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# Port Everglades Macroinvertebrate Monitoring: Monitoring of Benthic Macroinvertebrate Assemblages at the Southport Turning Basin and Adjacent Areas of John U. Lloyd State Recreation Area: Final Report

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**PORT EVERGLADES**  
**MACROINVERTEBRATE MONITORING**  
**MONITORING OF BENTHIC MACROINVERTEBRATE ASSEMBLAGES**  
**AT THE SOUTHPORT TURNING BASIN AND ADJACENT AREAS OF**  
**JOHN U. LLOYD STATE RECREATION AREA**

**FINAL REPORT**

**Prepared for:**

**Port Everglades Authority**

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**Submitted: 30 October 1997**



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## EXECUTIVE SUMMARY

Monitoring of benthic macroinvertebrate assemblages in the vicinity of Port Everglades Southport began in September 1988 in anticipation of dredging of the Southport Turning Notch and concomitant mitigation of mangrove habitats at adjacent areas of John U. Lloyd State Recreation Area. Twice-yearly surveys were carried out from September 1988 to January 1991 by Sheldon Dobkin (Florida Atlantic University), and subsequently, from August 1991 to January 1997, under the supervision of Charles G. Messing and Richard E. Dodge (Nova Southeastern University Oceanographic Center). From 1990 onward, surveyed sites consisted of 11 Ponar grab stations, 11 mangrove crab census stations, and three intertidal hand collection stations.

*Ponar grab collections:* Surveys from August 1991 to January 1997 enumerated 100,524 organisms identified to 370 species. Overall organism abundance peaked in January 1993 through January 1994, declined through 1995 and recovered in 1996. Overall species richness followed a similar trend, with the largest number of species recorded in the final survey. Several taxa of invertebrates, including polychaetes, oligochaetes, mollusks, sipunculans and peracarid crustaceans, are consistently important faunal components at several stations, and may represent useful indicators of future environmental perturbations. The fauna at station 17 in Whisky Creek appears to be unique and worthy of careful preservation. Possible faunal changes here may be the result of taxonomic difficulties. The most distinct trend observed was a seasonal variation in numbers of certain polychaetes and crustaceans at a few stations. Because the previous contractor overlooked or did not identify a substantial percentage of the fauna, pre- and post-dredging comparisons are extremely limited. However, with the possible exception of unidentified sabellid polychaetes found in numbers adjacent to the dredging site during and before dredging, but rarely afterward, dredging of the Turning Basin appears to have had little effect on infaunal macroinvertebrate assemblages in the Intracoastal Waterway.

*Crab collections:* Censusing of mangrove crabs at the seven stations north of the Turning Basin on the west side of the Intracoastal Waterway reveals two important features: a strong seasonal trend, with larger populations recorded in summertime surveys (except during the summer of dredging, 1989), and a steep decline in populations of most species after 1992, including the disappearance of the formerly most abundant species, *Sesarma curacaoense*. This species also disappeared from station 15 on the east side of the ICWW. Crab numbers also declined at east side station 10. Finally, the fiddler crab, *Uca rapax*, has become the dominant species and has increased in numbers over the last several surveys at east side station 16.

*Hand collections:* Station 9 has maintained a typical rocky intertidal fauna throughout the project. However, barnacles have declined while a vermetid gastropod, tentatively identified as *Petalconchus varians*, has increased substantially in numbers. Several red mangrove trees along the fringe margin died during 1995, increasing the exposure of the site and perhaps accounting for the appearance of encrusting sponges and colonial tunicates. Stations 13 and 17 have remained relatively unchanged, although attached bivalves have increased in numbers at the former site since 1993. The gastropod, *Batillaria minima*, and the springtail insect, *Anurida maritima*, dominate both stations.

## A. INTRODUCTION

Monitoring of benthic macroinvertebrate assemblages in the vicinity of Port Everglades Southport began in September 1988 in anticipation of dredging of the Southport Turning Notch and concomitant mitigation of mangrove habitats at adjacent areas of John U. Lloyd State Recreation Area. Twice-yearly monitoring surveys were carried out from September 1988 to January 1991 under the supervision of Sheldon Dobkin (Florida Atlantic University). Subsequent surveys, from August 1991 to January 1997, were carried out under the supervision of Charles G. Messing and Richard E. Dodge (Nova Southeastern University Oceanographic Center). This report documents the final, January 1997, survey, includes a summary of previous results, and outlines general patterns and trends where visible.

### A.1. History

Benthic macroinvertebrate communities at the Southport Turning Basin site and adjacent areas of John U. Lloyd State Recreation Area were initially monitored in March, May, and September 1988, before basin dredging and mangrove mitigation began. Only results of September 1988 sampling were reported. Nineteen stations were occupied during the September 1988 and January 1989 sampling periods as follows: eight stations in two transects north of the proposed turning basin and 11 stations in four transects in John U. Lloyd State Recreation Area on the east side of the Intracoastal Waterway (ICWW) (Figure 1). Tree removal for mitigation began on the east side of the ICWW in late 1988, but scraping to intertidal level began only after the January 1989 sampling period. Dredging of the turning basin began in the first half of 1989 and destroyed several station sites along the northern margin of the turning basin before the August survey. These stations were relocated ~10 m north for the August 1989 survey. Also in August 1989, four additional stations were added [two on the west side (1a, 8a) and two on the east side (10a, 13a) of the ICWW]. In January 1990, the turning basin approached final size; planting of mangrove seedlings and cord grass was underway in some mitigation areas. By the August 1990 sampling period, extensive mitigation and emplacement of riprap was completed along the east side of the ICWW; dredging continued in the turning basin but the margin was almost completely lined with riprap.

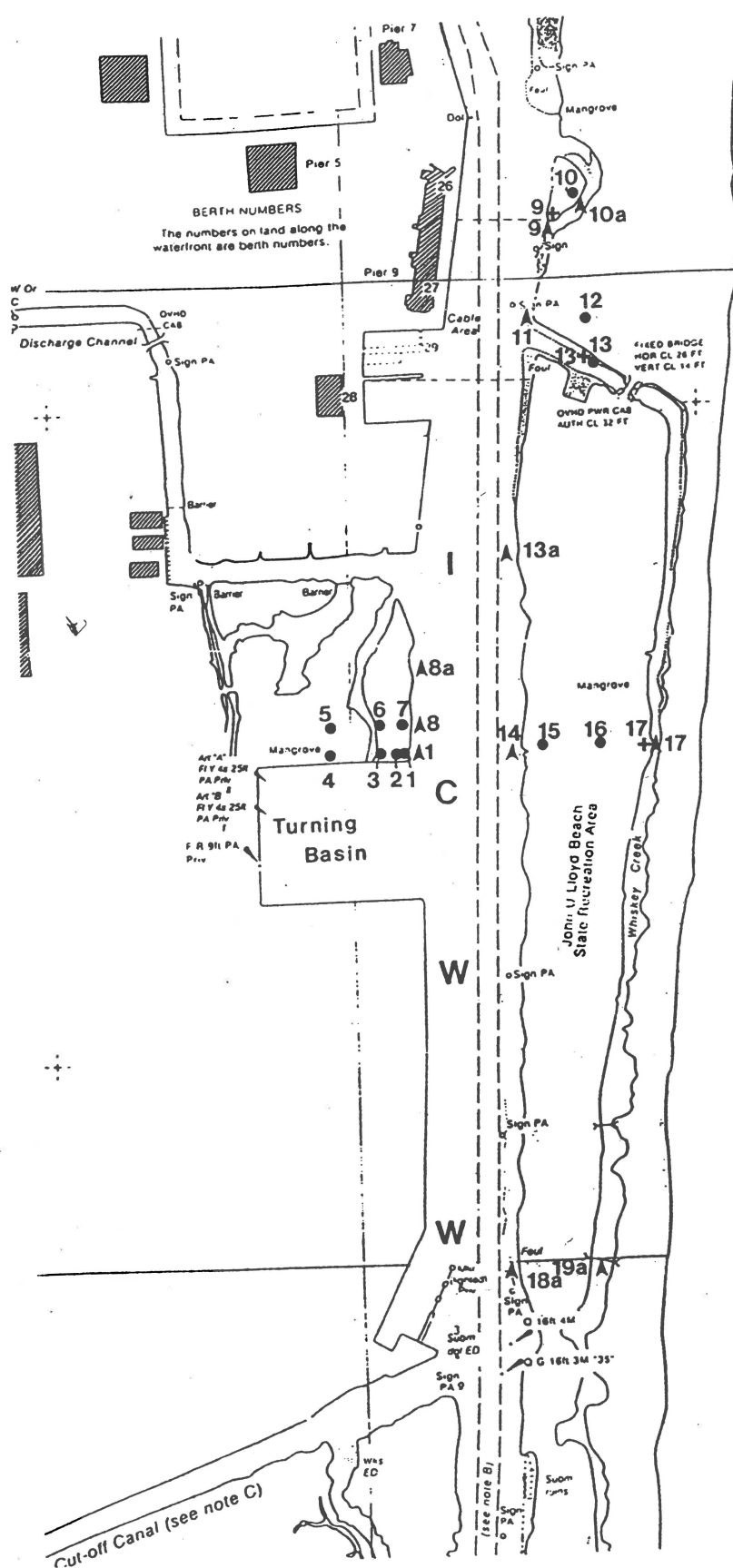


Figure 1. Map of project area showing all macroinvertebrate monitoring stations: Ponar grab stations (upright arrowheads); crab census stations (●); intertidal hand collection stations (+).



## B. METHODOLOGY

Figure 1 illustrates locations of stations occupied for the January 1997 sampling period and the kind of sample (Ponar grab, crab census, or hand collection) taken at each.

Shannon-Weaver Diversity Indices are calculated for each station and, at Ponar grab and hand stations, for each replicate as well using the following equation:

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

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 ( $p_1 = p_2 = p_3 \dots$ ), 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 ( $J'$ ) has also been calculated for each station and replicate using the equation:

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

As a ratio between the diversity index ( $H'$ ) for a given sample and the maximum possible diversity index ( $H'_{\max}$ ) for the number of species and specimens in that sample, evenness ( $J'$ ) gives an indication of how close the data come to maximum possible diversity.

The original agreement specified on page 3 that "A mean S-W Index for each semi-annual report will be determined and compared against that previously calculated for the previous semi-annual samplings." However, the great faunal differences found at several different sites (notably stations 10a and 17 relative to most other stations), together with variations in the most abundant species, rendered such an overall index useless, if not misleading. For example, the tanaidacean, *Kalliapseudes aliciae*, found almost exclusively at station 17, alone accounted for between 13% and 24% of all specimens from all stations. An overall mean diversity index was, therefore, not calculated.

Similarly, the original agreement indicated (also on page 3) that "Overall population counts shall be split into four categories of major Taxonomic groups; Polychaetes, Peracaridan crustaceans, Brachyuran crustaceans, and Sipunculans, and the percentages for each group calculated", with other taxonomic groups (e.g., oligochaetes) included as necessary. Brachyuran

crabs never constituted a major taxonomic group in Ponar grab samples (unlike polychaetes, peracaridans and sipunculans), and were sampled chiefly at other sites via a different protocol (excavation of individual burrows). They have been documented separately.

Modifications in sampling and handling protocols instituted during the August 1991 survey to improve sampling accuracy in conformity with contract specifications have been maintained through subsequent surveys, and are outlined under specific station methodologies below.

Samples for this final survey were taken chiefly during the first two weeks of January 1997 although hand collections were made during early February. Two crab stations (4 and 5) were unfortunately omitted initially and sampled on 5 March 1997.

### **B.1. Ponar Grab Samples**

Benthic grab samples were taken according to contract specifications with a 225-cm<sup>2</sup> Ponar grab sampler at stations 1, 8, 8a, 9, 10a, 11, 13a, 14, 17, 18 and 19a, with three replicate samples at each station. Please note that contract specifications called for a 225 cm<sup>3</sup> grab sampler, but this was an error. Such a grab sampler, 6.083 cm on a side, was not used by the previous contractor and is not, to our knowledge, manufactured.

All samples were fixed in 5% seawater buffered formalin with rose Bengal stain and sieved through a 0.5 mm mesh screen. Organisms and sediment retained on the screen were transferred to 70% ethanol and sorted to most specific distinguishable taxa. Taxa were either identified by us or sent to recognized experts for identification (Table 13). Nematodes and harpacticoid copepods were not enumerated or included in diversity calculations. These organisms are normally treated as meiofauna, not macrofauna. The relatively few large specimens retained by a 0.5-mm mesh screen do not accurately reflect their true abundances. Similarly, a small number of planktonic organisms (e.g., calanoid copepods) accidentally collected by the grab sampler were likewise not included in counts and diversity calculations.

Modifications in sampling and handling protocols instituted during the August 1991 are as follows: Mixed rocky and unconsolidated substrates at several stations adjacent to riprap along the ICWW required that the grab sampler be operated by a diver in order to ensure consistent sample size. Shallow-water stations (10a, 17 and 19a) were sampled via hand-emplaced grab sampler rather than shovel. This ensured that all samples collected at stations specified for grab-sampler covered equal areas of substrate.

The previous contractor sieved and sorted through one-third of each sample. We sieved all samples completely. Samples including up to approximately 0.5 liter of sediment retained on the 0.5-mm screen were sorted completely. When a larger volume was retained, we sorted through half the sample, doubling the recorded number of each taxon. This protocol guaranteed more accurate enumeration of collected organisms. (In a few instances in a few surveys, so much dense mangrove peat was retained on the sieve that only a fourth of the volume was sorted through and the number of counted organisms multiplied accordingly). Depths recorded for Ponar stations sometimes differed somewhat among surveys because of tidal variations.

### **B.2. Crab Collections**

Three 1.0-m<sup>2</sup> replicate quadrats were randomly placed within about 2.0 m of each other at stations 1a, 2, 3, 4, 5, 6, 7, 10, 13, 15 and 16. Within each quadrat, all crab burrows were counted and 10% excavated, and the inhabitants counted and identified in the field or collected and identified in the laboratory, according to contract specifications.

Modifications in sampling and handling protocols instituted during the August 1991 survey to improve sampling accuracy in conformity with contract specifications follow. Contract specifications required that "Arboreal crabs are to be noted and recorded within a specified observation area..." The previous contractor recorded arboreal crabs only as "few," "moderate" or "abundant" without indicating the quantitative range of each term. Observations were made in a circle of trees "approximately 3-4 meters in diameter." Because these crabs crawl out of sight (into the canopy and around the far side of trunks and branches) upon approach, we reduced the observation area in order to make more accurate counts. We counted crabs on trees arising from a 1.0-m<sup>2</sup> quadrat selected randomly within about 2.0 m of burrow-census quadrats. Arboreal censuses were carried out first at each site to minimize disturbance.

### **B.3 Hand Collections**

Hand collections were taken at stations 9, 13, and 17, with three replicates at each station. Each replicate sample covered an area of 0.1m<sup>2</sup>. Justification for this sampling area is discussed below. Organisms identifiable in the field were counted and released. Taxa unidentifiable in the field were collected by hand, with forceps, or by agitating algae-covered rocks in a bag of

seawater. Collected specimens were placed in plastic bags with seawater, fixed in 10% buffered seawater formalin in the laboratory, and finally stored in 70% ethanol.

Modifications in sampling and handling protocols instituted during the August 1991 survey to improve sampling accuracy in conformity with contract specifications are as follows. Contract specifications required that "hand collections are to be performed within a measured area..." The previous contractor made no mention of the area sampled. Each of our replicate samples consisted of a 1.0-m transect 0.1 m wide (an area of  $0.1 \text{ m}^2$ ), parallel to the local waterline. Replicates at each station were taken at about the same distance from the water's edge and no more than ~1.0 meter apart.

We selected the  $0.1\text{-m}^2$  area for the following reasons. Intertidal environments are often highly patchy and vertically zoned with distinct assemblages of organisms occupying immediately adjacent substrates. While a larger area would have reduced possible inter-replicate variability due to local environmental patchiness and zonation (e.g., larger samples might have included fauna on rocks with and without algal cover, and both high and low intertidal zone assemblages), it would also have severely expanded sampling time, especially in densely populated areas. For example, a  $1.0\text{-m}^2$  quadrat may be large enough to include both low intertidal oysters and high intertidal periwinkle snails, but requires either counting several thousand barnacles or implementing statistically sophisticated subsampling protocols. We reduced potential inter-replicate variability by taking all replicates at the same height above the tide line.

Contract specifications state that "organisms collected within a specified sampling area shall be enumerated..." The previous contractor explicitly did not count the several species of barnacles listed. Resulting diversity indices, therefore, did not accurately reflect community structure. Our samples included an enumeration of all visible organisms as well as qualitative notes on additional organisms observed on adjacent substrates. Because the vast majority of barnacles enumerated in this survey were small juveniles, they were often not identified below the level of genus.

## C. RESULTS (January 1997)

### C.1. Ponar Grab Samples

Table 1 lists raw data for all samples by station and by replicate for all groups for the current survey. Table 2 summarizes numbers and percentages of specimens by major taxonomic group. Tables 5a-d summarize numbers of the most abundant species for all surveys carried out by Nova Southeastern University (i.e., August 1991 to January 1997). Table 5a lists the three similar "typical" stations on the west side of the Intracoastal Waterway (stations 1, 8, 8a). Table 5b lists the three similar "typical" stations on the east side of the ICWW (stations 13a, 14, 18). Table 5c lists "atypical" ICWW stations (9, 10a, 11) (see individual station descriptions below), and table 5d lists the Whiskey Creek stations (17, 19a). The most abundant species included in these tables are those of which at least 25 specimens occur in one station in at least one survey. Table 6a summarizes abundances of major taxonomic groups by station for all surveys. Table 6b summarizes percent occurrence of major taxonomic groups by station for all surveys. Table 7 summarizes organism abundance, richness, diversity and evenness for all surveys.

A total of 9171 specimens was sorted from the 33 grab samples (11 stations with three replicates each), a substantial decline from the August 1996 value, yet still higher than in any other survey since January 1994. Total species richness (190) exceeds that recorded in any preceding survey, although only two stations (9, 18a) equal previous maxima, and only one (19a) exceeds it. The 72 species recorded at the latter is the second highest richness found at any station in any survey. Richness at five stations (9, 10a, 11, 18a and 19a) has exhibited a general increase over the last six surveys. Where richness values have declined in 1997 from peaks in 1996, values remain higher than in 1995.

Stations 9 and 19a record diversity maxima in 1997. Five other stations either approach maximum diversity values (1, 14), or record high levels not seen since much earlier in the project (10a, 11, 18a). With one exception (station 17), 1997 diversity indices at all stations are higher than in either 1995 survey. Station 17 has maintained a diversity index between 1.78 and 2.28 for almost the entire project. The index at station 10a continues to vary seasonally with higher values in January surveys.

Polychaete worms remain the most abundant group overall in 1997 (36.5%), followed by peracarid crustaceans (21.9%), oligochaetes (15.4%) and mollusks (12.5%). These relative

abundances are similar to those reported for each group in both 1996 surveys (Table 6b). Although such total values must be treated with caution because they sum data from very different habitats, it may be noted that polychaetes account for between 35 and 46% of all specimens in nine of the 12 surveys (with maximum and minimum contributions of 58.7 and 25.1%).

The most abundant species overall in January 1997 are the gastropod *Caecum pulchellum* (821), the polychaetes *Aricidea philbinae* (532) and *A. taylori* (515), the oligochaete *Pectinodrilus molestus* (278), and the tanaidacean *Kalliapseudes aliciae* (1487). *P. molestus*, and *K. aliciae* owe their abundance to a single station (17); *C. pulchellum* occurs in numbers at four stations and *A. philbinae* and *A. taylori* at five each (Table 1). Figures 2-4 illustrate common taxa recorded during this project.

Overall polychaete richness (~78 species) is greater than that recorded in both 1996 surveys (57 and 68 species in January and August, respectively), and is substantially greater than the low recorded in August 1995 (38 species). The six species of amphipods found in 1997 is down from the nine recorded in August 1996, but remains up substantially from the three found in August 1995.

A brief description of each station with a characterization of the January 1997 fauna follows. Quantitative data, i.e., total numbers of organisms, species richness, diversity index and evenness, are given both at the end of Table 1, and in Table 7 with the data for all surveys.

Station 1: West side of Intracoastal Waterway (ICWW) at NE corner of Southport Turning Notch. Depth: approx. 3m. Bottom: fine muddy sand with finely divided mangrove detritus and algae-covered rocks.

Polychaetes and oligochaetes again account for about 80% of the fauna. The former have increased in absolute numbers over the last five surveys and now account for 59.9%, more than in any survey since January 1993. Oligochaetes (21.6%) dropped below 1996 levels to numbers and relative abundance found in 1995 (Table 2, 6a, b).

The most abundant species are the polychaetes, *Aricidea taylori* and *Mediomastus californiensis*, and the oligochaete *Tubificoides motei*. Figure 5 illustrates the dominance of *A. taylori* relative to its congener *A. philbinae* at this and the following two, adjacent stations (8 and 8a). Previously important taxa, the polychaete *Lumbrineris verrilli* and the gastropod, *Caecum*

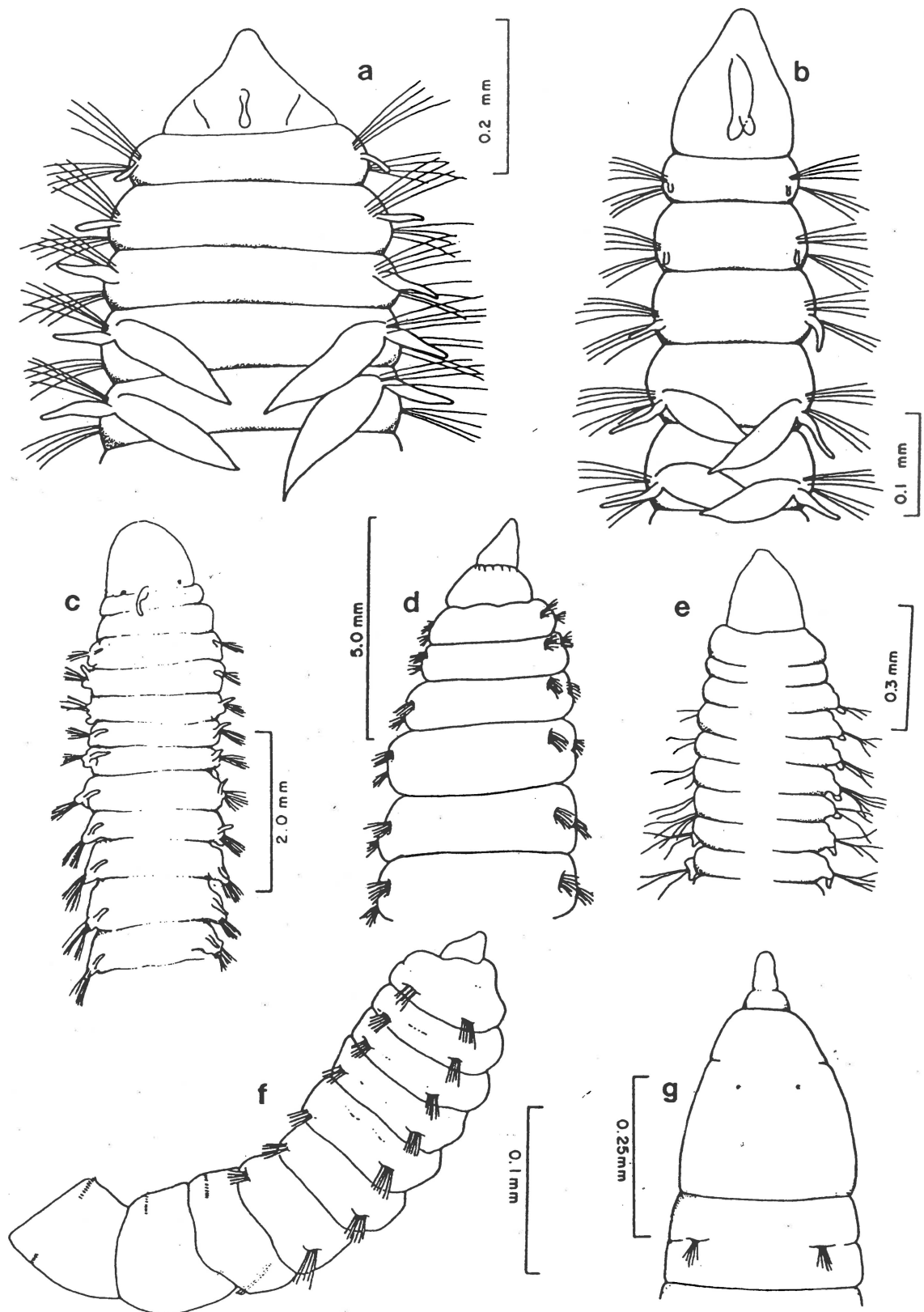


Figure 2. Common polychaete worms in Ponar grab samples. a. *Aricidea taylori* (Paraonidae), b. *Aricidea philbiniae* (Paraonidae), c. *Nematonereis hebes* (Eunicidae), d. *Leitoscoloplos robustus* (Orbiniidae), e. *Lumbrineris verrilli* (Lumbrinereidae), f. *Capitella capitata* (Capitellidae), g. *Mediomastus californiensis* (Capitellidae) (from Uebelacker, J. M & Johnson, P. G. 1984).

