis pallidula				1												4										3		1			6	3	
Mooreonuphis sp.																												1			1		
Family LUMBRINERIDAE																																	
Lumbrinereis latreilli				1																											1		
Lumbrinereis tetraura		1									3		3							3									1		3	8	
Lumbrinereis tenuis																									1						1		
Lumbrinereis verrilli																													1			1	
Lumbrineris sp.																											1			1			2

Table 3-1. Identification and enumeration of infauna, Hollywood-Hallandale Beach Renourishment: 1990-1992.

STATION	T88			R90			R92			R94			R106			T111			R116			R120			BAC			BA			TOTALS		
YEAR	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992
Family ARABELLIDAE																																	
Arabella multidentata		1				1																										1	1
Arabella mutans				1												3															4		
Drilonereis longa																			1						1			1			3		
Drilonereis sp. B																1															1		
Drilonereis sp.																										1						1	
Family DORVILLEIDAE																																	
Pettibonia duofurca																									1						1		
Protodorvillea kefersteini					1																											1	
Schistomeringos pectinata																											1			1			2
unidentified dorvilleid																									1		1				1		1
Order TEREBELLIDA																																	
Family PECTINARIIDAE																																	
Pectinaria gouldii																									1						1		
Family TEREBELLIDAE																																	
Ameaena trilobata																											2						2
Polycirrus plumosus																										1			1			2	
Polycirrus sp. B																													1			1	
Polycirrus sp.																									1						1		
Scionella sp. A																									1						1		
Thalanessa sp. A																										1						1	
unidentified terebellid																											1			1			2
Family TRICHOBRANCHIDAE																																	
Terebellides stroemi																										1		1			1	1	
Order SABELLIDA																																	
Family BOGUEIDAE																																	
Boguea enigmatica																											2			2			4
unidentified bogueid																											2						2
Family SABELLIDAE																																	
Branchiomma nigromaculata																									1						1		
Chone cf. americana																									6	3	12	4	41	18	10	44	30
Demonax sp.																													2			2	
Fabricia sp. A																											14			4			18
Fabriciola trilobata																									20	5	1				20	5	1
Sabellastarte sp. A																												1			1		
unidentified sabellid																											3			1			4
Family SERPULIDAE																																	
unidentified serpulid																1															1		
Order FLABELLIGERIDA																																	
Family FLABELLIGERIDAE																																	
Pherusa inflata																1															1		
Class OLIGOCHAETA																																	

Table 3-1. Identification and enumeration of infauna, Hollywood-Hallandale Beach Renourishment: 1990-1992.

STATION	T88			R90			R92			R94			R106			T111			R116			R120			BAC			BA			TOTALS		
YEAR	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992
Family TUBIFICIDAE																																	
Bathydrilus adriaticus				1												1												1			3		
Heterodrilus bulbiporous				1																								4			5		
Heterodrilus pentcheffi				1																											1		
Inanidrilus leukodermatus				1																								1			2		
Limnodriloides monothecus																											1						1
Olavius/Inanidrilus sp.				1												1											2			1	2		3
Pectinodrilus molestus			1																														1
Smithsonidrilus luteolus																											1						1
Smithsonidrilus marinus																											1						1
Tectidrilus bori																											1	1			1		1
unidentified tubificid		2		1											1	5	2					1					1	20			27	4	2
Family ENCHYTRAEIDAE																																	
Grania sp.																2															2		
Phylum SIPUNCULA																																	
Class SIPUNCULIDEA																																	
Order GOLFINGIIFORMES																																	
Family PHASCOLIONIDAE																																	
Phascolion sp. A																2															2		
Order ASPIDOSIPHONIFORMES																																	
Family ASPIDOSIPHONIDAE																																	
Aspidosiphon fischeri				1																											1		
unidentified sipunculan A																										2			5	17		7	17
Phylum MOLLUSCA																																	
Class POLYPLACOPHORA																																	
Order NEOLORICATA																																	
Acanthochitona sp.													1																		1		
Class GASTROPODA																																	
Family OLIVIDAE																																	
Olivella mutica																						1									1		
Family CERITHIDAE																																	
Cerithium litteratum																2															2		
Family VOLVATELLIDAE																																	
Cylindrobulla beaui				1												4															5		
Family CAECIDAE																																	
Caecum pulchellum			1	36		20	1		1			1				10		1													47		24
Meioceras nitidum						2																											2
Family RISSOIDAE																																	
Amphithalamus vallei				1																											1		
unidentified rissoid (juv.)																1															1		
Family CYLICHNIDAE																																	
Cylichnella bidentata																												1			1		

Table 3-1. Identification and enumeration of infauna, Hollywood-Hallandale Beach Renourishment: 1990-1992.

STATION	T88			R90			R92			R94			R106			T111			R116			R120			BAC			BA			TOTALS		
YEAR	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992
Family CYCLOSTREMATIDAE																																	
Arene tricarinata																									1						1		
Family VITRINELLIDAE																																	
Teinostoma clavium												1																					1
Family NATICIDAE																																	
unidentified naticid (juv)																														1			1
Class BIVALVIA																																	
Family SOLEMYACIDAE																																	
Solemya occidentalis																											1						1
Family ARCIDAE																																	
Barbatia candida				1																											1		
Family CARDITIDAE																																	
Pleuromeris tridentata				2																											2		
Family LEPTONIDAE																																	
unidentified leptonid																											2						2
Family CARDIIDAE																																	
Laevicardium sp.																											1						1
Family LUCINIDAE																																	
Parvilucina multilineata																									6	2			3		6	5	
Lucina sp.																									1						1		
unidentified lucinid				1																											1		
Family SEMELIDAE																																	
Cumingia tellinoides																1															1		
Semele bellastriata																									1						1		
Family UNGULINIDAE																																	
Diplodonta semiaspera																									1	3					1	3	
Diplodonta sp.																									5						5		
Family MESODESMATIDAE																																	
Ervilia concentrica											2														1		1				1	2	1
Ervilia sp.								1																		1						2	
Family THRACIIDAE																																	
Bushia elegans																									2						2		
Family VERTICORDIIDAE																																	
Venicordia ornata																									1	1					1	1	
Family VENERIDAE																																	
Parastarte triquetra																		1															1
Tivela floridana	5	1		13	9	8	43	21	15	6	105	16	8	353	9	5	3	2	54	61	7		188	9	6						140	741	66
Transennella sp.																											1						1
Gouldia cerina																									1						1		
Family MYTILIDAE																																	
Brachiodontes modiolus																24															24		
Family TELLINIDAE																																	

Table 3-1. Identification and enumeration of infauna, Hollywood-Hallandale Beach Renourishment: 1990-1992.

STATION	T88			R90			R92			R94			R106			T111			R116			R120			BAC			BA			TOTALS		
YEAR	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992
Strigilla mirabilis		91	2		4			58			111	8		7	1		2	1		3												276	12
Tellina iris?																7														7		
Tellina sybaritica																									1		4	1		1	2		5
Tellina texana																									1	7			1		1	8	
Tellina sp.				1												14	1	1							1		1		2		16	3	2
unidentified tellinid																1															1		
unidentified bivalve								1			2				3	1		1				1				1	2	2		1	4	4	7
Phylum BRYOZOA																																	
Class GYMNOLAEMATA																																	
Order CHEILOSTOMATA																																	
Cupuladria sp.			2	10		4	1			1		2						1			1			5	23	17	41	27	12	18	82	29	74
Phylum BRACHIOPODA																																	
Class INARTICULATA																																	
Lingula sp.																									1						1		
Phylum ARTHROPODA																																	
Subphylum CHELICERATA																																	
Class PYCNOGONIDA																																	
unidentified pycnogonid																											1	1		1	1		2
Subphylum CRUSTACEA																																	
Class COPEPODA																																	
Order CYCLOPOIDA														1											2	2					2	3	
Order CALANOIDA	2			1			2			5						1						1			2	2					14	2	
Order HARPACTICOIDA		3			22	2		7	3		1	1		1		2	144			1			2		31	9	11	15		26	48	190	43
Class OSTRACODA																																	
Subclass MYODOCOPIDA																																	
Family CYLINDROLEBERIDIDAE																																	
Prionotoleberis salomani																1												1			2		
Asteropella punctata																												1			1		
Family PHILOMEDIDAE																																	
Harbansus paucichelatus		6						3			11																					20	
Family RUTIDERMATIDAE																																	
Rutiderma darbyi																												4			4		
unidentified ostracodes												1															4			1			6
Class MALACOSTRACA																																	
Order AMPHIPODA																																	
Family CAPRELLIDAE																																	
Caprella pentantis																									1			2			3		
Family AMPELISCIDAE																																	
Ampelisca abdita																														1			1
Ampelisca bicarinata																									2	2		5	6		7	8	
Ampelisca sp.																													1			1	
Family AORIDAE																																	

Table 3-1. Identification and enumeration of infauna, Hollywood-Hallandale Beach Renourishment: 1990-1992.

