

6-28-1996

# Port Everglades Macroinvertebrate Monitoring: Monitoring of Benthic Macroinvertebrate Assemblages at the Southport Turning Basin and Adjacent Areas of John U. Lloyd State Recreation Area: January 1996

Charles G. Messing


*Nova Southeastern University Oceanographic Center, [messingc@nova.edu](mailto:messingc@nova.edu)*

Richard E. Dodge

*Nova Southeastern University Oceanographic Center, [dodge@nova.edu](mailto:dodge@nova.edu)*

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## NSUWorks Citation

Charles G. Messing and Richard E. Dodge. 1996. Port Everglades Macroinvertebrate Monitoring: Monitoring of Benthic Macroinvertebrate Assemblages at the Southport Turning Basin and Adjacent Areas of John U. Lloyd State Recreation Area: January 1996 : 1 -23. [https://nsuworks.nova.edu/occ\\_facreports/25](https://nsuworks.nova.edu/occ_facreports/25).

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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: JANUARY 1996**

**Prepared for:**

**Port Everglades Authority**

**Prepared by:**

**Dr. Charles G. Messing, Dr. Richard E. Dodge**

**Nova University Oceanographic Center**

**8000 North Ocean Drive**

**Dania, FL 33004**

**Submitted: 28 June 1996**

## A. INTRODUCTION

This report documents the January 1996 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 eighth monitoring effort of the series carried out by Nova Southeastern University Oceanographic Center. Collections were made between 17 and 31 January 1996.

## B. METHODOLOGY

Figure 1 illustrates locations of stations occupied for the January 1996 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

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<sup>1</sup> Contract specifications incorrectly call for a 225 cm<sup>3</sup> grab sampler, not used by the previous contractor.

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 maintained.

### **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 and relative abundances of major taxonomic groups (percent occurrence).

A total of 8513 specimens was sorted from the 33 grab samples (11 stations with three replicates each). This represents a substantial increase relative to the last three surveys, but does not yet approach the high values recorded from January 1993 to January 1994.

Polychaete worms dominate, accounting for about 50% or more of the fauna at seven of eleven stations. Although present in moderate abundance at station 17 relative to other sites, they are vastly outnumbered here by mollusks, oligochaetes, sipunculans and peracarids and account for only 4.6% of the fauna. They are also slightly outnumbered by peracarid crustaceans at station 10a. Peracarids are the next most abundant group overall (20.5%), due chiefly to their overwhelming abundance at station 17. They also account for over a third of the fauna at stations 9 and 10a. Mollusks account for 15.0% and oligochaetes for 14.2% of the fauna overall. Their relative abundances are similar to the higher values recorded in several previous surveys. Mollusks account for 27.6-29.60% of the fauna at stations 13a and 17, but no more than about 9% at any other station (and 3-7% at six stations). Oligochaetes account for 24.2-37.0% of the fauna at three stations, 12.6-17.6% at four stations, and <10% at the rest. Of the other major taxonomic groups, ostracodes account for 27.8% of organisms at station 18 and no more than about 5% at any other station. Sipunculans represent 13.4% at station 17, and are present (1.1%) only at one other (19a). Nemertines represent no more than 7% of the fauna at any station.

The gastropod, *Caecum pulchellum*, is the most abundant organism due to its presence in large numbers at station 17 and, to a lesser extent, at station 13a. The polychaete, *Aricidea philbinae*, is second due to its abundance at stations 14 and 19 and, to a lesser extent, 9 and 13a. The tanaidacean, *Kalliapseudes aliciae*, ranks third. It is no longer the most abundant organism