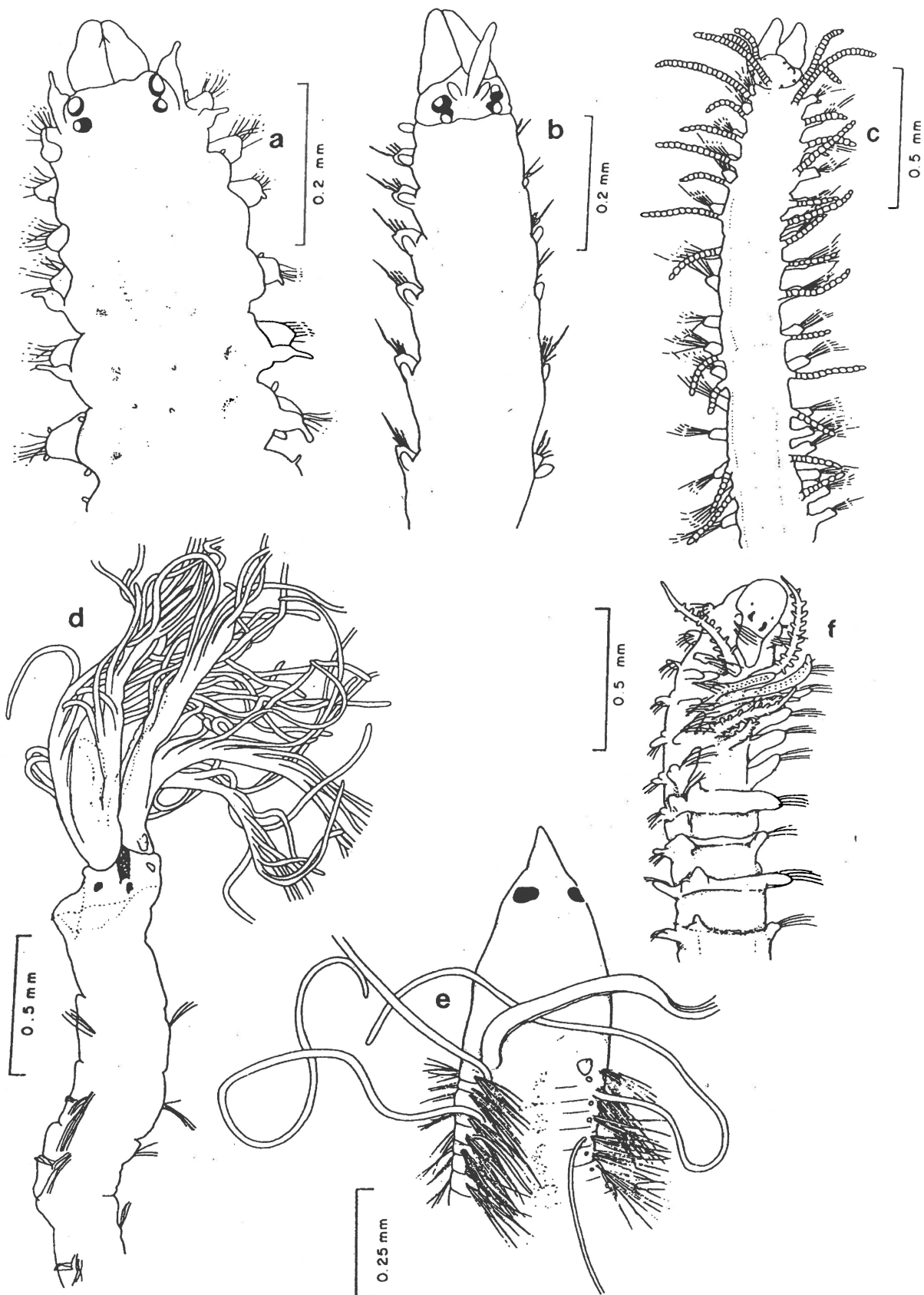


Figure 3. Common polychaete worms in Ponar grab samples. a. *Sphaerosyllis taylori* (Syllidae), b. *Exogone dispar* (Syllidae), c. *Ehlersia cornuta* (Syllidae), d. *Fabricinuda trilobata* (Sabellidae), e. *Cauleriella* sp. A (Cirratulidae), f. *Prionospio cristata* (Spionidae) (from Uebelacker, J. M & Johnson, P.G. 1984).



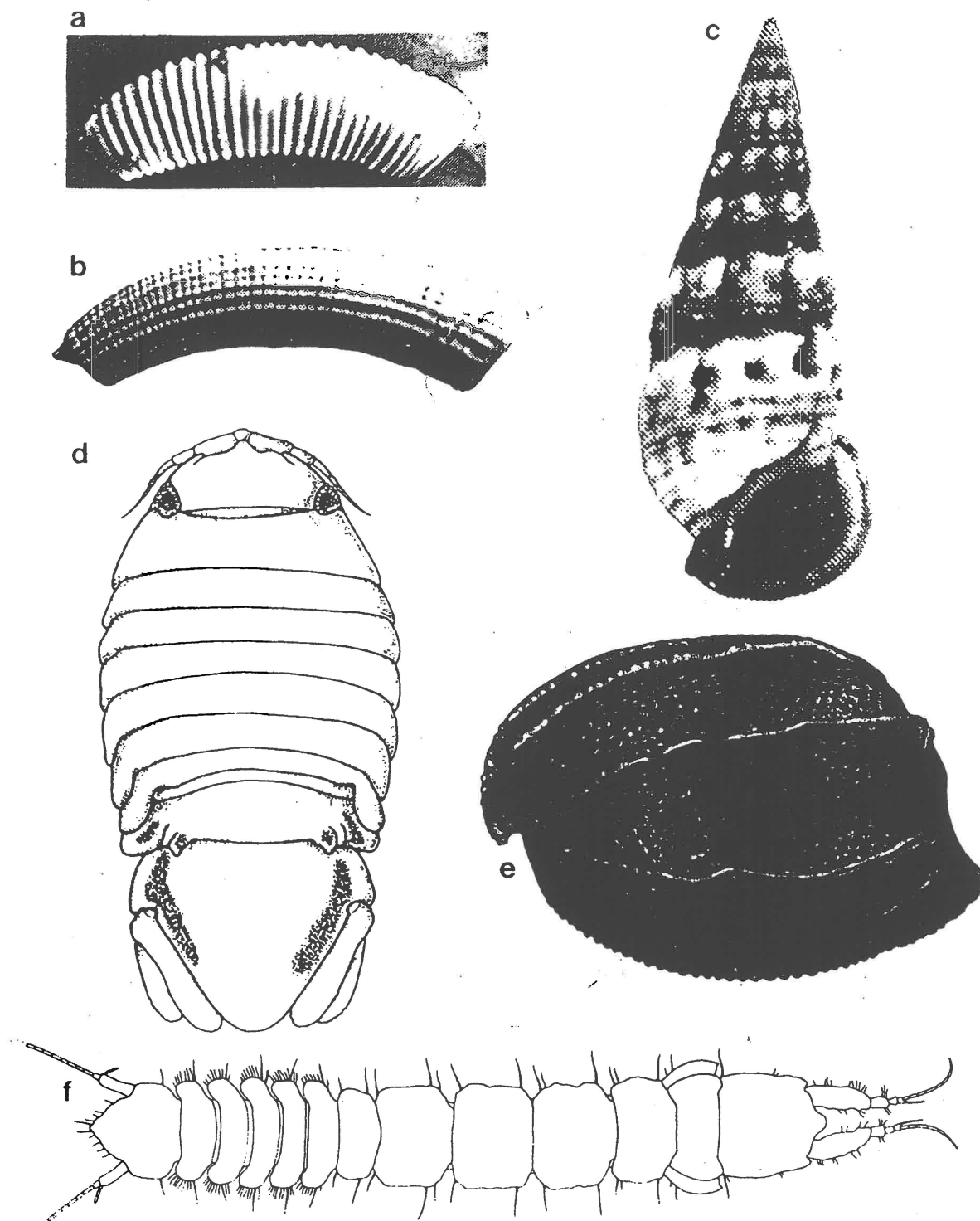


Figure 4. Common gastropods and crustaceans in Ponar grab samples. Gastropoda: a. *Caecum pulchellum*, b. *Caecum imbricatum*, c. *Batillaria minima* (from Abbott, 1974); Crustacea: d. *Exosphaeroma productatelson* (Isopoda) (from Kensley & Schotte, 1989), e. *Rutiderma darbyi* (Ostracoda) (from Kornicker, 1983), f. *Kalliapseudes* sp. (Tanaidacea) (possibly not *K. aliciae*) (from McSweeney, 1968).

*pulchellum* are present in smaller numbers. Diversity indices and richness have remained about the same for the last three surveys.

Station 8: West side of ICWW approximately 30 m north of station 1. Depth: approximately 3m. Bottom: fine muddy sand with finely divided mangrove detritus and scattered hand-sized, algae-covered rocks.

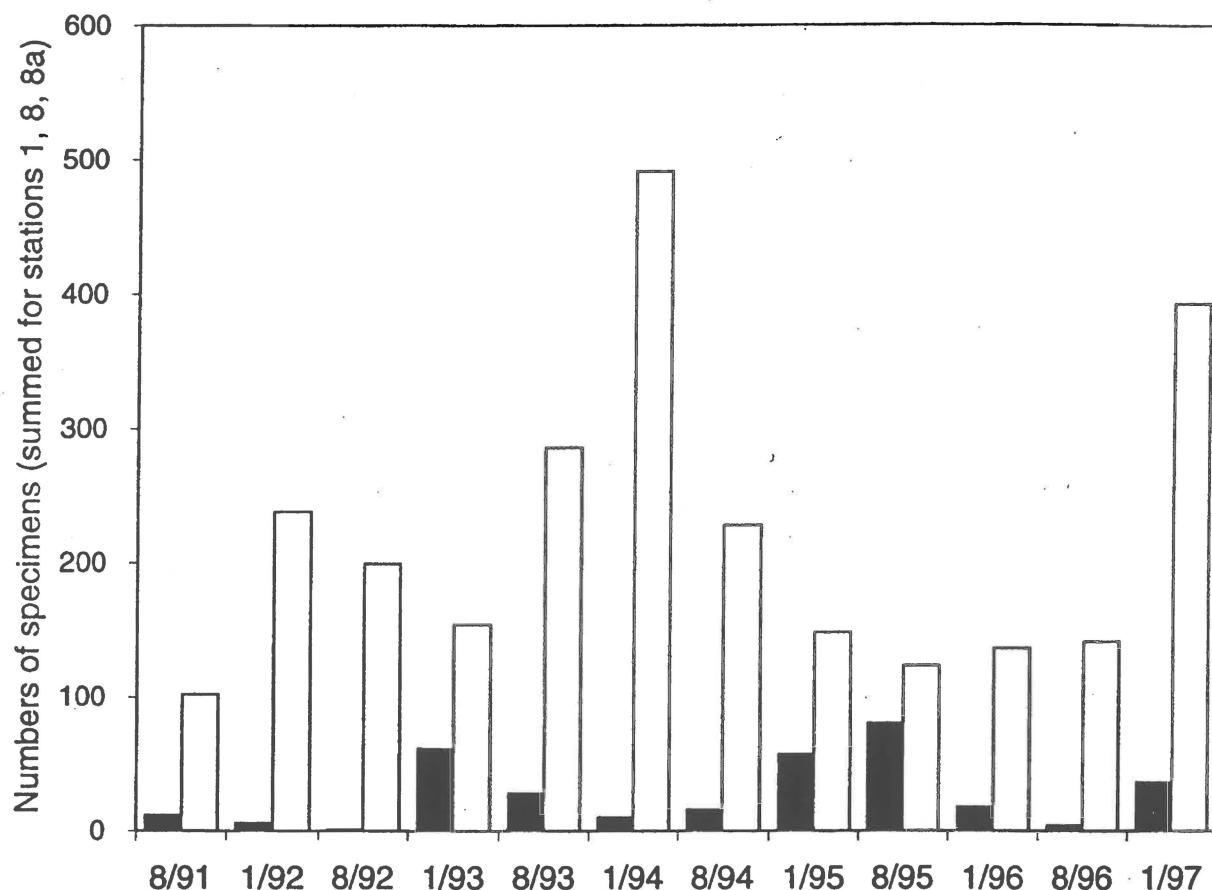


Figure 5. Numbers of the polychaetes, *Aricidea taylori* (open bars) and *A. philbinae* (solid bars) at west side ICWW stations 1, 8 and 8a (data summed for all three stations in each survey; see Table 5a for raw data).

Polychaetes dominate (53.7%), followed by oligochaetes (35.5%). Although numbers of polychaetes have varied seven-fold during the project, they have always contributed substantially to the fauna (~40-80%), and have remained between 55 and 65% over the last five surveys. Numbers and proportion of oligochaetes has also varied widely, from 16 to 402 specimens, but so has their percentage (6.9 to 48.0%). Together, the two groups have always accounted for ~75-90% of the fauna here.

The most abundant species is by far the polychaete, *Aricidea taylori* (42% of specimens). Previously important taxa, the polychaete *Lumbrineris verrilli*, the oligochaetes *Smithsonidrilus hummelincki* and *Tubificoides motei*, and the gastropod, *Caecum pulchellum* all remain present in reduced numbers. All have been consistently abundant here (with a few exceptions) at least since 1992 or 1993. Total abundance and richness are less than in August 1996, but higher than in January 1996 (Table 7). Diversity is slightly lower than in both 1996 surveys, but remains greater than in any other survey since January 1993.

Station 8a: West side of ICWW approximately 50 m north of station 8. Depth: approximately 3m. Bottom: fine muddy sand with finely divided mangrove detritus and scattered hand-sized, algae-covered rocks.

Polychaetes (55.8%) have accounted for between ~50 and 62% of the fauna in all surveys but one since January 1992 (August 1996, 43.4%, was the exception). However, absolute numbers have increased threefold since January 1995. Oligochaetes (32.5%) remain the second most abundant group, as in most preceding surveys. The number of oligochaetes is only slightly below that recorded in August 1996, and remains higher than in any other survey except August 1993 (Tables 2, 6a-b).

The most abundant taxon is again the polychaete, *A. taylori* (54% of specimens), followed at a distance by the oligochaete *T. motei*. *A. taylori* has been consistently abundant and *T. motei* at least present in all surveys. The polychaete *Mediomastus californiensis*, previously abundant in the August 1993 and January 1994 surveys, has again appeared in numbers in the last four surveys (Table 5a). The gastropod, *C. pulchellum*, which increased in numbers from 1995 to 1996 has decreased to 1995 values. Organism abundance has increased almost continuously over the last five surveys to a level in August 1996 not seen since January 1994. Diversity is lower in January 1997 than in either 1996 survey, but higher than in either 1995 survey. Richness, though slightly lower than in August 1996, remains higher than in any other survey since January 1994 (Table 7).

Station 9: East side of ICWW at the SW corner of a mangrove island north of the northern entrance to Whiskey Creek. Depth: approximately 1 m. Bottom: Very firm muddy sand.

Relative abundances of polychaetes and peracarids have exhibited a seasonal variation at this station throughout the project, with polychaete values higher in summer (59-99%) than in

adjacent winters (40-66%), and peracarids relatively more common in the winter (15-35%) than in summer (0-7%).

The most abundant taxa are the polychaetes, *Leitoscoloplos* spp. and *Aricidea philbinae*, the ostracode, *Peratocytheridea setipunctata* and the cumacean *Cyclapsis varians*. In contrast to west side ICWW stations 1, 8 and 8a, *A. philbinae* is more important than *A. taylori* at east side stations (Figure 6). The polychaete, *Paraonis fulgens*, abundant from August 1994 through August 1995, declined substantially in 1996 and disappeared in 1997. The polychaete, *Capitella capitata*, exhibited summertime peaks in 1992, 1995 and 1996. Richness in 1997 matches the maximum value previously reported here (59 species in January 1993). Diversity is greater than in any previous survey (Table 7).

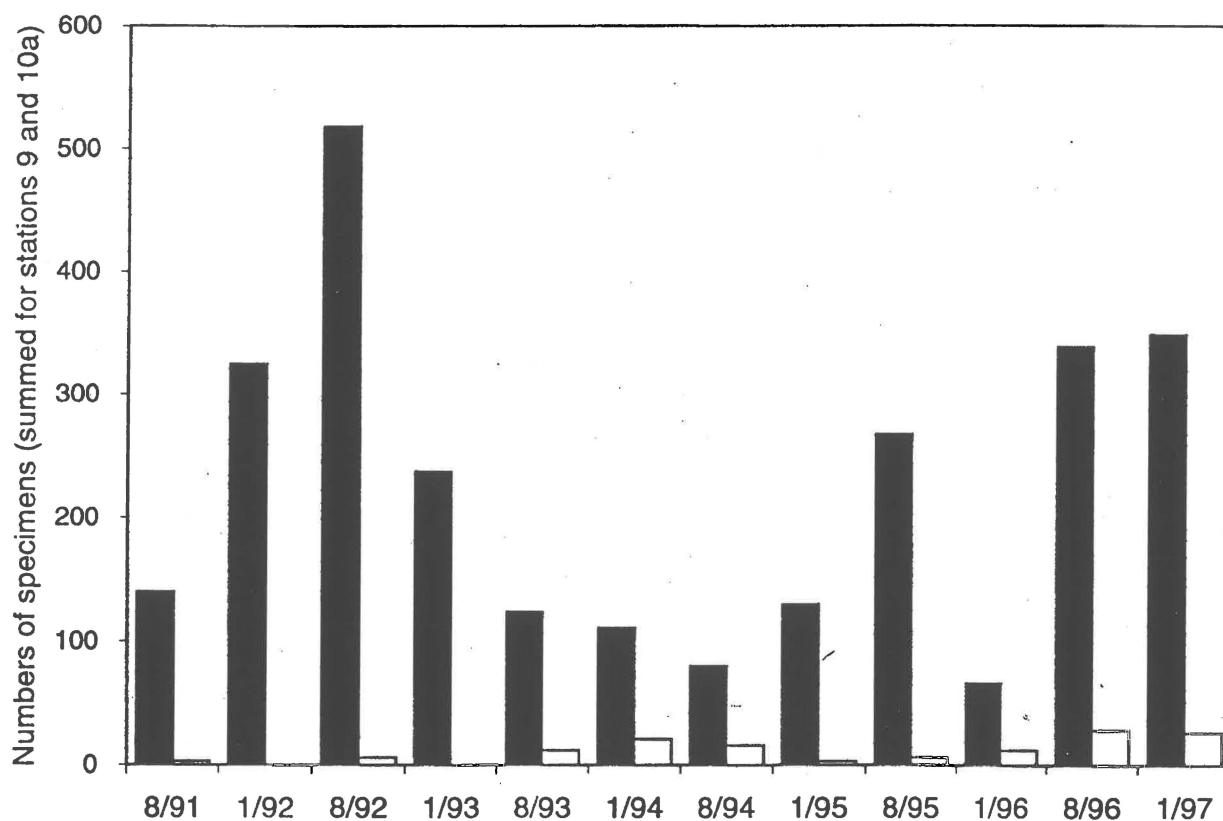


Figure 6. Numbers of the polychaetes, *Aricidea taylori* (open bars) and *A. philbinae* (solid bars) at east side ICWW stations 9 and 10a (data summed for both stations in each survey; see Table 5c for raw data).

Station 10a: Middle of shallow creek behind Environmental Education Bldg., John U. Lloyd State Recreation Area, east side of ICWW. Depth: approximately 0.1m (exposed at low tide). Bottom: Sandy mud with numerous depressions.

Polychaetes dominate the fauna to greater extent (71.9%) than in either 1996 survey. Their numbers are greater than in any winter survey since January 1993. Peracarid crustaceans again exhibit the high relative and absolute abundances typical of all preceding January surveys, while ostracodes occur at typically low winter levels (Figure 7).

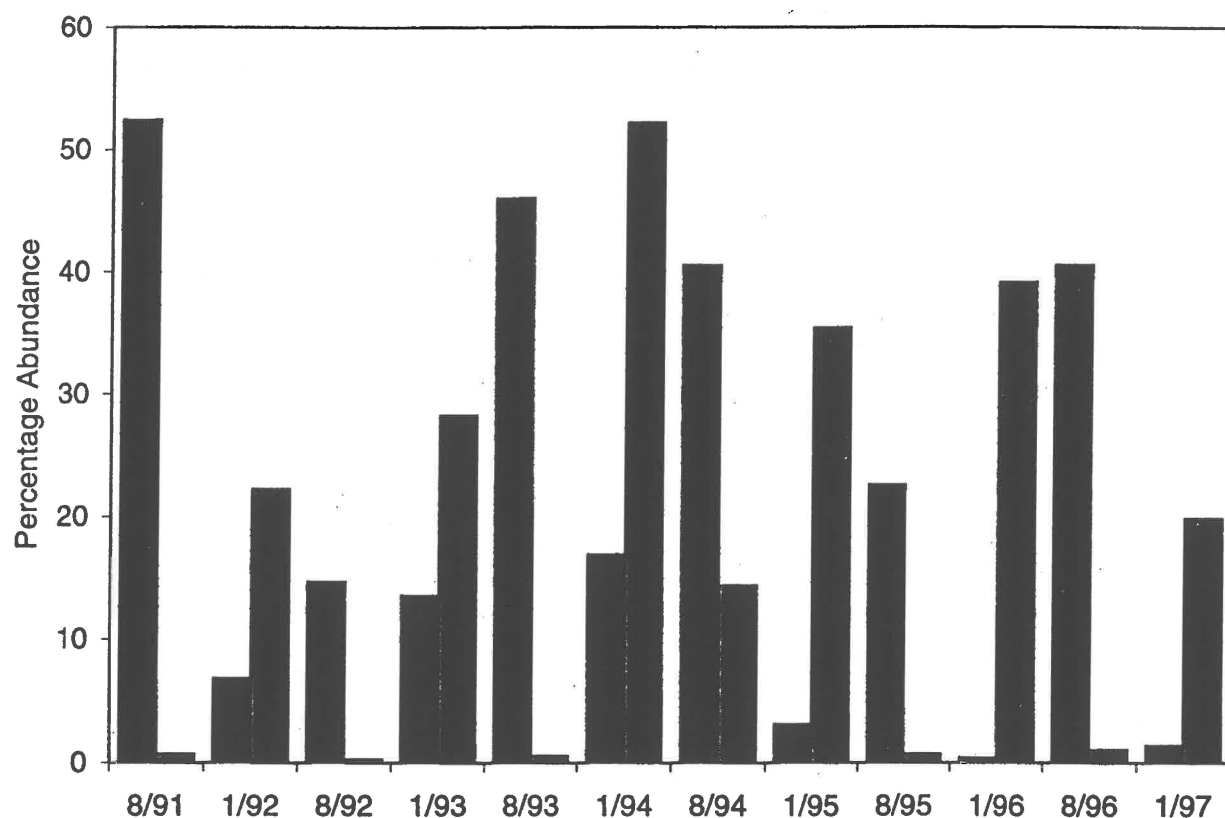


Figure 7. Relative abundances of ostracodes (solid bars) and peracarid crustaceans (hatched bars) as percentages of total specimen numbers at station 10a, showing pattern of alternating greater proportions of peracarids and ostracodes in January and August surveys, respectively.

The polychaete, *A. philbinae*, is far and away the most abundant species (40% of specimens). The polychaete, *Capitella capitata*, is another consistently important species. Other species typically occur in numbers during either the summer (e.g., the ostracodes, *Cyprideis americana* and *Peratocytheridea setipunctata*) or winter (the amphipods *Cerapus* n. sp. and *Grandidierella bonnieroides*). Richness and diversity are greater than in any survey since January 1993 and

January 1994, respectively. Organism abundance is greater than in any winter survey since January 1994 (Table 7).

Station 11: At north corner of the northern entrance to Whiskey Creek. Depth: approximately 4 m. Bottom: Fine mud among large boulders (riprap). (The January 1993 sample was taken in fine mud at the base of the riprap in about 10 m depth because no suitable sediment could be located among the boulders where sampling normally took place.)

As in August 1996, polychaetes again approach the numbers recorded during the early stages of this project (and not seen since January 1994). They remain the most important group (46.0%), but do not dominate to as great a degree as in most preceding surveys due to higher relative numbers of mollusks (16.0%) and oligochaetes (20.9%) (Tables 6a-b). The gastropod, *Caecum pulchellum*, is again the most abundant species. Probably because of the difficulty we have experienced in repeatedly sampling the same microhabitat at this station, only the polychaete, *M. californiensis* (perhaps identified as *Mediomastus* sp. in some surveys), has proven a consistently common species here. Organism abundance and richness in the last two surveys are higher than in any survey since August 1993 and January 1994, respectively. Diversity is higher in January 1997 than in any survey since August 1992.

Station 13a: East side of ICWW opposite the Florida Power & Light discharge canal. Depth: approximately 1.5 m. Bottom: Fine muddy sand with algal turf and algae-covered rocks.

Polychaetes dominate (51.1%) followed by mollusks (26.3%). Oligochaetes contribute less to the fauna (5.7%) than in any previous survey. The most abundant taxa are the polychaetes *Nematoneris hebes* and *Mediomastus californiensis*, and the gastropod, *Caecum pulchellum*. No species has been a consistent dominant at this station. However, the gastropod *C. pulchellum* has been at least present in every survey (and *A. philbinae* in all surveys but one), and the oligochaete, *Smithsonidrilus hummelincki*, has occurred in double-digits in every survey beginning in August 1992 (Table 5b). *A. philbinae* again typically outnumbers *A. taylori* at this station and the following, but not as consistently as at east side stations 9 and 10a (Figure 8). With the exception of 1992, total organism abundance has been consistently higher in August than in adjacent January surveys. Species richness and diversity has declined from both 1996 surveys, but remains higher than in both 1995 surveys (Table 7).

Station 14: East side of ICWW opposite northern margin of Southport Turning Notch. Depth: ~1.5 m. Bottom: Fine muddy sand with algal turf and numerous algae-covered rocks.