STATION	T88			R90			R92			R94			R106			T111			R116			R120			BAC			BA			TOTALS		
YEAR	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992
Amphideutopus dolichocephalus																												1	6		1	6	
Bemlos unifasciatus reductus																										2		10	6		10	8	
Family GAMMARIDAE																																	
Elasmopus levis																													1			1	
Elasmopus sp.																													1			1	
Family HAUSTORIIDAE																																	
Acanthohaustorius pansus					1																											1	
Haustorius n. sp.	6		10	1		6	6	2	2		4	7	9	5	8			2	2	9	5	3	14	3					1		27	35	43
Bathyporeia parkeri																			4												4		
Family MEGALUROPIDAE																																	
Gibberosus myersi											2							1											1			3	1
Family OEDICEROTIDAE																																	
Monoculodes sp.																										1							1
Synchelidium americanum																										1	1		3	1		4	2
Family PHOXOCEPHALIDAE																																	
Metharpinia floridana	10	17	20	4	5	17	4	84	7	1	19	34	8	34	5	6	4	11	1	26	1	1	29	1	1	1	6	11		2	47	219	104
Family PLATYISCHNOPIDAE																																	
Eudevanopus honduranus	1	5		2	2	2	4	4	1	2		2	3		2	1	3		3	8	6		4	4							16	26	17
Family SYNOPIIDAE																																	
Synopia caraibica											1																					1	
Family COROPHIIDAE																																	
Cerapus sp.									1																								1
unidentified corophiid			2																						1			2	1		3	1	2
Family NEOMEGAMPHOPIDAE																																	
unidentified neomegamphopid																											4			4			8
Order ISOPODA																																	
Family ANTHURIDAE																																	
Amakusanthura magnifica																											2	2	1		2	1	2
Family GNATHIIDAE																																	
Gnathia sp.																											1						1
Family HYSSURIDAE																																	
Xenanthura brevitelson																									54	49	8	39	1		93	50	8
Family CIROLANIDAE																																	
Eurydice convexa																											1						1
Eurydice personata																								1									1
Eurydice sp.								3																					3			6	
Family SPHAEROMATIDAE																																	
Ancinus braziliensis			2																					1									3
Ancinus sp.	2						1			4			1																		8		
Order CUMACEA																																	
Family BODOTRIIDAE																																	
Cyclaspis cf. longipes			2						2		2	7			5		1	2			5		4	2		1			5			13	25

Table 3-1. Identification and enumeration of infauna, Hollywood-Hallandale Beach Renourishment: 1990-1992.

STATION	T88			R90			R92			R94			R106			T111			R116			R120			BAC			BA			TOTALS		
YEAR	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992
Cyclaspis cf. varians		10			2	1		4			4			5			13			2			6			1			2	1		49	2
Cyclaspis cf. striata/bacescui												4			1			1			3			2								11
Cyclaspis n. sp. D	5			11			7	3		4	4		8	3		5	3		4	20			25								44	58	
Cyclaspis n. sp. E				1																											1		
Bodotriidae n. gen. A																4														1	4		1
unidentified cumacean fragment																									1						1		
Order TANAIDACEA																																	
Family PARATANAIDAE																																	
Leptochelia forresti																												1			1		
Leptochelia sp.	1																								1	1	2			1	2	1	3
Family APSEUDIDAE																																	
Apseudes sp. A																									4		2	2			6		2
Family KALLIAPSEUDIDAE																																	
Cirratodactylus floridensis																									81	15	22	49		5	130	15	27
Kalliapseudes sp.																												1			1		
unidentified tanaidacean																									1						1		
Order MYSIDACEA																																	
unidentified mysid				1						1		1	1		1	1				3					1			1			6	3	2
Order DECAPODA																																	
Infraorder PENAEIDEA																																	
Family SOLENOCERIDAE																																	
Solenocera sp.																														1			1
Infraorder CARIDEA																																	
Family ALPHEIDAE																																	
Automate sp.																										1			1			2	
unidentified alpheid																														1			1
Family OGYRIDIDAE																																	
Ogyrides alphaerostris			2								2																					2	2
Family PROCESSIDAE																																	
Processa sp.														1																		1	
unidentified processid																									1						1		
unidentified caridean postlarva																	1															1	
unidentified Alpheoid																									2						2		
Infraorder THALASSINIDEA																																	
Family CALLIANASSIDAE																																	
Callianassid new genus					1																					2			2			5	
unidentified callianassid larva																										1						1	
Infraorder ASTACIDEA																																	
Family NEPHROPIDAE																																	
unidentified nephropid																									1						1		
Infraorder ANOMURA																																	
Family ALBUNEIDAE																																	

Table 3-1. Identification and enumeration of infauna, Hollywood-Hallandale Beach Renourishment: 1990-1992.

STATION	T88			R90			R92			R94			R106			T111			R116			R120			BAC			BA			TOTALS		
YEAR	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992
Albunea gibbesii																													1			1	
Family PAGURIDAE																																	
unidentified pagurid																											1						1
Infraorder BRACHYURA																																	
Family LEUCOSIIDAE																																	
Ebalia stimpsonii																											1						1
Family MAJIDAE																																	
Batrachonotus sp.																										1							1
Family PINNOTHERIDAE																																	
Pinnixa cristata	3						1												1												5		
Pinnixa gorei						2															1												3
Pinnixa sp.											1													1								1	1
unidentified pinnotherid							1			1																		1			3		
Family CALAPPIDAE																																	
Cycloes bairdii																												1	2		1	2	
unidentified megalopa											1						1			1											1	3	
unidentified zoea																												1			1		
Phylum ECHINODERMATA																																	
unidentified ophiuroid																									1		3	3	frag	8	4		11
unidentified holothuroid				3												1											1			1	4		2
Phylum CHAETOGNATHA	3																														3		
Phylum HEMICHORDATA																																	
unidentified enteropneust																													1	1		1	1
Phylum CHORDATA																																	
Subphylum CEPHALOCHORDATA																																	
Branchiostoma caribaeum																									1					1	1		1
Subphylum VERTEBRATA																																	
Class OSTEICHTHYES																																	
unidentified labrid																												1			1		
Unknown		2	1		5		6	1			5	1		1		3					1	3					2	4		1	16		6
Total Number of Organisms	221	222	537	297	1185	310	380	343	241	387	440	354	162	524	399	307	321	191	202	243	246	173	356	159	624	247	434	443	260	512	3196	4127	3383
Number of Organisms for H' & J'	118	200	502	137	169	273	112	330	226	49	409	351	97	504	375	248	135	180	88	231	224	69	243	152	440	215	322	354	216	413	1712	2652	3018
Number of species for H' & J'	14	28	22	45	24	23	14	22	23	15	28	25	17	18	22	70	21	27	11	17	23	11	13	21	90	54	96	85	69	87			
Diversity Index (H')	1.661	2.245	1.641	3.045	2.186	2.523	2.096	2.294	2.487	2.360	2.326	2.388	2.462	1.329	1.824	3.735	2.297	2.366	1.497	2.324	2.023	1.159	1.629	1.883	3.351	3.123	4.333	3.643	3.368	3.783			
Evenness (J')	0.634	0.674	0.531	0.800	0.600	0.804	0.794	0.742	0.793	0.871	0.698	0.742	0.869	0.460	0.590	0.878	0.755	0.718	0.246	0.382	0.645	0.190	0.268	0.619	0.550	0.513	0.949	0.820	0.795	0.847			

