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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: August 1993 (Including a Summary of Previous Survey Results, 1991-1993)

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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: AUGUST 1993  
(INCLUDING A SUMMARY OF PREVIOUS SURVEY RESULTS, 1991-1993)**

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## A. INTRODUCTION

This report documents the August 1993 monitoring of benthic macroinvertebrate assemblages in the Port Everglades Southport turning basin vicinity and adjacent areas of John U. Lloyd State Recreation Area. This is the fifth monitoring effort of the series carried out by Nova University Oceanographic Center. Sampling was carried out chiefly during 2-12 August. Hand collections and a few crab survey stations were delayed until 2-12 October primarily because of weather and tidal constraints.

## B. METHODOLOGY

Figure 1 illustrates locations of stations occupied for the August 1993 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 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.

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

Benthic grab samples are taken according to contract specifications with a 225 cm<sup>2</sup> grab sampler<sup>1</sup> at stations 1, 8, 8a, 9, 10a, 11, 13a, 14, 17, 18 and 19a, with three replicate samples at each station. All samples are 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 are transferred to 70% ethanol and sorted to most specific distinguishable taxa. Taxa are either identified or sent to recognized experts for identification (Table 6). Nematodes and harpacticoid copepods have not been 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 have likewise not been included in counts and diversity calculations.

Modifications in sampling and handling protocols instituted during the August 1991 survey to improve sampling accuracy in conformity with contract specifications are described in previous reports and have been maintained. Depths recorded for Ponar stations below may differ from those recorded previously because of tidal variations.

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

Three 1.0-m<sup>2</sup> replicate quadrats are randomly placed within about 2.0m of each other at stations 1a, 2, 3, 4, 5, 6, 7, 10, 12, 13, 15 and 16. Within each quadrat, all crab burrows are 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 are described in previous reports and have been main-

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1. Contract specifications call for a 225 cm<sup>3</sup> grab sampler, but this is clearly an error. Such a grab sampler, about 6 cm on a side, was not used by the previous contractor and is not, to our knowledge, manufactured.

tained.

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

Hand collections are taken at stations 9, 13, and 17, with three replicates at each station. Each replicate sample covers an area of 0.1m<sup>2</sup>. Justification for this sampling area is discussed in the survey report for August 1991. Organisms identifiable in the field are counted and released. Taxa unidentifiable in the field are collected by hand, with forceps, or by agitating algae-covered rocks in a bag of seawater. Collected specimens are 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 described in previous reports and have been maintained.

## **C. RESULTS**

### **C.1. Ponar Grab Samples**

Table 1 lists raw data for all samples by station and by replicate for all groups. Table 2 summarizes numbers of specimens by major taxonomic group; Table 3 summarizes relative abundances of major taxonomic groups (percent occurrence). Tables 4 and 5 summarize numbers of the most abundant species for all surveys carried out by Nova University (August 1991-August 1993). Table 4 lists the six similar "typical" stations on both sides of the Intracoastal Waterway (stations 1, 8, 8a on the west side and 13a, 14 18 on the east side). Table 5 lists the Whiskey Creek stations (17, 19a,) the deep ICWW station (11) and the stations in and adjacent to a shallow creek (9 and 10a). Table 6 summarizes percent occurrence of major taxonomic groups by station for all surveys. Table 7 summarizes raw abundances of major taxonomic groups by station for all surveys. Table 8 summarizes organism abundance, richness, diversity and evenness for all surveys.

A total of 10,083 specimens was sorted from the 33 grab samples (11 stations with three replicates each). This figure is 15% less than the 11,863 given in the preceding January 1993

final report.

Polychaete worms remain the most abundant group (34.7%), but account for a smaller percentage of the total fauna than in any previous survey. Peracarid crustaceans, molluscs and oligochaetes account for similar proportions of the total fauna (15-17%). Except for about a 10% increase in the percent of oligochaetes and a corresponding decrease in polychaetes, relative abundances of major taxonomic groups at all stations combined (Table 6 totals) are almost identical to those recorded in August 1991. Although this is largely coincidental because values for individual stations often differ between these two surveys, several groups at several stations have returned to or near relative abundances not seen since August 1991. Examples include ostracodes at sta. 10a, sipunculans and peracarids at sta. 17, and polychaetes and sipunculans at sta. 19a.

The two most abundant species are again the tanaidacean *Kalliapseudes aliciae* (1183 specimens) and the gastropod *Caecum pulchellum* (810), followed this time by the sipunculan *Aspidosiphon muelleri* (803), the oligochaete *Tubificoides motei* (697), the gastropod *Caecum imbricatum* (542), and the ostracode *Rutiderma darbyi* (502). All but the oligochaete owe their dominance to their abundance at a single station (17). Disregarding this station, the most abundant taxa are the oligochaetes *T. motei* and *Smithsonidrilus hummelincki* (302) and the polychaetes *Aricidea taylori* (403), *Mediomastus californianus* (383) and *Lumbrineris verrilli* (271).

Overall polychaete species richness (64) continues to decrease, down from (72) in January 1993, August 1992 (85), and January 1992 (67). Some variations in richness values result from ongoing taxonomic revisions. Amphipod richness has declined to four species, a level not seen since August 1991.

Species occurring at the majority of stations include one gastropod (*Caecum pulchellum* at 10 stations), the polychaetes *Aricidea taylori* (10 stations), *Prionospio heterobranchia*, *Aricidea philbinae* and *Lumbrineris verrilli* (8 stations each), the oligochaetes *Limnodriloides barnardi* and *Smithsonidrilus hummelincki* (9 each) and *Limnodriloides rubicundus* (8), and the amphipod *Grandidierella bonnieroides* (8).

Numbers of podocopan ostracodes given in Table 1 again represent our best estimate of the specimens alive when collected. Substantial numbers of apparently very recently dead indi-

viduals were again taken.

Following is a brief description of results for each station.

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. Faunal totals: 780 specimens, 58 species.  $H'$ : 3.193.  $J'$ : 0.786.

Polychaetes still dominate (57.9%), but their proportion of the fauna continues to decline from their January 1992 peak (86%). They represent the same percentage of the fauna as in August 1991, although they are twice as abundant. Oligochaetes continue to increase in both absolute and relative abundance. All other groups contribute less than 8% of the fauna. The most abundant species are the polychaetes, *Mediomastus californiensis*, *Aricidea taylori*, and *Lumbrineris verrilli*, and the oligochaetes *Smithsonidrilus hummelincki* and *Tubificoides motei*. Of these, *M. californiensis* sp. (or *Mediomastus* sp.) and *A. taylori* have been consistently abundant at this station (Table 4). Total abundance of organisms and species richness are 82% and 88%, respectively, of January 1992 values.

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. Faunal totals: 838 specimens, 36 species.  $H'$ : 2.671.  $J'$ : 0.745.

Oligochaetes (48.0%) now dominate the fauna while polychaetes comprise only 43.9%. The most abundant species are the polychaetes, *Mediomastus californiensis*, *Aricidea taylori*, and *Lumbrineris verrilli*, and the oligochaetes *Smithsonidrilus hummelincki*, *Tectidrilus gabriellae* and *Tubificoides motei*. Of these, *A. taylori*, *M. californiensis* (or *Mediomastus* sp.) and *T. motei* have been consistently abundant here in all five surveys. Organism abundance and species diversity have both declined substantially from the preceding survey. Species richness is only about half that of January 1993. However, all three values still exceed those reported at this station for the August 1991 and January 1992 surveys.

Station 8a: West side of ICWW approximately 50 m north of station 8. Depth and bottom: similar to station 8. Faunal totals: 1236 specimens, 50 species.  $H'$  2.994.  $J'$  0.765.

Polychaete dominance (51.8%) is slightly higher than in January 1993, but remains lower

than in the three preceding surveys. However, polychaete abundance is more than twice that recorded in any previous survey. Oligochaetes continue to increase in absolute and relative abundance (37.7%). As at stations 1, the most abundant taxa are the polychaetes *A. taylori*, *M. californiensis* sp. and *L. verrilli*, and the oligochaetes *S. hummelincki* and *T. motei*, here accompanied by an unidentified cirratulid polychaete. Of these, only *A. taylori* has been consistently abundant in all surveys. Abundance is more than twice that in August 1992. Diversity is slightly greater than in any previous survey, and species richness continues to increase.

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 with soft, light brown algal "crusts." Faunal totals: 130 specimens, 21 species. H': 2.406. J': 0.790.

Polychaete dominance (90.0%) is greater than in any previous survey. All other major groups except oligochaetes are absent or virtually so. The polychaete *Aricidea philbinae* accounts for almost a third of the fauna and has been a consistent dominant in all surveys. Other taxa present throughout are the polychaetes *Prionospio heterobranchia* and *Capitella capitata*. Organism abundance and species richness are both much lower than previously recorded at this station, although diversity remains in the middle of the previously recorded range.

Note in Table 5, podocopan ostracodes were not identified to species in the first two surveys and probably represent *Cypredeis americana* and/or *Peratocytheridea setipunctata*, both found during subsequent surveys.

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. Faunal totals: 352, 15 species. H': 1.837. J': 0.678.

Polychaete relative abundance is lower than previously recorded here (33.5%) and ostracodes dominate for the first time since August 1991. Although not as abundant numerically as in January 1993, oligochaetes are relatively more abundant than previously. Peracarid crustaceans again exhibit low levels typical of both preceding August surveys. The most abundant taxa are the polychaete *A. philbinae*, the oligochaete *Limnodriloides rubicundus* and the ostracode



*Cyprideis americana*. Consistently important taxa at this station include *A. philbinae* and podocopan ostracodes. Organism abundance and species richness are lower than in any previous survey. Richness and diversity values, and peracarid abundances may reflect a seasonal variation: all three are low during the August surveys. The current survey was taken at low tide and the water temperature, although not measured, almost certainly exceeded 30°C.