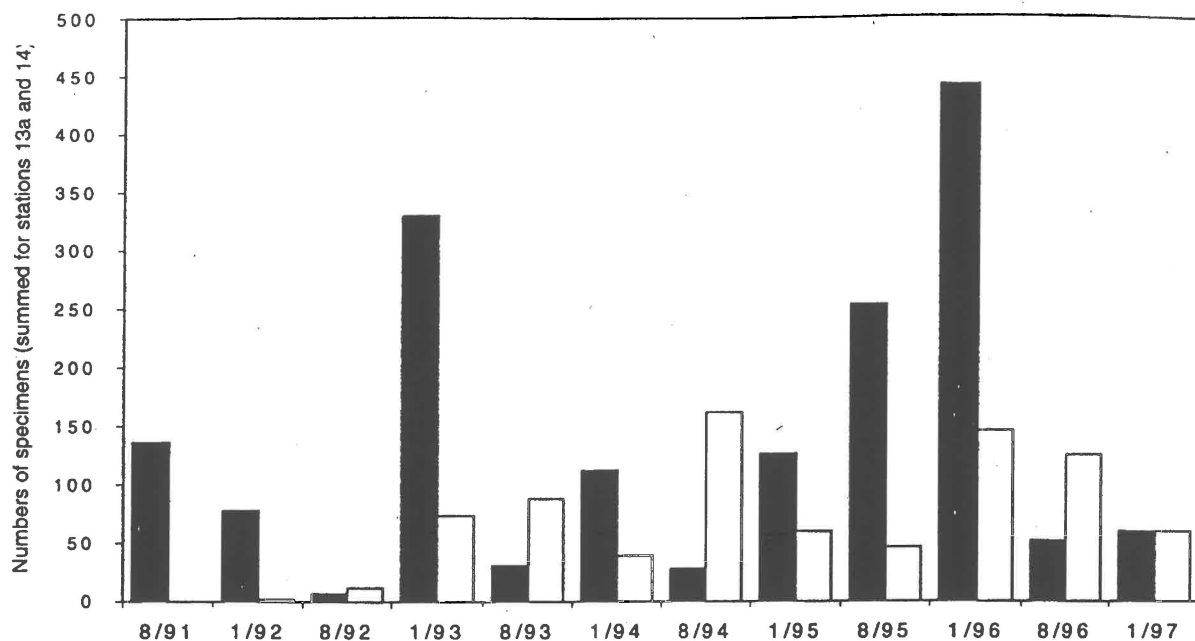


Figure 8. Numbers of the polychaetes, *Aricidea taylori* (open bars) and *A. philbinae* (solid bars) at east side ICWW stations 13a and 14 (data summed for both stations in each survey; see Table 5b for raw data).

Polychaetes (46.3%) dominate, but to a lesser extent than in any survey since August 1992 due to a great relative and absolute increase in oligochaetes (24.8%). The occurrence of 70 specimens of micrurid nemertines in a single replicate (double the 35 counted in half the sample) is responsible for the 11.5% contribution of nemertine worms to the fauna. Peracarids have occurred in higher numbers in every January survey excepting that of 1995.

In addition to the micrurid nemertine, the most abundant species are the polychaetes, *Cauleriella* sp. A, *Aricidea philbinae* and *A. taylori*, and the oligochaetes, *Limnodriloides rubicundus* and *Smithsonidrilus hummelincki*. The latter three have remained consistently common, if not abundant at least since August 1992. However, dominant taxa have varied substantially over the last few surveys. The most abundant polychaetes in August 1996, *Cirriformia* sp. A, *Bispira melanostigma* and *Nematonereis hebes*, never occurred in numbers here before and have since disappeared. *Aricidea philbinae*, a consistent dominant in most preceding surveys, almost disappeared in August 1996, but recovered in 1997. The polychaete *Glycera abbranchiata* (sometimes identified as *Glycera* sp.) has consistently occurred in greater numbers in every January survey (Table 5b) (Figure 9). Species richness and total abundance, though lower than in either 1996 survey, remain higher than in 1995. Diversity is slightly lower than in August 1996, but higher than in any other previous survey (Table 7).



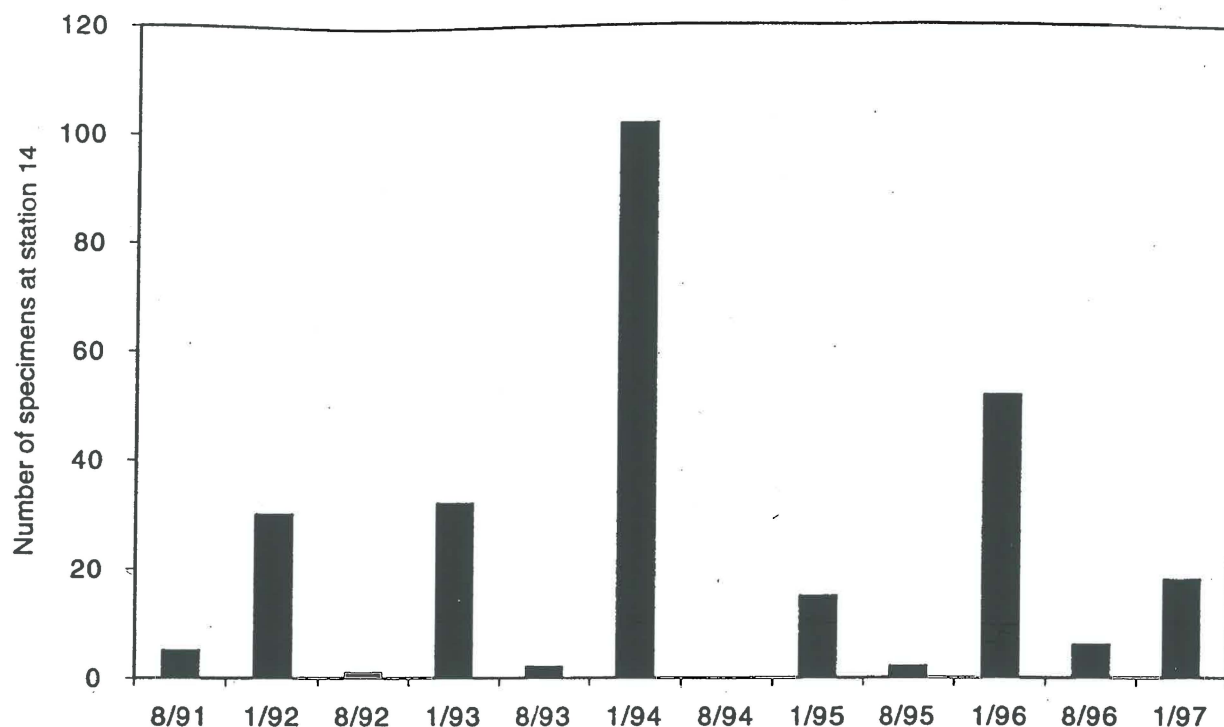


Figure 9. Numbers of the polychaete, *Glycera abbranchiata* (including specimens identified as *Glycera* sp, in some surveys) at ICWW station 14 (east side), showing generally larger populations in January surveys.

Station 17: Whiskey Creek on a line directly east of station 14. Depth: 0.2 m. Bottom: Coarse shelly sand (incorrectly reported for August 1991 as fine muddy sand) with large shallow depressions and scattered clumps of filamentous algae.

This station continues to exhibit a fauna that differs strongly from all other stations. Peracarids again dominate the fauna (52.9%). Mollusks account for 18.7%. The numerical and proportional dominance by polychaetes recorded in August 1995 appears to have been a one-time phenomenon (Tables 6a-b).

The most abundant taxa are the tanaidacean, *Kalliapseudes aliciae*, the gastropods, *Caecum pulchellum* and *Batillaria minima*, the oligochaete *Pectinodrilus molestus*, the sipunculan *Aspidosiphon muelleri* and the ostracode *Rutiderma darbyi*. Two other typical taxa remain in substantial numbers: the polychaetes *Ehlersia cornuta* and *Nematonereis hebes*. Three species of the gastropod, *Caecum*, still occur. The isopods, *Exosphaeroma diminuta* and *E. productatelson*, which have replaced each other here during this project, probably represent the same species (M. Schotte, personal communication). The abundance of the ostracode, *Peratocytheridea setipunctata*, in the August 1995 survey, appears to have been a one-time phenomenon (Table 5d). Total organism abundance in 1997 is substantially lower than in August 1996, but remains



higher than in any survey since August 1994. Richness and diversity have declined from 1996 levels.

Station 18: East side of ICWW opposite Southport Everglades container dock. Depth: approximately 1 m. Bottom: Fine muddy sand with finely divided mangrove detritus, and algae-covered rocks.

Polychaetes (41.4%) dominate the fauna, followed by mollusks (29.8%) and oligochaetes (11.8%). Because total abundance is relatively low and diversity high, no individual taxon dominates the fauna. The most abundant species is the gastropod *C. pulchellum*. The polychaete, *Aricidea philbinae*, present in every survey except August 1996, has again appeared in 1997. *A. taylori* has remained present (since January 1992) in modest numbers (Tables 1, 5b). Organism abundance has been higher in each January survey since 1992. Both richness and diversity have generally increased over the last four or five surveys (Table 7).

Station 19a: Whiskey Creek on a line due east of station 18 (10 m south of the southern footbridge). Depth: 0.2 m. Bottom: Fine, peaty mud with some sand and shell debris.

Polychaetes dominate (43.6%), followed by oligochaetes (22.3%) and ostracodes (14.7%). The latter have declined in numbers from August 1996, but remain more abundant than in any other previous survey except that of January 1993. Peracarids have broken a long seasonal trend and occur in no greater abundance in January 1997 than in August 1996.

The most abundant organisms are the polychaetes, *Aricidea philbinae*, *Fabricinuda trilobata* and, in one replicate, *Monticellina dorsobranchialis*, the oligochaete, *Thalassodrilides gurwitschi*, and the ostracode *Peratocytheridea setipunctata*. This station probably represents the least stable environment of all Ponar sampling sites. No species has been a consistent dominant although the amphipod, *Grandidierella bonnieroides*, has maintained substantially greater numbers in every January survey (except 1997). Of the few that have occurred in large numbers here, most have done so in fewer than half the surveys. However, several species have now remained consistently common for at least the last two years: *A. philbinae*, *Capitella capitata*, and *M. dorsobranchialis* (Table 5d). Organism abundance, richness and diversity are all higher in 1997 than in any preceding survey (Table 7).

## C.2. Crab Collections

Table 3 lists all crab census data including numbers of burrows, species and specimens, diversity indices and evenness values for January 1997. Table 8 summarizes crab census data by station (except burrow counts) for all surveys, including those carried out by the previous contractor. Station descriptions follow, below.

The substrate at all stations on the west side of the ICWW (1a-7) (north of the Turning Notch) is fine, black mud. However, the extremely dense mangrove root system often hampered excavation of crab burrows. In addition, it was frequently difficult to distinguish between actual crab burrows and simple openings and depressions between roots. As a result, burrow numbers reported at these stations are probably significantly inflated. However, while *Uca* (Ocypodidae) excavates its own burrows, the grapsid, *Sesarma curacaoense*, apparently hides in any hole of suitable size, regardless of its origin.

*Sesarma curacaoense*, formerly the most abundant crab at the seven west-side stations, was present in small numbers at five stations in January 1996, but disappeared completely from all seven in August 1996 and has not returned. It has been declining in numbers here since 1994. *Uca* spp. also declined here over several of the last surveys (0 specimens in January 1995; 6 in August 1995; 3 in January 1996, and 1 in August 1996), but increased slightly to 8 specimens in 1997. *Uca rapax* remains in numbers on the east side of the ICWW at station 16, but disappeared from station 15. The xanthid, *Eurytium limosum*, was last collected at any station in August 1993.

Only three tree crabs, *Aratus pisonii*, were observed at stations on the west side of the ICWW, one at each of three stations. On the east side, they disappeared in both 1996 surveys from station 16 where they were formerly most abundant, but reappeared in low numbers (2 specimens) in 1997.

Station 1a: Edge of red mangrove fringe adjacent to riprap at the northeast corner of the Southport Turning Notch.

Station 2: In dense red mangrove fringe 10 m north of the Turning Notch and 10 m west of the ICWW.

Station 3: In dense red mangrove fringe 3 m east of a natural drainage creek, 10 m north of the Turning Notch.

Station 4: In dense red mangrove fringe 10 m north of the Turning Notch and approximately 40 m west of the natural drainage creek.

Station 5: In dense red mangrove fringe 30 m north of station 4.

Station 6: In dense red mangrove fringe 3 m east of the natural drainage creek and 10 m north of station 3.

Station 7: In dense red mangrove fringe 30 m north of station 2.

Station 10: In an open area among scattered large red mangroves, east of the center of a small island on east side of the ICWW north of the northern entrance to Whiskey Creek (directly west of the John U. Lloyd Park Environmental Education Building).

Station 12: On high ground among Australian pine trees at a point intersected by lines running due east from station 11 (on the north side of the northern entrance to Whiskey Creek) and due north of station 13. Because of its location well outside the mangroves and the intertidal habitat of associated crabs, no crabs were ever found here.

Station 13: On muddy sand with small rocks and pebbles among shrubby white mangroves on the north side of Whiskey Creek, approximately 20 m west of the North Ocean Drive bridge.

Station 15: In dense red mangrove fringe 35 m west of North Ocean Drive on a line running east from the north side of the Turning Notch. This site is relatively small area of mature red mangroves flanked to the north and south by mitigation areas.

Station 16: Among tall red mangroves 110 m east of North Ocean Drive on line running due east of north side of Turning Notch. The substrate is fine, black mud.

### **C.3. Hand Collections**

A total of 476 specimens representing 16 taxa was collected at the three hand collection stations. Table 4 lists all raw data, diversity indices and evenness values by station and by replicate. Table 9 summarizes organism abundance, diversity, richness and evenness values by station for all surveys.

The snail, *Batillaria minima*, and the springtail insect, *Anurida maritima*, account for 44.5% and 23.3%, respectively, of all organisms enumerated, almost identical to the percentages recorded in August 1996. Numbers of encrusting sponges and colonial tunicates at station 9 are again estimates because it was not possible to determine precisely in all cases whether the small encrusting masses were connected or not. Results are summarized below.

Station 9: Intertidal rubble in a red mangrove fringe protected from heavy wave action by adjacent riprap on the southwestern corner of a small island along the east side of the ICWW just north of the northern entrance to Whiskey Creek (southwest of the John U. Lloyd Environmental Education Building). The substrate consists of numerous rocks (up to about 30 cm long) with chiefly red and green algal turf, and black encrusting cyanobacteria.

The vermetid gastropod *Petalochonchus varians* is again the most abundant organism, outnumbering previously dominant *Batillaria minima* and barnacles (Tables 4, 9). It has increased in numbers almost continuously since August 1991 while barnacles have exhibited a general decline (Table 9). Bivalves have been more abundant during the last six surveys than during the first six, although their numbers remain low. As noted in 1995, the site is more exposed to open water than it was earlier in the project. A qualitative visual assessment suggests that one or a few red mangrove trees along the edge of the fringe have died. Closer proximity to the Intracoastal Waterway may be responsible for the appearance of small encrusting sponges and colonial tunicates (under intertidal rocks) during the last 4-5 surveys. Vermetid gastropods are now noticeably abundant on adjacent large riprap boulders.

Station 13: Intertidal muddy sand with numerous small rocks, pebbles and shells on the north side of Whiskey Creek, about 15m west of the North Ocean Drive bridge; replicates were taken at or near low tide, 1-2 m below most seaward mangrove pneumatophores.

The fauna is dominated by the gastropod, *Batillaria minima* (66.4%), followed by the springtail, *Anurida maritima* (22.0%).

Station 17: Intertidal, coarse shelly sand and gravel with filamentous green algae and partly buried rocks, west side of Whiskey Creek, on a line running due east of the north side of the Turning Notch, about 500 m north of the northern footbridge. In taking all samples at the same level above the water line along the shore, replicates sometimes fell among or just below scattered red mangrove prop roots and white mangrove pneumatophores.

Very few organisms, mostly *Anurida maritima*, were counted inside the transects. However, *Batillaria minima* was abundant at and below the low tide line, below the transects. Numerous flat tree oysters, *Isognomon alatus*, grew on adjacent prop roots. The hanging ends of red mangrove prop roots adjacent to the shoreline were heavily bored.

## B. DISCUSSION

### D.1. Ponar Grab samples

Nova Southeastern University personnel have now taken twelve surveys (six each in August and January). The following discussion begins with a description of the most recent, final survey of January 1997 and a comparison with immediately preceding surveys. An examination of more general trends follows.

The total organism abundance of 9,171 specimens recorded in January 1997 represents a decline from the survey peak in August 1996 (14,335 specimens), but remains higher than in any other survey since January 1994 (12,294) (Table 7). Stations 1, 8, 8a, 11 and 19a all exhibit general increases in organism abundance over the last 4-5 surveys, while several others show distinct seasonal variations over the same period: stations 13a and 18a higher in January and stations 9 and 10a higher in August surveys.

Overall species richness has increased over the last four surveys with a project maximum of 190 species in January 1997. However, only four stations record continuous increases in richness over the same period. No distributional pattern exists; stations showing increases are scattered on both sides of the ICWW and in Whiskey Creek. Also, five stations recorded their richness maxima before August 1994. The 75 species found at station 14 in August 1996 represent the maximum richness value recorded during this project.

Organism abundance and species richness exhibit an interesting pattern over the course of the project at stations 1, 8 and 8a on the west side of the ICWW. Both factors climb from low values in January 1992 to peaks in 1993 (through January 1994 for richness), decline through 1995 and rebound in 1997 (Figures 10, 11). A similar pattern exists at station 17 in Whiskey Creek (Table 7) and, because of the large numbers generally recorded from this latter station, a similar pattern holds for total organism abundance at all stations combined. However, the pattern is much weaker at stations 13a, 14 and 18a on the east side of the ICWW (Figure 12).

Diversity indices were greater in both 1996 surveys than in both 1995 surveys at eight stations and increased progressively over the last four surveys at four of them (8, 8a, 11 and 18). Diversity decreased at least slightly at six of the eight (1, 8, 8a, 13a, 14, 17) and continued to increase at two (11 and 18a) in January 1997. With only a couple of exceptions early in the project, stations 9 and 10a have exhibited higher diversity indices in January surveys. Diversity at

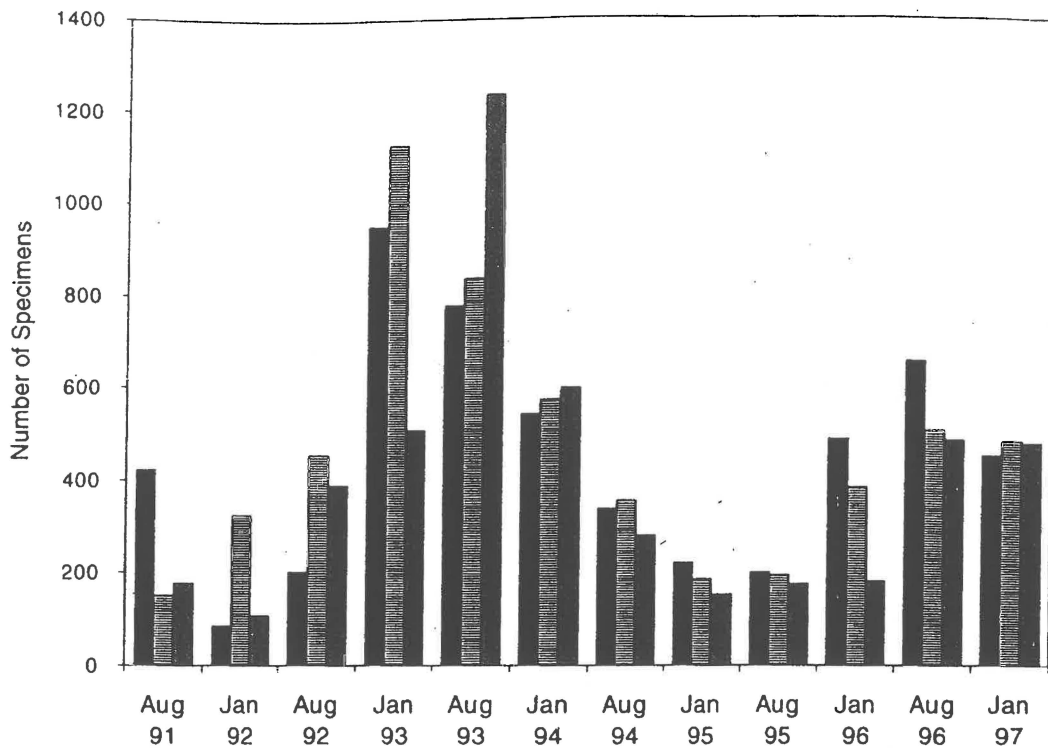


Figure 10. Organism abundance by survey for stations 1 (solid bar), 8 (horizontal hatching), and 8a (diagonal hatching) on the west side of the ICWW.

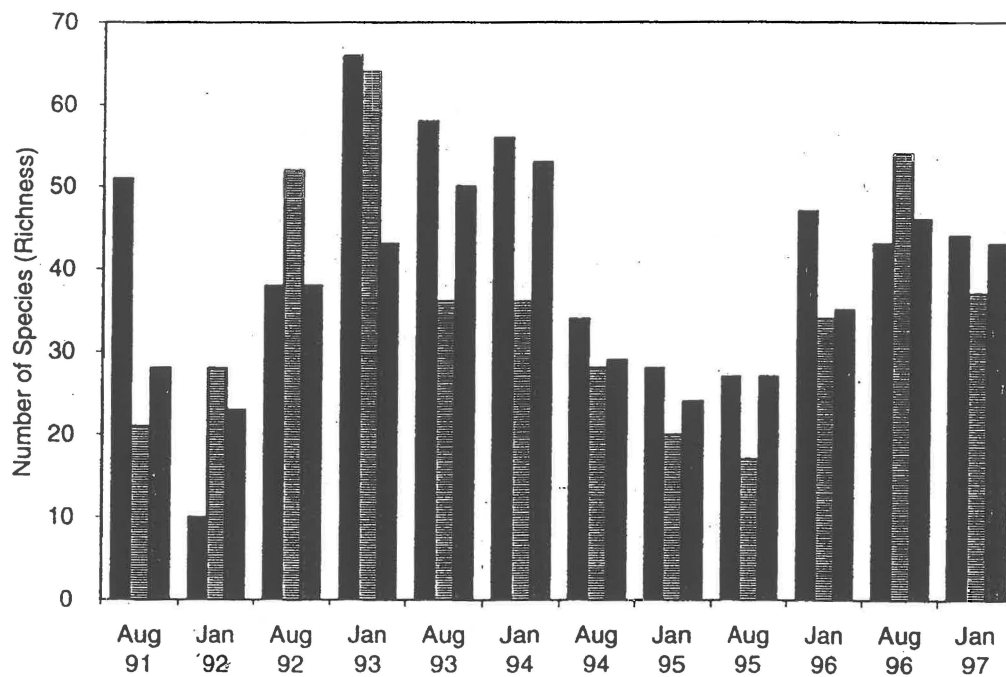


Figure 11. Species richness by survey for stations 1 (solid bar), 8 (horizontal hatching), and 8a (diagonal hatching) on the west side of the ICWW.

station 19a in January 1997 is the maximum recorded at this site, although it is not the result of a progressive trend here.

At station 9, polychaetes dominate to a greater degree in August surveys, while ostracodes and peracarid crustaceans tend to occur in greater numbers in January (Tables 6a-b). At station 10a, ostracodes are relatively more abundant in August while peracarids make up a greater proportion of the fauna in January. In other cases, apparent patterns have not been maintained quite throughout the survey period. Thus, at stations 1, 8 and 8a, oligochaetes constitute greater

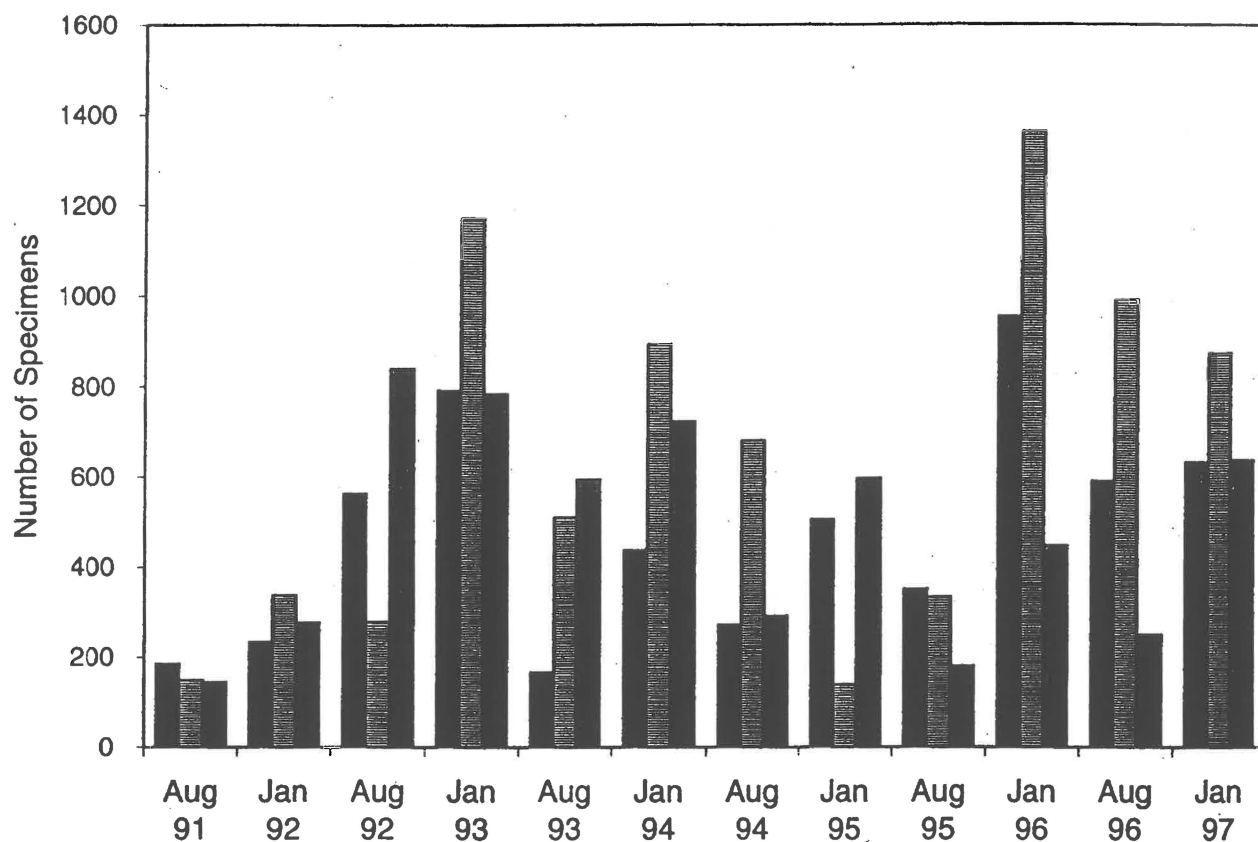


Figure 12. Organism abundance by survey at stations 13a (solid-bar), 14 (horizontal hatching), and 18a (diagonal hatching) on the east side of the ICWW.

proportions of the fauna in the August surveys from 1991 through 1994, but the pattern has since broken down at stations 1 and 8 and weakened at station 8a (Table 6b). Raw abundance data does not reflect this trend in proportions (Table 6a). At station 17, the polychaete *Ehlersia cornuta* exhibits a pattern of August peaks interrupted by the occurrence of large numbers in the January 1994 survey (Table 5d). A similar pattern for the polychaete *Nematonereis hebes* at the same

station breaks down further with a drop in numbers in August 1995, although the pattern resumes in 1996.