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							T88															R90								
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TAXON																														
Phylum ANNELIDA																														
Class POLYCHAETA																														
Leitoscoloplos sp.																														
Scoloplos sp.																														
Aricidea cerrutii																														
Aricidea suecica																														
Aricidea sp.																														
Paraonis fulgens	1	4	3	1		3		1	3	4	2	4	2		2	1			4		1			1	2		7	2	1	
Apoprionospio dayi																														
Dispio uncinata	39	20	4	19	9	13	12	23	28	31	14	19	49	29	13	5			10		19		8	4	8	10	6		14	4
Paraprionospio pinnata																														
Prionospio cristata																														
Prionospio sp.																														
Pseudopolydora spp.																														
Scolelepis texana	6	3		1	1		3		7	7	4	3	7		4	11			7		7		4	9	5	6	3	1	5	
Spio pettiboneae	1			4			2	3	1	2		8	1	3	1	2			1		2		2	2		1	1	2	1	2
Unident. spionid																4														1
Poecilochaetus johnsoni																														
Magelona pettiboneae																														
Magelona sp. C																														
Magelona sp. H																														
Magelona sp.																														
Unident. chaetopterid (juv)																														
Caulleriella killariensis																														
Chaetozone sp. B																														
Chaetozone sp.																														
Tharyx dorsobranchialis																														
Tharyx marioni																														
Tharyx sp. (juv)																														
Unident. cirratulid																														
Mediomastus spp.																														
Notomastus americanus																														
Notomastus sp.																														
Unident. capitellid																														

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							T88									R90													
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TAXON																														
Phylum CNIDARIA																														
Unident. hydroid																														
Sphenotrochus sp.																												1		
Unident. actinian																														
Phylum PLATYHELMINTHES																														
Class TURBELLARIA																														
?Coelogynopora sp.																														
Unident. bothryoplanid																														
Unident. otoplanid																														
Unident. proseriate																														
Unident. typhloplanid																														
Unident. turbellarian				1				1									1													
Phylum NEMERTINA																														
Baseodiscus sp.																														
Carinoma sp. A			1																			1								
Carinomella lactea																														
Cephalothrix sp. A				1								1		1																
Cephalothrix sp. 114							1		1	1								2						1				1	1	
Hubrechtella dubia																														
?Micrura sp.																														
Paleonemertine sp. 103																														
Tetrastemma worki			1																											
Tubulanus pellucidus																														
Tubulanus rhabdotus																														
Tubulanus sp.																														
Unident. drepanophorid																														
Unident. archinemertine																														
Unident. hoplonemertine								1																						
Unident. paleonemertine											1																	1		
Unident. nemertine																														
Phylum NEMATODA	1	4		22	2					2	1			2			1										1	3		30

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							T88															R90								
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TAXON																														
Unident. maldanid																														
Armandia agilis	1	3		2	2		1	4		1	1	4	2		1	1			1		3			1	1	1	1	2	2	
Armandia sp. (juv)																1														
Sclerobregma stenocerum																														
Genetyllis cf. castanea																														
Phyllodoce arenae																														
Unident. phyllodocid																														
Sigalion arenicola																														
Sthenelais boa																														
Unident. sigalionid																														
Bhawania heteroseta																														
Podarkeopsis levifuscina																														
Synelmis sp. B																														
Brania wellfleetensis																														
Exogone dispar																														
Sphaerosyllis longicauda																														
Sphaerosyllis taylori																														
Streptosyllis pettiboneae																														
Ceratonereis longicirrata																														
Platynereis dumerilii																														
Unident. nereid																														
Glycera americana																									1					
Glycinde solitaria																														
Unident. glycerid																														
Goniada littorea																														
Chloeia viridis																														
Pseudeurythoe sp.																														
Diopatra cuprea																														
Lumbrineris sp.																														
Arabella multidentata																			1											
Schistomeringos pectinata																														
Unident. dorvilleid																														
Amaeana trilobata																														
Unident. terebellid																														

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							T88									R90													
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TAXON																														
Boguea enigmatica																														
Unident. bogueid																														
Chone cf. americana																														
Fabricia sp. A																														
Fabriciola trilobata																														
Unident. sabellid																														
Class OLIGOCHAETA																														
Limnodriloides monothecus																														
Olavius/Inanidrilus (juv)																														
Pectinodrilus molestus				1																										
Smithsonidrilus luteolus																														
Smithsonidrilus marinus																														
Tectidrilus bori																														
Unident. tubificid																														
Phylum SIPUNCULA																														
Unident. sipunculans																														
Phylum MOLLUSCA																														
Class GASTROPODA																														
Caecum pulchellum									1							1	4			5				1		3		4		2
Meioceras nitidum																													2	
Teinostoma clavium																														
Unidentified naticid (juv.)																														
Class BIVALVIA																														
Solemya occidentalis																														
Unidentified leptonid																														
Laevicardium sp.																														
Ervilia concentrica																														
Tellina sybaritica																														
Tellina sp.																														
Strigilla mirabilis									1			1																		
Parastarte triquetra																														
Tivela floridana																	2		1	1				3		1				
Transennella sp.																														
Unident. bivalve																														

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							T88															R90								
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TAXON																														
Phylum BRYOZOA																														
Cupuladria sp.								1		1											1							2		1
Phylum ARTHROPODA																														
Subphylum CHELICERATA																														
Class PYCNOGONIDA																														
Unidentified pycnogonid																														
Subphylum CRUSTACEA																														
Class COPEPODA																														
Unident. harpacticoids																1												1		
Class OSTRACODA																														
Unident. ostracodes																														
Class MALACOSTRACA																														
Order ISOPODA																														
Amakusanthura magnifica																														
Xenanthura brevitelson																														
Gnathia sp.																														
Eurydice convexa																														
Eurydice personata																														
Ancinus braziliensis										1					1															
Order CUMACEA																														
Cumella sp. A																														
Cyclaspis sp. A																													1	
Cyclaspis sp. B	1										1																			
Cyclaspis sp. C																														
?Vaunthompsoniinae sp.																														
Order AMPHIPODA																														
Ampelisca abdita																														
Cerapus n. sp.																														
Eudevanopus honduranus																												1		1
Gibberosus myersi																														
Haustorius sp.			1	1			2	2					1	3				1				3						2		
Metharpinia floridana	1		3	2	2			2	1	3	1	4	1					1	1	1	1	3	1	2	3		1	1		2
Monoculodes sp.																														
Synchelidium americanum																														

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							T88																R90								
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TAXON																														
Unident. corophiid														2																
Unident. neomegamphopid																														
Order TANAIDACEA																														
Leptochelia sp.																														
Cirratodactylus floridensis																														
Apseudes sp.																														
Order MYSIDACEA																														
Unidentified mysid																														
Order DECAPODA																														
Solenocera sp.																														
Ogyrides alphaerostris	1											1																		
Unidentified alpheid																														
Unidentified pagurid																														
Ebalia stimpsonii																														
Pinnixa gorei																					1					1				
?Pinnixa sp. (juv.)																														
Batrachonotus sp.																														
Phylum ECHINODERMATA																														
Unident. ophiuroid																														
Unident. holothuroid																														
Phylum HEMICHORDATA																														
Unident. enteropneust																														
Phylum CHORDATA																														
Branchiostoma caribaeum																														
Unknown					1																									

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							R92															R94								
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TAXON																														
Phylum CNIDARIA																														
Unident. hydroid																														
Sphenotrochus sp.																														
Unident. actinian																														
Phylum PLATYHELMINTHES																														
Class TURBELLARIA																														
?Coelogynopora sp.					1							1	1																	
Unident. bothryoplanid																														
Unident. otoplanid																														
Unident. proseriate																														
Unident. typhloplanid																														
Unident. turbellarian						1															1									
Phylum NEMERTINA																														
Baseodiscus sp.																														
Carinoma sp. A																														
Carinomella lactea	1					1	1																							
Cephalothrix sp. A									1																1	1			1	
Cephalothrix sp. 114							4					1	1		3	4	2		3					1						5
Hubrechtella dubia																														
?Micrura sp.																														
Paleonemertine sp. 103													2																	
Tetrastemma worki																									1					
Tubulanus pellucidus																														
Tubulanus rhabdotus																														
Tubulanus sp.																														
Unident. drepanophorid																														
Unident. archinemertine																														
Unident. hoplonemertine							1														1									
Unident. paleonemertine																														
Unident. nemertine																														
Phylum NEMATODA									1		1			4	6			1												