Note in Table 5, podocopan ostracodes were not identified to species in the first two surveys and probably represent *Cyprideis americana* and/or *Peratocytheridea setipunctata*, both found during subsequent surveys.

Station 11: At north corner of the northern entrance to Whiskey Creek. Depth: approximately 4 m. (This is about half as deep as in the previous survey because a suitable sediment accumulation was again located along the channel wall.) Bottom: Fine mud among large boulders (riprap). Faunal totals: 409 specimens, 40 species. H': 2.656. J': 0.720.

Polychaetes have decreased substantially in relative numbers since the last survey (57.5, down from 76.7%), but still dominate. Oligochaetes and molluscs each contribute 18.8% of the fauna, the latter representing a much greater component than in any previous survey. The most abundant taxa are the polychaetes *M. californiensis* and an unidentified cirratulid, the oligochaete *T. motei* and the gastropod *Caecum pulchellum*. Probably because of the difficulty we have experienced in repeatedly sampling the same microhabitat at this station, no individual species has been consistently present in all surveys. Organism abundance is slightly greater than in January 1993 and slightly less than in August 1992. Richness is slightly lower than in the last survey and much lower than in August 1992, but is still much greater than in the first two surveys.

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. Faunal totals: 166 specimens, 27 species. H': 2.760. J': 0.837.

Relative abundances of major groups approach those recorded in August 1991. Polychaetes are again the overwhelmingly dominant group (70.5%). Molluscs (14.5%) are more important than previously, but oligochaetes have declined sharply (9.0% down from 32% in the

last two surveys). The most abundant taxa are the polychaetes *A. taylori* and *M. californiensis*, and the gastropod *C. pulchellum*. None of these have been consistent dominants at this station. Organism abundance and species richness are sharply lower than in any previous survey except August 1991.

Station 14: East side of ICWW opposite northern margin of Southport Turning Notch. Depth: approximately 1.5 m. Bottom: Fine muddy sand with algal turf and numerous algae-covered rocks. Faunal totals: 510 specimens, 56 species.  $H'$ : 3.073.  $J'$ : 0.764.

Polychaetes are again dominant (60%), followed by ostracodes (14.1%) and oligochaetes (12%). Although not reflected by relative numbers, absolute abundances of peracarids may show a seasonal variation with greater numbers present in January surveys. The most abundant species are the polychaetes *Aricidea philbinae* and *Pseudopolydora* sp. B, the oligochaete *Limnodrioides rubicundus*, and the ostracode *Peratocytheridea setipunctata*. Several polychaetes and the gastropod *C. pulchellum* have been present in every survey here, but none has been a consistent dominant. Organism abundance and species richness are less than in January 1993, but remain higher than in the three earlier 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. Faunal totals: 4876 specimens, 24 species.  $H'$ : 2.139.  $J'$ : 0.673.

This station continues to exhibit a fauna that differs strongly from all other stations. Peracarid crustaceans continue to dominate, but their relative abundance (32.2%) has declined to the same low level reported in August 1991 (31.3%). Similarly, sipunculan and molluscan relative abundances have increased to about August 1991 levels. Polychaetes have also increased, but not as much. The tanaidacean *Kalliapseudes aliciae* is still by far the most abundant organism (24.2% of all specimens), but is now accompanied by over 800 specimens of sipunculans (*Aspidosiphon muelleri*), over 500 each of the gastropods *Caecum pulchellum* and *C. imbricatum*, and the ostracode *Rutiderma darbyi*. Other abundant taxa include the polychaetes *Ehlersia cornuta* and *Nematonereis hebes* and the isopod *Exosphaeroma productitelson*. The sipunculan

*A. muelleri* appears to have replaced the closely related *A. albus* which was previously abundant here. A possible explanation is that the former prefers to live in empty gastropod shells. Here, it occupies shells of *Batillaria minima* which was collected here alive as well for the first time. Organism abundance exceeds the previously recorded maximum (August 1992) by 33%, accounts for 48% of all specimens collected in this survey, and is by far the greatest for any station in any of the surveys so far. Species richness is about the same as in January 1993, but has declined from August 1992: 24 species down from 36.

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. Faunal totals: 594 specimens, 68 species.  $H'$ : 3.438.  $J'$ : 0.815.

Polychaetes are relatively more abundant than in any previous survey here (67.3%), while oligochaetes (14.0%) have declined to the same low level as in the first two surveys (13.9 and 12.3%). No other group accounts for more than 6% of the fauna. The most abundant taxa are the polychaetes *Caulleriella* cf. *alata* and *Lumbrineris verrilli*. Taxa present in every survey and often abundant include the polychaetes *A. taylori*, *L. verrilli* and *Prionospio heterobranchia*, the gastropod *C. pulchellum* and the oligochaete *T. motei*. Organism abundance has declined somewhat from the previous two surveys, but species richness (68) is very high, higher than in any previous survey at this station. The diversity index (3.438) is the greatest recorded at any station so far.

Station 19a: Whiskey Creek on a line due east of station 18. Depth: 0.2 m. Bottom: Fine peaty mud with some sand and shell debris. Faunal totals: 192 specimens, 21 species.  $H'$ : 1.988.  $J'$ : 0.653.

Ostracodes (34.4%) are now the most abundant group, although both they, polychaetes and nemertines have declined sharply in absolute numbers from the preceding survey. The most abundant taxa are the ostracode *P. setipunctata*, the sipunculan *Phascolion cryptum*, and the polychaete *Tharyx dorsobranchialis*. Only the amphipod *Grandidierella bonnieroides* and probably the ostracode *P. setipunctata* (the latter not definitely identified among podocopan ostracodes in the first two surveys) are present in numbers in every survey here. Organism

abundance, richness and diversity have all declined sharply from the preceding survey to about August 1992 levels.

### C.3. Crab Census

Table 9 lists all crab census data including numbers of burrows, species and specimens, diversity indices and evenness values. Table 10 summarizes crab census data (except burrow numbers) for all surveys. Of ground-dwelling crabs, the grapsid *Sesarma curacaoense* and the ocypodid fiddler crab *Uca thayeri* are the most abundant taxa, followed by *Uca rapax*, *U. pugilator*, *U. speciosa*, *Eurytium limosum*, an unidentified xanthid, *Aratus pisonii* and *Uca* sp. (juveniles). Another species of *Sesarma*, probably *S. cinereum*, was again collected at station 10A, but was found only on the sediment surface, not in burrows. As in most previous surveys, *S. curacaoense*, *U. thayeri*, *U. speciosa* and *E. limosum* are restricted to stations on the west side of the ICWW, while *U. rapax* and *U. pugilator* occur only at stations on the east side of the ICWW.

Tree crab (*Aratus pisonii*) counts at stations west of the ICWW are substantially less than in January 1993, but remain greater than in August 1992. They are again absent at stations 10 and 15, but again occur in abundance at station 16. All crab census results are summarized below.

Station 1a: Edge of red mangrove fringe adjacent to rip rap at northeast corner of Southport Turning Notch. Crab census data: *Sesarma curacaoense* (3), unidentified xanthid, *Uca thayeri*, *U. speciosa* and *Uca* sp. (juveniles) (1 each); *Aratus pisonii* (1 specimens in 1 tree/m<sup>2</sup>). Number of burrows by replicate: 53, 82, 74. Shannon-Weaver Diversity Index (H'): 1.494. Evenness (J'): 1.078.

Station 2: In dense red mangrove fringe 10 m north of Turning Notch and 10 m west of ICWW. Crab census data: *S. curacaoense* (10), *U. thayeri* (1); *A. pisonii* (3 in 2 tree/m<sup>2</sup>). Number of burrows by replicate: 156, 154, 135. H': 0.305. J': 0.439.

Station 3: In dense red mangrove fringe 3 m east of natural drainage canal, 10 m north of Turning Notch. Crab census data: *S. curacaoense* (2), *Uca speciosa* (3), *U. thayeri* (2); *A. pisonii* (2 in 3 trees/m<sup>2</sup>). Number of burrows by replicate: 117, 134, 98. H': 0.693. J': 0.631.

Station 4: In dense red mangrove fringe 10 m north of Turning Notch and approximately 40 m west of drainage canal. Crab census data: *S. curacaoense* (9), *Eurytium limosum* (1), *Uca thayeri* (1); *A. pisonii* (4 in 3 trees/m<sup>2</sup>). Number of burrows by replicate: 165, 128, 176. H': 0.600. J': 0.546.

Station 5: In dense red mangrove fringe 30 m north of station 4. Crab census data: *S. curacaoense* (6), *Uca thayeri* (5); *A. pisonii* (2 on 2 trees/m<sup>2</sup>). Number of burrows by replicate: 94, 155, 115. H': 0.689. J': 0.994.

Station 6: In dense red mangrove fringe 3 m east of natural drainage canal and 10 m north of station 3. Crab census data: *Eurytium limosum* (3), *Uca thayeri* (1), *Uca* sp. (juv.) (1); *A. pisonii* (6 in 4 trees/m<sup>2</sup>). Number of burrows by replicate: 132, 133, 87. H': 0.950. J': 0.865.

Station 7: In dense red mangrove fringe 30 m north of station 2. Crab census data: *S. curacaoense* (4), *E. limosum* (2), unidentified xanthid (1), *U. thayeri* (1); *A. pisonii* (1 on ground, 8 in 3 trees/m<sup>2</sup>). Number of burrows by replicate: 123, 113, 74. H': 0.1.183. J': 0.735.