The strongest pattern remains the apparent seasonal variation in peracarid crustaceans at several stations, although this pattern is not perfectly consistent either. The cumacean, *Oxyurostylis* sp., the tanaidacean, *Leptochelia rapax*, and the amphipods, *Cerapus* n. sp. and *Grandidierella bonnieroides*, all tend to exhibit January increases in numbers at the shallow creek stations (9, 10a) and, to a lesser extent, the three east ICWW stations (Tables 5b, 5c; Figure 7). They are all almost completely absent from August surveys at station 9. The polychaete, *Glycera abbranchiata*, also tends to occur in larger numbers at ICWW and shallow creek stations in January surveys (Tables 5a-5c; Figure 9). Specimens identified as *Glycera* sp. also probably belong to *G. abbranchiata*.

Tables 5a-d show that some species are consistently important faunal components at different stations in all, or virtually all, surveys so far. If they prove characteristic of their respective sites over a longer term, they may serve as useful environmental indicators. It is widely recognized that changing physicochemical conditions control distributions of numerous polychaetes, mollusks and peracarid crustaceans (e.g., Boesch, 1977; Fenchel, 1977; Levinton, 1977; Uebelacker & Johnson, 1984; Lardicci et al., 1991). Although Gaston (1984) notes that the role of paraonid polychaetes as environmental indicators is confused because of questionable taxonomy, the two commonest species found here are quite distinct and may prove useful. Thus, *Aricidea taylori* dominates at stations 1, 8, and 8a, while *A. philbinae* is most important at 9 and 10a (Figures 5, 6, 8). Other examples include *Mediomastus californiensis* (specimens identified as *Mediomastus* sp. in some surveys are probably also this species; M. Milligan, personal communication) at station 1, *Ehlersia cornuta* and *Nematonereis hebes* at station 17; the tanaidacean, *Kalliapseudes aliciae*, and the gastropod, *Caecum pulchellum*, also at station 17.

A few species have become consistently important since the project began: the oligochaetes, *Tubificoides motei*, at stations 1, 8, 8a and 18 beginning in August 1992; *Smithsonidrilus hummelincki* at stations 13a and 14, and *Thalassodrilides gurwitschi* (sometimes identified as *Thalassodrilides* sp., M. Milligan, personal commun.) at station 10a since January 1993; the polychaetes, *Aricidea philbinae* and *A. taylori*, also at 13a and 14 since January 1993 (although the latter disappeared from 13a in January 1997); the gastropod, *Batillaria minima*, at station 17



since August 1993, and the sipunculan, *Phascolion cryptum*, at station 19a in four of the last five surveys.

Other species are similarly important, but less consistently so: the ostracode, *Rutiderma darbyi*, and the oligochaete *Pectinodrilus molestus*, at station 17; the ostracode, *Cyprideis americana*, at station 10a, and the polychaete *Capitella capitata* at stations 9 and 10a. Other frequently common taxa are the polychaete, *Mediomastus californiensis* at stations 8, 8a, 11 and 18, *Lumbrineris verrilli* at 1 and 8, and the gastropod *C. pulchellum* at most ICWW stations. Several of the less consistently common species exhibited peak occurrences as part of the overall organism abundance peaks recorded from August 1992 through January 1994, and declined in 1995. Some recovered in 1996: the oligochaetes, *Tubificoides motei* and *Smithsonidrilus hummelincki*, and the polychaete, *Lumbrineris verrilli*, at stations 1, 8, 8a and 18, the oligochaete *Limnodriloides rubicundus* at station 10a, and the isopod, *Exosphaeroma diminuta* at station 17 (Tables 5a-d.). Others, such the gastropod, *Caecum imbricatum*, did not. Still others, such as the polychaete, *Paraonis fulgens* at station 9, appeared for a while and then declined (Table 5c). As mentioned in previous reports, it is not clear if any of these apparent changes represent post-dredging changes, returns to pre-dredging conditions, or variations un-related to dredging and/or mitigation.

The faunal change noted previously for station 17 in Whiskey Creek remains unchanged: the sipunculan *Aspidosiphon* cf. *muelleri* and the isopod *Exosphaeroma diminuta* appear to have replaced *A. albus* and *E. productatelson*, respectively. However, consultant Marilyn Schotte (Smithsonian Institution) has suggested (personal communication) that the two isopod species may not prove distinguishable. The gastropod *Batillaria minima* also remains abundant at station 17 and may be responsible for the co-occurrence of *A.* cf. *muelleri* which is a more frequent resident of empty gastropod shells than its congener *A. albus*. However, consultants Mary Rice and Julie Piraino (Smithsonian Institution) report (personal communication) that benthic shelf communities may support as many as six species of *Aspidosiphon*. Thus, *A. albus* and *A.* cf. *muelleri* may both occur in Whiskey Creek simultaneously although we have not yet found them together at the same time. The possibility also exists that one or the other has been misidentified so that a single species has occurred here throughout. The other major change at this site is the decline since August 1994 of the gastropod, *C. imbricatum*, and the appearance, beginning in January 1996, of *Caecum textile* (Table 5d). The August 1995 disappearance of the ostracode

*Rutiderma darbyi* and its replacement by *Peratocytheridea setipunctata* appears to have been a one-time phenomenon.

Several species previously reported as transients remain so and have not reappeared at their respective sites. Examples include the polychaetes, *Tharyx marioni* at stations 1, 8, 8a and 11 in January 1993; *Lumbrineris testudinum* at stations 1, 8, 9, 11, 13a, 14 and 18 in August 1992; *Nematonereis hebes* at station 8 in January 1993; *Sphaerosyllis longicauda* at stations 13a, 14 and 18 in January 1993; *Branchiomma nigromaculata* at station 11 in August 1991; the nemertine, *Hubrechtella dubia*, at stations 13a and 18 in August 1992; and the ostracode, *Harbansus paucichelatus*, at station 17 in January 1992 (Table 5a-d). Several other transients have reappeared in numbers after at least year-long absences. Examples include the polychaetes, *Leitoscoloplos robustus* at stations 9 and 10a; *Pseudopolydora* spp. and *Exogone dispar* at stations 13a and 14; the ostracode *Peratocytheridea setipunctata* at station 13a, and the nemertine, *Tubulanus pellucidus* at stations 17 and 19a. A few transients reappeared in January 1997 after long absences, but only in small numbers: *Leitoscoloplos robustus* at station 14 and *Laeonereis culveri* at station 10a.

Because the previous contractor did not identify most polychaetes and non-decapod crustaceans to species, and apparently completely overlooked ostracodes, oligochaetes, nemertines and the gastropod genus *Caecum*, comparison of his data (September 1988 to January 1991) with surveys carried out by Nova Southeastern University is limited. However, some data allow recognition of faunal similarities and differences before and after dredging at some stations. The previous contractor reported numbers of specimens for both crab and grab stations together; they are included here as originally reported (Table 10a, b). His summary data for the September 1988 through January 1990 surveys are given in Table 11.

Station 17 provides the best data for pre- and post-dredging comparison. Dobkin's surveys include substantial numbers of sipunculans (either unidentified or referred to *Phascolion strombus*) and tanaidaceans (unidentified species E). It seems most likely that these taxa actually represent *Aspidosiphon* sp. and *Kalliapseudes aliciae*, respectively. They are found in similar numbers in Dobkin's final survey and our initial survey, and they suggest that the community at station 17 was relatively unaffected by the dredging.

At the three stations on the west side of the ICWW (1, 8, 8a), Dobkin records substantial numbers of a sabellid polychaete (his species F), particularly during the survey most likely

affected by dredging (August 1989). Its absence in his three subsequent surveys (with the exception of a single specimen at 8a in August 1990) suggests that dredging may have significantly affected the fauna here. However, we reported substantial numbers of the sabellid *Fabricinuda trilobata* at station 8 in January 1993, and both *F. trilobata* and *Bispira melanostigma* at station 8a in August 1993 (Table 5a). Both species also occur in numbers, although rarely, at stations on the east side of the ICWW (Table 5b). The possibility thus exists that they may merely be transient species. However, *Fabricinuda trilobata* is a brooder with non-planktonic larvae that crawl away from their maternal tube (Rouse and Fitzhugh, 1994). As such, restoration of populations may require a more extended period following a disturbance than would a broadcast spawning species.

Finally, it is worth noting that the benthic macroinvertebrate fauna of the Intracoastal Waterway appears to be unusually diverse (in terms of species richness) for a subtropical estuarine environment. Numbers of taxa distinguished as species (i.e., either identified to species or recognized as the single representative of a genus or higher group) are listed by major taxonomic group as follows:

Platyhelminthes	7	Oligochaeta	25
Nemertina	19	Ostracoda	18
Gastropoda	32	Peracarida	42
Bivalvia	30	Decapoda	26
Polychaeta	150	Other	21

We collected a total of 370 species in Ponar grab samples for all surveys beginning in August 1991. Table 12 lists all species taken. The 150 species of polychaetes are equivalent to 25% of the 593 species collected by the Minerals Management Service survey of the entire northern Gulf of Mexico (4.5-189 m) (Uebelacker & Johnson, 1984). The figure represents a far greater number than recorded in several other warm temperate to tropical estuaries: Ortobello Lagoon, central Italy, 79 species (Lardicci et al., 1991); Bahia de San Quintin, Baja California, 39 species (Calderon-Aguilera, 1992); Jaltepeque Estuary, El Salvador, 30 species (Molina Lara & Vargas Zamora, 1995); Isla Rasa, Gulf of California, 17 species (Salazar Vallejo, 1990); Bay of Tabunsu, Republic of Guinea; 45 species (Shalovenknov, 1997), although our sampling effort was also substantially greater than in these studies. Thus, it is not surprising that Sanchez-Mata et al. (1993) found 59 species of malacostracan crustaceans at 48 stations across the estuarine Ria

de Ares-Betanzos (NW Spain) while we found 47 species at eleven stations spanning a narrower range of habitats.

## D.2. Crab Collections

The ground-dwelling crab fauna at the seven stations west of the ICWW (north of the Turning Notch) has typically consisted of the grapsid, *Sesarma curacaoense*, the ocypodid, *Uca thayeri* (and, less commonly, *U. speciosa*), and the xanthid, *Eurytium limosum*. With few exceptions, each species has been present in greater numbers, or only present at all, in August surveys, including those made by Dobkin beginning in September 1988 (Table 8; his crab data are also presented in Tables 10a and 10b as originally submitted in combination with Ponar data; his summary data and diversity indices are given in Table 11). The only exception has been small juvenile *Uca* sp., unidentifiable to species and commoner in January. However, all species have declined in numbers over the last few years. For example, the most recent peak crab abundance at any of these stations was recorded in August 1992. *Sesarma curacaoense*, the dominant species here throughout most of the project, has not been found in double digits per station since August 1993 and has not been seen at all since January 1996 (Figure 13).

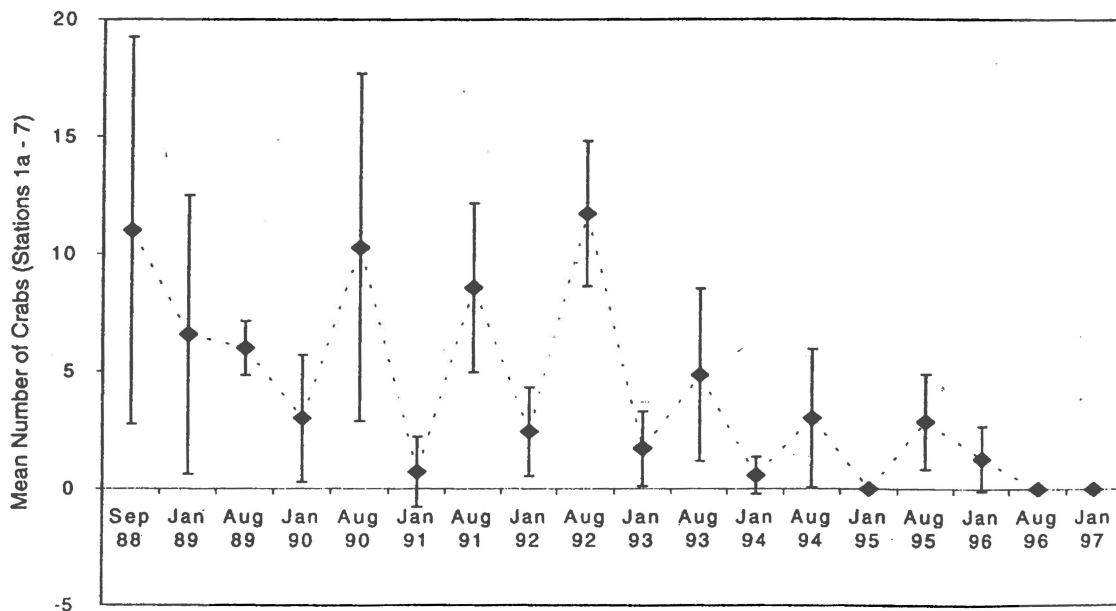


Figure 13. Mean abundances ( $\pm$ std. dev.) of the grapsid, *Sesarma curacaoense*, at crab stations 1a to 7 (north side of Southport Turning Basin), September 1988 to January 1997. Note a) generally larger numbers during summer surveys, b) overall decline after 1992, and c) low numbers in August 1989, during dredging.

The low numbers reported in August 1989 perhaps reflect dredging-related disturbance. Dredging of the turning notch began in the summer of 1989 and destroyed several station sites along the northern margin of the turning basin before the August survey. These stations were relocated ~10 m to the north for the August 1989 survey. Similarly, *Uca thayeri*, usually the next most common species, has been found only singly at any station since August 1994. *Eurytium limosum* has been absent here since January 1993 (Table 8).

Tree crab (*Aratus pisonii*) abundances have also gradually declined here, with the peak abundance at any west ICWW station occurring no more recently than August 1993 (Table 8). With the exception of station 5 (3 and 6 specimens in January and August 1996, respectively), no more than two specimens have been counted at any station since August 1995. By contrast, no station recorded fewer than three specimens each in August 1991 and January 1992. Most recorded five or more each.

*Sesarma curacaoense*, *Uca thayeri* and *Eurytium limosum* occurred at stations 10 and 15 in John U. Lloyd Park from 1988 to 1991, but have essentially vanished since then. Only one specimen each of *E. limosum* and *U. thayeri* have since been found here. Crabs have been rare in general at station 10 since 1992. At station 15, *Uca rapax* first appeared in January 1992 and has since been the most common species.

At station 13, along the northern edge of Whisky Creek, *Uca pugilator* has been the most common species in most surveys. At station 16, in the mature John U. Lloyd Park mangrove forest, *Uca rapax* has dominated, especially since August 1992.

### D.3. Hand Collections

It is difficult to compare results obtained at hand collection stations by the previous contractor with our results for two reasons: the previous contractor did not specify the area surveyed, and only began distinguishing grab, crab and hand samples at stations 9, 13 and 17 in August 1990. His results are summarized in Tables 11c and 12. The few points that can be drawn are included in discussions of individual stations, below.

Station 9 continues to maintain a generally typical intertidal fauna. However, barnacles continue a general decline in numbers that began in 1995, and the vermetid gastropod, *Petalconchus varians*, continues the general increase in numbers exhibited throughout the

project. It has been the most abundant species in the last two surveys (August 1996 and January 1997). Qualitative visual assessments (August 1995 and 1996) indicate that barnacles remain on adjacent riprap but suggest that they are not as abundant as previously, while vermetids have become abundant.

Since August 1995, fewer prop roots have existed between the sample site and the fringe margin which, in turn, appears about 1-2 meters further inshore from the line of riprap boulders than previously. One or a few red mangrove trees along the water's edge have died. The appearance of an unidentified encrusting sponge and a colonial tunicate on the undersides of rocks in the transects over the last 4-5 surveys (Table 9) may be associated with this erosion of the red mangrove fringe. The gastropod, *Batillaria minima*, has declined in numbers over the same period, although it rebounded somewhat in January 1997. Otherwise, the 1996 and 1997 surveys record most of the species found in earlier surveys.

In addition to the quantitative 0.1-m<sup>2</sup> transects, we also qualitatively surveyed the barnacle fauna adjacent to station 9 in January 1997, as follows:

- 1) Intertidal rocks adjacent to replicate 1: *Chthamalus angustitergum*, *Balanus amphitrite*.
- 2) Intertidal rocks adjacent to replicate 3: *Chthamalus fragilis*, *B. amphitrite*.
- 3) Intertidal riprap adjacent to station 9: *C. fragilis*, *B. amphitrite*, *Newmanella radiata*.

*Chthamalus angustitergum* was not included among the species recorded within station 9 transects because it was only found on rocks adjacent to replicate 1, in which no barnacles occurred. However, specimens recorded as *Chthamalus stellatus* in August 1993 and both 1994 surveys may represent this species. *C. stellatus* is actually a European species (Pilsbry, 1916, and P. McLaughlin, personal communication). Pilsbry (1916) treated *C. angustitergum* as a subspecies of *C. stellatus*, although he suggested that it was probably distinct. Ross (1968) formally raised it to specific rank. We also found *Balanus amphitrite* on intertidal rocks on the mud flat immediately southwest of the John U. Lloyd Park Environmental Education Center (20 m south of grab station 10a).

The previous contractor apparently examined the entire intertidal zone at station 9 because he reported both high intertidal littorinids (e.g., *Littorina ziczac* and *Tectarius muricatus*) and lower intertidal *Batillaria minima* and a sponge. He noted (but did not enumerate) the barnacles, *Balanus amphitrite*, *Chthamalus* sp. and *Tetraclita squamosa* (= *T. stalactifera*) from September 1988 through August 1989. Subsequently, *Chthamalus* sp. was recorded in August 1990, and *B.*

*amphitrite* in January 1991. We observed *T. stalactifera* on riprap adjacent to station 9 transects during several surveys. Dobkin also reported a vermetid gastropod (identified as *Spiroglyphus annulatus*, but probably the same species identified by us as *Petaloconchus varians*) in September 1988 (not enumerated) and January 1991 (1 specimen).

At station 13, the fauna continues to be dominated by the gastropod, *Batillaria minima* and the springtail insect, *Anurida maritima*, accompanied by smaller numbers of the bivalves, *Brachidontes exustus* and *Crassostrea virginica*. The latter two have been consistently present since January 1994 (and sporadically before that). Large numbers of small *Balanus* sp. have been recorded occasionally as larger rocks have fallen within randomly placed transects (although barnacles have not occurred on all larger rocks at this site).

*Batillaria minima* declined in 1996 from the large numbers recorded in the 1995 surveys, but rebounded somewhat in 1997. It remains the most common organism. *Anurida maritima* has increased over the last three surveys to numbers similar to those recorded earlier in the project. Its abundance in January 1997 is the third highest reported at this station. Both the gastropod and insect vary in their distribution along the shore with the changing tide so their numbers counted within the transect areas at any given moment may not accurately reflect population sizes.

In August 1990, Dobkin reported *B. minima*, *C. virginica*, three species of *Uca*, and a large number of the small hermit crab, *Clibanarius tricolor* here. In January 1991, he again recorded *B. minima* and at least two species of *Uca*. His reporting of both *Uca* spp., found by us among mangrove pneumatophores above our transects, and hermit crabs, occasionally found by us under rocks within the transects, again suggests that he sampled a broad intertidal area here.

At station 17, *B. minima* and *A. maritima* are again the most common organisms. Although few *B. minima* were found within transects in January 1997, the species was abundant at and below the water line, outside the transects. (The station was surveyed at low tide.) The sporadic appearance of the bivalve, *Isognomon alatus*, here is due to its scattered presence on red mangrove prop roots and their occasional inclusion in randomly placed transects. In January 1997, numerous specimens were observed on prop roots adjacent to the transects.

In August 1990, the four taxa recorded here by the former contractor were never found by us: the isopod *Sphaeroma* sp. (although this may be the same as the sphaeromatids, *Exosphaeroma* spp., collected by us in the subtidal grab samples), an unidentified sponge, the wood-boring

bivalve *Bankia gouldi*, and the mud crab, *Eurytium limosum*. He recorded no specimens of any species in January 1991. We apparently did not sample the same local habitats.



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## TABLES

**TABLE 1. Grab Collection Stations: raw data, diversity ( $H'$ ) and evenness ( $J'$ ): January 1997.**

STATION REPLICATE	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	TOT					
TAXON																																				
Phylum CNIDARIA																																				
Order ACTINIARIA																																				
Unidentified actinian		8			6			2														10		10		1			6	6	12		1	62		
Phylum PLATYHELMINTHES																																				
Order KALYPTORHYNCHA																																				
Unidentified kalyptorhynch									2					1	1							2		6				4			1	2	19			
Unidentified turbellarian									2																					1		3				
Phylum NEMERTINA																																				
Order PALEONEMERTEA																																				
Family CEPHALOTHRICIDAE																																				
?Cephalothrix sp.								2										2														4				
Family CARINOMIDAE																																				
Carinoma tremaphoros					2						1										4											15				
Carinomella lactea						2					2		3						2								2	2	1			16				
Family TUBULANIDAE																																				
Tubulanus pellucidus	4	2	2	2		2			2		1	1		1		1		4		4	18	12	10		4	2	6	21	14	20	2	4	1	1	2	143
Order HETERONEMERTEA																																				
Family BASEODISCIDAE																																				
Baseodiscus floridanus															1																		1			
?Baseodiscus sp.																	2	4															6			
Family MICRURIDAE																																				
Unidentified micrurid													1			2		2						8		70				2			85			
Family LINEIDAE																																				
Unidentified lineid									2							2	2	4		4	4												18			
Order HOPLONEMERTEA																																				
Family AMPHIPORIDAE																																				
?Amphiporus sp.				6	2			2		4		2																				1	17			
Family TETRASTEMMIDAE																																				
Tetrastemma worki?									2			1																					3			
Hoplonemertine JLN 114?											1				1																		2			
Unidentified nemertine															1															1			2			
Phylum MOLLUSCA																																				
Class GASTROPODA																																				
Family CERITHIDAE																																				
Cerithium atratum						2																											2			
Family CAECIDAE																																				
Caecum pulchellum	4	2	6	10	4	2			4	4		1				10	4	42	18	62	74		4	8	6	206	133	52	28	94	43		821			
Caecum imbricatum																										3	7	5				15				
Caecum textile																										8	5	3				16				
Meioceras nitidum																		2														2				
Family POTAMIDIDAE																																				
Batillaria minima													7		8											39	30	55			15	5	13	172		
Family RISSOINIDAE																																				
Rissoina catesbyana																											2					2				
Family BULLIDAE																																				
Bulla striata		2					4				1	1				2						4	2	2								18				
Family Haminoeidae																																				
Haminoea antillarum																															1	1				

TABLE 1. Grab Collection Stations: raw data, diversity ( $H'$ ) and evenness ( $J'$ ): January 1997.