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							R92															R94								
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TAXON																														
Phylum ANNELIDA																														
Class POLYCHAETA																														
Leitoscoloplos sp.																														
Scoloplos sp.																														
Aricidea cerrutii																														
Aricidea suecica																														
Aricidea sp.								1																						
Paraonis fulgens	1	2	3			2		2	5	2	3	5		2	1		1		1	2				2	2	1	1	2	1	3
Apoprionospio dayi																		1				1				2				
Dispio uncinata	7	10	4		2	2	1	2	1	2	2	9	3	10	3	20	17	1	3	2	4	5	6	5	12	4	2	5	3	6
Paraprionospio pinnata																														
Prionospio cristata																			1											
Prionospio sp.																														
Pseudopolydora spp.																					1									
Scolelepis texana	5	3	2		1	2	1	1	7	2			5	7	6	12	3	4	5	3	4	1	1	4	3	4	2			5
Spio pettiboneae	2	5	2		1	1		1				1	1	8	4	10	3	3	3			3	3	1	1	2	5	5	4	4
Unident. spionid													1																	
Poecilochaetus johnsoni																														
Magelona pettiboneae																														
Magelona sp. C																														
Magelona sp. H																														
Magelona sp.																														
Unident. chaetopterid (juv)																														
Caulleriella killariensis																														
Chaetozone sp. B																														
Chaetozone sp.																														
Tharyx dorsobranchialis																														
Tharyx marioni																														
Tharyx sp. (juv)																														
Unident. cirratulid																														
Mediomastus spp.																														
Notomastus americanus																														
Notomastus sp.																														
Unident. capitellid																														

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							R92																R94								
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TAXON																														
Unident. maldanid																														
Armandia agilis		2	4		2		1			1	1	6			2	1	4	2			2	3	7	2	4	4	1		1	
Armandia sp. (juv)																														
Sclerobregma stenocerum																														
Genetyllis cf. castanea																														
Phyllodoce arenae																														
Unident. phyllodocid																														
Sigalion arenicola																														
Sthenelais boa																														
Unident. sigalionid																														
Bhawania heteroseta																														
Podarkeopsis levifuscina																														
Synelmis sp. B																														
Brania wellfleetensis																														
Exogone dispar																														
Sphaerosyllis longicauda																														
Sphaerosyllis taylori																														
Streptosyllis pettiboneae																														
Ceratonereis longicirrata																														
Platynereis dumerilii																														
Unident. nereid							1																							
Glycera americana																														
Glycinde solitaria						1																								
Unident. glycerid																														
Goniada littorea																														
Chloeia viridis																														
Pseudeurythoe sp.																														
Diopatra cuprea																														
Lumbrineris sp.																														
Arabella multidentata																														
Schistomeringos pectinata																														
Unident. dorvilleid																														
Amaeana trilobata																														
Unident. terebellid																														

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							R92																R94							
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TAXON																														
Boguea enigmatica																														
Unident. bogueid																														
Chone cf. americana																														
Fabricia sp. A																														
Fabriciola trilobata																														
Unident. sabellid																														
Class OLIGOCHAETA																														
Limnodriloides monothecus																														
Olavius/Inanidrilus (juv)																														
Pectinodrilus molestus																														
Smithsonidrilus luteolus																														
Smithsonidrilus marinus																														
Tectidrilus bori																														
Unident. tubificid																														
Phylum SIPUNCULA																														
Unident. sipunculans																														
Phylum MOLLUSCA																														
Class GASTROPODA																														
Caecum pulchellum					1																		1							
Meioceras nitidum																														
Teinostoma clavium																												1		
Unidentified naticid (juv.)																														
Class BIVALVIA																														
Solemya occidentalis																														
Unidentified leptonid																														
Laevicardium sp.																														
Ervilia concentrica																														
Tellina sybaritica																														
Tellina sp.																														
Strigilla mirabilis																		1	2						2		1	2		
Parastarte triquetra																														
Tivela floridana	1	1	1	5	1	1						1		1	3	1	1	1	2				2			1	4	2	1	1
Transennella sp.																														
Unident. bivalve																														

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							R92															R94								
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TAXON																														
Phylum BRYOZOA																														
Cupuladria sp.																									1			1		
Phylum ARTHROPODA																														
Subphylum CHELICERATA																														
Class PYCNOGONIDA																														
Unidentified pycnogonid																														
Subphylum CRUSTACEA																														
Class COPEPODA																														
Unident. harpacticoids				1				1						1															1	
Class OSTRACODA																														
Unident. ostracodes																			1											
Class MALACOSTRACA																														
Order ISOPODA																														
Amakusanthura magnifica																														
Xenanthura brevitelson																														
Gnathia sp.																														
Eurydice convexa																														
Eurydice personata																														
Ancinus braziliensis																														
Order CUMACEA																														
Cumella sp. A																														
Cyclaspis sp. A																														
Cyclaspis sp. B		1								1								1			2			1	1	1				1
Cyclaspis sp. C																					1			1			2			
?Vaunthompsoniinae sp.																														
Order AMPHIPODA																														
Ampelisca abdita																														
Cerapus n. sp.												1																		
Eudevanopus honduranus			1														1									1				
Gibberosus myersi																														
Haustorius sp.					1										1		2	1						1		1	1	1		
Metharpinia floridana			2						2		1				2	4	4			2	1	2	1	5	1	5	7		2	
Monoculodes sp.																														
Synchelidium americanum																														

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							R92															R94								
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TAXON																														
Unident. corophiid																														
Unident. neomegamphopid																														
Order TANAIDACEA																														
Leptochelia sp.																														
Cirratodactylus floridensis																														
Apseudes sp.																														
Order MYSIDACEA																														
Unidentified mysid																									1					
Order DECAPODA																														
Solenocera sp.																														
Ogyrides alphaerostris																														
Unidentified alpheid																														
Unidentified pagurid																														
Ebalia stimpsonii																														
Pinnixa gorei																														
?Pinnixa sp. (juv.)																														
Batrachonotus sp.																														
Phylum ECHINODERMATA																														
Unident. ophiuroid																														
Unident. holothuroid																														
Phylum HEMICHORDATA																														
Unident. enteropneust																														
Phylum CHORDATA																														
Branchiostoma caribaeum																														
Unknown																					1									

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							R106															T111									
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TAXON																														
Phylum CNIDARIA																														
Unident. hydroid																														
Sphenotrochus sp.																	1													
Unident. actinian																														
Phylum PLATYHELMINTHES																														
Class TURBELLARIA																														
?Coelogynopora sp.																														
Unident. bothryoplanid																														
Unident. otoplanid																														
Unident. proseriate																														
Unident. typhloplanid																														
Unident. turbellarian									1																					
Phylum NEMERTINA																														
Baseodiscus sp.																														
Carinoma sp. A																	1													
Carinomella lactea																														
Cephalothrix sp. A		1					1						2		1															
Cephalothrix sp. 114		1							1			3	1								1								1	
Hubrechtella dubia																													1	
?Micrura sp.																														
Paleonemertine sp. 103																														
Tetrastemma worki																														
Tubulanus pellucidus																														
Tubulanus rhabdotus																														
Tubulanus sp.																														
Unident. drepanophorid																														
Unident. archinemertine											1																			
Unident. hoplonemertine																					1									
Unident. paleonemertine																														
Unident. nemertine										1			1										1							
Phylum NEMATODA			2	2	1							7	6		6				7		2						2			