Station 10: In open area among scattered large red mangroves east of the center of small island on east side of ICWW north of northern entrance to Whiskey Creek. Crab census data: *Sesarma ?cinereum* (3); *A. pisonii* (0 in 1 tree/m<sup>2</sup>). Number of burrows by replicate: 3, 0, 1. H': 0. J': 0.

Station 12: On high ground among Australian pine trees at a point intersected by lines running due east from station 11 (north side of northern entrance to Whiskey Creek) and due north of station 13. Crab census data: no crabs, no burrows.

Station 13: On sand among shrubby white mangroves north side of Whiskey Creek approximately 20 m west of North Ocean Drive bridge. Crab census data: *Uca pugilator* (5). Number of burrows by replicate: 15, 19, 18. H': 0. J': 0.

Station 15: Among dense red mangrove fringe 35 m west of North Ocean Drive on line running east of north side of Turning Notch. Crab census data: *U. rapax* (6); no tree crabs in 2 red mangroves. Number of burrows by replicate: 26, 30, 35. H': 0. J': 0.

Station 16: Among red mangroves 110 m east of North Ocean Drive on line running due

east of north side of Turning Notch. Crab census data: *Uca rapax* (3); *A. pisonii* (13 on 1 tree/m<sup>2</sup>). Number of burrows by replicate: 40, 46, 98. H': 0. J': 0.

### C.5. Hand Collections

A total of about 735 specimens representing 14 taxa were collected at the three hand collection stations. Table 11 lists all raw data, diversity indices and evenness values by station and by replicate. Table 12 summarizes hand collection station data for all surveys.

The snail, *Batillaria minima*, accounts for 41% of all specimens collected, and the springtail, *Anurida maritima*, about 43%. Figures for the latter at station replicates 13-2 and 17-2 are estimates due to dense clusters found (perhaps caught or sheltering) in air pockets under intertidal rocks. Only twelve and two specimens, respectively, were counted in these samples apart from the clusters. Barnacles, now chiefly *Chthamalus stellatus*, are more abundant than in January 1993, but remain in lower numbers than in the preceding surveys. They remain dense on small rocks immediately outside the transect area and on adjacent rip-rap, however. Results are summarized below.

Station 9: Intertidal rubble in a red mangrove fringe protected from heavy wave action by adjacent rip-rap on the southwestern corner of a small island along the east side of the ICWW just north of the northern entrance to Whiskey Creek. Numerous rocks with red algal turf and a dark, possibly cyanobacterial, crust. A green algal turf occurs higher on mangrove prop roots. H': 1.611. J': 0.672.

The gastropod *Batillaria minima* is the most abundant organism, followed by the barnacle *Chthamalus stellatus* and the springtail *Anurida maritima*. The vermetid gastropod *Petalonchus varians* is more abundant than previously. Adjacent boulders (rip-rap) appear to support the same intertidal fauna as recorded in previous surveys.

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 taken between fringe of shrubby white mangroves and water's edge. Small mangrove seedlings noted in previous surveys are no longer present. H': 0.871. J': 0.486.

With the exception of a cluster of *A. maritima* in replicate 2, *Batillaria minima* is the overwhelming dominant. Several small xanthids and juvenile *Uca* sp. were noted outside the transect. Rocks and sediment lower in the intertidal zone support a varied fauna including hermit crabs, barnacles and bivalves.

Station 17: Intertidal, coarse shelly sand and gravel with filamentous green algae, among partly algae-covered red mangrove roots and white mangrove pneumatophores with partly buried rocks, west side of Whiskey Creek, on a line running due east of the north side of the Turning Notch and about 500 m north of the footbridge. Meter transects were taken along the mangrove roots closest to the water's edge.  $H'$ : 0.557.  $J'$ : 0.507.

Apart from a cluster of *A. maritima* in replicate 2, *Batillaria minima* is the most abundant taxon, although it appears in far fewer numbers than in January 1993.

## D. DISCUSSION

### D.1. Grab samples

Overall organism abundance is 15% lower than in January 1993, having declined at eight of the eleven stations. It remains over 10% greater than in August 1992, however, and about 2.5 times greater than in January 1992 and August 1991. Species richness decreases at nine stations relative to January 1993, and at six stations relative to August 1992. Station 9 alone records a richness value lower than in any previous survey at that site. Stations 8a and 18 record higher richness values than previously. Diversity indices decline at seven stations from January 1993 levels; all of these stations also show decreases in richness; six also show declines in organism abundance. Limited correlation exists between these declines and environment, however: west ICWW stations 1 and 8 and east ICWW stations 13a and 14 exhibit declines while stations 8a (west ICWW) and 18 (east ICWW) exhibit increases in most or all parameters. Sharp decreases in abundance, richness and diversity at stations 9 and 10a may be due to extremely warm temperatures at extreme low tide. Although temperature was not measured, the water at station 10a was estimated to be  $>30^{\circ}\text{C}$ . Station 9 is only about 50 m from 10a.

Five surveys have now been taken by Nova University personnel including samples in three successive summers. A few limited patterns may now be recognized. The three west ICWW stations (1, 8, 8a) all exhibit important progressive increases in absolute and relative abundances of oligochaetes and absolute numbers of polychaetes over the five surveys (Tables 6, 7). The east ICWW stations (13a, 14, 18) also exhibit the same increases in oligochaetes, but all show sharp declines in the most recent August 1993 survey. Stations 9 and 11 do not follow this trend, but probably represent different microhabitats. Station 9 is at the mouth of a shallow creek and appears to be faunally related to nearby station 10a in the creek. Station 11 is located in sediment pockets on the steep rip-rap wall of the ICWW.

The other pattern is an apparent seasonal variation. Peracarid crustaceans--the cumacean *Oxyurostylis* sp., the tanaidacean *Leptochelia rapax*, and the corophiid amphipods *Cerapus* n. sp. and *Grandidierella bonnieroides*--all exhibit January increases in numbers at the three east ICWW stations and shallow creek stations 9 and 10a (Tables 4, 5). The polychaetes *Ehlersia cornuta* and *Nematoneris hebes* both show August increases at station 17.

Tables 4 and 5 show that some species are consistently important faunal components at different stations (e.g., *Aricidea taylori* at 1, 8, 8a; *A. philbinae* at 9 and 10a; *Kalliapseudes aliciae* and *E. cornuta* at 17) and may prove characteristic of those sites over a longer term. Other species are similarly important, but less consistently so and it is not yet clear if they represent taxa characteristic of their localities. Thus, *Caecum pulchellum* and *C. imbricatum* are abundant at station 17, but were both absent in January 1992; *Capitella capitata* occurs in abundance at 10a in three of five surveys; *Tubificoides motei* is abundant at stations 1, 8, 8a and 18 except in the first one or two surveys. The latter may be part of the general increase in oligochaete abundance and richness at many stations mentioned above. It is not clear, however, if this increase represents a post-dredging environmental change, a return to pre-dredging conditions, or a variation un-related to dredging and/or mitigation.

One interesting faunal change is apparently unrelated to dredging at the Turning Notch because it has occurred at station 17 in Whiskey Creek. It may, however, be related to mangrove mitigation at the north end of the creek which may have altered flow patterns. In the most recent



survey (August 1993), the sipunculan *Aspidosiphon muelleri* apparently replaced *A. albus*. Our consultants, Mary Rice and Julie Piraino (Smithsonian Institution), double-checked the identification because they noted (personal communication, January 1994) that *A. muelleri* is typically found in deeper water. It is more frequently found in empty gastropod shells than is *A. albus* and its appearance may be explained by the co-appearance of large numbers of living individuals and dead shells of the gastropod *Batillaria minima*. This snail is very abundant along the shore of Whiskey Creek (see Hand Collection Station 17) but it has never before been found in the middle of the creek channel at the Ponar grab site.

Several species appear to be transients (e.g., the polychaetes *Leitoscoloplos robustus* at sta. 9, 10a and 11, *Tharyx marioni* at several stations in January 1993, *Nematonereis hebes* at 8, the nemertine *Tubulanus pellucidus* at 19a). It will be interesting to see if any pattern of occurrence appears over a longer period of time.

#### D.2. Crab Censuses

Crab abundance on the west side of the ICWW north of the Turning Notch is greater than reported in January 1993, but not as great as in August 1992. The fauna at these stations remains similar to that found in previous August surveys: *Sesarma curacaoense* dominates, accompanied by *Eurytium limosum*, *Uca thayeri* and *U. speciosa*. All are more abundant during summer surveys and the latter species has not been found here in either January survey. Tiny juvenile *Uca* sp. are found most often during January. During the last three surveys, the tree crab, *Aratus pisonii*, has tended to occur in greater numbers at the three stations within the mangrove forest (5, 6, 7) than at the four stations adjacent to the Turning Notch (1a, 2, 3, 4).

As in January 1993, station 10 exhibits specimens of a different species of *Sesarma*, probably *S. cinereum*. *Uca pugilator* again occurs at station 13, now in four of five surveys here. Stations 15 and 16 are again characterized by *Uca rapax*, now found at these stations in three of the five surveys. As at west ICWW stations, tiny juvenile *Uca* sp. are found at east ICWW stations only in the January surveys. Tree crabs occur at all four east ICWW stations (10, 13, 15, 16) in most surveys and exhibit no pattern of variation over time.