STATION	1			8			8a			9			10a			11			13a			14			17			18a			19a			TOT
REPLICATE	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3				
TAXON																																		
Haminoea succinea																															2	2		
Haminoea sp.							2																									2		
Unident. opisthbranch (naked)																									6			2				8		
Unident. opisthbranch (shelled)																													2			2		
Class BIVALVIA																																		
Family LUCINIDAE																																		
Codakia orbiculata																		2											2			4		
Lucina sp.										2																						4		
Parvilucina multilineata																		2														2		
Family LEPTONIDAE																																		
Unidentified leptonid																									4				8			12		
Family LYONSIIDAE																																		
Lyonsia floridana																														2		2		
Lyonsia sp.													1																			1		
Family TELLINIDAE																																		
Macoma constricta		4			2	2		2		1		3		1	1						14	4	2					2	1		1	40		
Tellina sp.										1																						1		
Family SEMELIDAE																																		
Cumingia coarctata																																8		
Cumingia sp.																																4		
Family SOLECURTIDAE																																		
Tagelus divinus																																1		
Tagelus sp.														1																		1		
Unidentified bivalve																																3		
Phylum ANNELIDA																																		
Class POLYCHAETA																																		
Order ORBINIIDA																																		
Family ORBINIIDAE																																		
Leitoscoloplos fragilis										4		4																				8		
Leitoscoloplos robustus										1	19			4							4											28		
Leitoscoloplos sp.										35		31			1								2									69		
Naineris sp.																														1		3		
Orbinia riseri																						2										2		
Scoloplos rubra																												4		12		16		
Scoloplos texana										1					1													4				2		
Unidentified orbiniid?																															1	1		
Family PARAONIDAE																																		
Aricidea philibinae			2		22	8		2	2	15	15	23	27	62	206					6	6	24	20	4				2		1	17	28	40	532
Aricidea taylori	72	44	20	46	38	26	72	54	20			2	1		23				6			20	36	4				14	4	8		1	4	515
Aricidea sp.																		2														2		
Cirrophorus sp.																														2		2		
Order COSSURIDA																																		
Family COSSURIDAE																																		
Cossura sayeri					2				2								4											2	2				12	
Order SPIONIDA																																		
Family SPIONIDAE																																		
Apopriospio pygmaea																						2										2		
Polydora socialis																																8		

**TABLE 1. Grab Collection Stations: raw data, diversity ( $H'$ ) and evenness ( $J'$ ): January 1997.**

STATION REPLICATE	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	TOT		
TAXON	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	TOT		
Prionospio cristata						4	2			2		2	1		2							4				4			1	1		21	
Prionospio heterobranchia			2	4	2					1	3	3	1	2	2			2				2							10	11	13	58	
Prionospio multibranchiata			2						2																							4	
Prionospio perkinsi				2												6	2															11	
Prionospio sp.	2																							1								2	
Pseudopolydora sp. B			2	2			2					2	1	2		4	10	14				14	4			2		1				60	
Scolecopsis texana										1																						1	
Spio pettiboneae										1							4															5	
Family MAGELONIDAE																																	
Magelona pettiboneae												1																				1	
Family CHAETOPTERIDAE																																	
Spiochaetopterus ?oculatus																															2	2	
Family CIRRATULIDAE																																	
Cauleriella sp. A				4						1		7									2	76	32	10					13	11	3	159	
Cauleriella sp.	8						2								1																	31	
Chaetozoe sp.						2																				14		6				8	
Cirratulus sp.												1																	2			5	
Cirratuliformia sp. A			2																														
Cirratuliformia sp.																											4	2	1			23	
Monicellina dorsobranchialis				2	2																									1		1	
Unidentified cirratulid	14	2	4	6	2	4	8	2		1		1				4	14	2	10	40	4				2				80	2		88	
Order CAPITELLIDA																																	
Family CAPITELLIDAE																																	
Capitella capitata										3	1	4	3	20	41	2	8	4				14		6					1	14	10	131	
Capitomastus sp.		2																														4	
Mediomastus californiensis	14	12	22	16	10	12	2	18	6	1		2				2	6		18	18	14	6		2			14	10	4			209	
Family MALDANIDAE																																	
Unidentified maldanid			4																							2						6	
Order OPHELIIDA																																	
Family OPHELIIDAE																																	
Armandia agilis										2																						2	
Order PHYLLODOCIDA																																	
Family HESIONIDAE																																	
Microphthalmus sp.																													1		2	3	
Podarke obscura																													1			1	
Family SYLLIDAE																																	
Brania sp.																													1			1	
Ehlersia cornuta							2																										
Exogone dispar	2									2	3			18	16		2	2							34	17	4		4	2		67	
Odontosyllis enopla																		2											1	7	20	4	88
Sphaerosyllis labyrinthophila																											2	2				5	
Sphaerosyllis piriferopsis																											2		2		4	44	
Sphaerosyllis cf. renaudae			2																								2		1			3	
Sphaerosyllis riseri																																2	
Sphaerosyllis taylori	8																												6			11	
Streptosynigera heteroseta					2																									1	8	2	117
Streptosyllis pettiboneae										2	1	1																				2	
Unidentified syllid																																2	

**TABLE 1.** Grab Collection Stations: raw data, diversity ( $H'$ ) and evenness ( $J'$ ): January 1997.

STATION	1			8			8a			9			10a			11			13a			14			17			18a			19a			TOT		
REPLICATE	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	TOT					
TAXON																																				
Family NEREIDAE																																				
<i>Laeonereis culveri</i>														1																	1					
<i>Stenionereis martini</i>																													1		1					
Family GLYCERIDAE																																				
<i>Glycera abbranchiata</i>	4	2	2	12	6	4			2		3	3	8	5	4	3	2	6	12		2	2	6	6	6			10		10		120				
Order AMPHINOMIDA																																				
Family AMPHINOMIDAE																																				
<i>Paramphinode</i> sp. B																				2					2						4					
Order EUNICIDA																																				
Family EUNICIDAE																																				
<i>Marphysa</i> cf. <i>conferta</i>																															4					
<i>Nematonereis hebes</i>								2											30	44	52				29	7	8		4			176				
Unidentified eunicid																													4		4					
Family LUMBRINERIDAE																																				
<i>Lumbrineris tenuis</i>						2																									2					
<i>Lumbrineris verrilli</i>	4	12	4	2	8	6	6	12	4	3	6	15	10	14	28	2	16	10		4		4	6	4			20	10	10			220				
Family ARABELLIDAE																																				
<i>Drilonereis</i> sp. C																													1		1					
Family DORVILLEIDAE																																				
<i>Ophryotrocha</i> sp. A																														2	6	2	10			
<i>Schistomeringos</i> ? <i>rudolphi</i>																			4												4					
Unidentified dorvilleid										1																						1				
Order STERNASPIDA																																				
Family STERNASPIDAE																																				
<i>Sternaspis scutata</i>					2		2	2																					1			7				
Order TERESELLIDA																																				
Family TERESELLIDAE																																				
<i>Loimia medusa</i>															2																	2				
<i>Polycirrus</i> sp.																				4												4				
<i>Streblosoma hartmannae</i>																2	2	2														12				
Unidentified terebellid																			2				2									4				
Family TRICHOBRANCHIDAE																																				
<i>Terebellides stroemi</i>																	6															6				
Order SABELLIDA																																				
Family SABELLIDAE																																				
<i>Bispira melanostigma</i>																				4	4											8				
<i>Branchiomma nigromaculata</i>																							3	1				2				6				
<i>Chone</i> cf. <i>americana</i>													1		1															1		5				
<i>Fabricinuda trilobata</i>			2												1			2		2					16	6	6				16	2	9	23	47	135
<i>Laonome</i> sp.										1	4	13			5				2		2					2								38		
<i>Megalomma</i> sp. B																										2							4			
Unidentified sabellid											1																						1			
Family SERPULIDAE																																				
<i>Salmacina</i> sp.																											2					2				
Class OLIGOCHAETA																																				
Family TUBIFICIDAE																																				
<i>Ctenodrilus serratus</i>												1																					1			
<i>Limnodriloides baculatus</i>										1		2													2								5			



**TABLE 1. Grab Collection Stations: raw data, diversity ( $H'$ ) and evenness ( $J'$ ): January 1997.**

STATION	1			8			8a			9			10a			11			13a			14			17			18a			19a			TOT
REPLICATE	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	TOT			
TAXON																																		
<i>Limnodriloides barnardi</i>		4	2		2	34	10					4			1		2					4	10					18		11	1		9	112
<i>Limnodriloides monotheucus</i>																											2				1	3		
<i>Limnodriloides rubicundus</i>		6	4			4	2	14	28				24		3	2		2					34	40	2					2	7	1	7	182
<i>Pectinodrilus molestus</i>																										189	36	53					278	
<i>Smithsonidrilus hummelincki</i>		4	8			14	8	8	8		1	1	21				4	18	4	24	4	4	26	30	8			2		1			198	
<i>Smithsonidrilus marinus</i>																	2																2	
<i>Smithsonidrilus multiglandulari</i>																	2														5	1	24	30
<i>Smithsonidrilus</i> sp.								2									2																6	
<i>Tecidrilus gabriellae</i>		16			2	8	8																6				4		10			1	1	54
<i>Tecidrilus squalidus</i>								10	2	4																							16	
<i>Thalassodrilides gurwitschi</i>			4	2						8		2	3	3	13			12	18				10	6	6						53	57	22	219
<i>Tubificoides brownae</i>							2																	2							2	5		11
<i>Tubificoides motel</i>	2	26	14	26	4	6	30	22		2							4	2	2	2			12	6				2		9			2	173
<i>Tubificoides parviductus</i>			4	4			4																								2			14
Unidentified tubificid		4			8	30		6	16								8					6	4	2				10	4		2	5	6	111
Phylum PRIAPULA																																		
Unidentified priapulan?		2																																2
Phylum SIPUNCULA																																		
Order GOLFINGIIFORMES																																		
Family PHASCOLIONIDAE																																		
<i>Phascollon cryptum</i>																											47				13	16	23	99
Order ASPIDOSIPHONIFORMES																																		
Family ASPIDOSIPHONIDAE																																		
<i>Aspidosiphon cf. muelleri</i>																											117		45					162
Unidentified sipunculan								2		1		1							2	2	6								2				16	
Phylum ARTHROPODA																																		
Subphylum UNIRAMIA																																		
Class INSECTA																																		
Unidentified insect larva														1																				1
Subphylum CHELICERATA																																		
Class PYCNOGONIDA																																		
Unidentified pycnogonid																												2			1			3
Subphylum CRUSTACEA																																		
Class CEPHALOCARIDA																																		
Unidentified cephalocarid	2																						10											12
Class OSTRACODA																																		
Subclass MYODOCOPA																																		
Family SARSIELLIDAE																																		
<i>Eusarsiella spinosa</i>										1							2																	3
<i>Eusarsiella zostericola</i>							2															2					2				9	5	20	
Family RUTIDERMATIDAE																																		
<i>Rutiderma darbyi</i>								2																			71	66	30					169
Subclass PODOCOPA																																		
Family CYTHERIDIDAE																																		
<i>Cyprideis americana</i>																															3	13	6	22
<i>Peratocytheridea setipunctata</i>										15	17	19		7	1	3			4				14	4	6			4		1	26	50	28	199
Unident. campylocytherine																													2					2
Unident. paracypridine																																1		1



TABLE 1. Grab Collection Stations: raw data, diversity ( $H'$ ) and evenness ( $J'$ ): January 1997.

STATION REPLICATE	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	TOT
TAXON																															
Class MALACOSTRACA																															
Order MYSIDACEA																															
Unidentified mysid																															
Order TANAIDACEA																															
Family KALLIAPSEUDIDAE																															
<i>Kalliapseudes aliciae</i>																															
Family PARATANAIDAE																															
<i>Leptochella forresti</i>																															
<i>Leptochella</i> sp.																															
Family TANAIDAE																															
<i>Sinelobus stanfordi</i>																															
Order ISOPODA																															
Family ANTHURIDAE																															
<i>Amakusanthura magnifica</i>																															
Family ARCTURIDAE																															
<i>Erichsonella attenuata</i>																															
Family HYSSURIDAE																															
<i>Xenanthura brevitelson</i>																															
Family MUNNIDAE																															
<i>Uromunna caribaea</i>																															
Family SPHAEROMATIDAE																															
<i>Dynamenella angulata</i>																															
<i>Exosphaeroma productatelson</i>																															
<i>Paracerceis caudata</i>																															
Order AMPHIPODA																															
Family AMPELISCIDAE																															
<i>Ampelisca burkei</i>																															
Family AMPHILOCHIDAE																															
Unidentified amphiloichid																															
Family AMPITHOIDAE																															
<i>Cymadusa compta</i>																															
Family AORIDAE																															
<i>Bemlos</i> sp.																															
Family COROPHIIDAE																															
<i>Cerapus</i> n. sp.																															
<i>Grandidierella bonnieroides</i>																															
Unidentified corophiid (frag.)																															
Order CUMACEA																															
<i>Cyclaspis varians</i>																															
<i>Oxyurostylis smithi</i>																															
Order DECAPODA																															
Infraorder CARIDEA																															
Family ALPHEIDAE																															
<i>Alpheus armillatus</i>																															
Unidentified alpheid																															
Family HIPPOLYTIDAE																															
<i>Periclimenes americanus</i>																															
Family PROCESSIDAE																															

TABLE 1. Grab Collection Stations: raw data, diversity (H') and evenness (J'): January 1997.

STATION	1			8			8a			9			10a			11			13a			14			17			18a			19a			TOT
REPLICATE	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3				
TAXON																																		
<i>Processa</i> sp.																																		
Unidentified caridean				2																												2		
Infraorder THALASSINIDEA																																		
Family UPOGEBIIDAE																																		
<i>Upogebia affinis</i>																																		
Infraorder ANOMURA																																		
Family PAGURIDAE																																		
<i>Pagurus mclaughlinae</i>										1	2																					3		
<i>Pagurus stimpsoni</i>										1	5		2																			8		
Unidentified paguridean																						2										2		
Infraorder BRACHYURA																																		
Family XANTHIDAE																																		
<i>Micropanope sculptipes</i>																																		
<i>Neopanope</i> sp.																													1			1		
Unidentified xanthid	2																					2										4		
Family PORTUNIDAE																																		
Unidentified portunid (juv.)																						1										1		
Unidentified decapod fragments																2		2														4		
Phylum ECHINODERMATA																																		
Class OPHIUROIDEA																																		
Family AMPHIURIDAE																																		
<i>Amphioplus sepultus</i>									2																							2		
<i>Amphiodia thrombodes</i>																													3			3		
Unidentified amphiurid																														4		4		
Unidentified ophiuroid			4							1	1								2	2			2		1			2	1		1	17		
Class HOLOTHUROIDEA																																		
Family SYNAPTIDAE																																		
<i>Leptosynapta tenuis</i>																							1	10			2		2	28		43		
Unidentified holothuroid (juv.)			14															2												1	1	18		
Phylum HEMICHORDATA																																		
Unidentified enteropneust?																				2												2		
UNKNOWN							4													2												6		
TOTAL	148	158	148	166	204	114	198	232	50	179	139	240	92	188	522	66	154	154	164	252	214	398	260	214	1560	746	615	254	180	201	336	324	301	9171
Total # species (by replicate)	17	20	28	23	23	19	25	26	11	47	23	36	20	25	34	22	26	26	23	27	22	34	28	38	18	22	16	47	24	41	44	43	37	190
H' (by replicate)	1.968	2.422	2.954	2.525	2.553	2.623	2.409	2.547	2.000	3.129	2.562	3.042	2.423	2.474	2.318	2.943	3.009	2.685	2.608	2.512	2.221	3.048	2.812	2.945	1.651	1.872	1.680	3.439	2.092	3.098	2.804	2.952	3.006	
J' (by replicate)	0.695	0.808	0.887	0.805	0.814	0.891	0.748	0.782	0.834	0.813	0.817	0.849	0.809	0.769	0.657	0.952	0.923	0.824	0.832	0.762	0.719	0.864	0.844	0.809	0.571	0.606	0.606	0.893	0.658	0.834	0.741	0.785	0.832	
Total # specimens (by station)		454			484			480			558			802			374			630			872			2921			635		961			
Total # species (by station)		44			37			43			59			43			42			44			56			27			68		72			
H' (by station)		3.006			2.861			2.725			3.294			2.495			3.226			2.706			3.300			1.788			3.319		3.216			
J' (by station)		0.794			0.792			0.725			0.808			0.663			0.863			0.715			0.820			0.543			0.786		0.752			

TABLE 2. Summary of major taxonomic groups in grab samples by number (upper) and percentage (lower). January 1997.

STATION	1	8	8a	9	10a	11	13a	14	17	18	19a	TOT
NEMERTINA	14	12	14	10	6	28	54	100	55	15	4	312
MOLLUSCA	20	24	12	10	19	60	166	48	546	189	52	1146
POLYCHAETA	272	260	268	282	577	172	322	404	108	263	419	3347
OLIGOCHAETA	98	172	156	67	25	78	36	216	278	75	214	1415
SIPUNCULA	0	0	2	2	0	0	10	0	209	2	52	99
OSTRACODA	0	0	4	52	11	6	0	26	167	9	141	416
PERACARIDA	10	6	10	124	159	24	28	30	1544	45	33	2013
OTHER	40	10	14	11	5	6	14	48	14	37	46	245
TOTALS	454	484	480	558	802	374	630	872	2921	635	961	9171

[illegible]

Table 3. Crab census data. \*Numbers in parentheses indicate numbers of trees inside 1.0 square meter sampling area. January 1997.

STATION	1a			2			3			4			5			6			7			10			12			13			15			16			TOT
REPLICATE	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3				
CRAB BURROWS	66	72	133	115	67	117	72	92	72	57	45	55	55	58	47	96	57	117	91	119	80	6	4	8	0	0	0	38	42	47	22	25	?	31	37	25	
CRAB CENSUS																																					
Family GRAPSIDAE																																					
Aratus pisonii																		1																		1	
Family OCYPODIDAE																																					
Uca pugilator																											1									1	
Uca rapax																																	1	2	1	4	
Uca thayeri										1			1					1				1										1			5		
Uca speciosa	1							1																												2	
Uca species (juvenile)			1						1						1								1													4	
Total #specimens	1	0	1	0	0	0	1	1	0	1	0	0	1	0	1	0	0	2	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	2	2	1	17
Total #species (by station)		2			0			2			1			2			2					2			0			1			0			2			
H' (by station)		0.693			0.000			0.693			0.000			0.693			0.693			0.000		0.693			0.000		0.000			0.000			0.500				
J' (by station)		1.000			0.000			1.000			0.000			1.000			1.000			0.000		1.000			0.000		0.000			0.000			0.722				
TREE CRAB CENSUS																																					
Family GRAPSIDAE																																					
Aratus pisonii *		0(2)			1(1)			0(1)			1(1)			1(1)			0(1)			0(2)		0(1)			0		0(0)			0(1)			2(1)				

Burrow data for station 15, replicate 3 lost.

TABLE 4. Hand collection stations: raw data, diversity (H') and evenness (J'). January 1997.

STATION	9			13			17			TOT
REPLICATE	1	2	3	1	2	3	1	2	3	
TAXON										
Phylum PORIFERA										
Unidentified encrusting sponge	2		1							3
Phylum ANNELIDA										
Class POLYCHAETA										
Family SERPULIDAE										
Unidentified serpulid	2	1								3
Family EUNICIDAE										
Unidentified eunicid			1							1
Phylum SIPUNCULA										
Family PHASCOLOSOMATIDAE										
<i>Phascolosoma</i> sp.	4		2							6
Phylum MOLLUSCA										
Class GASTROPODA										
Family POTAMIDIDAE										
<i>Batillaria minima</i>	1	35		68	62	42		1	3	212
Family VERMETIDAE										
? <i>Petalococonchus varians</i>	24	22	26							72
Class BIVALVIA										
Family MYTILIDAE										
<i>Brachidontes exustus</i>	2	3		6	5	1				17
Family ISOGNOMONIDAE										
<i>Isognomon alatus</i>	1									1
<i>Isognomon</i> sp. (juv.)	1	1								2
Family OSTREIDAE										
<i>Crassostrea virginica</i>	1				5					6
Phylum ARTHROPODA										
Subphylum CRUSTACEA										
Class CIRRIPIEDIA										
Family BALANIDAE										
<i>Balanus amphitrite</i> (juv.)		3	1		4					8
Family CHTHAMALIDAE										
<i>Chthamalus fragilis</i>		2	7							9
Class MALACOSTRACA										
Order AMPHIPODA										
Unidentified amphipod	2	1	1		2	4				10
Order DECAPODA										
Family XANTHIDAE										
Unidentified juvenile xanthid		1	1	1	2					5
Subphylum UNIRAMIA										
Class INSECTA										
Order COLLEMBOLA										
Family ANURIDIDAE										
<i>Anurida maritima</i>	15	14	5	31	11	15	7	3	10	111
Phylum CHORDATA										
Class ASCIDIACEA										
Unidentified colonial tunicate		1	9							10
Total # of specimens	55	84	54	106	91	62	7	4	13	476
Total # species (by replicate)	11	11	10	4	7	4	1	2	2	16
H' (by replicate)	1.680	1.605	1.627	0.851	1.141	0.851	0.000	0.562	0.540	
J' (by replicate)	0.701	0.669	0.707	0.614	0.586	0.614	0.000	0.811	0.779	
Total # specimens (by station)		193			259			24		
Total # species (by station)		16			7			2		
H' (by station)		1.952			1.027			0.451		
J' (by station)		0.704			0.528			0.650		

Table 5a. Summary of Major Taxa by Survey: Typical Intracoastal Waterway (ICWW) Stations (1, 8, 8a). 1991-1997.

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Table 5a. Summary of Major Taxa by Survey: Typical Intracoastal Waterway (ICWW) Stations (1, 8, 8a). 1991-1997.

STATION						1											8											8a								
SURVEY	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97
TAXON																																				
<i>Tectidrilus bori</i>			3	21	16	7	8	4		27	20				29	10	16	4	2		2	4	1				6	6	12	2	2		1	2	4	
<i>Tectidrilus gabriellae</i>			5	28	14	4		12				16			52	22	70			8				18			23	13				1				
<i>Tectidrilus squalidus</i>							27		3	13	18							52				32	15							6		4	7	14	16	
<i>Thalassodrilides gurwitschi</i>												4											2								1					
<i>Thalassodrilides</i> sp.																20																				
<i>Tubificoides bermudae</i>			4	1	2	2	10	2		2					2												2			2		2				
<i>Tubificoides motei</i>	20		24	72	126	39	61	26	15	92	122	42	4	4	97	55	222	40	66	6	10	36	98	36	4	2	46	68	256	34	42	2	27	25	98	52
Unident. tubificid	22			21	6	1	7	4	3	4	26	4	6	10		4		2	6	4	8	6	6	38	8		4	8	10	2	2	3	2	6	22	
OSTRACODA																																				
<i>Peratocytheridea setipunctata</i>																						4														
PERACARIDA																																				
<i>Oxyurostylis</i> sp.										1	2	2										4		4												
<i>Kalliapseudes aliciae</i>															1	10							2				1									
<i>Leptochelia rapax</i>				1		6										4		2											2							
<i>Xenanthura brevitelson</i>						2		2											2				2					4	2		2	7				
<i>Cerapus</i> n. sp.	2				2											8	2								8				18						2	
<i>Grandidierella bonnieroides</i>	6			12	8	30	1			1	12	6		12	2	12	4	10					7	2	4	4		8	2	10				1	4	10

TABLE 5b. Summary of major taxa by survey: Typical Intracoastal Waterway (ICWW) stations (13a, 14, 18). 1991-1997.

STATION SURVEY	8/91	1/92	8/92	1/93	8/93	1/94	13a 8/94	1/95	8/95	1/96	8/96	1/97	8/91	1/92	8/92	1/93	8/93	1/94	14 8/94	1/95	8/95	1/96	8/96	1/97	8/91	1/92	8/92	1/93	18 8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	
TAXON																																					
NEMERTINA																																					
Carinomella lactea			7		1		2	6	3	8	4				2	1	3	9	4	2			7	2			7	3	4	4	11	2	6	16	4	5	
Hubrechtella dubia			13												3											2	25										
Tubulanus pellucidus				1		1	2		3		2	40			6	2	2	6			2	1	47	12			2	9	2	15	6	8	4	6	16	7	
Unident. micrurid								3															78												2		
GASTROPODA																																					
Caecum pulchellum	7	3	25	27	22	102	14	143	32	260	115	154	13	6	9	24	24	67	30	12	1	43	92	18	42	9	14	92	32	170	75	272	7	30	20	165	
POLYCHAETA																																					
Leitoscoloplos fragilis																27	2	1																			
Leitoscoloplos robustus																139								4													
Scoloplos rubra				2												1	1	1										114	5	13	12	4	2		2	16	
Aricidea cf. catherinae		5	129		12		96												78																		
Aricidea philinae	76	26	5	127		12	4	112	89	62	49	12	60	52	2	204	31	100	24	14	165	380	3	48	12	19	1	25	2	2	4	22	31	2		3	
Aricidea taylori		2		58	21	17	28	46	16	42	80				12	16	67	22	134	14	30	104	45	60		7	5	70	15	16	9	24	37	16	10	26	
Prionospio cristata		7		10		9				7				1		14		4				3	4			2	5	1		2		4	1		4		
Prionospio heterobranchia	2	1	6	1	6	1	28		9		26		11	5	3	2	20	7	84		13	3	4	2	6	1	22	3	26	5	6		6		4		
Pseudopolydora spp.	49	1	1	6	18	27				40	28		23	2	3	4	70	32	28			24	2	18		2	6		31	6	4	2		2		3	
Caulleriella killariensis				43												60									2			7									
Caulleriella sp. A		1				2	2	14			6	2		14		1	11	51	16	7		37	15	118		13	6		8		8			4			
Cirriformia sp. A										8	2	14					1	12	2			7	139						10		18			24	2	7	
Monticellina dorsobranchialis			1							2				2	3	6			2	1				2			48			20		2	1	4	8		
Tharyx marioni				7												6										2	17	8									
Capitella capitata	1	1		1	3	5		4	34	5	45				5	48	6	2			46	120	1	20		3	1	1	2	6			3	2			
Mediomastus californiensis			33		24	8		32		33	5	50			8		7	16		3		7	8	8		1	28		23	41		30		8	12	28	
Mediomastus sp.	2	2		23	9								6	7		13	2		18						2	6		36	7		41						
Unident. capitellid																57																					
Ehlersia cornuta	3	3	1	4		17	4			15	1		1	2		5		17	2				14				4		1	2	2			8		6	
Exogone dispar	7			20		4				34	16	4				15		16	2			17	33	4			2		1	8		6	1		10	1	
Sphaerosyllis labyrinthophila											3																									4	
Sphaerosyllis longicauda				9												19							1	4	4				34								
Sphaerosyllis riseri				22		2				8	1			1		13	1	2				7	7			4	1		17	11		3	2	2		2	6
Sphaerosyllis taylori				13		2								1		16	5						2				1		6		2		2		6	3	
Sphaerosyllis sp.		2	67												8		1										1	21		2							
Streptosyllis pettiboneae	1	2							1	1	8	2	4	5	1	33	13	2		1		19	9	36		3	12	4	2					2	3		
Glycera abranchiata	5	6	1	27	2	102		15	2	52	6	18	7	10	1	13		102	6	21	1	67	8	18		15	2		4	24	2	22	2	8		20	
Glycera sp.		24		5											5	2											1										
Nematoneis hebes	2			3		2						126				1							80						22	10	32	6	10		60	6	4
Lumbrineris testudinum			6													13													96								
Lumbrineris verrilli			1	13	3		2	6	3	36	5	4	2	9		19	8	9	14	2		12	39	14	10	21	6		58	15	18	14	12	6	24	40	
Bispira melanostigma						2		4				8						4					80						12		6						
Fabricinuda trilobata				2	2					1		2		1		89	1	22				15	5	28		9	18	2	14	5			2	4	18		
OLIGOCHAETA																																					
Limnodriloides barnardi	3	2	20	3	1		2		1	3	9				1	2	2	3	8		1	8	10	14		1	3	5	7						29		
Limnodriloides rubicundus			3	20	4	4		2	27	24	32			2	11	3	33	10	2	3	17	15	26	76				44	8	10			13	18	2	2	
Smithsonidrilus hummelincki			145	135	10	44	46	61	34	97	18	32			67	83	9	66	52	28	10	28	24	64				79	28	49	3	12	11	2	4	3	



TABLE 5b. Summary of major taxa by survey: Typical Intracoastal Waterway (ICWW) stations (13a, 14, 18). 1991-1997.