due to its presence in only small numbers at two of the three replicates at station 17. The 654 specimens represent a substantial increase relative to the nadir recorded in August 1995, but remain well below numbers recorded from August 1992 through August 1994. Station 17 retains its distinctive fauna, including the gastropods *Caecum pulchellum* and *C. imbricatum*, the ostracode, *Rutiderma darbyi*, the sipunculan *Aspidosiphon* cf. *muelleri*, the isopod, *Exosphaeroma diminutum*, the oligochaete, *Pectinodrilus molestus*, and the polychaetes *Ehlersia cornuta* and *Nematonereis hebes*, although the latter two and *C. imbricatum* occur in substantially fewer numbers than in many previous surveys. Important species at other stations include the polychaetes *A. taylori* (1, 8, 8a, 13a, 14), *Capitella capitata* (10a, 14, 19a), *Mediomastus californiensis* (1, 8, 13a), *Fabricinuda trilobata* (19a), and *Glycera abbranchiata* (9, 10a, 13a, 14); the ostracode *Peratocytheridea setipunctata* (14, 18), and the amphipod *Cerapus* n. sp. (9, 10a, 17, 19a).

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: 489 specimens, 47 species. H': 2.950. J': 0.766.

Polychaetes dominate (52.8%), followed by oligochaetes (37.0%). All other groups contribute less than 4%. The most abundant species are the polychaetes, *Lumbrineris verrilli* and *Mediomastus californiensis*, and the oligochaete, *Tubificoides motei*. Species richness, diversity and total abundance of organisms have all increased substantially relative to 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. Faunal totals: 384 specimens, 34 species. H': 2.954. J': 0.838.

Polychaetes again dominate (64.1%), followed by oligochaetes (26.0%). All other groups contribute less than 6%. The most abundant species are the polychaete, *Aricidea taylori*, and the oligochaete, *Tubificoides motei*. *A. taylori* has been consistently abundant here in all ten surveys. Organism abundance, diversity and species richness have all increased relative to the last several surveys, and diversity is higher than it has been since January 1993.

Station 8a: West side of ICWW approximately 50 m north of station 8. Depth and bottom: similar to station 8. Faunal totals: 182 specimens, 35 species. H' 2.849. J' 0.801.

Dominant groups of organisms are similar to those of stations 1 and 8 with polychaetes most important (56.0%), followed by oligochaetes (24.2%). Mollusks account for 8.8%. The most abundant species are the polychaete, *Aricidea taylori*, and the oligochaete, *Tubificoides motei*. The former has been consistently abundant in all but one survey. Diversity and richness have increased substantially relative to the last three surveys. Organism abundance, though still low, has increased continually since its nadir in January 1995.

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 silty with some algal mats. Faunal totals: 411 specimens, 48 species. H': 2.940. J': 0.759.

Polychaete dominance (48.9%) has declined again and peracarids (34.8%), again chiefly cumaceans, represent an important component of the fauna. The most abundant taxa are the polychaetes, *Aricidea philbinae*, *Glycera abbranchiata* and *Lumbrineris verrilli*, the amphipod *Cerapus* n. sp., and the cumaceans *Cyclaspis varians* and *Oxyurostylis smithi*. *A. philbinae* has been a consistent dominant in all surveys. Organism abundance has declined substantially from that recorded during the previous two surveys, but richness is greater than in any survey since January 1993 and diversity is the highest recorded.

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, mangrove detritus and a dense algal mat. Faunal totals: 466 specimens, 28 species. H': 2.405. J': 0.722.

Peracarid crustaceans again exhibit high relative abundances typical of preceding January surveys. They are more abundant than in January 1995, but remain much less abundant numerically than in earlier January surveys (1992-1994). As in January 1995, but unlike any other survey, ostracodes are almost absent. The most abundant taxa are the polychaetes, *A. philbinae* and *Capitella capitata*, the oligochaete *Thalassodrilides gurwitschi*, and the amphipod *Cerapus* n. sp. *A. philbinae* has been a consistently important taxon at this station. Organism abundance is much lower than in January 1994 and August 1995, but higher than in August 1994.



and January 1995. Species richness is about the same as in the preceding two surveys. Diversity is typical of January values (higher than typical August values).

Station 11: At north corner of the northern entrance to Whiskey Creek. Depth: approximately 4 m. Bottom: Rocky with much algal growth. Faunal totals: 123 specimens, 30 species. H': 2.844. J': 0.836.