Station 12 again records no crabs. As mentioned in the last report, it is not clear that the spot identified as station 12 in August 1991 is the same as that used previously. Earlier sampling efforts (before August 1991) recorded both *Uca rapax* and *U. pugilator* and the grapsid *Sesarma ricordi* here. Directions provided to us by the previous contractor place this station on high ground where no crabs were observed.

### D.3. Hand Collections

Station 9 continues to maintain a typical intertidal fauna. This survey records most of the species found in earlier surveys with two exceptions. We found no brachyurans and fewer barnacles within the transect areas; also, the barnacles present include a different species than previously reported (*Chthamalus stellatus*). Barnacles and other typical intertidal organisms (e.g., isognomonids) remain abundant on adjacent rip-rap. Despite the lack of brachyurans, species richness is similar to most preceding surveys, and diversity is higher than previously.

As in earlier surveys at station 13, *Batillaria minima* dominates the fauna (except for a cluster of *Anurida maritima* under one rock in replicate 2). The absence of barnacles again appears due to the patchy distribution of the larger rocks that barnacles appear to prefer.

Abundance of *Batillaria minima* at station 17 approaches that recorded during the first three surveys and is much less than that reported in January 1993. The large number of *Anurida maritima*, as at station 13, derives from a single dense cluster found under one rock in one replicate. Species richness is lower than previously recorded here. Extremely low diversity indices at stations 13 and 17 in several surveys are due to overwhelming dominance by either *B. minima* or *A. maritima*.

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TABLE 1. Grab Collection Stations: raw data, diversity (H') and evenness (J'): August 1993.

STATION	1			8			8a			9			10a			11			13a			14			17			18			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	1	2	3	TOT		
TAXON																																				
Family MONTACUTIDAE																																				
Montacuta sp.																															2			2		
Family SOLECURTIDAE																																				
Tagelus divisus																																	1		1	
Family TELLINIDAE																																				
Macoma constricta			2				2																			7	2								13	
Tellina sp.			2																																2	
Family CORBULIDAE																																				
Corbula sp.													2																						2	
unidentified bivalve																									1										1	
Phylum ANNELIDA																																				
Class POLYCHAETA																																				
Order ORBINIDA																																				
Family ORBINIDAE																																				
Leitoscoloplos fragilis												1	4											1	1										7	
Leitoscoloplos sp. (juv.)													11											1											12	
Scoloplos rubra	6	2						4								3								1				3	8	2					30	
Scoloplos texana																													1						1	
Family PARAONIDAE																																				
Aricidea cf. catherinae																				4	8														28	
Aricidea philbiniae		2						20	6	9	31		52	28	4	8	2						5	14	12			1		1	2	8		205		
Aricidea taylori	2	50	10	20	2	94	34	48	26					4	1						20	1		11	25	31		1	6	8		1		403		
Aricidea sp.			4														3																		7	
Cirrophorus sp. A																							1												1	
Paraonis fulgens										3	3																								6	
Order COSSURIDA																																				
Family COSSURIDAE																																				
Cossura soyeri	2		6	2				4	2																										16	
Order SPIONIDA																																				
Family SPIONIDAE																																				
Polydora socialis																												3								3
Prionospio heterobranchia		8	8	10				4	4	2	3				7	2	4	6				1	9	10			5	12	9						106	
Prionospio sp.	2					2																	1												9	
Pseudopolydora sp. B	2							4	4	2								4	6	8			25	19	26			1	18	12					131	
Scolelepis texana											1																						1			2
Spio pettiboneae							2								2																			1		6
Unidentified spionid																			2				1		1				2						6	
Family CHAETOPTERIDAE																																				
Spiochaetopterus cf. oculatus								4																												4
Family CIRRHATULIDAE																																				
Caulerietta cf. alata																1								3	9			24	54	16						107
Caulerietta sp.	32		2	4		6	12		2						15	8	1						10	1				8							102	
Cirriformia sp.																							1										2			3

TABLE 1. Grab Collection Stations: raw data, diversity (H') and evenness (J'): August 1993.

STATION	1			8			8a			9			10a			11			13a			14			17			18			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	1	2	3	1	2	3	
<b>TAXON</b>																																					
<i>Tharyx dorsobranchialis</i>	6	4	6	12		2	4									2		4																38			78
Unidentified cirratulid (juv.)	2	4	28	8	2	4	72	24								28	10	16	4	3	2	4	2	3				6	6	4							232
<b>Order CAPITELLIDA</b>																																					
<b>Family CAPITELLIDAE</b>																																					
<i>Capitella capitata</i>	2					2													2	1				6						2							31
<i>Capitomastus</i> sp.																																					2
<i>Dasybranchus</i> sp.																											1										1
? <i>Leiochrides pallidor</i>																																					1
<i>Mediomastus californiensis</i>	42	16	36	28		26	4	32	72							37	14	22				11	13	6	1					12	11						383
<i>Mediomastus</i> sp.	2	4		2				4								3		3	6	1	2						2	1	1	2	3	4					40
<i>Notomastus americanus</i>																												1									1
<i>Notomastus latericeus</i>						2																															2
<i>Notomastus</i> sp.																1								1				2									4
<b>Family HESIONIDAE</b>																																					
<i>Podarke obscura</i>																														1							1
<b>Family PILARGIIDAE</b>																																					
<i>Cabira incerta</i>																								1													1
<b>Family SYLLIDAE</b>																																					
<i>Ehlersia cornuta</i>	2											2													74	116	225	1					3				423
<i>Exogone arenosa</i>	12								6																			1	4								23
<i>Exogone atlantica</i>	2								10																												12
<i>Exogone dispar</i>	2							4							1																		1				8
<i>Exogone lourei</i>			2																																		2
<i>Exogone</i> sp. (juv.)	4																							2													6
<i>Haplosyllis spongiicola</i>															1																						1
<i>Sphaerosyllis riseri</i>	12		6	4		34	2		20			2			1									1						10	1						93
<i>Sphaerosyllis taylori</i>	2	4		12	2		4	36	6				4	2										1	3	1											77
<i>Sphaerosyllis</i> sp.																								1													1
<i>Streptosyllis pettiboneae</i>																								2	9	2				2							15
Unidentified syllid (juv.)	2		2																								2						4	2	1		13
<b>Family GLYCERIDAE</b>																																					
<i>Glycera abbranchiata</i>	2		2	2			2					2												2						1	1	2	1				17
<b>Family AMPHINOMIDAE</b>																																					
<i>Paramphinome</i> sp. B																												1	1								2
<b>Order EUNICIDA</b>																																					
<b>Family EUNICIDAE</b>																																					
<i>Nematoneis hebes</i>	2							4							3		1								74	121	61	10									276
Unidentified eunicid												1																									1
<b>Family LUMBRINERIDAE</b>																																					
<i>Lumbrineris vermili</i>	48	10	16	22	2	18	20	40	2	5					14		5							3	1	2	5			14	30	14				271	
<i>Lumbrineris</i> sp. B	2	4				4			2						1		1										1										15
<b>Family ARABELLIDAE</b>																																					
<i>Arabella multidentata</i>																												1									1

TABLE 1. Grab Collection Stations: raw data, diversity (H') and evenness (J'): August 1993.

STATION	1			8			8a			9			10a			11			13a			14			17			18			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	1	2	3				
TAXON																																					
Family DORVILLEIDAE																																					
Ophryotrocha sp. A												17																			1			18			
Pettiboneia duofurca		2																													1		1	4			
Schistomeringos cf. rudolphi																															4			4			
Order TEREBELLIDA																																					
Family TEREBELLIDAE																																					
Polycirrus plumosus																															3			3			
Family TRICHOBRANCHIDAE																																					
Terebellides stroemi																								1										1			
Family BOGUEIDAE																																					
Boquea enigmatica												1						2			1													4			
Order SABELLIDA																																					
Family SABELLIDAE																																					
Fabriciella sp. A	12								12									2						1	1			14					42				
Notaulax sp.																																	1	1			
Sabella melanostoma									52						2		1								2			12					69				
Unidentified sabeliid (juv.)			10	22		16		24	2					1		1						2	17	6				20				120					
Class OLIGOCHAETA																																					
Family TUBIFICIDAE																																					
Ctenodrilus serratus				2																														2			
Limnodriloides barnardi	4		12		6	2	16	8				2		6	1		2					1	1	1				6	1	3		72					
Limnodriloides monospermathecus																															2			2			
Limnodriloides rubicundus	2		14		26		36					32	12	2				4				1	12	20			1	6	1	2		171					
Pectinodrilus molestus																											57							57			
Smithsonidrilus hummelincki	12	6	38	10	4	44	10	80	30			2			9	9				10	1	6	2				4	16	8	1		302					
Tectidrilus bori	8		8	8		8		8	4						1																		45				
Tectidrilus gabriellae	4	10		42	6	22											5						1				2		1			93					
Tectidrilus sp.		2				2		4						2																			10				
Thalassodriloides gurwitschi												7		12										3							1		23				
Tubificoides bermudae			2																					2										4			
Tubificoides cf. brownae																																1		1			
Tubificoides motei	14	28	84	134	12	76	16	196	44						33	4	13					2	4	5			5	20	7			697					
Tubificoides parviductus	10	2	2					4																									18				
Unident. tubificid	6							4	4				1	2												1		1	2			21					
Phylum SIPUNCULA																																					
Order GOLFINGIIFORMES																																					
Family GOLFINGIIDAE																																					
Nephasoma sp.									2																									2			
Family PHASCOLIONIDAE																																					
Phascolion cryptum																													2		23	9	2	36			
Order ASPIDOSIPHONIFORMES																																					
Family ASPIDOSIPHONIDAE																																					
Aspidosiphon muelleri																																		180	337	286	803





TABLE 1. Grab Collection Stations: raw data, diversity (H') and evenness (J'): August 1993.