STATION	13a												14												18											
SURVEY	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97
TAXON																																				
<i>Tectidrilus bori</i>															1	2							2					26	5		13		2	1	2	
<i>Tectidrilus gabriellae</i>															18	5	1							6			75	26	3	8		10				14
<i>Tectidrilus squalidus</i>																			2				15									2	6			
<i>Thalassodrilides gurwitschi</i>		3		53			2		25		26			3	2	25	3				10		4	22		6							2	4		
<i>Thalassodrilides</i> sp.																																				
<i>Tubificoides bermudae</i>		1	2	1										1	8		2					32					15	1		6			3			
<i>Tubificoides motei</i>			4			1	4	3	2			4	1		39	19	11	16	4	3	1	1	30	18	8	4	157	89	32	79		36	18	22	28	11
Unident. tubificid	8	9	2	48		4	6		19	1	21		2	9	1	7		3	44		3		22	12	6	11	2	12	3	6	1	2	4	4		14
OSTRACODA																																				
<i>Peratocytheridea setipunctata</i>				24					19	16	1					13	70	114		3	9	49	10	24				19	1				1	116		5
Unident. podocopan													44												10	11										
PERACARIDA																																				
<i>Oxyurostylis</i> sp.		5		8		6				6				8	71	22		6		1		6	1	10		13		6		4						
<i>Kalliapseudes aliciae</i>																3							1													
<i>Leptochelia rapax</i>	71	2	1	1	2				3	13		6	76	7		3		18				25	6	4		4		3		13		4		6		4
<i>Xenanthura brevitelson</i>															1		1			1	1	2	4	10		12		43	5			2	1			
<i>Cerapus</i> n. sp.	6	69		6		13				13	1		3	62	2	18	17	5			1	2	3	2		4		8	5						2	
<i>Grandidierella bonnieroides</i>	1	21		19	3			8		21		4		44		34	2	23	2	1		81	2	4	4	50		28	3	18	20	8	1	12		22

**Table 5c. Summary of Major Taxa by Survey: atypical ICWW stations (9, 10a, 11). 1991-1997.**

STATION SURVEY														9										10a										11									
	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97							
MAJOR TAXON																																											
NEMERTINA																																											
<i>Tubulanus pellucidus</i>										6		2			16							4		2		6		1					1	2	1	20	8						
GASTROPODA																																											
<i>Caecum pulchellum</i>				1	1	1		1		2		1			5	2					1				12		14	4	76	111	22		10	7	70	56							
POLYCHAETA																																											
<i>Leitoscoloplos fragilis</i>	6	16		41	5	2	2		4			8	65	1																													
<i>Leitoscoloplos robustus</i>			43	97				39	12	6	14	20			85					2	55	6	69	4																			
<i>Leitoscoloplos</i> sp.				3	11			29	32		39	66	4				2			71		9	1																				
<i>Aricidea</i> cf. <i>catherinae</i>			*												16											26	3																
<i>Aricidea philbiniae</i>	42	72	120	53	40	63	19	107	142	38	103	53	98	253	398	184	84	48	61	23	125	28	235	295	52			11	10		4		14	3	12								
<i>Aricidea taylora</i>	3		1		8	1		2	2	2	3	2			5		4	20	16	1	4	10	25	24				2	1	1		2		4		6							
<i>Paraonis fulgens</i>					6	8	123	46	89	5	1																																
<i>Prionospio cristata</i>		2		1		2		1		3		4										2		1		26	3	19		8	8	13	2	3	2								
<i>Prionospio heterobranchia</i>	20	3	5	5	5	1	1	1	5		15	7		5		2			22				5	4		2	10	13				4			2								
<i>Pseudopolydora</i> spp.	26	6	18	8		12		3	5	5	26	2	3	2	3	8		10			1	4	8	3	4		1			5					28								
<i>Caulerella</i> sp. A		10				1					20	8		1												1				24	6	12	1	14	2	8							
<i>Monticellina dorsobranchialis</i>			1																							2	35	9	6	5	26	27	18	3	4								
<i>Tharyx marioni</i>																												40															
<i>Tharyx</i> sp.																											19	58		1													
<i>Capitella capitata</i>	21	2	295	189	10			24	453	12	313	8	4	138	340	255	6	60	38	54	557	78	593	64				3		3	18	1	2			14							
<i>Mediomastus californiensis</i>			1								5	3								2			4				50		73	21	10	24	18	24	46	8							
<i>Mediomastus</i> sp.	3														1										28	16		53	6														
<i>Ehlersia cornuta</i>				1	2																1		4		16		10	2		6				2	4								
<i>Exogone dispar</i>				8					5	6	2	5		1		69		8		4	3		4	34			2		1	2			1		6								
<i>Sphaerosyllis labyrinthophila</i>								2	1		2									2	53	2	347	28																			
<i>Sphaerosyllis longicauda</i>														16		32												1	1														
<i>Sphaerosyllis riseri</i>				1			1					1			1	2	16					4					1	3	1					2									
<i>Sphaerosyllis taylora</i>										3	1	19		6		143	4	2				6	9	42				1	2														
<i>Sphaerosyllis</i> sp.			3										3	6	157													5															
<i>Streptosyllis pettiboneae</i>		5	8	1		1		2	12			4		26	3	27		10				2		1						1		1											
<i>Laeonereis culveri</i>		1											3	210										1																			
<i>Glycera abranchiata</i>	3	57	1	9		48		32	1	81	4	14	2	8		10	2	20		2	1	28	1	12	10	2				32	2			13	20								
<i>Glycera</i> sp.														30															5														
<i>Nematonereis hebes</i>						1									1										2		11	5	4	15	8		26	22									
<i>Lumbrineris testudinum</i>			13												1												7																
<i>Lumbrineris verrilli</i>	7	2		29	7			1	1	30	36	24								2		4	4	52		2	1	4	19	5	4	1		4	18	28							
<i>Opfryotrocha</i> sp. A			66	6	17						2			2		3							13																				
<i>Bispira melanostigma</i>																												3															
<i>Branchiomma nigromaculata</i>	4																								42																		
OLIGOCHAETA																																											
<i>Limnodriloides rubicundus</i>	12		9	4								24		6	21	12	46	20		1	11	24	8	5			3	11			4	4		4	2								
<i>Smithsonidrilus hummelincki</i>	77		3	3	2					1		23			2			18							72	72	70	11	18	17		19	4		14	26							
<i>Tectidrilus bori</i>																											8	11	1		4			2									
<i>Thalassodrilides gurvitschi</i>		2	40	9	7				3	4	6	10		10		83	12		26		60	58	30	19		2	2								30								
<i>Thalassodrilides</i> sp.																	92		40																								

Table 5c. Summary of Major Taxa by Survey: atypical ICWW stations (9, 10a, 11). 1991-1997.

STATION	9												10a												11												
SURVEY	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	
MAJOR TAXON																																					
<i>Tubificoides bermudae</i>			3																								17				1						
<i>Tubificoides motel</i>				3								2		1		1		2									76	14	50	9		1	2	2	8	6	
OSTRACODA																																					
<i>Cyprideis americana</i>		a		3				6	5		1				78	124	134	156	145	5	108		275														
<i>Peratocytheridea setipunctata</i>			2	61		9		199	115	16	48	51			87	104	28	56	4	3	171	2	675	11												4	
Unidentified podocopan	31	157		2									218	79							3		42														
PERACARIDA																																					
<i>Oxyurostylis</i> sp.		54		29		28		6		51	1	31		17		16		16				2		12											6		
<i>Leptochelia rapax</i>		6		7		2		2		6		1	21	52	1	35		88	53	5	5	20		9			2						1		14		
<i>Cerapus</i> n. sp.	14	1		44		6		66		29		14		104	2	288		402		61	1	140	1	85													
<i>Grandidierella bonnieroides</i>		36		27		14		6		6		10	2	79		68		132		29	2	6	8	21		2			1	2				2		4	

Table 5d. Summary of Major Taxa by Survey: Non-Intracoastal Waterway Stations (17, 19). 1991-1997.

STATION	17												19a											
SURVEY	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97
MAJOR TAXON																								
NEMERTINA																								
<i>Tubulanus pellucidus</i>	2		2	17				5	2	3	50	55				85			1	1	2	1	3	
GASTROPODA																								
<i>Batillaria minima</i>					124	174	230	78	74	92	558	124		2		2	19		6	113	4	15	33	
<i>Caecum pulchellum</i>	190		153	572	594	701	473	57	46	624	779	391					1		1		4			
<i>Caecum imbricatum</i>	210		170	829	540	1113	448	45	8	33	56	15												
<i>Caecum textile</i>										5	104	16												
POLYCHAETA																								
<i>Aricidea philbinae</i>													6	3		27	10	19	2	35	34	123	23	85
<i>Prionospio heterobranchia</i>				1			2		2						3	6		1		5	16	5	14	34
<i>Monticellina dorsobranchialis</i>															21		38	21	2	61	26	27	11	82
<i>Capitella capitata</i>									2	2	1		2	10	194	3		1		10	78	136	61	25
<i>Ehlersia cornuta</i>	328	18	212	89	415	208	203	46	822	60	312	55			3	3	3		5	6	6	8		
<i>Exogone dispar</i>	14		1				3		10		163	1						5	3	2	1		32	31
<i>Sphaerosyllis labyrinthophila</i>																			1			19	3	
<i>Nematonereis hebes</i>	88	28	39	7	256	331	183	138	22	45	109	44												
<i>Bispira melanostigma</i>					2	3						1												
<i>Fabricinuda trilobata</i>				3	1										7	192					169	142	79	
OLIGOCHAETA																								
<i>Limnodriloides barnardi</i>													2	3		3	3	23	1	12		3		10
<i>Limnodriloides rubicundus</i>			1										2			1	2	4	20	3	13	10	4	15
<i>Pectinodrilus molestus</i>			58	44	57	125	124		160	414	513	278												
<i>Thalassodrilides gurwitschi</i>															12	1		17		35	71	27	132	
<i>Thalassodrilides</i> sp.																	18		30					
SIPUNCULA																								
<i>Aspidosiphon cf. albus</i>	68	328	172	115											1									
<i>Aspidosiphon muelleri</i>					803	875	351	168	112	369	276	162								2	2	1		
<i>Phascolion cryptum</i>								2				47								22	37	8	53	52
OSTRACODA																								
<i>Harbansus paucichelatus</i>		78																						
<i>Rutiderma darbyi</i>	46		7	587	502	519	245	65		126	429	167										24		
<i>Cyprideis americana</i>															34		8	1				11	22	
<i>Peratocytheridea setipunctata</i>							2		262	1	6				4	200	66	34		10	14		199	104
Unidentified podocopan	6												12	29							1			
PERACARIDA																								
<i>Kalliapseudes aliciae</i>	544	578	2161	1138	1182	2089	933	691	364	616	2497	1482		2		6		2	5		25	12		
<i>Leptochelia rapax</i>			281	4	1		31	1	28	13	7	3									79			
<i>Exosphaeroma diminutum</i>						112	282	40	8	72	434											10		
<i>Exosphaeroma productitelson</i>	720		218	44	356							39												
<i>Cerapus</i> n. sp.		2	122	27	18	94	14	20	2	174	3	4				1		1			33		3	
<i>Grandidierella bonnieroides</i>		10				49	2	21	2	3		10	6	23	10	23	3	16		24	1	29	2	6

TABLE 6a. Summary of Major Taxonomic Groups by Abundance in Grab Collections, August 1991-January 1997.

STATION		1												8												8a													
SURVEY	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97			
NEMERTINA	24	0	7	64	22	12	20	10	18	17	42	14	10	12	21	72	20	20	12	8	8	8	42	12	10	6	10	71	34	28	12	8	13	10	34	14			
MOLLUSCA	62	2	1	66	8	78	40	50	45	19	32	20	14	4	8	111	26	32	28	34	20	22	38	24	12	0	3	31	38	70	52	19	2	16	44	12			
POLYCHAETA	242	74	140	574	452	222	117	82	88	258	266	272	98	258	226	752	368	376	142	102	126	246	252	260	120	86	242	246	640	372	136	90	90	102	212	268			
OLIGOCHAETA	74	6	45	200	268	159	150	70	44	181	264	98	16	22	189	134	402	110	168	36	32	100	142	172	12	2	119	125	466	66	64	26	57	44	166	156			
SIPUNCULA	0	0	0	0	0	3	1	0	1	0	4	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	2	2			
OSTRACODA	2	0	0	1	0	7	0	0	0	1	0	0	0	0	0	4	6	6	0	0	0	4	8	0	0	0	0	7	4	16	0	0	0	0	4				
PERACARIDA	10	0	0	22	18	40	5	4	0	4	14	10	0	14	3	40	12	20	0	2	0	4	12	6	12	4	9	18	38	22	2	7	0	2	10	10			
OTHERS	8	4	8	24	12	23	6	4	6	9	38	40	12	8	5	14	4	10	6	4	6	0	14	10	12	8	3	8	14	26	14	1	12	8	20	14			
TOTAL	422	86	201	951	780	544	339	220	202	489	660	454	150	320	452	1128	838	574	356	186	194	384	488	484	178	106	386	506	1236	600	280	152	174	182	488	480			

STATION		13a												14												18															
SURVEY	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97					
NEMERTINA	0	3	30	11	5	7	16	15	6	18	19	54	2	5	5	9	7	38	26	6	2	9	62	100	6	10	48	17	14	37	22	14	10	32	22	15					
MOLLUSCA	8	6	31	42	24	113	16	152	51	282	139	166	15	9	14	42	37	86	42	21	13	80	115	48	56	12	22	99	34	174	91	284	12	36	30	189					
POLYCHAETA	156	101	292	412	117	231	180	256	158	377	292	322	115	127	68	860	306	452	479	66	256	936	609	404	44	119	474	282	400	262	138	200	99	154	136	263					
OLIGOCHAETA	11	21	180	260	15	55	56	67	108	144	108	36	3	21	162	136	61	108	112	34	43	86	133	216	20	34	283	261	83	177	5	64	53	38	75						
SIPUNCULA	0	0	0	0	0	0	0	0	1	0	9	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	1	0	0	2					
OSTRACODA	0	0	2	24	0	0	0	0	20	26	20	0	0	45	2	15	72	115	0	4	9	57	15	26	10	14	2	25	10	10	2	0	1	124	0	9					
PERACARIDA	10	97	10	39	5	23	0	8	3	79	1	28	10	122	13	90	22	82	10	3	2	157	18	30	4	86	3	90	31	42	24	18	1	22	2	45					
OTHERS	1	6	18	3	0	8	2	7	3	28	2	14	4	8	14	19	5	11	10	5	6	37	38	48	4	2	7	9	20	20	8	14	2	22	20	37					
TOTAL	186	234	563	791	166	437	270	505	350	954	590	630	149	337	278	1171	510	892	679	139	331	1362	990	872	144	277	839	783	594	722	290	596	179	446	248	635					

STATION		9												10a												11															
SURVEY	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97					
NEMERTINA	7	1	11	2	1	3	0	1	1	7	0	10	0	3	0	21	0	8	0	2	0	8	0	6	14	6	12	7	9	8	2	2	8	1	28	28					
MOLLUSCA	9	33	17	22	2	4	1	8	14	24	31	10	8	22	16	22	0	12	6	4	1	12	66	19	16	2	18	5	77	116	24	1	12	8	88	60					
POLYCHAETA	144	202	598	472	117	148	147	297	768	201	632	282	182	760	912	832	118	212	129	121	880	180	1326	577	174	84	221	277	235	172	140	82	102	95	166	172					
OLIGOCHAETA	34	7	59	32	10	0	0	0	3	7	6	67	0	21	30	101	70	152	31	45	75	82	45	25	8	18	221	59	77	34	4	28	10	4	36	78					
SIPUNCULA	0	1	0	0	0	0	0	0	0	0	0	2	0	6	0	21	0	0	0	0	2	0	9	0	0	0	1	1	0	1	0	0	2	0	0	0					
OSTRACODA	31	158	2	66	0	12	1	205	120	22	52	52	218	79	166	233	162	214	149	9	282	2	1024	11	0	0	0	4	2	0	0	0	0	0	0	10	6				
PERACARIDA	16	101	2	120	0	81	0	91	0	143	8	124	3	257	3	485	2	660	53	101	9	182	25	159	2	2	1	3	2	3	2	0	4	0	24						
OTHERS	3	0	9	3	0	1	0	1	4	7	6	11	5	6	3	3	0	6	0	3	1	0	36	5	8	10	12	5	7	5	10	1	12	11	34	6					
TOTAL	244	503	698	717	130	249	149	603	910	411	735	558	416	1154	1130	1718	352	1264	368	284	1250	466	2531	802	222	122	486	361	409	339	182	114	146	123	364	374					

STATION		17												19a												TOT															
SURVEY	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97					
NEMERTINA	2	16	5	28	0	11	3	5	8	20	111	55	0	11	1	100	0	4	0	1	2	12	2	4	75	73	150	402	112	176	113	72	76	142	362	312					
MOLLUSCA	404	0	326	831	1258	1990	1072	180	148	761	1507	546	0	10	1	13	22	4	22	11	122	13	24	52	604	100	465	1284	1526	2679	1394	764	440	1273	2114	1146					
POLYCHAETA	454	46	278	106	686	559	418	191	864	127	621	108	12	18	234	282	56	74	16	150	192	577	371	419	1741	1875	3685	5095	3495	3080	2042	1637	3623	3253	4883	3347					
OLIGOCHAETA	12	16	61	44	58	128	126	0	160	414	516	278	8	7	19	25	8	71	54	48	74	87	62	214	198	175	1431	1377	1518	1060	770	418	659	1205	1516	1415					
SIPUNCULA	328	68	176	115	803	875	351	168	114	369	277	209	8	5	4	15	34	7	19	22	41	10	54	52	336	82	181	153	841	886	371	193	162	379	357	99					
OSTRACODA	52	78	7	587	503	519	248	65	262	128	449	167	12	29	4	253	66	42	1	12	15	1	240	141	325	403	185	1219	825	941	401	295	709	365	1818	416					
PERACARIDA	570	594	2790	1222	1568	2353	1299	773	408	916	2943	1544	8	32	20	69	4	24	2	44	21	233	32	33	645	1309	2854	2198	1702	3350	1397	1051	444	1746	3065	2013					
OTHERS	0	0	7	24	0	7	2	1	6	25	8	14	0	0	2	23	2	5	2	4	4	3	4	46	57	52	88	135	64	122	60	45	64	150	220	245					
TOTAL	1822	818	3650	2957	4876	6442	3519																																		



TABLE 6b. Summary of Major Taxonomic Groups by Percentage Abundance in Grab Collections, August 1991-January 1997.

STATION	1												8												8a											
SURVEY	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97
NEMERTINA	5.7	0.0	3.5	6.7	2.8	2.2	5.9	4.5	8.9	3.5	6.4	3.1	6.7	3.8	4.6	6.4	2.4	3.5	3.4	4.3	4.1	2.1	8.3	2.5	5.6	5.7	2.6	14.0	2.8	4.7	4.3	5.3	7.5	5.5	7.0	2.9
MOLLUSCA	14.7	2.3	0.5	6.9	1.0	14.3	11.8	22.7	22.3	3.9	4.8	4.4	9.3	1.3	1.8	9.8	3.1	5.6	7.9	18.3	10.3	5.7	7.5	5	6.7	0.0	0.8	6.1	3.1	11.7	18.6	12.5	1.1	8.8	9.0	2.5
POLYCHAETA	57.3	86.0	69.7	60.4	57.9	40.8	34.5	37.3	43.6	52.8	40.3	59.9	65.3	80.6	50.0	66.7	43.9	65.5	39.9	54.8	64.9	64.1	49.6	53.7	67.4	81.1	62.7	48.6	51.8	62.0	48.6	59.2	51.7	56.0	43.4	55.8
OLIGOCHAETA	17.5	7.0	22.4	21.0	34.4	29.2	44.2	31.8	21.8	37.0	40.0	21.6	10.7	6.9	41.8	11.9	48.0	19.2	47.2	19.4	16.5	26.0	28.0	35.5	6.7	1.9	30.8	24.7	37.7	11.0	22.9	17.1	32.8	24.2	34.0	32.5
SIPUNCULA	0.0	0.0	0.0	0.0	0.0	0.6	0.3	0.0	0.5	0.0	0.6	0.0	0.0	0.6	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.7	0.0	0.4	0.4	
OSTRACODA	0.5	0.0	0.0	0.1	0.0	1.3	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.4	0.7	1.0	0.0	0.0	0.0	1.0	1.6	0.0	0.0	0.0	0.0	1.4	0.3	2.7	0.0	0.0	0.0	0.0	0.8	
PERACARIDA	2.4	0.0	0.0	2.3	2.3	7.4	1.5	1.8	0.0	0.8	2.1	2.2	0.0	4.4	0.7	3.5	1.4	3.5	0.0	1.1	0.0	1.0	2.4	1.2	6.7	3.8	2.3	3.6	3.1	3.7	0.7	4.6	0.0	1.1	2.0	2.1
OTHERS	1.9	4.7	4.0	2.5	1.5	4.2	1.8	1.8	3.0	1.8	5.8	8.8	8.0	2.5	1.1	1.2	0.5	1.7	1.7	2.2	4.1	0.0	2.8	2.1	6.7	7.5	0.8	1.6	1.1	4.3	5.0	0.7	6.9	4.4	4.1	2.9

STATION	13a												14												18											
SURVEY	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97
NEMERTINA	0.0	1.3	5.3	1.4	3.0	1.6	5.9	3.0	1.7	1.9	3.2	8.6	1.3	1.5	1.8	0.8	1.4	4.3	3.8	4.3	0.6	0.7	6.3	11.5	4.2	3.6	5.7	2.2	2.4	5.1	7.6	2.3	5.6	7.2	8.9	2.4
MOLLUSCA	4.3	2.6	5.5	5.3	14.5	25.9	5.9	30.1	14.6	29.6	23.6	26.3	10.1	2.7	5.0	3.6	7.3	9.6	6.2	15.1	3.9	5.9	11.6	5.5	38.9	4.3	2.6	12.6	5.7	24.1	31.4	47.7	6.7	8.1	12.1	29.8
POLYCHAETA	83.9	43.2	51.9	52.1	70.5	52.9	66.7	50.7	45.1	39.5	49.5	51.1	77.2	37.7	24.5	73.4	60.0	50.7	70.5	47.5	77.3	68.7	61.5	46.3	30.6	43.0	56.5	36.0	67.3	36.3	47.6	33.6	55.3	34.5	54.8	41.4
OLIGOCHAETA	5.9	9.0	32.0	32.9	9.0	12.6	20.7	13.3	30.9	15.1	18.3	5.7	2.0	6.2	58.3	11.6	12.0	12.1	16.5	24.5	13.0	6.3	13.4	24.8	13.9	12.3	33.7	33.3	14.0	24.5	1.7	10.7	29.6	12.6	15.3	11.8
SIPUNCULA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	1.5	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.3	0.6	0.0	0.3	
OSTRACODA	0.0	0.0	0.4	3.0	0.0	0.0	0.0	0.0	5.7	2.7	3.4	0	0.0	13.4	0.7	1.3	14.1	12.9	0.0	2.9	2.7	4.2	1.5	3	6.9	5.1	0.2	3.2	1.7	1.4	0.7	0.0	0.6	27.8	0.0	1.4
PERACARIDA	5.4	41.5	1.8	4.9	3.0	5.3	0.0	1.6	0.9	8.3	0.2	4.4	6.7	36.2	4.7	7.7	4.3	9.2	1.5	2.2	0.6	11.5	1.8	3.4	2.8	31.0	0.4	11.5	5.2	5.8	8.3	3.0	0.6	4.9	0.8	7.1
OTHERS	0.5	2.6	3.2	0.4	0.0	1.8	0.7	1.4	0.9	2.9	0.3	2.2	2.7	2.4	5.0	1.6	1.0	1.2	1.5	3.6	1.8	2.7	3.8	5.5	2.8	0.7	0.8	1.1	3.4	2.8	2.8	2.3	1.1	4.9	8.1	5.8