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							R106														T111								
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TAXON																														
Phylum ANNELIDA																														
Class POLYCHAETA																														
Leitoscoloplos sp.						1				1																			1	
Scoloplos sp.																														
Aricidea cerrutii																														
Aricidea suecica																														
Aricidea sp.																														
Paraonis fulgens	2	11	2	1	2	11	11	13	5	3	6	5	15	5	11		1		1			4					5		2	3
Apoprionospio dayi																					1					1			1	
Dispio uncinata	18	2	5	14	10	5	3	25	18	17	11	18	16	6	17	1			1	1	4	3	6	5	8	4	5	1	1	
Paraprionospio pinnata																														
Prionospio cristata																														
Prionospio sp.																														
Pseudopolydora spp.																														
Scolelepis texana	1	1		1					4			1	8		1	5	2	1	2	7		3	3	2	8		6	6	9	2
Spio pettiboneae		1	1	1	1			1			1	1	5			1	1	2			1	1		1	4	2	9	1	1	
Unident. spionid										1																				
Poecilochaetus johnsoni																														
Magelona pettiboneae																														
Magelona sp. C																														
Magelona sp. H																														
Magelona sp.																														
Unident. chaetopterid (juv)																														
Caulleriella killariensis																														
Chaetozone sp. B																														
Chaetozone sp.																														
Tharyx dorsobranchialis																														
Tharyx marioni																														
Tharyx sp. (juv)																														
Unident. cirratulid																														
Mediomastus spp.																				1										
Notomastus americanus																														
Notomastus sp.																														
Unident. capitellid																														

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							R106														T111								
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14
TAXON																													
Unident. maldanid																													
Armandia agilis		1							2					1				3	1										2
Armandia sp. (juv)																													
Sclerobregma stenocerum																													
Genetyllis cf. castanea																													
Phyllodoce arenae																													
Unident. phyllodocid																													
Sigalion arenicola																													
Sthenelais boa																													
Unident. sigalionid																													
Bhawania heteroseta																													
Podarkeopsis levifuscina																													
Synelmis sp. B																													
Brania wellfleetensis																													
Exogone dispar																													
Sphaerosyllis longicauda																													
Sphaerosyllis taylori																													
Streptosyllis pettiboneae																													
Ceratonereis longicirrata																													
Platynereis dumerilii																													
Unident. nereid																													
Glycera americana																													
Glycinde solitaria																													
Unident. glycerid																										1			
Goniada littorea																													
Chloeia viridis																													
Pseudeurythoe sp.																													
Diopatra cuprea																													
Lumbrineris sp.																													
Arabella multidentata																													
Schistomeringos pectinata																													
Unident. dorvilleid																													
Amaeana trilobata																													
Unident. terebellid																													

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							R106									T111													
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TAXON																														
Boguea enigmatica																														
Unident. bogueid																														
Chone cf. americana																														
Fabricia sp. A																														
Fabriciola trilobata																														
Unident. sabellid																														
Class OLIGOCHAETA																														
Limnodriloides monothecus																														
Olavius/Inanidrilus (juv)																														
Pectinodrilus molestus																														
Smithsonidrilus luteolus																														
Smithsonidrilus marinus																														
Tectidrilus bori																														
Unident. tubificid			1																											
Phylum SIPUNCULA																														
Unident. sipunculans																														
Phylum MOLLUSCA																														
Class GASTROPODA																														
Caecum pulchellum																		1												
Meioceras nitidum																														
Teinostoma clavium																														
Unidentified naticid (juv.)																														
Class BIVALVIA																														
Solemya occidentalis																														
Unidentified leptonid																														
Laevicardium sp.																														
Ervilia concentrica																														
Tellina sybaritica																														
Tellina sp.																							1							
Strigilla mirabilis									1														1							
Parastarte triquetra																				1										
Tivela floridana		1	1			1	2		1	1			2					1		1										
Transennella sp.																														
Unident. bivalve					2							1											1							

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							R106														T111									
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TAXON																														
Phylum BRYOZOA																														
Cupuladria sp.																			1											
Phylum ARTHROPODA																														
Subphylum CHELICERATA																														
Class PYCNOGONIDA																														
Unidentified pycnogonid																														
Subphylum CRUSTACEA																														
Class COPEPODA																														
Unident. harpacticoids																														
Class OSTRACODA																														
Unident. ostracodes																														
Class MALACOSTRACA																														
Order ISOPODA																														
Amakusanthura magnifica																														
Xenanthura brevitelson																														
Gnathia sp.																														
Eurydice convexa																														
Eurydice personata																														
Ancinus braziliensis																														
Order CUMACEA																														
Cumella sp. A																														
Cyclaspis sp. A																														
Cyclaspis sp. B										2	1		1		1										1		1			
Cyclaspis sp. C									1																					1
?Vaunthompsoniinae sp.																														
Order AMPHIPODA																														
Ampelisca abdita																														
Cerapus n. sp.																														
Eudevanopus honduranus												1	1																	
Gibberosus myersi																1														
Haustorius sp.		1		1		1	3					1	1										1				1			
Metharpinia floridana						1	1	1					1	1					1				4	1	1	2	2			
Monoculodes sp.																														
Synchelidium americanum																														

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							R106														T111								
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TAXON																														
Unident. corophiid																														
Unident. neomegamphopid																														
Order TANAIDACEA																														
Leptochelia sp.																														
Cirratodactylus floridensis																														
Apseudes sp.																														
Order MYSIDACEA																														
Unidentified mysid						1																								
Order DECAPODA																														
Solenocera sp.																														
Ogyrides alphaerostris																														
Unidentified alpheid																														
Unidentified pagurid																														
Ebalia stimpsonii																														
Pinnixa gorei																														
?Pinnixa sp. (juv.)																														
Batrachonotus sp.																														
Phylum ECHINODERMATA																														
Unident. ophiuroid																														
Unident. holothuroid																														
Phylum HEMICHORDATA																														
Unident. enteropneust																														
Phylum CHORDATA																														
Branchiostoma caribaeum																														
Unknown																														

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							R116															R120								
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TAXON																														
Phylum CNIDARIA																														
Unident. hydroid																														
Sphenotrochus sp.	1																													
Unident. actinian																														
Phylum PLATYHELMINTHES																														
Class TURBELLARIA																														
?Coelogynopora sp.																														
Unident. bothryoplanid										1																				
Unident. otoplanid				1																							1			
Unident. proseriate	1									1	2												1							
Unident. typhloplanid																			1											
Unident. turbellarian		1										1	1																	
Phylum NEMERTINA																														
Baseodiscus sp.																														
Carinoma sp. A																														
Carinomella lactea												1							1											
Cephalothrix sp. A	1			1																										
Cephalothrix sp. 114						1																	1							
Hubrechtella dubia																														
?Micrura sp.																														
Paleonemertine sp. 103																														
Tetrastemma worki																														
Tubulanus pellucidus																														
Tubulanus rhabdotus																														
Tubulanus sp.																														
Unident. drepanophorid																														
Unident. archinemertine																														
Unident. hoplonemertine																														
Unident. paleonemertine																														
Unident. nemertine																			1											
Phylum NEMATODA	2			5		3	2	3			1	1	4					4			2									1

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							R116															R120								
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TAXON																														
Phylum ANNELIDA																														
Class POLYCHAETA																														
Leitoscoloplos sp.																														
Scoloplos sp.					1																									
Aricidea cerrutii																														
Aricidea suecica																														
Aricidea sp.																														
Paraonis fulgens	6	5	3	1	11	9	2	2	6	3	6	2	8	1	5	1	1	3	9	2	2		2	1	3	8	2		2	2
Apoprionospio dayi																														
Dispio uncinata	6	2	5	9	7	12	5	1	4	3	3	4	18	1	15	4	7	3	4	4	3	2	2	12	3	9	7	5	5	4
Paraprionospio pinnata																														
Prionospio cristata							1																							
Prionospio sp.																														
Pseudopolydora spp.																														
Scolelepis texana		1		1	2				1			1	1		1												1		1	
Spio pettiboneae							1				1	2	1						1											
Unident. spionid																														
Poecilochaetus johnsoni																														
Magelona pettiboneae																														
Magelona sp. C																														
Magelona sp. H																														
Magelona sp.																														
Unident. chaetopterid (juv)																														
Caulleriella killariensis																														
Chaetozone sp. B																														
Chaetozone sp.																														
Tharyx dorsobranchialis																														
Tharyx marioni																														
Tharyx sp. (juv)																														
Unident. cirratulid																														
Mediomastus spp.																														
Notomastus americanus																														
Notomastus sp.																														
Unident. capitellid																														