STATION	1			8			8a			9			10a			11			13a			14			17			18			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	1	2	3				
<b>TAXON</b>																																					
<i>Granddicerella bonnieroides</i>		8			2			2									1			2			1	2								3			3		26
Unident. amphipod fragment			4											2																							6
Order DECAPODA																																					
Infraorder CARIDEA																																					
Family ALPHEIDAE																																					
<i>Alpheus floridanus</i>			2																												2						
<i>Alpheus</i> sp.																															1	2					
<i>Salmoneus cavicolus</i>			2																												2						
Family PALAEMONIDAE																																					
<i>Periclimenes cf. americanus</i>	2																												1								
<i>Periclimenes</i> sp.																															2						
Unident. palaemonid																															2	1					
Family PROCESSIDAE																																					
<i>Processa</i> sp.																															2	1					
Unidentified caridean																															1						
Infraorder ANOMURA																																					
Family PAGURIDAE																																					
<i>Pagurus maccloughlinae</i>																															1	1	1				
Phylum ECHINODERMATA																																					
Class OPHIUROIDEA																																					
Unidentified ophiuroid	2																												2	8	2	2	1	2	1		
UNKNOWN																																					
<b>TOTAL</b>	280	182	318	370	32	436	178	668	390	24	95	11	110	70	172	219	56	134	76	37	53	84	256	170	1503	1619	1754	169	294	131	86	69	37	10083			
Total # species (by replicate)	39	22	29	24	8	29	18	30	33	10	13	4	9	5	10	34	8	21	14	13	13	27	39	31	19	16	13	43	37	29	13	11	3				
H' (by replicate)	3.012	2.550	2.653	2.402	1.808	2.613	2.038	2.690	2.770	1.964	2.106	0.886	1.440	1.240	1.323	2.711	1.824	2.427	2.228	2.205	2.138	2.658	2.893	2.806	2.031	2.120	2.088	3.220	3.093	2.865	1.690	1.713	0.333				
J' (by replicate)	0.822	0.825	0.788	0.756	0.869	0.776	0.705	0.791	0.792	0.853	0.821	0.639	0.655	0.770	0.574	0.769	0.877	0.797	0.844	0.859	0.834	0.806	0.790	0.817	0.690	0.764	0.814	0.856	0.857	0.851	0.659	0.715	0.303				
Total # species (by station)	58			36			50			21			15			40			27			56			24			68			21			140			
H' (by station)	3.193			2.671			2.994			2.406			1.837			2.656			2.760			3.073			2.139			3.438			1.988						
J' (by station)	0.786			0.745			0.765			0.790			0.678			0.720			0.837			0.764			0.673			0.815			0.653						

TABLE 2. Summary of Major Taxonomic Groups in Grab Collections, August 1993.

STATION	1	8	8a	9	10a	11	13a	14	17	18	19a	TOT
NEMERTINA	22	20	34	1	0	9	5	7	0	14	0	112
MOLLUSCA	8	26	38	2	0	77	24	37	1258	34	22	1526
POLYCHAETA	452	368	640	117	118	235	117	306	686	400	56	3495
OLIGOCHAETA	268	402	466	10	70	77	15	61	58	83	8	1518
SIPUNCULA	0	0	2	0	0	0	0	0	803	2	34	841
OSTRACODA	0	6	4	0	162	2	0	72	503	10	66	825
PERACARIDA	18	12	38	0	2	2	5	22	1568	31	4	1702
OTHERS	12	4	14	0	0	7	0	5	0	20	2	64
TOTAL	780	838	1236	130	352	409	166	510	4876	594	192	10083



TABLE 4. Summary of Major Taxa by Survey: Typical Intracoastal Waterway (ICWW) Stations.

STATION	1					8					8a					13a					14					18						
SURVEY	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93		
MAJOR TAXON																																
NEMERTINA																																
<i>Carinomella lactea</i>	6		2	15	6	6	2	4	32	8	8		2	8	18			7		1			2	1	3					7	3	4
<i>Hubrechtella dubia</i>	10		4			6	7				4							13					3						2	25		
<i>Tubularus pallucidus</i>	4			35	6			4	37	8	2		3	57	16				1						6	2				2	9	2
GASTROPODA																																
<i>Batillaria minima</i>																																
<i>Caecum pulchellum</i>	36			60	4	4	4	8	71	24	10		1	31	32	7	3	25	27	22	13	6	9	24	24	42	9	14	92	32		
<i>Caecum imbricatum</i>										2																						
POLYCHAETA																																
<i>Leitoscoloplos fragilis</i>																									27	2						
<i>Leitoscoloplos robustus</i>									1																139							
<i>Scoloplos rubra</i>			1	6	8			1							4					2				1	1				114	5	13	
<i>Aricidea cf. catherinae</i>			5															5	129	12												
<i>Aricidea philibinae</i>	8			59	2		4				4	2	1	2	26	76	26	5	127		60	52	2	204	31	12	19	1	25	2		
<i>Aricidea taylori</i>	14	54	13	21	62	56	180	25	34	116	32	4	161	99	108			2		58	21			12	16	67		7	5	70	15	
<i>Prionospio cristata</i>			1	5			6	2				8		2				7		10			1	14				2	5	1		
<i>Prionospio heterobranchia</i>	52			7	16	8		4	4	12	14		8		8	2	1	6	1	6	11	5	3	2	20	6	1	22	3	26		
<i>Pseudopolydora spp.</i>			1		2	2	2	4	2		6	6		2	10	49	1	1	6	18	23	2	3	4	70		2	6		31		
<i>Caulierella killariensis</i>	6																			43				60		2			7			
<i>Tharyx dorsobranchialis</i>		2	3	6	16		2	6		14		2	2		4			1				2	3	6					48			
<i>Tharyx marioni</i>				69					69					12						7				6			2	17	8			
<i>Tharyx sp.</i>			1	1				3	3				2					2	1			1	1									
<i>Capitella capitata</i>	6		1		2					2			1			1	1		1	3			5	48	6		3	1	1	2		
<i>Mediomastus californiensis</i>			62		94			66		54	2	4	13		108			33		24			8		7		1	28		23		
<i>Mediomastus sp.</i>	86	12		219	6	20	16		184	2	36	22		61	4	2	2		23	9	6	7		13	2	2	6		36	7		
<i>Unident. capitellid</i>				12					39					8										57								
<i>Ehlersia comuta</i>					2			2	10		4		1	2		3	3	1	4		1	2		5				4		1		
<i>Exogone dispar</i>	4			36	2		2	2	40					2	4	7			20					15				2		1		
<i>Sphaerosyllis longicauda</i>	4			1					8		2								9					19					34			
<i>Sphaerosyllis riseri</i>	2			10	18		2	1	21	38		2		1	22				22			1		13	1	4	1		17	11		
<i>Sphaerosyllis taylori</i>	2			2	6		8			14	4	2		27	46				13			1		16	5		1		6			
<i>Sphaerosyllis sp.</i>			3					35					21					2	67					8		1	1	21				
<i>Streptosyllis pettiboneae</i>	4															1	2				4	5	1	33	13		3	12	4	2		
<i>Laenoreis culveri</i>																																
<i>Glycera abranchiata</i>	2		3	20	4		8	2	11	2	2	14		3	2	5	6	1	27	2	7	10	1	13			15	2		4		
<i>Glycera sp.</i>						6			1									24		5			5				1					
<i>Nematoneis hebes</i>			4	43	2				144		2	6		6	4	2			3					1					22	10		
<i>Lumbrineris testudinum</i>			28					25											6					13					96			
<i>Lumbrineris verilli</i>	8			17	74	8			36	42	2			6	60				1	13	3	2	9		19	8	10	21	6		58	
<i>Ophryotrocha sp. A</i>	2																														1	
<i>Branchiomma nigromaculata</i>	2																2	1				1	1									
<i>Fabriciella sp. A</i>	2			4	12			8	54						12				2	2			1		89	1	9	18	2	14		
OLIGOCHAETA																																
<i>Limnodriloides barnardi</i>					16			2		6					26	3	2	20	3	1			1	2	2		1	3	5	7		
<i>Limnodriloides rubicundus</i>		6			16				1	26				1	36			3	20	4		2	11	3	33				44	8		
<i>Pecinodrilus molestus</i>																								2								

TABLE 4. Summary of Major Taxa by Survey: Typical Intracoastal Waterway (ICWW) Stations.