STATION	9												10a												11											
SURVEY	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97
NEMERTINA	2.9	0.2	1.6	0.3	0.8	1.2	0.0	0.2	0.1	1.7	0.0	1.8	0.0	0.3	0.0	1.2	0.0	0.6	0.0	0.7	0.0	1.7	0.0	0.7	6.3	4.9	2.5	1.9	2.2	2.4	1.1	1.8	5.5	0.8	7.7	7.5
MOLLUSCA	3.7	6.6	2.4	3.1	1.5	1.6	0.7	1.3	1.5	5.8	4.2	1.8	1.9	1.9	1.4	1.3	0.0	0.9	1.6	1.4	0.1	2.6	2.6	2.4	7.2	1.6	3.7	1.4	18.8	34.2	13.2	0.9	8.2	6.5	24.2	16.0
POLYCHAETA	59.0	40.2	85.7	65.8	90.0	59.4	98.7	49.3	84.4	48.9	86.0	50.5	43.8	65.9	80.7	48.4	33.5	16.8	35.1	42.5	70.4	38.6	52.4	71.9	78.4	68.9	45.5	76.7	57.5	50.7	76.9	71.9	69.9	77.2	45.6	46.0
OLIGOCHAETA	13.9	1.4	8.5	4.5	7.7	0.0	0.0	0.0	0.3	1.7	0.8	12.0	0.0	1.8	2.7	5.9	19.9	12.0	8.4	16.0	6.0	17.6	1.8	3.1	3.6	14.8	45.5	16.3	18.8	10.0	2.2	24.6	6.8	3.3	9.9	20.9
SIPUNCULA	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.5	0.0	1.2	0.0	0.0	0.0	0.0	0.2	0.0	0.4	0.0	0.0	0.0	0.2	0.3	0.0	0.3	0.0	1.4	0.0	0.5	0.0	
OSTRACODA	12.7	31.4	0.3	9.2	0.0	4.8	0.7	34.0	13.2	5.4	7.1	9.3	52.4	6.8	14.7	13.6	46.0	16.9	40.5	3.1	22.6	0.4	40.5	1.4	0.0	0.0	0.0	0.0	1.1	0.5	0.0	0.0	0.0	0.0	2.7	1.6
PERACARIDA	6.6	20.1	0.3	16.7	0.0	32.5	0.0	15.1	0.0	34.8	1.1	22.2	0.7	22.3	0.3	28.2	0.6	52.2	14.4	35.4	0.7	39.1	1.0	19.8	0.9	1.6	0.2	0.8	0.5	0.9	1.1	0.0	0.0	3.3	0.0	6.4
OTHERS	1.2	0.0	1.3	0.4	0.0	0.4	0.0	0.2	0.4	1.7	0.8	2	1.2	0.5	0.3	0.2	0.0	0.5	0.0	0.9	0.1	0.0	1.4	0.6	3.6	8.2	2.5	1.4	1.7	1.5	5.5	0.9	8.2	8.9	9.3	1.6

STATION	17												19a												TOT											
SURVEY	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97
NEMERTINA	0.1	2.0	0.1	0.9	0.0	0.2	0.1	0.4	0.4	0.7	1.7	1.9	0.0	9.8	0.4	12.8	0.0	1.7	0.0	0.3	0.4	1.3	0.3	0.4	1.9	1.8	1.7	3.4	1.1	1.4	1.7	1.6	1.2	1.7	2.5	3.4
MOLLUSCA	22.2	0.0	8.9	28.1	25.8	30.9	30.5	13.0	7.5	27.6	23.4	18.7	0.0	8.9	0.4	1.7	11.5	1.7	19.0	3.8	25.9	1.4	3.0	5.4	15.2	2.5	5.1	10.8	15.1	21.8	21.3	17.1	7.1	15.0	14.7	12.5
POLYCHAETA	24.9	5.6	7.6	3.6	14.1	8.7	11.9	13.8	43.9	4.6	9.7	3.7	25.0	16.1	82.1	36.2	29.2	32.0	13.8	51.4	40.8	61.6	47.0	43.6	43.7	46.1	40.8	42.9	34.7	25.1	31.2	36.6	58.7	38.2	34.1	36.5
OLIGOCHAETA	0.7	2.0	1.7	1.5	1.2	2.0	3.6	0.0	8.1	15.0	8.0	9.5	16.7	6.3	6.7	3.2	4.2	30.7	46.6	16.4	15.7	9.3	7.9	22.3	5.0	4.3	15.8	11.6	15.1	8.6	11.8	9.3	10.7	14.2	10.6	15.4
SIPUNCULA	18.0	8.3	4.8	3.9	16.5	13.6	10.0	12.1	5.8	13.4	4.3	7.2	16.7	4.5	1.4	1.9	17.7	3.0	16.4	7.5	8.7	1.1	6.8	5.4	8.4	2.0	2.0	1.3	8.3	7.2	5.7	4.3	2.6	4.5	2.5	1.1
OSTRACODA	2.9	9.5	0.2	19.9	10.3	8.1	7.0	4.7	13.3	4.6	7.0	5.7	25.0	25.9	1.4	32.4	34.4	18.2	0.9	4.1	3.2	0.1	30.4	14.7	8.2	9.9	2.0	10.3	8.2	7.7	6.1	6.6	11.5	4.3	12.7	4.5
PERACARIDA	31.3	72.6	76.4	41.3	32.2	36.5	36.9	55.9	20.7	33.2	45.8	52.9	16.7	28.6	7.0	8.8	2.1	10.4	1.7																	

TABLE 7. Summary of organism abundance, richness, diversity and evenness for all ponar surveys.

		SURVEY											
Station		Aug 91	Jan 92	Aug 92	Jan 93	Aug 93	Jan 94	Aug 94	Jan 95	Aug 95	Jan 96	Aug 96	Jan 97
1	Total # organisms	422	86	201	951	780	544	339	220	202	489	660	454
	Species Richness	51	10	38	66	58	56	34	28	27	47	43	44
	Diversity Index	3.162	1.365	2.667	3.105	3.193	3.102	2.868	2.623	2.578	2.95	3.047	3.006
	Evenness	0.804	0.593	0.733	0.741	0.786	0.761	0.813	0.787	0.782	0.766	0.810	0.794
8	Total # organisms	150	320	452	1128	838	574	356	186	194	384	508	484
	Species Richness	21	28	52	64	36	36	28	20	17	34	54	37
	Diversity Index	2.306	2.057	2.974	3.202	2.671	2.433	2.473	2.271	2.283	2.954	2.959	2.861
	Evenness	0.757	0.617	0.753	0.77	0.745	0.679	0.742	0.758	0.806	0.838	0.742	0.792
8a	Total # organisms	178	106	386	506	1236	600	280	152	174	182	488	480
	Species Richness	28	23	38	43	50	53	29	24	27	35	46	43
	Diversity Index	2.808	2.8	2.304	2.839	2.994	2.874	2.469	2.309	2.681	2.849	3.003	2.725
	Evenness	0.843	0.893	0.633	0.755	0.765	0.724	0.733	0.727	0.813	0.801	0.784	0.725
9	Total # organisms	244	503	698	717	130	249	149	603	910	411	735	558
	Species Richness	34	36	41	59	21	32	7	30	25	48	40	59
	Diversity Index	2.868	2.364	2.129	2.808	2.406	2.487	0.637	2.233	1.689	2.94	2.251	3.294
	Evenness	0.813	0.66	0.573	0.689	0.79	0.718	0.328	0.657	0.525	0.759	0.61	0.808
10a	Total # organisms	416	1154	1130	1718	352	1264	368	284	1250	466	2531	802
	Species Richness	19	46	23	59	15	38	15	26	26	28	39	43
	Diversity Index	1.397	2.555	1.712	2.851	1.837	2.507	1.861	2.445	1.884	2.405	2.202	2.495
	Evenness	0.474	0.667	0.546	0.699	0.678	0.689	0.687	0.75	0.578	0.722	0.601	0.663
11	Total # organisms	222	122	486	361	409	339	182	114	146	123	364	374
	Species Richness	26	25	72	45	40	47	25	25	21	30	41	42
	Diversity Index	2.549	2.614	3.326	3.069	2.656	2.87	2.845	2.353	2.677	2.844	3.039	3.226
	Evenness	0.782	0.812	0.778	0.806	0.72	0.745	0.884	0.731	0.879	0.836	0.818	0.863
13a	Total # organisms	186	234	563	791	166	437	270	505	350	954	590	630
	Species Richness	23	47	48	57	27	46	26	34	31	58	49	44
	Diversity Index	1.985	2.823	2.571	3.027	2.76	2.685	2.242	2.361	2.568	2.964	2.958	2.706
	Evenness	0.633	0.733	0.664	0.749	0.837	0.701	0.688	0.67	0.748	0.73	0.76	0.715
14	Total # organisms	149	337	278	1171	510	892	679	139	331	1362	990	872
	Species Richness	21	45	51	74	56	68	48	28	27	69	75	56
	Diversity Index	2.129	2.831	3.204	3.288	3.073	3.261	2.963	2.733	1.899	2.971	3.414	3.300
	Evenness	0.699	0.744	0.769	0.764	0.764	0.773	0.765	0.82	0.576	0.702	0.791	0.820
17	Total # organisms	1822	818	3650	2957	4876	6442	3519	1383	1970	2760	6432	2921
	Species Richness	21	12	36	26	24	26	32	18	27	33	46	27
	Diversity Index	1.961	1.139	1.612	1.786	2.139	2.048	2.285	1.786	1.868	2.227	2.143	1.788
	Evenness	0.644	0.458	0.45	0.548	0.673	0.629	0.659	0.618	0.567	0.637	0.56	0.543
18a	Total # organisms	144	277	839	783	594	722	290	596	179	446	248	635
	Species Richness	24	51	65	54	68	63	36	50	28	44	40	68
	Diversity Index	2.679	3.282	3.026	3.171	3.438	3.23	2.874	2.529	2.677	2.948	3.313	3.319
	Evenness	0.843	0.835	0.725	0.795	0.815	0.78	0.802	0.646	0.803	0.779	0.898	0.786
19a	Total # organisms	48	112	285	780	192	231	116	292	471	936	789	961
	Species Richness	10	21	23	54	21	32	20	33	39	49	51	72
	Diversity Index	2.109	2.408	1.459	2.601	1.988	2.869	2.401	2.838	2.661	2.838	2.811	3.216
	Evenness	0.916	0.791	0.465	0.652	0.654	0.828	0.802	0.812	0.726	0.729	0.715	0.752
TOTAL	Total # organisms	3981	4076	9039	11863	10083	12294	6548	4474	6177	8513	14335	9171
	Species Richness	117	140	179	179	140	159	120	114	106	148	175	190

Table 8. Summary of crab census data for all surveys (September 1988-January 1997).

STATION	1a																	2															3																					
SURVEY DATE	9/88	1/89	8/89	1/90	8/90	1/91	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	9/88	1/89	8/89	1/90	8/90	1/91	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	9/88	1/89	8/89	1/90	8/90	1/91	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97
<i>Sesarma curacaoense</i>			5	1	5		7	4	13		3	2	1		3	2			21	5	7	3	22		9	2	13	1	10		6		7	4			8	6	6		6		5	1	16		2	1	1		3	1		
<i>Aratus pisonii</i>			1		2			2												1		3	3													2																		
<i>Eurydium limosum</i>			2		4				1	1															3		1									1	2																	
<i>Panopeus helveticus</i>																																				1																		
Unidentified xanthid											1																																											
<i>Uca speciosa</i>								1		1								1		1	1		1			1	1		1	1		1							1															
<i>Uca thayeri</i>		3						1	1	2		1				1			1	1	1		1			1	1		1	1		1					1	2				4		1	2	1	1		1					
<i>Uca</i> sp. (juv.)				2				6	2	4	1		3					1	3	2			1				5	1									2			1	1			3	1	2								
Total # specimens	X	X	11	1	11	0	7	13	18	5	8	2	5	0	3	3	0	2	25	9	8	6	27	0	12	8	16	1	11	2	7	0	8	4	0	0	12	9	10	1	8	0	12	4	18	4	7	3	2	0	4	3	0	2
Total # species (by station)			4	1	4	0	1	4	5	2	5	1	3	0	1	2	0	2	3	4	2	2	4	0	2	3	4	1	2	2	2	0	2	1	0	0	4	3	3	1	3	0	3	2	3	2	3	2	0	2	2	0	2	
F† (by station)			1.241	0.000			0.000	0.916	0.800	0.500	1.494	0.000	0.950	0.000	0.000	0.637	0.000	0.693	0.530	1.149	0.860	0.693			0.562	1.220	0.689	0.000	0.305	0.693	0.410	0.000	0.377	0.000	0.000	0.000	0.983	0.849	0.966	0.000		1.076	0.562	0.426	0.693	0.693	1.100	0.693	0.000	0.562	0.637	0.000	0.693	
J† (by station)							0.000	0.834	0.497	0.722	1.078	0.000	0.865	0.000	0.000	0.918	0.000	1.000								0.811	0.880	0.497	0.000	0.439	1.000	0.592	0.000	0.544	0.000	0.000	0.000			0.981	0.811	0.388	1.000	0.631	1.000	1.000	0.000	0.811	0.918	0.000	1.000			
TREE CRAB CENSUS							13	9	0	4	1	1	0	0	1	?	0	0								3	7	0	5	3	0	0	2	3	1	3	1			4	5	1	1	2	1	0	0	0	0	2	0			

STATION	4																	5																	6																							
SURVEY DATE	9/88	1/89	8/89	1/90	8/90	1/91	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	9/88	1/89	8/89	1/90	8/90	1/91	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	9/88	1/89	8/89	1/90	8/90	1/91	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97				
<i>Sesarma curacaoense</i>	11	8	7	6	10		9	5	12	3	9	1	8			3	1		15	17	6	5	18	4	12	4	6	4	6		3		1				2			4		1	1	4		10	3					2						
<i>Arahus pisoni</i>			1		2															1	1		1			1			4	6							1																	1				
<i>Pachygrapsus transversus</i>												1									1																																					
<i>Eurytium limosum</i>	1				2				2		1									2																																						
Unidentified xanthid																																																										
<i>Uca speciosa</i>									3																1																																	
<i>Uca thayeri</i>		1	3		2		3		1		1		2		1			1	3	2	3	1	1	1	4		3		5		3		1				2				2					1								1				
<i>Uca</i> sp. (juv.)	1				1			3	1	1												1		1				1			2			1														1	3	1	1							
Unidentified crab																																																										
Total # specimens	13	9	11	6	17	0	12	8	19	4	11	2	10	0	4	1	0	1	18	22	11	6	21	5	18	5	9	5	11	2	6	0	3	0	1	2	3	0	6	1	5	1	9	1	11	6	5	6	0	0	2	0	0	2				
Total # species (by station)	3	2	3	1	5	0	2	2	5	2	3	2	2	0	2	1	0	1	2	4	4	2	4	2	4	2	2	2	2	1	2	0	3	0	1	2	2	0	2	1	2	1	3	1	2	2	3			0	0	1	0	0	2			
H' (by station)	0.536	0.886	0.937	0.000			0.562	0.662	0.822	0.562	0.600	0.690	0.500	0.000	0.562	0.000	0.000	0.000	1.451	0.776	1.121	0.451				0.926	0.500	0.898	0.500	0.689		0.693	0.000	1.099	0.000	0.000	0.693	0.637	0.000	0.637	0.000				1.061	0.000	0.305	0.693	0.950			0.000	0.000	0.000	0.000	0.000	0.693	
J' (by station)							0.811	0.954	0.511	0.811	0.546	1.000	0.722	0.000	0.811	0.000	0.000	0.000	0.668	0.722	0.817	0.722	0.994			0.668	0.722	0.817	0.722	0.994		1.000	0.000	1.000	0.000	0.000	1.000				0.966	0.000	0.439	1.000	0.865			0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.693			
TREE CRAB CENSUS							11	4	0	1	4	0	3	0	0	0	0	1								6	7	4	8	2	2	0	1	3	3	6	1							10	7	2	13	6	0	0	0	0	7	0	2	0		

[illegible]



Table 8. Summary of crab census data for all surveys (September 1988-January 1997).

STATION	15																		16																	
SURVEY DATE	9/88	1/89	8/89	1/90	8/90	1/91	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	9/88	1/89	8/89	1/90	8/90	1/91	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97
<i>Sesarma curacaoense</i>	3	15	13	5	3	1															1			1			1			1						
<i>Aratus pisonii</i>	1																												1				1			
<i>Eurytium limosum</i>	5	3			2																										1					
<i>Uca pugnax</i>							5																													
<i>Uca rapax</i>								2		1	6			1	3	2	5				2		2				87	1	3	1	1	2	1	6	10	4
<i>Ucu speciosa</i>		2															3				1															
<i>Uca thayeri</i>	3	6	5		5	3	1													2				4	2							1		1	1	
<i>Uca</i> sp. (juv.)	1		2	2	5	2				1					1	4					4		2	1		1		1		3		3	1			
Total # specimens	13	26	20	7	15	6	6	2	0	2	6		0	1	4	6	8	0	0	2	8	0	4	6	2	1	1	2	3	5	2	7	2	8	11	5
Total # species (by station)	5	4	3	2	4	3	2	1	0	2	1		0	1	2	2	2	0	0	1	4	0	2	3	1	1	2	2	1	3	2	4	2	3	2	2
H' (by station)	1.439	1.102	1.084	0.598			0.451	0.000	0.000	0.693	0.000		0.000	0.000	0.562	0.637	0.662	0.000	0.000	0.000	1.213	0.000			0.000	0.000	0.349	0.693	0.000	0.950	0.693	1.277	0.693	0.736	0.305	0.500
J' (by station)							0.650	0.000	0.000	1.000	0.000		0.000	0.000	0.811	0.918	0.954	0.000		.					0.000	0.000	0.503	1.000	0.000	0.865	1.000	0.921	1.000	0.670	0.439	0.722
TREE CRAB CENSUS							0	0	0	0	0		0	0	5	0	0	0						6	1	3	17	13	3	8	5	4	0	0	2	

\*Sta. 7, Aug. 1989, also recorded the thalassinid *Upogebia* sp.

\*\* Reported as station 13

|| Sta 13a, Jan. 1991: *Uca thayeri* & *Uca* sp. reported at sta. 13, *U. pugilator* at sta. 13a.

X indicates station not yet established.

Summary of hand collection stations (August 1991-January 1997).

STATION	9												13												17												
SURVEY DATE	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	8/91	1/92	8/92	1/93	8/93	1/94	8/94	1/95	8/95	1/96	8/96	1/97	
Phylum PORIFERA																																					
Unident. sponge(s)					1				34	24	7	3															1										
Phylum CNIDARIA																																					
Unident. actinian																	1																				
Phylum SIPUNCULA																																					
Phascolosoma sp.			4			1	1	2		9					1																						
Phylum ANNELIDA																																					
Unident. eunicid	3										1																										
Unident. serpulid												2	3																								
Unident. polychaete										1																											
Phylum MOLLUSCA																																					
Class GASTROPODA																																					
Baillaria minima	88	89	71	76	93	72	110	12	22	3	2	36	100	155	18	152	182	51	33	225	305	92	66	172	3	13	10	539	29	7	3	45	22	10	190	4	
?Petalocochus varians	3	10	12	10	28	37	57	45	40	42	82	72																									
Nassarius vibex	2			2													1	1			2					2		2	1								
Neritina virginea					1															1																	
Siphonaria pectinatu					1																																
Class BIVALVIA																																					
Brachidontes exustus				2	2	1	1	1	4	2	6	5		2	3		8	6	1	11	2	7	3	12													
Crassostrea virginica			1	1			2	1	2			1			4			2	4	5	5	4	9	5			1										
Isoognomon alatus				1			2	3	4			3	1			1				1	*		1				8	3	2			1	2	6	13		
Isoognomon bicolor											3	3																									
Isoognomon sp.						1						2																									
Phylum ARTHROPODA																																					
Class CIRRIPEdia																																					
Balanus amphitrite	17	15			1	6	10					4			4		4		7				4			24											
Balanus reticulatus	11	3																																			
Balanus ?venustus						2																															
Balanus sp. (juv.)			122	6						1	2		71		1					1		2	35														
Chthamalus fragilis	126	163	5	38	13							9	2																								
Chthamalus stellatus					42	88	61																														
Chthamalus sp.						14		17	2	18	1																										
Class MALACOSTRACA																																					
Hyale grandicornis	4	31		2	5	14	2	1	1					3	1	15				1							1										
Unidentified amphipod											2	4											6														
Unidentified isopod																			1																		
Unidentified alpheid																																					
Clibanarius tricolor			4																																		
Clibanarius sp.?														7								1															
Aratus pisonii		2							2		5															2											
Pachygrapsus transversus				1		1			1	1	1																										
Sesarma sp. (juv.)													1																								
Unident. grapsid	3		1	1																																	
Caralepidodius floridanus																1																					
Panopeus sp.	5		1	2					1						2																						
Unident. xanthid (juv.)		3					1	2	2		2	2		1				4	1		1	1	3			1					1						
Uca sp. (juv.)						1													3							10	1		2	7		5			9		
Unident. brachyura (juv.)			2													4											35										
Class INSECTA																																					
Anurida maritima	9	30	36	165	27	45	33	314	18	150	68	34		38	42	1	123	82	21	7		9	35	57	9		69	57	166	104	128	82		4	31	20	
Unident. fly larva			1													1																					
Class ARACHNIDA																																					
Unidentified acarine												1																									
Phylum CHORDATA																																					

Table 10a. Combined Ponar grab and crab collection data reported by the previous contractor (S. Dobkin), stations 1 through 10a (Sep. 1988 to Jan. 1991).

[illegible]

Table 10a. Combined Ponar grab and crab collection data reported by the previous contractor (S. Dobkin), stations 1 through 10a (Sep. 1988 to Jan. 1991).

[illegible]

Table 10a. Combined Ponar grab and crab collection data reported by the previous contractor (S. Dobkin), stations 1 through 10a (Sep. 1988 to Jan. 1991).

[illegible]





Table 10b. Combined Ponar grab and crab data collected by the previous contractor (S. Dobkin) at stations 11-19a (including species totals)(Sep. 1988 - Jan. 1991).

[illegible]

Table 10b. Combined Ponar grab and crab data collected by the previous contractor (S. Dobkin) at stations 11-19a (including species totals)(Sep. 1988 - Jan. 1991).

[illegible]



Table 10c. Hand collection data reported as listed by the previous contractor (S. Dobkin), stations 9, 13 and 17, August 1990 and January 1991.

STATION	9	13	17	9	13	TOT
SURVEY	8/90	8/90	8/90	1/91	1/91	
TAXON						
Phylum PORIFERA						
Class Demospongiae						
Unidentified sponge A	1					1
Unidentified sponge B			1			1
Phylum ANNELIDA						
Class POLYCHAETA						
<i>Spirorbis</i> sp.				15		15
Phylum Mollusca						
Class GASTROPODA						
<i>Batillaria mimina</i>	2	2		6	6	16
<i>Spiroglyphus annulatus</i>				1		1
<i>Littorina ziczac</i>	3					3
<i>Nassaruis vibex</i>		1			1	2
<i>Tectarius muricatus</i>	1					1
Class BIVALVIA						
<i>Bankia gouldi</i>	1		1			2
<i>Brachidontes domingensis</i>	1					1
<i>Crassostrea virginica</i>		X				X
<i>Isognomon radiatus</i>	2					2
<i>Isognomon alatus</i>				1		1
Phylum ARTHROPODA						
Subphylum CRUSTACEA						
Class CIRRIPIEDIA						
<i>Balanus amphitrite</i>				X		X
<i>Chthamalus</i> sp.	X					X
Class MALACOSTRACA						
Order Amphipoda						
Species B				1	3	4
Unident. gammarideans					2	2
Order Isopoda						
<i>Sphaeroma</i> sp.			8			8
Order Decapoda						
<i>Palaemonetes transversus</i>		1				1
<i>Clibanarius tricolor</i>		41				41
Unident. pagurid		7				7
<i>Eurytium limosum</i>			1			1
<i>Panopeus herbstii</i>				1	1	2
<i>Uca pugilator</i>		4			2	6
<i>Uca rapax</i>		5				5
<i>Uca thayeri</i>		1			3	4
Unidentified <i>Uca</i>					5	5

Table 11. Summary data and diversity indices as reported by the previous consultant (Sheldon Dobkin), for all stations, September 1988 -January 1990.