Polychaetes are again the overwhelmingly dominant group (77.2%), followed by decapod crustaceans (8.9%). Mollusks have almost disappeared. The most abundant taxa are the polychaetes *Nematoneris hebes* and *Mediomastus californiensis*. 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 [with the possible exception of the polychaete, *Mediomastus californiensis* (perhaps sometimes identified as *Mediomastus* sp.)]. Organism abundance remains at the same low level recorded during the last two surveys, but diversity is higher, and richness is higher than in the last three 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: 954 specimens, 58 species. H': 2.964. J': 0.730.

Polychaetes dominate, followed by mollusks and oligochaetes (39.5, 29.6 and 15.1%, respectively). Mollusk abundance is greater than in any previous survey. Although polychaete abundance is greater than in any survey except that of January 1993, the group's relative abundance is lower than in any previous survey. The most abundant taxa are the polychaetes *A. philbinae*, *A. taylori* and *G. abbranchiata*; the oligochaete, *Smithsonidrilus hummelincki*, and the gastropod *C. pulchellum*. None of these has been a consistent dominant at this station, although *S. hummelincki* has been present in numbers since August 1992. Organism abundance and species richness are greater than in any previous survey. Diversity is greater than in any survey except that of January 1993 which had only one fewer species and the second highest recorded abundance.

Station 14: East side of ICWW opposite northern margin of Southport Turning Notch. Depth: approximately 1.5 m. Bottom: Fine muddy sand and numerous algae-covered rocks. Faunal totals: 1362 specimens, 69 species. H': 2.971. J': 0.702.



As during the last three January surveys and unlike the last two August surveys, polychaetes are the overwhelmingly dominant group (68.7%). Peracarids account for 11.5% while mollusks and oligochaetes represent about 6% each. Total abundance is much greater than in any preceding survey and mollusks, despite their minimal proportion, are also more abundant than previously. Peracarids have returned to their traditionally high January levels and are also more abundant than in any previous survey. The most abundant species are the polychaetes *A. philbinae*, *A. taylori*, *G. abbranchiata*, *Laonome* sp. and the amphipod, *G. bonnieroides*. Only *A. philbinae* and *A. taylori* have been abundant in the great majority of surveys here. Species richness is greater than in any survey except that of January 1993. Diversity, while not quite as high as during the period from August 1992 to January 1994, is higher than in the previous two surveys.

Station 17: Whiskey Creek on a line directly east of station 14. Depth: 0.2 m. Bottom: Coarse shelly sand with large shallow depressions and dense filamentous algae. Faunal totals: 2760 specimens, 33 species. H': 2.227. J': 0.637.

This station continues to exhibit a fauna that differs strongly from all other stations. Peracarid crustaceans continue to dominate (33.2%). The gastropod *C. pulchellum* is the most abundant organism. The formerly first-ranked species, the tanaidacean *K. aliciae*, is overwhelmingly dominant in one replicate, but occurs in much smaller numbers in the other two. Other abundant taxa include the sipunculan *Aspidosiphon muelleri*, the ostracode, *Rutiderma darbyi*, and the oligochaete *Pectinodrilus molestus*. Several species previously abundant here occur in fewer numbers (the isopod *Exosphaeroma diminutum*, the polychaetes *Ehlersia cornuta* and *Nematoneris hebes*, and the gastropod *Caecum imbricatum*). Our isopod consultant, Marilyn Schotte, informs us that *Exosphaeroma diminutum* may be a synonym of the previously collected *E. productitelson* (personal communication, September 1995). Organism abundance is higher than in the preceding two surveys, but remains lower than levels recorded from August 1992 to August 1994. However, richness is higher than in any survey except that of August 1992 and diversity is higher than in any survey except that of August 1994.

Station 18: East side of ICWW opposite Southport Everglades container dock. Depth: approximately 1 m. Bottom: Fine muddy sand with algae-covered rocks. Faunal totals: 446 specimens, 44 species. H': 2.948. J': 0.779.