STATION	1					8					8a					13a					14					18							
SURVEY	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93			
MAJOR TAXON																																	
<i>Smithsonicrilus hummelincki</i>	26		6	52	56	72		40	27	58			36	20	120			145	135	10			67	83	9					79	28		
<i>Tectidrilus bori</i>			3	21	16			29	10	16			6	6	12								1	2						26	5		
<i>Tectidrilus gabriellae</i>			5	28	14			52	22	70			23	13									18	5	1					75	26	3	
<i>Thalassodrilides gurwitschi</i>																		3		53			3	2	25	3			6				
<i>Tubificoides bermudae</i>			4	1	2			2					2					1	2	1			1	8		2			15		1		
<i>Tubificoides motel</i>	20		24	72	126	4	4	97	55	222	4	2	46	68	256			4			1		39	19	11	8	4	157	89	32			
Unident. tubificid	22			21	6	6	10		4		8		4	8		8	9	2	48		2	9	1	7		6	11	2	12	3			
SIPUNCULA																																	
<i>Aspidosiphon cf. albus</i>																																	
<i>Aspidosiphon muelleri</i>																																	
OSTRACODA																																	
<i>Harbansus paucichelatus</i>																														1			
<i>Rutiderna darbyi</i>	2			1																													
<i>Cyprideis americana</i>																									2								
<i>Peratocytheridea setipunctata</i>																			24				13	70						19	1		
Unident. podocoran																					44					10	11						
PERACARIDA																																	
<i>Oxymystilis sp.</i>																		5		8			8	21	22			13		6			
<i>Kalliapseudes aliciae</i>								1	10				1												3								
<i>Leptochelia rapax</i>				1					4												21	2	1	1		26	7		3		3		
<i>Xenanthura brevitelson</i>													4	2											1			1		12	43	5	
<i>Exosphaeroma productitelson</i>																																	
<i>Ceraeus n. sp.</i>	2				2					8	8			18	6	69			6			3	62	2	18	17		4		8	5		
<i>Grandidierella bonnieroides</i>	6			12	8		12	2	12	4	4	4		8	2	1	21		19	3			44	34	2	4	50		28	3			

TABLE 5. Summary of Major Taxa by Survey: non-ICWW or atypical ICWW stations.

STATION	9					10a					11					17					19a						
SURVEY	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93		
MAJOR TAXON																											
NEMERTINA																											
Carinomella lactea	4		1	1									1	4	8												
Hubrechtella dubia	3		4										2					12	2								
Tubulanus pellucidus								16		6		1				2		2	17						85		
GASTROPODA																											
Batillaria minima								4													124	2		2	19		
Caecum pulchellum				1	1			5	2	12	14	4	76	190				153	572	594						1	
Caecum imbricatum														210			170	829	540								
POLYCHAETA																											
Leitoscoloplos fragilis	6	16		41	5	65	1																				
Leitoscoloplos robustus			43	97						85																	
Scoloplos rubra					1								1		3												
Aricidea cf. catherinae										16		26	3														
Aricidea philibinae	42	72	120	53	40	98	253	398	184	84	52			11	10						6	3		27	10		
Aricidea taylori	3		1		8			5		4				2	1			1								1	
Prionospio cristata		2		1							26	3	19													2	
Prionospio heterobranchia	20	3	5	5	5		5		2	4		2	10	13					1					3	6		
Pseudopolydora spp.	26	6	18	8		3	2	3	8	4		1														5	
Caulerella killariensis				2								1	8			2										5	
Tharyx dorsobranchialis			1								2	35	9	6										21	38		
Tharyx marioni													40													3	
Tharyx sp.												19	58											1	3		
Capitella capitata	21	2	295	189	10	4	138	340	255	6			3								2	10	194	3			
Mediomastus californiensis			1									50	73					2									
Mediomastus sp.	3								1	28	16		53	6	2					4							
Unident. capitellid				4																							
Ehlersia cornuta				1	2					16	10	2		328	18	212	89	415					3	3	3		
Exogone dispar				8			1	69				2	1	14			1										
Sphaerosyllis longicauda							16	32				1	1												1		
Sphaerosyllis riseri				1				1	2			1	3	1	6											4	
Sphaerosyllis taylori							6	143	4				1	2												1	
Sphaerosyllis sp.			3			3	6	157				5						8									
Streptosyllis pettiboneae		5	8	1			26	3	27														3	3			
Laeonereis culveri		1				3	210																				
Glycera abranchiata	3	57	1	9		2	8	10	2	10	2									1		1					
Glycera sp.							30						5														
Nematonereis hebes								1		2		11	5	4	88	28	39	7	256								
Lumbrineris testudinum			13					1				7															
Lumbrineris verilli	7	2		29	7						2	1	4	19													
Ophryotrocha sp. A			66	6	17		2	3																			
Branchiomma nigromaculata	4									42					8												
Fabriciella sp. A						2						2	2					3	1				7	192			
OLIGOCHAETA																											
Limnodriloides barnardi	1			4		1	3	5	8			4		3							2	3		3	3		
Limnodriloides rubicundus	12		9	4		6	21	12	46			3	11					1			2			1	2		
Pectinodrilus molestus																		58	44	57							

TABLE 5. Summary of Major Taxa by Survey: non-ICWW or atypical ICWW stations.

STATION	9					10a					11					17					19a							
SURVEY	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93			
MAJOR TAXON																												
<i>Smithsonidrilus hummelincki</i>	??		3	3	2			2			??	??	70	11	18											3	1	
<i>Tectidrilus bori</i>													8	11	1													
<i>Tectidrilus gabriellae</i>				1									5	1	5													
<i>Thalassodrilides gurwitschi</i>		2	40	9	7		10		83	12		2	2													12	1	
<i>Tubificoides bermudae</i>			3										17															
<i>Tubificoides motel</i>				3			1		1				76	14	50											2		
<i>Unident. tubificid</i>	9	2		4	1		2			2	6	4	5	7		12					1				2	3	6	
SIPUNCULA																												
<i>Aspidosiphon cf. albus</i>													1			68	328	172	115							1		
<i>Aspidosiphon muelleri</i>																				803								
OSTRACODA																												
<i>Harbansus paucichelatus</i>		1															78											
<i>Ruiderma darbyi</i>																46		7	587	502								
<i>Cyprideis americana</i>				3				78	124	134																34		
<i>Peratocytheridea setipunctata</i>			2	61				87	104	28																4	200	66
<i>Unident. podocopan</i>	31	157		2		218	79								6						12	29						
PERACARIDA																												
<i>Oxyurostylis sp.</i>		54		29			17		16																7	21		
<i>Kalliapseudes aliciae</i>														1	544	578	2161	1138	1182						2	6		
<i>Leptochefia rapax</i>		6		7		??	52	1	35				2					281	4									
<i>Xenanthura brevitetson</i>			1						5																	7	1	
<i>Exosphaeroma productitetson</i>															??		218	44	356									
<i>Cerapus n. sp.</i>	14	1		44			104	2	288							2	122	27	18							1		
<i>Grandiclerella bonnieroides</i>		36		27		2	79		68			2		1			10				6	23	10	23	3			

TABLE 6. Summary of Major Taxonomic Groups by Percent Occurrence in Grab Collections, August 1991-August 1993.

STATION	1					8					8a					13a					14					18				
SURVEY	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93
NEMERTINA	5.7	0.0	3.5	6.7	2.8	6.7	3.8	4.6	6.4	2.4	5.6	5.7	2.6	14.0	2.8	0.0	1.3	5.3	1.4	3.0	1.3	1.5	1.8	0.8	1.4	4.2	3.6	5.7	2.2	2.4
MOLLUSCA	14.7	2.3	0.5	6.9	1.0	9.3	1.3	1.8	9.8	3.1	6.7	0.0	0.8	6.1	3.1	4.3	2.6	5.5	5.3	14.5	10.1	2.7	5.0	3.6	7.3	38.9	4.3	2.6	12.6	5.7
POLYCHAETA	57.3	86.0	69.7	60.4	57.9	65.3	80.6	50.0	66.7	43.9	67.4	81.1	62.7	48.6	51.8	83.9	43.2	51.9	52.1	70.5	77.2	37.7	24.5	73.4	60.0	30.6	43.0	56.5	36.0	67.3
OLIGOCHAETA	17.5	7.0	22.4	21.0	34.4	10.7	6.9	41.8	11.9	48.0	6.7	1.9	30.8	24.7	37.7	5.9	9.0	32.0	32.9	9.0	2.0	6.2	58.3	11.6	12.0	13.9	12.3	33.7	33.3	14.0
SIPUNCULA	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.2	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
OSTRACODA	0.5	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.4	0.7	0.0	0.0	0.0	1.4	0.3	0.0	0.0	0.4	3.0	0.0	0.0	13.4	0.7	1.3	14.1	6.9	5.1	0.2	3.2	1.7
PERACARIDA	2.4	0.0	0.0	2.3	2.3	0.0	4.4	0.7	3.5	1.4	6.7	3.8	2.3	3.6	3.1	5.4	41.5	1.8	4.9	3.0	6.7	36.2	4.7	7.7	4.3	2.8	31.0	0.4	11.5	5.2
OTHERS	1.9	4.7	4.0	2.5	1.5	8.0	2.5	1.1	1.2	0.5	6.7	7.5	0.8	1.6	1.1	0.5	2.6	3.2	0.4	0.0	2.7	2.4	5.0	1.6	1.0	2.8	0.7	0.8	1.1	3.4