GRAB	September 1988			January 1989			August 1989			January 1990		
Sta. #	# Indiv.	# Spp.	S-W Index	# Indiv.	# Spp.	S-W Index	# Indiv.	# Spp.	S-W Index	# Indiv.	# Spp.	S-W Index
1	178	20	2.34250	23	7	1.68095	124	19	2.45845	32	10	1.96498
8	263	22	2.65101	173	22	2.71742	184	19	2.21074	37	14	2.40483
8a							411	18	2.25038	71	23	2.87746
9	207	23	2.86715	9	6	1.73513	205	14	2.41866	72	26	3.06471
10a							35	11	2.17845	63	10	1.59291
11	265	22	2.95303	231	28	2.95704	40	16	2.50353	79	21	2.41183
13a							51	11	2.18339	20	12	2.41505
14	475	26	2.75840	59	14	2.33504	43	14	2.35728	65	25	2.99555
17	319	12	1.60456	45	8	1.25031	449	11	0.70671	283	10	0.83512
18	23	8	2.26094	93	14	1.76884	43	17	2.09775	18	13	2.50529
19a	93	20	2.72304	17	10	2.15006	20	11	2.31957	25	13	2.37699
Tot.# specs.	1823			650			1605			765		
Mean S-W			2.52007			2.07434						2.31315
Mean S-W excluding new stations									2.13408			2.31866

CRAB	September 1988			January 1989			August 1989			January 1990		
Sta. #	# Indiv.	# Spp.	S-W Index	# Indiv.	# Spp.	S-W Index	# Indiv.	# Spp.	S-W Index	# Indiv.	# Spp.	S-W Index
1a							11	4	1.24068	1	1	0.00000
2	25	3	0.52964	9	4	1.14906	8	2	0.85996	6	2	0.69314
3	12	4	0.98308	9	3	0.84868	10	3	0.96566	1	1	0.00000
4	13	3	0.53596	11	4	0.88557	9	3	0.93688	6	1	0.00000
5	18	2	0.45056	22	4	0.77571	11	4	1.12095	6	2	0.45056
6	2	1	0.63651	0	0	0.00000	6	2	0.63651	1	1	0.00000
7	23	3	0.47023	12	2	0.45056	13	3	0.89813	6	1	0.00000
10	4	3	1.03972	6	3	1.01140	9	2	0.52970	2	2	0.69314
12	3	2	0.63651	0	0	0.00000	2	1	0.00000	1	1	0.00000
13	8	1	0.00000	9	1	0.00000	13	2	0.27118	7	1	0.00000
15	14	5	1.43888	26	4	1.10219	22	4	1.08358	7	2	0.59827
16	1	1	0.00000	2	1	0.00000	8	4	1.21301	1	1	0.00000
Tot.# specs.	128			106			122+3			45+1		
Mean S-W			0.161119			0.56574			0.81302			0.20292
Mean S-W excluding new stations									0.77414			0.22137

HAND	September 1988			January 1989			August 1989			January 1990		
Sta. #	# Indiv.	# Spp.	S-W Index	# Indiv.	# Spp.	S-W Index	# Indiv.	# Spp.	S-W Index	# Indiv.	# Spp.	S-W Index
9	22	11	1.91091	23	10	2.16013	25	10	1.84412	26	11	1.95634
13	12	5	1.23427	23	4	1.18778	18	5	1.45936	12	4	1.14371
17	58	9	1.61419	25	7	1.37681	47	15	1.78927	19	9	1.98262
Tot.# specs.	92			71								
Mean S-W			0.158645			1.5749			1.69758			1.69422
Tot. all charts	2043	93		827	71		1820	90		868	82	

Table 12. Identified species collected in all infaunal surveys (Aug 91-Jan 97). An unidentified taxon is included if it is the only representative of its group or is distinct from identified members of its group.

## Phylum CNIDARIA

### Order ACTINIARIA

Unidentified actinian

### Order CERIANTHARIA

Unidentified cerianthid

## Phylum PLATYHELMINTHES

### Order ACOELA

Unidentified acoel

### Order KALYPTORHYNCHA

Unidentified kalyptorhynch

### Order LECITHOEPITHELIATA

Unident. lecitheopitheiathan

### Order POLYCLADIDA

Unidentified polyclad

### Order PROSERIATA

#### Family COELOGYNOPORIDAE

*Coelogygnopora* sp.

#### Family MONOCELIDIDAE

Unidentified monacelid

### Order RHABDOCOELA

Unidentified rhabdocoel?

## Phylum NEMERTINA

### Order PALEONEMERTEA

#### Family CEPHALOTHRICIDAE

Cephalothricid sp. JLN 113

Cephalothricid sp. JLN 114

#### Family CARINOMIDAE

*Carinoma tremaphoros*

*Carinomella lactea*

#### Family TUBULANIDAE

*Tubulanus pellucidus*

*Tubulanus rhabdotus*

Paleonemertine sp. JLN 103

### Order HETERONEMERTEA

#### Family BASEODISCIDAE

*Baseodiscus floridanus*

?*Baseodiscus* sp.

#### Family LINEIDAE

Lineid sp. A

#### Family MICRURIDAE

Unidentified micrurid

### Order HOPLONEMERTEA

#### Family AMPHIPORIDAE

*Amphiporus* sp.

#### Family TETRASTEMMIDAE

*Tetrastemma worki*

#### Family ZYGONEMERTIDAE

*Zygonemertes ?simonae*

*Zygonemertes* sp. JLN 359

*Zygonemertes* sp.

Hoplonemertine sp. JLN 114?

Hoplonemertine sp. JLN 131

*Poseidonemertes* sp.

## Phylum MOLLUSCA

### Class POLYPLACOPHORA

#### Family ACANTHOCHITONIDAE

*Acanthochitona* sp.

#### Family ISCHNOCHITONIDAE

*Ischnochiton* sp.

### Class GASTROPODA

#### Subclass PROSOBRANCHIA

#### Family ACLIDIDAE

*Hemiaclis* sp.

#### Family CAECIDAE

*Caecum pulchellum*

*Caecum imbricatum*

*Caecum textile*

*Meioceras nitidum*

#### Family CERITHIDAE

*Cerithium atratum*

*Cerithium lutosum*

*Diastoma varium*

#### Family CYCLOSTREMATIDAE

*Skenea* sp.

#### Family EULIMIDAE

Unidentified eulimid

#### Family NASSARIIDAE

*Nassarius vibex*

#### Family NATICIDAE

Unidentified naticid

#### Family NERITIDAE

*Neritina virginea*

#### Family POTAMIDIDAE

*Batillaria minima*

#### Family RISSOIDAE

Unidentified rissoid?

#### Family RISSOINIDAE

*Rissoina catesbyana*

#### Family PYRAMIDELLIDAE

*Turbonilla hemphilli*

#### Family VITRINELLIDAE

*Cyclostremiscus suppressus*

*Pleuromalaxis balesi*

### Subclass OPISTHOBRANCHIA

#### Family ACTEOCINIDAE

*Acteocina candei*

*Acteocina canaliculata*

#### Family APLUSTRIDAE

?*Hydatina vesicaria*

#### Family BULLIDAE

*Bulla striata*

#### Family GASTROPTERIDAE

?*Gastropteron* sp.

#### Family HAMINOEIDAE

*Haminoea antillarum*

*Haminoea elegans*

*Haminoea succinea*

#### Family PHILINIDAE

?*Philine* sp.

Unidentified tectibranch

Unidentified sacoglossan?

Unidentified cephalaspid?

### Class BIVALVIA

#### Family NUCULIDAE

*Nucula proxima*

#### Family ARCIDAE

*Arcopsis adamsi*

#### Family CARDIIDAE

*Laevicardium mortoni*

#### Family LUCINIDAE

*Codakia* cf. *costata*

*Codakia pectinella*

*Codakia orbiculata*

*Linga* sp.?

*Lucina* sp.

*Parvilucina multilineata*

#### Family LEPTONIDAE

*Montacuta* sp.

Unidentified leptonid

#### Family LYONSIIDAE

*Lyonsia floridana*

*Lyonsia hyalina*

#### Family MESODESMATIDAE

*Ervilia* sp.

#### Family MONTACUTIDAE

*Montacuta* sp.

#### Family MYTILIDAE

*Brachidontes exustus*

*Brachidontes modiolus*

#### Family PETRICOLIDAE

?*Petricola* sp.

#### Family SEMELIDAE

*Cumingia coarctata*

#### Family SOLECURTIDAE

*Tagelus divisus*

#### Family SPORTELLIDAE

Unidentified sportellid

Table 12. Identified species collected in all infaunal surveys (Aug 91-Jan 97). An unidentified taxon is included if it is the only representative of its group or is distinct from identified members of its group.

Family TELLINIDAE	<i>Prionospio heterobranchia</i>	Order PHYLLODOCIDA
<i>Macoma constricta</i>	<i>Prionospio multibranchiata</i>	Family PHYLLODOCIDAE
<i>Tellina consobrina</i>	<i>Prionospio perkinsi</i>	<i>Anaitides mucosa</i>
<i>Tellina iris</i>	<i>Pseudopolydora</i> sp. A	<i>Eteone heteropoda</i>
<i>Tellina mera</i>	<i>Pseudopolydora</i> sp. B	<i>Eteone lactea</i>
<i>Tellina texana</i>	<i>Scolecopsis squamata</i>	<i>Paranaitis gardneri</i>
<i>Tellina (Angulus)</i> sp.	<i>Scolecopsis texana</i>	<i>Phyllodoce arenae</i>
Family VENERIDAE	<i>Spio pettiboneae</i>	Family POLYNOIDAE
<i>Anomalocardia auberiana</i>	<i>Streblospio benedicti</i>	<i>Harmothoe</i> sp. B
<i>Chione cancellata</i>	Family MAGELONIDAE	<i>Malmgreniella</i> sp. B
<i>Gouldia cerina</i>	<i>Magelona pettiboneae</i>	Family HESIONIDAE
<i>Parastarte triquetra</i>	Family CHAETOPTERIDAE	<i>Gyptis brevipalpa</i>
Family CORBULIDAE	<i>Spiochaetopterus costarum</i>	<i>Microphthalmus</i> sp.
<i>Corbula contracta</i>	<i>Spiochaetopterus oculatus</i>	<i>Podarke obscura</i>
Class SCAPHOPODA	Family CIRRATULIDAE	Family PILARGIIDAE
Family DENTALIIDAE	<i>Cauleriella</i> cf. <i>alata</i>	<i>Cabira incerta</i>
<i>Dentalium</i> sp.	<i>Cauleriella killariensis</i>	Family SIGALONIDAE
Phylum ANNELIDA	<i>Cauleriella</i> sp. A	<i>Sthenelais boa</i>
Class POLYCHAETA	<i>Chaetozone</i> sp.	Family SYLLIDAE
Order ORBINIIDA	<i>Cirratulus</i> sp.	<i>Brania wellfleetensis</i>
Family ORBINIIDAE	<i>Cirriformia</i> sp. A	<i>Brania</i> sp. A
<i>Leitoscoloplos foliosus</i>	<i>Monticellina dorsobranchialis</i>	<i>Dentatisyllis caroliniae</i>
<i>Leitoscoloplos fragilis</i>	<i>Tharyx marioni</i>	<i>Ehlersia cornuta</i>
<i>Leitoscoloplos robustus</i>	Family ACROCIRRIDAE	<i>Exogone arenosa</i>
<i>Nainereis</i> sp.	<i>Macrochaeta</i> sp.	<i>Exogone atlantica</i>
<i>Orbinia riseri</i>	Order CAPITELLIDA	<i>Exogone dispar</i>
<i>Proscoplos</i> sp.	Family CAPITELLIDAE	<i>Exogone lourei</i>
<i>Scoloplos rubra</i>	<i>Capitella capitata</i>	<i>Exogone</i> sp. C
<i>Scoloplos texana</i>	<i>Capitomastus</i> sp.	<i>Geminosyllis</i> sp. A
Family PARAONIDAE	<i>Dasybranchus lumbricoides</i>	<i>Grubeosyllis clavata</i>
<i>Aricidea catherinae</i>	<i>Dasybranchus lunatus</i>	<i>Haplosyllis spongicola</i>
<i>Aricidea philbinae</i>	<i>Decamastus</i> sp.	<i>Odontosyllis enopla</i>
<i>Aricidea taylori</i>	<i>Heteromastus filiformis</i>	<i>Opisthodonta</i> sp. A
<i>Cirrophorus</i> sp.	<i>?Leiochrides pallidor</i>	<i>Sphaerosyllis bilobata</i>
<i>Paraonis fulgens</i>	<i>Mastobranchus</i> sp.	<i>Sphaerosyllis labyrinthophila</i>
Order COSSURIDA	<i>Mediomastus californiensis</i>	<i>Sphaerosyllis longicauda</i>
Family COSSURIDAE	<i>Notomastus americanus</i>	<i>Sphaerosyllis piriferopsis</i>
<i>Cossura soyeri</i>	<i>Notomastus hemipodus</i>	<i>Sphaerosyllis</i> cf. <i>renaudae</i>
Order SPIONIDA	<i>Notomastus latericeus</i>	<i>Sphaerosyllis riseri</i>
Family SPIONIDAE	<i>Notomastus lobatus</i>	<i>Sphaerosyllis taylori</i>
<i>Apoprionospio pygmaea</i>	Family ARENICOLIDAE	<i>Streptospyngera heteroseta</i>
<i>Carazziella hobsonae</i>	<i>Arenicola cristata</i>	<i>Streptosyllis pettiboneae</i>
<i>Dispio uncinata</i>	Family MALDANIDAE	<i>Syllis gracilis</i>
<i>Malacoceros vanderhorsti</i>	<i>Asychis elongatus</i>	<i>Trypanosyllis vittigera</i>
<i>Paraprionospio longicirrata</i>	<i>Axiotella mucosa</i>	<i>Typosyllis lutea</i>
<i>Polydora ligni</i>	Order OPHELIIDA	Family NEREIDAE
<i>Polydora socialis</i>	Family OPHELIIDAE	<i>Ceratonereis irritabilis</i>
<i>Prionospio cirrifer</i>	<i>Armandia agilis</i>	<i>Laeonereis culveri</i>
<i>Prionospio cristata</i>	<i>Armandia maculata</i>	<i>Neanthes micromma</i>

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<i>Neanthes succinea</i>	<i>Boguea enigmatica</i>	Family GOLFINGIIDAE
<i>Nereis falsa</i>	Family TRICHOBRANCHIDAE	<i>Nephasoma</i> sp.
<i>Stenonereis martini</i>	<i>Terebellides stroemi</i>	Family PHASCOLIONIDAE
Family GLYCERIDAE	<i>Trichobranchus glacialis</i>	<i>Phascolion cryptum</i>
<i>Glycera abbranchiata</i>	Order SABELLIDA	Order ASPIDOSIPHONIFORMES
<i>Glycera americana</i>	Family SABELLIDAE	Family ASPIDOSIPHONIDAE
Family SPHAERODORIDAE	<i>Bispira melanostigma</i>	<i>Aspidosiphon albus</i>
<i>Clavodorum</i> sp.	<i>Branchioma nigromaculata</i>	<i>Aspidosiphon</i> cf. <i>muelleri</i>
Order AMPHINOMIDA	<i>Chone</i> cf. <i>americana</i>	Unidentified sipunculan
Family AMPHINOMIDAE	<i>Fabricinuda trilobata</i>	<b>Phylum ARTHROPODA</b>
<i>Eurythoe complanata</i>	<i>Hypsicomus</i> sp.	Subphylum UNIRAMIA
<i>Paramphinode</i> sp. B	<i>Laonome</i> sp.	Class INSECTA
Order EUNICIDA	<i>Megalomma</i> sp. B	Unidentified insect larva
Family EUNICIDAE	<i>Notaulax</i> sp.	Subphylum CHELICERATA
<i>Eunice vittata</i>	<i>Potamilla linguicollaris</i>	Class PYCNOGONIDA
<i>Marphysa</i> cf. <i>conferta</i>	<i>Sabellastarte</i> sp.	Unidentified pycnogonid
<i>Marphysa sanguinea</i>	Family SERPULIDAE	Class ARACHNIDA
<i>Nematonereis hebes</i>	<i>Salmacina</i> sp.	Unidentified acarine
Family ONUPHIDAE	Class OLIGOCHAETA	Subphylum CRUSTACEA
<i>Kinbergonuphis simoni</i>	Family TUBIFICIDAE	Class CEPHALOCARIDA
Family LUMBRINERIDAE	<i>Bathyrilus adriaticus</i>	Unidentified cephalocarid
<i>Lumbrineris tenuis</i>	<i>Ctenodrilus serratus</i>	Class OSTRACODA
<i>Lumbrineris testudinum</i>	<i>Limnodriloides anxius</i>	Subclass MYODOCOPA
<i>Lumbrineris verrilli</i>	<i>Limnodriloides baculatus</i>	Family CYLINDROLEBERIDIDAE
<i>Lumbrineris</i> sp. B	<i>Limnodriloides barnardi</i>	<i>Asteropterygion oculitristis</i>
Family ARABELLIDAE	<i>Limnodriloides monotheucus</i>	Family PHILOMEDIDAE
<i>Arabella multidentata</i>	<i>Limnodriloides rubicundus</i>	<i>Harbansus paucichelatus</i>
<i>Arabella mutans</i>	<i>Limnodriloides sacculus</i>	Family Sarsiellidae
<i>Drilonereis</i> sp. C	<i>Limnodriloides uniampulatus</i>	<i>Eusarsiella cresseyi</i>
Family DORVILLEIDAE	<i>Parakakatio longiprostratus</i>	<i>Eusarsiella dispiralis</i>
<i>Ophryotrocha</i> sp. A	<i>Pectinodrilus molestus</i>	<i>Eusarsiella spinosa</i>
<i>Pettiboneia duofurca</i>	<i>Raphidrilus nemasoma</i>	<i>Eusarsiella zostericola</i>
<i>Pettiboneia</i> sp. A	<i>Smithsonidrilus hummelincki</i>	Family RUTIDERMATIDAE
<i>Schistomeringos pectinata</i>	<i>Smithsonidrilus marinus</i>	<i>Rutiderma cohenae</i>
<i>Schistomeringos rudolphi</i>	<i>Smithsonidrilus minusculus</i>	<i>Rutiderma darbyi</i>
Order STERNASPIDA	<i>Smithsonidrilus multiglandularis</i>	<i>Rutiderma gyre</i>
Family STERNASPIDAE	<i>Tectidrilus bori</i>	Subclass PODOCOPA
<i>Sternaspis scutata</i>	<i>Tectidrilus gabriellae</i>	Family CYTHERIDIDAE
Order TERESELLIDA	<i>Tectidrilus squalidus</i>	<i>Cytherella</i> sp.
Family PECTINARIIDAE	<i>Tectidrilus verrucosus</i>	<i>Cyprideis americana</i>
<i>Pectinaria gouldi</i>	<i>Thalassodrilides gurwitschi</i>	<i>Paranesidea</i> sp.
Family TERESELLIDAE	<i>Tubificoides bermudae</i>	<i>Peratocytheridea setipunctata</i>
<i>Amaeana trilobata</i>	<i>Tubificoides brownae</i>	<i>Pontocythere sulcata</i>
<i>Loimia medusa</i>	<i>Tubificoides motei</i>	<i>Thalassocyprina vavrai</i>
<i>Pista quadrilobata</i>	<i>Tubificoides parviductus</i>	Unident. campylocytherine
<i>Polycirrus plumosus</i>	<b>Phylum ECHIURA</b>	Unident. paracypridine
<i>Streblosoma hartmannae</i>	Unidentified echiuran	Family BAIRDIDAE
<i>Terebella rubra</i>	<b>Phylum SIPUNCULA</b>	<i>Neonesidea</i> sp.
Family BOGUEIDAE	Order GOLFINGIIFORMES	



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Class MALACOSTRACA	<i>Cerapus</i> n. sp.	<i>Processa</i> cf. <i>vicina</i>
Order MYSIDACEA	<i>Grandidierella bonnieroides</i>	Infraorder THALASSINIDEA
Unidentified mysid	<i>Siphonoceetes</i> sp.	Family UPOGEBIIDAE
Order TANAIIDACEA	Family HYALIDAE	<i>Upogebia affinis</i>
Family KALLIAPSEUDIDAE	<i>Hyale</i> sp.	<i>Upogebia vasquezii</i>
<i>Kalliapseudes aliciae</i>	Family LILLJEBORGIDAE	Infraorder ANOMURA
Family PARATANAIDAE	Unidentified lilljeborgid (juv.)	Family DIOGENIDAE
<i>Leptochelia forrestii</i>	Family LYSIANASSIDAE	<i>Clibanarius cubensis</i>
<i>Leptochelia rapax</i>	Unidentified lysianassid	Family PAGURIDAE
Family TANAIDAE	Family MEGALUROPIDAE	<i>Pagurus ?criniticornis</i>
<i>Sinelobus stanfordi</i>	<i>Gibberosus myersi</i>	<i>Pagurus mclaughlinae</i>
Order ISOPODA	Family OEDICEROTIDAE	<i>Pagurus stimpsoni</i>
Family ANTHURIDAE	<i>Monoculodes nyei</i>	Infraorder BRACHYURA
<i>Amakusanthura magnifica</i>	<i>Synchelidium americanum</i>	Family GONEPLACIDAE
Family ARCTURIDAE	Family TALITRIDAE	Unidentified goneplacid
<i>Erichsonella attenuata</i>	Unidentified talitrid	Family MAJIDAE
<i>Erichsonella filiformis</i>	Order CUMACEA	<i>Pitho therminieri</i>
Family CIROLANIDAE	Family BODOTRIIDAE	Family PINNOTHERIDAE
<i>Eurydice</i> sp.	<i>Cyclaspis varians</i>	<i>Pinnixa</i> sp.
Family CORALLANIDAE	Family DIASTYLIDAE	Family PORTUNIDAE
<i>Excorallana</i> cf. <i>delaneyi</i>	<i>Oxyurostylis smithi</i>	Unidentified portunid
Family HYSSURIDAE	Family NANNASTACIDAE	Family XANTHIDAE
<i>Xenanthura brevitelson</i>	<i>Cumella</i> sp.	<i>Dyspanopeus sayi</i>
Family MUNNIDAE	Family PSEUDOCUMIDAE	<i>Neopanope</i> sp.
<i>Uromunna caribaea</i>	<i>Vaunthomsonia</i> cf. <i>floridana</i>	<i>Panopeus</i> sp.
Family SPHAEROMATIDAE	<i>Vaunthomsonia minor</i>	Phylum ECHINODERMATA
<i>Dynamenella angulata</i>	Order NEBALIACEA	Class OPHIUROIDEA
<i>Exosphaeroma diminuta</i>	Unidentified nebaliacean	Family AMPHIURIDAE
<i>Exosphaeroma productatelson</i>	Order DECAPODA	<i>Amphioplus sepultus</i>
<i>Paracerceis caudata</i>	Infraorder PENAEIDEA	<i>Amphiodia thrombodes</i>
Order AMPHIPODA	Family PENAEIDAE	<i>Amphiodia trychna</i>
Family AMPELISCIDAE	<i>Penaeus duorarum</i>	Class HOLOTHUROIDEA
<i>Ampelisca abdita</i>	Infraorder CARIDEA	Family SYNAPTIDAE
<i>Ampelisca burkei</i>	Family ALPHEIDAE	<i>Leptosynapta tenuis</i>
<i>Spathiopus loeensis</i>	<i>Alpheus armillatus</i>	Unidentified holothuroid
Family AMPHILOCHIDAE	<i>Alpheus floridanus</i>	Phylum HEMICHORDATA
<i>Amphilochus</i> sp.	<i>Alpheus ?normani</i>	Unidentified enteropneust?
Family AMPITHOIDAE	<i>Alpheus nuttingi</i>	Phylum CHORDATA
<i>Cymadusa compta</i>	<i>?Alpheopsis labis</i>	Class ASCIDIACEA
<i>Cymadusa ?pilosa</i>	<i>Salmones cavicolus</i>	Unidentified ascidian
Family AORIDAE	Family HIPPOLYTIDAE	
<i>Bemlos</i> sp.	<i>Periclimenes americanus</i>	
<i>Lembos unicornis</i>	Family PALAEMONIDAE	
<i>Rutilemboides naglei</i>	<i>Brachycarpus biunguiculatus</i>	
Family ATYLIDAE	<i>Palaemonetes</i> sp.	
<i>Atylus</i> sp.	<i>Pontonia americana</i>	
Family BATEIDAE	Family PASIPHAEIDAE	
<i>Batea catharinensis</i>	<i>Leptochela serratorbita</i>	
Family COROPHIIDAE	Family PROCESSIDAE	

TABLE 13. List of outside taxonomic experts consulted over the course of this project, and their area(s) of expertise.

Dr. Julio Garcia-Gomez, Miami-Dade Community College (Decapoda)  
Dr. Richard Heard, Gulf Coast Research Laboratory, Ocean Springs, MS (Cumacea)  
Dr. Gordon Hendler, Natural History Museum of Los Angeles County, CA (Ophiuroidea)  
Dr. Louis Kornicker, Smithsonian Institution (Ostracoda)  
Dr. Rafael Lemaitre, Smithsonian Institution (Decapoda)  
Dr. Rosalie Maddocks, University of Houston (Ostracoda)  
Ms. Barbara Maloney, Florida International University (Cumacea).  
Dr. Patsy A. McLaughlin, Cedro Woolley, WA (Cirripedia)  
Dr. Charles G. Messing, Nova Southeastern University (Mollusca, Tanaidacea, Isopoda,  
Decapoda)  
Dr. Michael Milligan, Center for Systematics and Taxonomy (Polychaeta and Oligochaeta)  
Dr. Donald R. Moore, University of Miami (Mollusca)  
Dr. Jon F. Norenburg, Smithsonian Institution (Nemertina, Platyhelminthes)  
Dr. David L. Pawson, Smithsonian Institution (Holothuroidea)  
Dr. Julie Piraino, Smithsonian Institution (Sipuncula)  
Dr. Mary Rice, Smithsonian Institution (Sipuncula)  
Dr. James D. Thomas, Nova Southeastern University (Amphipoda)  
Dr. Austin Williams, U. S. National Marine Fisheries Service (Decapoda)