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							R116																R120								
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TAXON																														
Unident. maldanid																														
Armandia agilis												1																1	1	
Armandia sp. (juv)																														
Sclerobregma stenocerum																														
Genetyllis cf. castanea																														
Phyllodoce arenae																														
Unident. phyllodocid																														
Sigalion arenicola																														
Sthenelais boa																														
Unident. sigalionid																														
Bhawania heteroseta																														
Podarkeopsis levifuscina																														
Synelmis sp. B																														
Brania wellfleetensis																														
Exogone dispar																														
Sphaerosyllis longicauda																														
Sphaerosyllis taylori																														
Streptosyllis pettiboneae																														
Ceratonereis longicirrata																														
Platynereis dumerilii																														
Unident. nereid																														
Glycera americana																														
Glycinde solitaria																														
Unident. glycerid																														
Goniada littorea																														
Chloeia viridis																														
Pseudeurythoe sp.																														
Diopatra cuprea																														
Lumbrineris sp.																														
Arabella multidentata																														
Schistomeringos pectinata																														
Unident. dorvilleid																														
Amaeana trilobata																														
Unident. terebellid																														

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							R116															R120								
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TAXON																														
Boguea enigmatica																														
Unident. bogueid																														
Chone cf. americana																														
Fabricia sp. A																														
Fabriciola trilobata																														
Unident. sabellid																														
Class OLIGOCHAETA																														
Limnodriloides monothecus																														
Olavius/Inanidrilus (juv)																														
Pectinodrilus molestus																														
Smithsonidrilus luteolus																														
Smithsonidrilus marinus																														
Tectidrilus bori																														
Unident. tubificid																														
Phylum SIPUNCULA																														
Unident. sipunculans																														
Phylum MOLLUSCA																														
Class GASTROPODA																														
Caecum pulchellum																														
Meioceras nitidum																														
Teinostoma clavium																														
Unidentified naticid (juv.)																														
Class BIVALVIA																														
Solemya occidentalis																														
Unidentified leptonid																														
Laevicardium sp.																														
Ervilia concentrica																														
Tellina sybaritica																														
Tellina sp.																														
Strigilla mirabilis																														
Parastarte triquetra																														
Tivela floridana	1		1	1	1			2							1		1	2					2					4		
Transennella sp.																														
Unident. bivalve																														

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							R116															R120								
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TAXON																														
Phylum BRYOZOA																														
Cupuladria sp.							1															2	2	1						
Phylum ARTHROPODA																														
Subphylum CHELICERATA																														
Class PYCNOGONIDA																														
Unidentified pycnogonid																														
Subphylum CRUSTACEA																														
Class COPEPODA																														
Unident. harpacticoids																														
Class OSTRACODA																														
Unident. ostracodes																														
Class MALACOSTRACA																														
Order ISOPODA																														
Amakusanthura magnifica																														
Xenanthura brevitelson																														
Gnathia sp.																														
Eurydice convexa																														
Eurydice personata																												1		
Ancinus braziliensis																			1											
Order CUMACEA																														
Cumella sp. A																														
Cyclaspis sp. A																														
Cyclaspis sp. B					1		1					3							1									1		
Cyclaspis sp. C												1	2															1		1
?Vaunthompsoniinae sp.																														
Order AMPHIPODA																														
Ampelisca abdita																														
Cerapus n. sp.																														
Eudevanopus honduranus						3		2							1								1	3						
Gibberosus myersi																														
Haustorius sp.		1			1		1	1				1								1								1		1
Metharpinia floridana			1														1													
Monoculodes sp.																														
Synchelidium americanum																														

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							R116															R120								
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TAXON																														
Unident. corophiid																														
Unident. neomegamphopid																														
Order TANAIDACEA																														
Leptochelia sp.																														
Cirratodactylus floridensis																														
Apseudes sp.																														
Order MYSIDACEA																														
Unidentified mysid																														
Order DECAPODA																														
Solenocera sp.																														
Ogyrides alphaerostris																														
Unidentified alpheid																														
Unidentified pagurid																														
Ebalia stimpsonii																														
Pinnixa gorei							1																							
?Pinnixa sp. (juv.)																					1									
Batrachonotus sp.																														
Phylum ECHINODERMATA																														
Unident. ophiuroid																														
Unident. holothuroid																														
Phylum HEMICHORDATA																														
Unident. enteropneust																														
Phylum CHORDATA																														
Branchiostoma caribaeum																														
Unknown								1																						

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							BAC															BA								
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TAXON																														
Phylum CNIDARIA																														
Unident. hydroid													1																	
Sphenotrochus sp.		1			1	4		12	2											1										
Unident. actinian							1						1				1	1				3	3							
Phylum PLATYHELMINTHES																														
Class TURBELLARIA																														
?Coelogynopora sp.																							1							
Unident. bothryoplanid																														
Unident. otoplanid																														
Unident. proseriate		2																												
Unident. typhloplanid																														
Unident. turbellarian			1		4	1																								
Phylum NEMERTINA																														
Baseodiscus sp.																													1	
Carinoma sp. A					1																									
Carinomella lactea					3			2				1			1						2				2			2		
Cephalothrix sp. A		1			3																					1		1		
Cephalothrix sp. 114					1	1																								1
Hubrechtella dubia																														
?Micrura sp.																											1			
Paleonemertine sp. 103																														
Tetrastemma worki																														
Tubulanus pellucidus					1					1																1				1
Tubulanus rhabdotus																												1		
Tubulanus sp.																										1				
Unident. dreparophorid	1																													1
Unident. archinemertine																														
Unident. hoplonemertine	1		1			1																								
Unident. paleonemertine															1															
Unident. nemertine																		1												2
Phylum NEMATODA	3	9	5	1	10	7	15	3	11	4	3	6	21	1			3	2				1	4	3	7	31	5	1	2	13

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							BAC															BA								
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TAXON																														
Phylum ANNELIDA																														
Class POLYCHAETA																														
Leitoscoloplos sp.																														
Scoloplos sp.												1																		
Aricidea cerrutii								1	1										1											
Aricidea suecica												2																		
Aricidea sp.					1																									
Paraonis fulgens						1																				2				
Apoprionospio dayi																												1		
Dispio uncinata						2																1								
Paraprionospio pinnata												1								2			3	3	3	3	1		2	2
Prionospio cristata		9	1	1	6	3	4		1	1	1		1	1		2	2	1	2			1	11	3	4	4	2	6	12	4
Prionospio sp.						1																			1		1			
Pseudopolydora spp.		1					1		1		1		2			7	8	4	4	4	7	4	4	4	2	12	3	9	7	14
Scolelepis texana						1																	1		1					
Spio pettiboneae	1						2												1	1		1				2			2	
Unident. spionid							1								1															2
Poecilochaetus johnsoni					1						1																			
Magelona pettiboneae															1															
Magelona sp. C																														1
Magelona sp. H																			1											
Magelona sp.																		1	1											
Unident. chaetopterid (juv)																		2					1							
Caulleriella killariensis	1										1														1					
Chaetozone sp. B					1					1													1							
Chaetozone sp.			1			1																								
Tharyx dorsobranchialis							1																							
Tharyx marioni								1																						
Tharyx sp. (juv)									1																					
Unident. cirratulid					5																		1	1						
Mediomastus spp.																													1	
Notomastus americanus										1							1	1		1	1					2		2		
Notomastus sp.												1																		
Unident. capitellid								1				1											1							

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							BAC															BA								
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TAXON																														
Unident. maldanid																							1							
Armandia agilis	1				1	1	1		1														6	10		7	2	1	5	4
Armandia sp. (juv)																									1		2			
Sclerobregma stenocerum																										1				
Genetyllis cf. castanea												1	1							1			2			1	1			3
Phyllodoce arenae																								2						
Unident. phyllodocid																					1									
Sigalion arenicola										1							1													
Sthenelais boa					1					1																				1
Unident. sigalionid																										1			1	2
Bhawania heteroseta									1															1	1					
Podarkeopsis levifuscina													1																1	1
Synelmis sp. B		1						2			1		1																	
Brania wellfleetensis																													1	
Exogone dispar																1												1	1	
Sphaerosyllis longicauda														1													1			
Sphaerosyllis taylori																	1													
Streptosyllis pettiboneae		2				1			1																					
Ceratonereis longicirrata		1								1		1												1		2			2	
Platynereis dumerilii																1										1				1
Unident. nereid									2				1	1	1												1			
Glycera americana							1																							
Glycinde solitaria																														
Unident. glycerid									1	1															1					1
Goniada littorea									1																					
Chloeia viridis					1																									
Pseudeurythoe sp.		1																												
Diopatra cuprea																											1			
Lumbrineris sp.		1																	1											
Arabella multidentata																														
Schistomeringos pectinata								1																					1	
Unident. dorvilleid									1																					
Amaeana trilobata					1								1																	
Unident. terebellid										1														1						