STATION	9					10a					11					17					19a					TOT				
SURVEY	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93
NEMERTINA	2.9	0.2	1.6	0.3	0.8	0.0	0.3	0.0	1.2	0.0	6.3	4.9	2.5	1.9	2.2	0.1	2.0	0.1	0.9	0.0	0.0	9.8	0.4	12.8	0.0	1.9	1.8	1.7	3.4	1.1
MOLLUSCA	3.7	6.6	2.4	3.1	1.5	1.9	1.9	1.4	1.3	0.0	7.2	1.6	3.7	1.4	18.8	22.2	0.0	8.9	28.1	25.8	0.0	8.9	0.4	1.7	11.5	15.2	2.5	5.1	10.8	15.1
POLYCHAETA	59.0	40.2	85.7	65.8	90.0	43.8	65.9	80.7	48.4	33.5	78.4	68.9	45.5	76.7	57.5	24.9	5.6	7.6	3.6	14.1	25.0	16.1	82.1	36.2	29.2	43.7	46.1	40.8	42.9	34.7
OLIGOCHAETA	13.9	1.4	8.5	4.5	7.7	0.0	1.8	2.7	5.9	19.9	3.6	14.8	45.5	16.3	18.8	0.7	2.0	1.7	1.5	1.2	16.7	6.3	6.7	3.2	4.2	5.0	4.3	15.8	11.6	15.1
SIPUNCULA	0.0	0.2	0.0	0.0	0.0	0.0	0.5	0.0	1.2	0.0	0.0	0.0	0.2	0.3	0.0	18.0	8.3	4.8	3.9	16.5	16.7	4.5	1.4	1.9	17.7	8.4	2.0	2.0	1.3	8.3
OSTRACODA	12.7	31.4	0.3	9.2	0.0	52.4	6.8	14.7	13.6	46.0	0.0	0.0	0.0	1.1	0.5	2.9	9.5	0.2	19.9	10.3	25.0	25.9	1.4	32.4	34.4	8.2	9.9	2.0	10.3	8.2
PERACARIDA	6.6	20.1	0.3	16.7	0.0	0.7	22.3	0.3	28.2	0.6	0.9	1.6	0.2	0.8	0.5	31.3	72.6	76.4	41.3	32.2	16.7	28.6	7.0	8.8	2.1	16.2	32.2	31.6	18.5	16.9
OTHERS	1.2	0.0	1.3	0.4	0.0	1.2	0.5	0.3	0.2	0.0	3.6	8.2	2.5	1.4	1.7	0.0	0.0	0.2	0.8	0.0	0.0	0.0	0.7	2.9	1.0	1.4	1.3	1.0	1.1	0.6



TABLE 7. Summary of Major Taxonomic Groups in Grab Collections, August 1991-August 1993.

STATION	1					8					8a					13a					14					18				
SURVEY	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93
NEMERTINA	24	0	7	64	22	10	12	21	72	20	10	6	10	71	34	0	3	30	11	5	2	5	5	9	7	6	10	48	17	14
MOLLUSCA	62	2	1	66	8	14	4	8	111	26	12	0	3	31	38	8	6	31	42	24	15	9	14	42	37	56	12	22	99	34
POLYCHAETA	242	74	140	574	452	98	258	226	752	368	120	86	242	246	640	156	101	292	412	117	115	127	68	860	306	44	119	474	282	400
OLIGOCHAETA	74	6	45	200	268	16	22	189	134	402	12	2	119	125	466	11	21	180	260	15	3	21	162	136	61	20	34	283	261	83
SIPUNCULA	0	0	0	0	0	0	2	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
OSTRACODA	2	0	0	1	0	0	0	0	4	6	0	0	0	7	4	0	0	2	24	0	0	45	2	15	72	10	14	2	25	10
PERACARIDA	10	0	0	22	18	0	14	3	40	12	12	4	9	18	38	10	97	10	39	5	10	122	13	90	22	4	86	3	90	31
OTHERS	8	4	8	24	12	12	8	5	14	4	12	8	3	8	14	1	6	18	3	0	4	8	14	19	5	4	2	7	9	20
TOTAL	422	86	201	951	780	150	320	452	1128	838	178	106	386	506	1236	186	234	563	791	166	149	337	278	1171	510	144	277	839	783	594

STATION	9					10a					11					17					19a					TOT				
SURVEY	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93
NEMERTINA	7	1	11	2	1	0	3	0	21	0	14	6	12	7	9	2	16	5	28	0	0	11	1	100	0	75	73	150	402	112
MOLLUSCA	9	33	17	22	2	8	22	16	22	0	16	2	18	5	77	404	0	326	831	1258	0	10	1	13	22	604	100	465	1284	1526
POLYCHAETA	144	202	598	472	117	182	760	912	832	118	174	84	221	277	235	454	46	278	106	686	12	18	234	282	56	1741	1875	3685	5095	3495
OLIGOCHAETA	34	7	59	32	10	0	21	30	101	70	8	18	221	59	77	12	16	61	44	58	8	7	19	25	8	198	175	1431	1377	1518
SIPUNCULA	0	1	0	0	0	0	6	0	21	0	0	0	1	1	0	328	68	176	115	803	8	5	4	15	34	336	82	181	153	841
OSTRACODA	31	158	2	66	0	218	79	166	233	162	0	0	0	4	2	52	78	7	587	503	12	29	4	253	66	325	403	185	1219	825
PERACARIDA	16	101	2	120	0	3	257	3	485	2	2	2	1	3	2	570	594	2790	1222	1568	8	32	20	69	4	645	1309	2854	2198	1702
OTHERS	3	0	9	3	0	5	6	3	3	0	8	10	12	5	7	0	0	7	24	0	0	0	2	23	2	57	52	88	135	64
TOTAL	244	503	698	717	130	416	1154	1130	1718	352	222	122	486	361	409	1822	818	3650	2957	4876	48	112	285	780	192	3981	4069	9039	11863	10083

TABLE 8. Summary of organism abundance, richness, diversity and evenness for all surveys.

STATION		SURVEY				
		Aug 91	Jan 92	Aug 92	Jan 93	Aug 93
1	Total # organisms	422	86	201	951	780
	Species Richness	51	10	38	66	58
	Diversity Index	3.162	1.365	2.667	3.105	3.193
	Evenness	0.804	0.593	0.733	0.741	0.786
8	Total # organisms	150	320	452	1128	838
	Species Richness	21	28	52	64	36
	Diversity Index	2.306	2.057	2.974	3.202	2.671
	Evenness	0.757	0.617	0.753	0.77	0.745
8a	Total # organisms	178	106	386	506	1236
	Species Richness	28	23	38	43	50
	Diversity Index	2.808	2.8	2.304	2.839	2.994
	Evenness	0.843	0.893	0.633	0.755	0.765
9	Total # organisms	244	503	698	717	130
	Species Richness	34	36	41	59	21
	Diversity Index	2.868	2.364	2.129	2.808	2.406
	Evenness	0.813	0.66	0.573	0.689	0.79
10a	Total # organisms	416	1154	1130	1718	352
	Species Richness	19	46	23	59	15
	Diversity Index	1.397	2.555	1.712	2.851	1.837
	Evenness	0.474	0.667	0.546	0.699	0.678
11	Total # organisms	222	122	486	361	409
	Species Richness	26	25	72	45	40
	Diversity Index	2.549	2.614	3.326	3.069	2.656
	Evenness	0.782	0.812	0.778	0.806	0.72
13a	Total # organisms	186	234	563	791	166
	Species Richness	23	47	48	57	27
	Diversity Index	1.985	2.823	2.571	3.027	2.76
	Evenness	0.633	0.733	0.664	0.749	0.837
14	Total # organisms	149	337	278	1171	510
	Species Richness	21	45	51	74	56
	Diversity Index	2.129	2.831	3.204	3.288	3.073
	Evenness	0.699	0.744	0.769	0.764	0.764
17	Total # organisms	1822	818	3650	2957	4876
	Species Richness	21	12	36	26	24
	Diversity Index	1.961	1.139	1.612	1.786	2.139
	Evenness	0.644	0.458	0.45	0.548	0.673
18	Total # organisms	144	277	839	783	594
	Species Richness	24	51	65	54	68
	Diversity Index	2.679	3.282	3.026	3.171	3.438
	Evenness	0.843	0.835	0.725	0.795	0.815
19a	Total # organisms	48	112	285	780	192
	Species Richness	10	21	23	54	21
	Diversity Index	2.109	2.408	1.459	2.601	1.988
	Evenness	0.916	0.791	0.465	0.652	0.654
TOTAL	Total # organisms	3981	4076	9039	11863	10083
	Species Richness	117	140	179	179	140

Table 9. Crab census data. Numbers in parentheses indicate numbers of trees inside 1.0 square meter sampling area.

STATION	1a			2			3			4			5			6			7			10			12			13			15			16			TO
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	1	2	3	
CRAB BURROWS	53	82	74	156	154	135	117	134	98	165	128	176	94	155	115	132	133	87	123	113	74	3	0	1	0	0	0	15	19	18	26	30	35	40	46	98	
CRAB CENSUS																																					
Family GRAPSIDAE																																					
<i>Sesarma curacaoense</i>			3	5	4	1	1	1	1	4	3	2	1	4	1				2	1	1																
<i>Sesarma ?cinereum</i>																						1*		2*													
<i>Aratus pisonii</i>																				1																	
Family XANTHIDAE																																					
<i>Euryium limosum</i>										1						1	2		1	1																	
unident. xanthid		1																		1																	
Family OCYPODIDAE																																					
<i>Uca pugilator</i>																									2	1	2										
<i>Uca rapax</i>																												3	1	2				2	1		
<i>Uca speciosa</i>		1							3																												
<i>Uca thayeri</i>	1	1			1			1	1		1		3		2				1		1																
<i>Uca sp. (juv.)</i>	1																			1																	
Total # specimens	2	3	3	5	5	1	1	2	4	5	4	2	4	4	3	1	2	2	3	4	2	1	0	2	0	0	0	2	1	2	3	1	2	0	2	1	79
Total # species (by station)		4			2			3			3			2			3			5			1			0			1			1			1		
H' (by station)		1.494			0.305			0.693			0.600			0.689			0.950			1.183			0			0			0			0			0		
J' (by station)		1.078			0.439			0.631			0.546			0.994			0.865			0.735			0			0			0			0			0		
TREE CRAB CENSUS																																					
Family GRAPSIDAE																																					
<i>Aratus pisonii</i>	1(1)			3(2)			2(3)			4(3)			2(2)			6(4)			8(3)			0(1)			0(0)			0(0)			0(2)			13(1)			

\**Sesarma ?cinereum* found on mud surface, not in burrows.