Relative abundances of polychaetes (34.5%) and oligochaetes (12.6%) are about the same as recorded in January 1995. Both are substantially lower than in August 1995. Ostracodes now account for a greater percentage of the fauna here than in any previous survey (27.8%). The most abundant taxon is the ostracode *Peratocytheridea setipunctata* which has rarely been present here before. Organism abundance and richness are higher than during the last two August surveys, but lower than during the last two in January. Diversity is higher than in the preceding three surveys.

Station 19a: Whiskey Creek on a line due east of station 18. Depth: 0.2 m. Bottom: Fine mud with some sand and shell debris and algal mats and filaments. Faunal totals: 936 specimens, 49 species. H': 2.838. J': 0.729.

Polychaetes dominate (61.6%), followed by peracarids (24.9%). Mollusks account for a low proportion of the fauna typical of most January surveys. The most abundant taxa are the polychaetes, *A. philbinae*, *C. capitata*, and *Fabricinuda trilobata*, the oligochaete *Thalassodrilides gurwitschi*, and, in one replicate, the tanaidacean, *Leptochelia rapax*. Organism abundance is greater than in any previous survey; richness is greater than in any survey except that of January 1993 which recorded the second greatest abundance. Diversity follows the higher values recorded during preceding January surveys.

### C.3. Crab Census

Table 3 lists all crab census data including numbers of burrows, species and specimens, diversity indices and evenness values. The total number of crabs collected has rebounded from the minimum recorded during January 1995 to levels recorded in August 1994 and 1995. *Sesarma curacaoense* remains the most abundant species, but occurs in low numbers relative to most previous surveys and is again restricted to the west side of the ICWW. As in the previous several surveys, *Uca rapax* is the most common species at stations 15 and 16, and *U. pugilator* at station 13 on the east side of the ICWW. The mangrove tree crab, *Aratus pisonii*, occurs in small numbers at stations on the west side of the ICWW. However, it is absent for the first time from station 16 in a relatively undisturbed mangrove forest between the ICWW and Whiskey Creek. Because so few specimens were collected during this survey, a listing of numbers and indices separate from Table 3 is not considered necessary. Locality and habitat descriptions of the stations are identical to those given in previous surveys.

### C.5. Hand Collections

A total of 263 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.

The springtail insect, *Anurida maritima*, accounts for about 57% of all organisms enumerated due to a cluster of an estimated 150 specimens found in a hollow on the underside of a rock at station 9. Very few barnacles occur in the transects during this survey and all are small. Outside the transects they remain patchily dense on small rocks and, when present, nearby rip-rap. 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 algal turf. H': 1.532. J': 0.597.

The low diversity index is due to the great abundance of the springtail insect, *Anurida maritima*. The vermetid gastropod *Petalochonchus varians* is again the second most abundant organism. Adjacent boulders (rip-rap) appear to support the same intertidal fauna as recorded in previous surveys. However, several red mangroves along the outer edge of the fringe appear to have died so that the survey site is closer to the edge of the fringe. This has likely increased the exposure of the site to wave action and may account for the increased occurrence of encrusting sponges and colonial tunicates on the undersides of rocks.

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 mangrove fringe and water's edge. Small mangrove seedlings present until January 1994 have not returned. H': 0.777. J': 0.434.

Low diversity here derives from the abundance of the snail, *Batillaria minima*, relative to other organisms.

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.  $H'$ : 1.003.  $J'$ : 0.913.

As in previous surveys at this station, *Batillaria minima* and *Anurida maritima* are the typical organisms, but are accompanied in this survey by a cluster of the bivalve, *Isognomon alatus*, attached to a mangrove prop root that happened to fall within one replicate transect.

## D. DISCUSSION

### D.1. Grab samples

Total organism abundance has rebounded substantially relative to the last three surveys and has reached a higher level than in any survey since January 1994. Relative to the January and August 1995 surveys, the current survey records greater numbers of organisms at nine and eight stations, respectively. Only station 9 records fewer organisms than in either of the preceding two surveys. For the last three surveys, station 17 has accounted for 30-32% of total abundance at all stations, down from 48-53% in the three surveys before that.