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							BAC															BA								
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TAXON																														
Boguea enigmatica											1	1							1										1	
Unident. bogueid										1					1															
Chone cf. americana		1			4	1			3		1			2		1			1	1			5	1	1			1	4	3
Fabricia sp. A		4			1		2		2		2	1	1		1		1						1				2			
Fabriciola trilobata														1																
Unident. sabellid				1	1		1																							1
Class OLIGOCHAETA																														
Limnodriloides monothecus										1																				
Olavius/Inanidrilus (juv)							1							1									1							
Pectinodrilus molestus																														
Smithsonidrilus luteolus										1																				
Smithsonidrilus marinus					1																									
Tectidrilus bori											1																			
Unident. tubificid									1																					
Phylum SIPUNCULA																														
Unident. sipunculans																	1	3	1			3		2	1	3	1	1		1
Phylum MOLLUSCA																														
Class GASTROPODA																														
Caecum pulchellum																														
Meioceras nitidum																														
Teinostoma clavium																														
Unidentified naticid (juv.)																										1				
Class BIVALVIA																														
Solemya occidentalis						1																								
Unidentified leptonid		2																												
Laevicardium sp.		1																												
Ervilia concentrica												1																		
Tellina sybaritica					1			2			1												1							
Tellina sp.										1																				
Strigilla mirabilis																														
Parastarte triquetra																														
Tivela floridana																														
Transennella sp.					1																									
Unident. bivalve		1					1																							1

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							BAC																BA								
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TAXON																														
Phylum BRYOZOA																														
Cupuladria sp.	4	6	1		1	3	2	7		2	2		7	4	2		1	1		2	2			1	2	1	2		1	5
Phylum ARTHROPODA																														
Subphylum CHELICERATA																														
Class PYCNOGONIDA																														
Unidentified pycnogonid								1								1														
Subphylum CRUSTACEA																														
Class COPEPODA																														
Unident. harpacticoids		4	2			1	2			2							1							2	1	1	2		5	14
Class OSTRACODA																														
Unident. ostracodes		2					1	1																					1	
Class MALACOSTRACA																														
Order ISOPODA																														
Amakusanthura magnifica		1											1																	
Xenanthura brevitelson	1		2		2	1			1	1																				
Gnathia sp.		1																												
Eurydice convexa						1																								
Eurydice personata																														
Ancinus braziliensis																														
Order CUMACEA																														
Cumella sp. A																													1	
Cyclaspis sp. A																													1	
Cyclaspis sp. B																														
Cyclaspis sp. C																														
?Vaunthompsoniinae sp.																	1													
Order AMPHIPODA																														
Ampelisca abdita																										1				
Cerapus n. sp.																														
Eudevanopus honduranus																														
Gibberosus myersi																														
Haustorius sp.																														
Metharpinia floridana				1	1		1	1	1						1						1								1	
Monoculodes sp.												1																		
Synchelidium americanum					1																								1	

Table 3-2. Identification and enumeration of infauna by replicate, Hollywood-Hallandale Beach Renourishment: 1992.

STATION							BAC															BA								
REPLICATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TAXON																														
Unident. corophiid																														
Unident. neomegamphopid					3					1												1	1	1			1			
Order TANAIDACEA																														
Leptochelia sp.		2																												1
Cirratodactylus floridensis	1	3	1	2	4	1			1	2		4	3									1			1	2	1			
Apseudes sp.									2																					
Order MYSIDACEA																														
Unidentified mysid																														
Order DECAPODA																														
Solenocera sp.																													1	
Ogyrides alphaerostris																														
Unidentified alpheid																									1					
Unidentified pagurid																												1		
Ebalia stimpsonii																										1				
Pinnixa gorei																														
?Pinnixa sp. (juv.)																														
Batrachonotus sp.								1																						
Phylum ECHINODERMATA																														
Unident. ophiuroid		1							1		1					1										2	1	1	1	2
Unident. holothuroid												1										1								
Phylum HEMICHORDATA																														
Unident. enteropneust																													1	
Phylum CHORDATA																														
Branchiostoma caribaeum																								1						
Unknown											2																		1	

Table 3-3. Numerical abundances of major taxonomic groups by station and survey.

Station	T88			R90			R92			R94			R106			T111			R116			R120			BAC			BA		
Year	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992
TURBELLARIA	1		2	4	64	1	1		4	14		1	1	3	1						9	1		3			8	1		1
NEMERTINA	4	21	10	11	13	7	3	29	16	2	24	20	4	17	14	11	4	6		2	4	3	1	3	38	15	21	7	18	19
NEMATODA	98	17	34	159	989	35	260	4	12	333	24	1	65	17	24	53	41	11	114	10	21	100	11	7	148	19	99	67	46	72
POLYCHAETA	80	47	446	25	68	202	39	118	177	13	115	246	53	76	324	136	98	148	19	97	181	58	72	117	195	89	149	149	127	312
GASTROPODA			1	38		22	1		1			2				17		1				1			1			1		1
BIVALVIA	5	92	2	18	13	8	43	81	15	6	220	24	8	360	13	53	6	6	54	64	7	1	188	9	28	15	13	3	6	2
AMPHIPODA	17	22	32	7	8	25	14	90	11	3	26	43	20	39	15	7	7	14	10	43	12	4	47	8	5	6	12	31	27	8
ISOPODA	2		2				1	3		4			1											2	54	49	12	41	5	
CUMACEA	5	10	2	12	2	1	7	7	2	4	10	11	8	8	6	9	17	3	4	22	8		35	4	1	2			7	2
TANAIDACEA	1																								87	16	26	53		6
HARPACTICOIDA		3			22	2		7	3		1	1		1		2	144			1			2		31	9	11	15		26
BRYOZOA			2	10		4	1			1		2						1			1			5	23	17	41	27	12	18
OTHER	8	10	4	13	6	3	10	4		7	20	3	2	3	2	19	4	1	1	4	3	5		1	13	10	42	48	12	45
TOTAL	221	222	537	286	1185	310	380	343	241	387	440	354	162	524	399	307	321	191	202	243	246	173	356	159	624	247	434	443	260	512

(OTHER: Cnidaria, Priapula, Sipuncula, Oligochaeta, Pycnogonida, non-harpacticoid Copepoda, Ostracoda, Mysidacea, Decapoda, Echinodermata, Hemichordata, Chordata.

Table 3-4. Percentages of major taxonomic groups by station and survey.