Table 10. Summary of crab census data for all surveys (August 1991 to August 1993).

STATION	1a					2					3					4					5					6					7				
SURVEY DATE	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93
<i>Sesarma curacaoense</i>	7	4	13		3	9	2	13	1	10	5	1	16		2	9	5	12	3	9	12	4	6	4	6	4		10	3		14	1	12	1	4
<i>Sesarma ?cinereum</i>																																			
<i>Aratus pisonii</i>		2												2								1					1					1			1
<i>Eurytium limosum</i>			1	1		3		1										2		1						3				3		2	1		2
unident. xanthid					1																														1
<i>Uca pugilator</i>																																			
<i>Uca pugnax</i>																																			
<i>Uca rapax</i>																																			
<i>Uca speciosa</i>			1		1						3				3			3								1						2			
<i>Uca thayeri</i>		1	1		2		1	1		1	4		1		2	3		1		1	4		3		5	2				1	1	1	1	1	1
<i>Uca sp. (juv.)</i>		6	2	4	1		5	1				3	1	2			3	1	1		1			1				1	3	1	1	4			
Total # specimens	7	13	18	5	8	12	8	16	1	11	12	4	18	4	7	12	8	19	4	11	18	5	9	5	11	9	1	11	6	5	18	9	14	2	9
Total # species (by station)	1	4	5	2	5	2	3	4	1	2	3	2	3	2	3	2	2	5	2	3	4	2	2	2	2	3	1	2	2	3	4	5	3	2	5
H' (by station)	0.00	0.92	0.80	0.50	1.49	0.56	1.22	0.69	0.00	0.31	1.08	0.56	0.43	0.69	0.69	0.56	0.66	0.82	0.56	0.60	0.93	0.50	0.90	0.50	0.69	1.06	0.00	0.31	0.69	0.65	0.76	1.43	0.72	0.69	1.18
J' (by station)	0.00	0.83	0.50	0.72	1.08	0.81	0.88	0.50	0.00	0.44	0.98	0.81	0.39	1.00	0.63	0.81	0.95	0.51	0.81	0.55	0.67	0.72	0.82	0.72	0.99	0.97	0.00	0.44	1.00	0.87	0.55	0.89	0.52	1.00	0.74
TREE CRAB CENSUS	13	9	0	4	1	3	7	0	5	3	4	5	1	1	2	11	4	0	1	4	6	7	4	8	2	10	7	2	13	6	8	5	4	8	8

STATION	10					13					15					16				
SURVEY DATE	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93
<i>Sesarma curacaoense</i>																				1
<i>Sesarma ?cinereum</i>				1	3															
<i>Aratus pisonii</i>																				
<i>Eurytium limosum</i>				1																
unident. xanthid																				
<i>Uca pugilator</i>						4	2	6		5										
<i>Uca pugnax</i>						6					5									
<i>Uca rapax</i>							2	1				2		1	6			8?	1	3
<i>Uca speciosa</i>																				
<i>Uca thayeri</i>	3					3					1					2				
<i>Uca sp. (juv.)</i>		3		1										1				1		1
Total # specimens	3	3	0	3	3	13	4	7	0	5	6	2	0	2	6	2	1	1	2	3
Total # species (by station)	1	1	0	3	1	3	2	2	0	1	2	1	0	2	1	1	1	2	2	1
H' (by station)	0.00	0.00	0.00	1.10	0.00	1.06	0.69	0.41	0.00	0.00	0.45	0.00	0.00	0.69	0.00	0.00	0.00	0.35	0.69	0.00
J' (by station)	0.00	0.00	0.00	1.00	0.00	0.96	1.00	0.59	0.00	0.00	0.65	0.00	0.00	1.00	0.00	0.00	0.00	0.50	1.00	0.00
TREE CRAB CENSUS	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	6	1	3	17	13

TABLE 11. Hand collection stations: raw data, diversity (H') and evenness (J').

STATION	9			13			17			TOT
REPLICATE	1	2	3	1	2	3	1	2	3	
TAXON										
Phylum PORIFERA										
Unident. sponge	1									1
Phylum CNIDARIA										
Unident. actinian					1					1
Phylum MOLLUSCA										
Class GASTROPODA										
Family POTAMIDIDAE										
<i>Batillaria minima</i>	28	15	50	74	58	50	16	6	7	304
Family VERMETIDAE										
? <i>Petalocochus varians</i>	17	2	9							28
Family NASSARIIDAE										
<i>Nassarius vibex</i>				1						1
Family NERITIDAE										
<i>Neritina virginea</i>		1								1
Family SIPHONARIIDAE										
<i>Siphonaria pectinata</i>	1									1
Class BIVALVIA										
Family MYTILIDAE										
<i>Brachidontes exustus</i>	1		1	8						10
Phylum ARTHROPODA										
Subphylum CRUSTACEA										
Class CIRRIPIEDIA										
Family BALANIDAE										
<i>Balanus</i> ?amphitrite	1			2		2				5
Family CHTHAMALIDAE										
<i>Chthamalus fragilis</i>	5	6	2							13
<i>Chthamalus stellatus</i>	30		12							42
Class MALACOSTRACA										
Order AMPHIPODA										
Family HYALIDAE										
<i>Hyalé grandicornis</i>	3	1	1							5
Order ISOPODA										
Unidentified isopod										
Order DECAPODA										
Family OCYPODIDAE										
<i>Uca</i> sp. (juv.)							2	3	2	7
Subphylum UNIRAMIA										
Class INSECTA										
Order COLLEMBOLA										
Family ANURIDIDAE										
<i>Anurida maritima</i>	16	8	3	7	112	4	5	152	9	316
Total # of specimens	103	33	78	92	171	56	23	161	18	735
Total # species (by replicate)	10	6	7	5	3	3	3	3	3	
H' (by replicate)	1.7298	1.3937	1.1532	0.7159	0.674	0.4087	0.7966	0.2511	0.958	
J' (by replicate)	0.7512	0.7778	0.5926	0.4448	0.6135	0.372	0.7251	0.2286	0.872	
Total # species (by station)		11			6			3		
H' (by station)		1.6109			0.8711			0.5565		
J' (by station)		0.6718			0.4862			0.5065		

TABLE 12. Summary of hand collection stations (August 1991-August 1993).

STATION	9					13					17				
SURVEY DATE	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93	8/91	1/92	8/92	1/93	8/93
Phylum PORIFERA															
Unident. sponge					1							1			
Phylum CNIDARIA															
Unident. actinian										1					
Phylum SIPUNCULA															
Phascolosoma sp.			4					1							
Phylum ANNELIDA															
Unident. eunicid	3														
Phylum MOLLUSCA															
Class GASTROPODA															
Batillaria minima	88	89	71	76	93	100	155	18	152	182	3	13	10	539	29
?Petalococonchus varians	3	10	12	10	28										
Nassarius vibex	2			2					1	1	2		2	1	
Neritina virginea					1										
Siphonaria pectinata					1										
Class BIVALVIA															
Brachidontes exustus				2	2		2	3		8					
?Crassostrea virginica			1	1				4				1			
Isognomon alatus				1					1			8	3	2	
Phylum ARTHROPODA															
Class CIRRIPIEDIA															
Balanus amphitrite	17	15			1		4			4		24			
Balanus reticulatus	11	3													
Balanus sp. (juv.)			122	6		71		1							
Chthamalus fragilis	126	163	5	38	13	2									
Chthamalus stellatus					42										
Class MALACOSTRACA															
Hyalo grandicornis	4	31		2	5		3	1	15				1		
Unidentified isopod															
Clibanarius tricolor		4													
Clibanarius sp.?							7								
?Aratus pisonii		2									2				
Pachygrapsus transversus				1											
Sesarma sp. (juv.)						1									
Unident. grapsid	3		1	1											
Cataleptodius floridanus								1							
Panopeus sp.	5		1	2				2							
Unident. xanthid (juv.)		3					1					1			
Uca sp. (juv.)											10			2	7
Unident. brachyura (juv.)			2					4					35		
Class INSECTA															
Anurida maritima	9	30	36	165	27		38	42	1	123	9		69	57	166
Unident. fly larva			1					1							
Phylum CHORDATA															
Class ASCIDIACEA															
Unident. colonial tunicate				2											
Total # specimens	271	350	256	309	214	174	210	78	170	319	26	48	120	601	202
Total # species (by station)	11	10	11	14	11	4	7	11	6	6	5	6	7	5	3
H' (by station)	1.46	1.53	1.40	1.36	1.61	0.76	0.85	1.48	0.41	0.87	1.38	1.24	1.12	0.37	0.57
J' (by station)	0.61	0.68	0.58	0.52	0.87	0.55	0.44	0.62	0.23	0.49	0.86	0.69	0.58	0.23	0.51

**TABLE 13. List of outside taxonomic experts consulted and their area(s) of expertise.**

**Dr. Jon F. Norenburg, Smithsonian Institution (Nemertina)**

**Dr. Donald R. Moore, University of Miami (Mollusca)**

**Dr. Michael Milligan, Mote Marine Laboratory (Polychaeta and Oligochaeta)**

**Dr. Julie Piraino, Smithsonian Institution (Sipuncula)**

**Dr. Mary Rice, Smithsonian Institution (Sipuncula)**

**Dr. Louis Kornicker, Smithsonian Institution (Ostracoda)**

**Dr. Rosalie Maddocks, University of Houston (Ostracoda)**

**Dr. James D. Thomas, Newfound Harbor Marine Institute (Amphipoda)**

**Dr. Raphael LeMaitre, Smithsonian Institution (Decapoda)**