Station	T88			R90			R92			R94			R106			T111			R116			R120			BAC			BA		
Year	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992
TURBELLARIA	0.5		0.4	1.4	5.4	0.3	0.3		1.7	3.6		0.3	0.6	0.6	0.3						3.7	0.6		1.9			1.8	0.2		0.2
NEMERTINA	1.8	9.5	1.9		1.1	2.3	0.8	8.5	6.6	0.5	5.5	5.6	2.5	3.2	3.5	3.6	1.2	3.1		0.8	1.6	1.7	0.3	1.9	6.1	6.1	4.8	1.6	6.9	3.7
NEMATODA	44.3	7.7	6.3	55.6	83.5	11.3	68.4	1.2	5.0	86.0	5.5	0.3	40.1	3.2	6.0	17.3	12.8	5.8	56.4	4.1	8.5	57.8	3.1	4.4	23.7	7.7	22.8	15.1	17.7	14.1
POLYCHAETA	36.2	21.2	83.1	8.7	5.7	65.2	10.3	34.4	73.4	3.4	26.1	69.5	32.7	14.5	81.2	44.3	30.5	77.5	9.4	39.9	73.6	33.5	20.2	73.6	31.3	36.0	34.3	33.6	48.8	60.9
GASTROPODA			0.2	13.3		7.1	0.3		0.4			0.6				5.5		0.5				0.6			0.2			0.2		0.2
BIVALVIA	2.3	41.4	0.4	6.3	1.1	2.6	11.3	23.6	6.2	1.6	50.0	6.8	4.9	68.7	3.3	17.3	1.9	3.1	26.7	26.3	2.8	0.6	52.8	5.7	4.5	6.1	3.0	0.7	2.3	0.4
AMPHIPODA	7.7	9.9	6.0	2.4	0.7	8.1	3.7	26.2	4.6	0.8	5.9	12.1	12.3	7.4	3.8	2.3	2.2	7.3	5.0	17.7	4.9	2.3	13.2	5.0	0.8	2.4	2.8	7.0	10.4	1.6
ISOPODA	0.9		0.4				0.3	0.9		1.0			0.6											1.3	8.7	19.8	2.8	9.3	1.9	
CUMACEA	2.3	4.5	0.4	4.2	0.2	0.3	1.8	2.0	0.8	1.0	2.3	3.1	4.9	1.5	1.5	2.9	5.3	1.6	2.0	9.1	3.3		9.8	2.5	0.2	0.8			2.7	0.4
TANAIDACEA	0.5																								13.9	6.5	6.0	12.0		1.2
HARPACTICOIDA		1.4			1.9	0.6		2.0	1.2		0.2	0.3		0.2		0.7	44.9			0.4			0.6		5.0	3.6	2.5	3.4		5.1
BRYOZOA			0.4	3.5		1.3	0.3			0.3		0.6						0.5			0.4			3.1	3.7	6.9	9.4	6.1	4.6	3.5
OTHER	3.6	4.5	0.7	4.5	0.5	1.0	2.6	1.2		1.8	4.5	0.8	1.2	0.6	0.5	6.2	1.2	0.5	0.5	1.6	1.2	2.9		0.6	2.1	4.0	9.7	10.8	4.6	8.8
TOTAL	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

(OTHER: Cnidaria, Priapula, Sipuncula, Oligochaeta, Pycnogonida, non-harpacticoid Copepoda, Ostracoda, Mysidacea, Decapoda, Echinodermata, Hemichordata, Chordata.

Date: 21 December 1995

TO: J. P. McCreary

FROM: C. G. Messing

SUBJECT: Hollywood-Hallandale remaining balance

A significant portion of the remaining balance on the Hollywood-Hallandale Beach Renourishment Project (3-332437) results from our need to estimate costs based on the upper end of numbers of organisms and species that might be collected. My portion of the project required sorting and identifying invertebrates in 150 sediment samples per year for four years (1990, 91, 92 and 94). The initial cost estimate was based on results from the preceding similar, but smaller, John U. Lloyd renourishment project (3 surveys in 3 years). The following are examples of the difficulties involved in making estimates in advance. Keep in mind that the students who did the sorting and the consultants (subcontractors, 3114) who did much of the identifying were paid by the hour. For one station (18 samples), the mean sorting rate increased from 1.8 hours/sample in the first survey through 5.7 and 8.5 hrs/sample in the second and third surveys, respectively, because of increasing numbers of specimens (404, 2226, 13045). There was no way to anticipate these vastly increased numbers. Although such huge increases were not encountered at any other station, the mean time needed to sort samples from another station also increased between surveys (from 1.8 to 4.1 hrs/sample) because of increased organism numbers. By contrast, a third station ranged only between means of 2.1 and 2.7 hrs/sample in all three surveys.

With respect to the consultants, there was similarly no way to accurately predict how much work would be involved from year to year. Michael Milligan (then at Mote Marine Lab) was contracted to identify the annelid worms, often the most abundant and diverse group in such surveys. We sent him 1046, 1664 and 2494 specimens in the first, second and third John Lloyd surveys, respectively. His cost more than doubled from the first to the third surveys. Again, we could not anticipate this variation with any precision. At one station, the number of annelid worms increased from 77 through 615 to 1547, while at another they first increased from 324 to 508, but then dropped in the third survey to 235. When we budgeted for Hollywood-Hallandale, we had to base our estimate on the higher numbers.

My estimate for Hollywood-Hallandale excluded the very large number collected at one of the John Lloyd stations (13,045) but factored in a substantial increase in hourly fees charged by consultants. Please note that our consultants are professional taxonomists who

are widely recognized as experts in their fields. I believe that their inclusion in our presentation to the county was an important factor in getting the contract because it guaranteed that the state would get the best information available.

During the Hollywood-Hallandale project we experienced much of the same variation as in the John Lloyd project, so our initial budget estimates were not off base. In the 1991 survey, for example, the 15 samples from station R90 required 5.2 hrs/sample while station T88 required only 1.0hrs/sample. We saved as much as we did because many of the stations maintained low numbers and took similarly little time. There was no way to anticipate how many stations would require the greater amount of time, so we had to budget for it.

Our ongoing experience with the similar Port Everglades benthic macroinvertebrate monitoring project points out how easily the situation could have been reversed. We are currently over budget by more than $5000 in student salaries and $3000 in consultant fees because of unexpected increases in numbers of organisms in some of the stations during some of the surveys. Such variations could just as easily have occurred during the Hollywood-Hallandale project.

As a final note, for a recent proposal to Dade County DERM, we estimated a per sample cost of $590, based on our experience during the Port Everglades, John Lloyd and Hollywood-Hallandale projects. This was a much smaller project (125 total samples) so our cost/sample was greater. We were greatly underbid by Mote Marine and did not get the contract. It turns out that Mote really wanted the contract and was willing to subsidize its people in order to submit a low bid.

APPENDIX 4

TAXONOMIC SPECIALISTS

Nemertea, Platyhelminthes & Unknown worms: Dr. Jon Norenburg, Division of Worms, Smithsonian Inst., Washington, DC 20560.

Annelida: Dr. Mike Milligan, Mote Marine Lab., 1600 City Island, Sarasota, FL 33577.

Cnidaria: Dr. Stephen D. Cairns, Division of Echinoderms, NHB-163, Smithsonian Inst., Washington, DC 20560,

Mollusca: Dr. Donald R. Moore, Marine Geol. & Geophysics, Univ. of Miami/RSMAS, 4600 Rickenbacker Cswy., Miami, FL 33149

Ostracoda: Dr. Louis Kornicker, Division of Crustacea, NHB-163, Smithsonian Inst., Washington, DC 20560

Isopoda: Dr. Brian Kensley & Marilyn Schotte, Div. of Crustacea, Natural History Museum, Smithsonian Inst., Washington, DC 20560.

Amphipoda: Dr. James D. Thomas, Div. of Crustacea, Natural History Museum, Smithsonian Inst., Washington, DC 20560.

Cumacea: Dr. Les Watling, Darling Marine Center, Univ. of Maine, Walpole, ME 04573. Barbara Maloney, NOva University Oceanographic Center. Richard Heard, Ocean Springs, MS

Decapoda: Dr. Austin B. Williams, Natl. Marine Fish. Ser. Systematics Lab, Smithsonian Inst., Washington, DC 20560. Rafael Lemaitre, Div. of Crustacea, Natural History Museum, Smithsonian Inst., Washington, DC 20560.

Sipuncula: Dr. Mary Rice & Julie Piraino, Smithsonian Marine Station, 5612 Old Dixie Highway, Ft. Pierce, FL 34946.

Porifera: Dr. Shirley Pomponi, Harbor Branch Oceanographic Inst., 5600 Old Dixie Highway, Ft. Pierce, FL 34946, (407) 465 2400

Nematoda: Dr. D. Hope, Div. of Worms (NHB), Smithsonian Inst., Washington, DC 20560, (202) 357 4750

Urochordata: Dr. Linda Cole, Div. Echinoderms, Smithsonian Inst., Washington, DC 20560, (202) 357 2486

Algae: Dr. Jeffrey Prince, Biol. Dept., Univ. of Miami, Coral Gables, FL 33124
Dr. Bart Baca, Nova University Oceanographic Center, 8000 North Ocean Dr., Dania, FL 33004, & Coastal Systems Associates, Jacksonville, FL