Species richness is higher at all stations than in any of the preceding three surveys with a single exception: station 18 recorded a higher diversity in January 1995 than in the current survey. Stations 9, 14, 17, and 19a record richness values greater than in all but a single previous survey (which differs among stations), and station 13a records a record high richness. Diversity indices are greater than or virtually identical to values recorded at all stations during the preceding three surveys, again with a single exception: the index was slightly greater at station 17 in August 1994.

The amphipods *Grandidierella bonnieroides* and *Cerapus* n. sp. continue to show increased numbers in January relative to August. The tanaidacean *Leptochelia* sp. (probably *L. rapax*) again occurs in fewer numbers at station 10a than in the January surveys from 1992 to 1994.

The polychaete *Aricidea taylori* continues to be an important component of the fauna at west ICWW stations 1, 8 and 8a, again accompanied by its usual companion here, *Mediomastus californiensis*. The former also continues to occur at stations 13a, 14 and 18. The polychaete *A. philbinae* is again abundant at east ICWW stations 9 and 10a, at west ICWW stations 13a and 14, and at Whisky Creek station 19a. Station 17 continues to maintain its unique fauna although

several changes have been noted. The tanaidacean, *Kalliapseudes aliciae*, only occurs in typical abundance in one replicate; the gastropod, *C. imbricatum*, the polychaetes *Ehlersia cornuta* and *Nematonereis hebes*, and the isopod *Exosphaeroma diminutum* occur in substantially fewer numbers than in the several preceding surveys. The oligochaete, *Pectinodrilus molestus*, is again an important faunal component, having disappeared in January 1995 and reappeared in August 1995.

This survey is unique owing to the presence of several species recorded in numbers for the first time: the nemertine *Zygonemertes* sp., the polychaetes *Prionospio perkinsi* and *Laonome* sp. and the isopod *Uromunna caribea*. A cumacean previously recorded in abundance on occasion has finally been identified as *Oxyurostylis smithi*.

## **D.2. Crab Censuses**

Ground-dwelling crabs have reappeared in this January survey on the west side of the ICWW (they were completely absent in January 1995), but remain in generally fewer numbers than in most earlier surveys here (August 1994 and earlier). *Aratus pisonii* again occurs in very low numbers on the west side of the ICWW, consistent with the preceding four surveys with the exception of August 1995. It is absent from station 16 on the east side of the ICWW for the first time. Station 16 is again characterized by *Uca rapax*, now found at this station in the last five surveys. Station 13 is again characterized by *Uca pugilator*, now found at this station in six of the ten surveys.

## **D.3. Hand Collections**

Station 9 continues to maintain a typical intertidal fauna. However, several components appear to be changing, perhaps in association with the apparent death of a few red mangrove trees along the fringe and the concomitant greater exposure to wave action of the study site. This may account for the presence during the last two surveys of encrusting sponges and colonial tunicates. Although richness and diversity remain at typical levels, organism abundance is substantially lower during this (and the preceding, August 1995) survey. The decline is due chiefly to reduced numbers of the gastropod, *Batillaria minima*, and barnacles. Barnacles and

other typical intertidal organisms (e.g., isogonomonids) remain abundant on adjacent rip-rap, although cover appears qualitatively more patchy than previously.

Species richness remains about the same at station 13 as in the previous several surveys, while diversity is higher than in the preceding two, due to reduced dominance of *B. minima*. Station 17 exhibits the same low organism abundance levels reported in August 1991 and 1995. Richness remains at the same low level as in the August 1993-August 1995 surveys (i.e., slightly lower than in the August 1991-January 1993 surveys).

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4. Hand collection stations: raw data, diversity ( $H'$ ) and evenness ( $J'$ ), January 1995.
5. List of outside taxonomic experts consulted and their area(s) of expertise.



TABLE 5. 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, Center for Systematics and Taxonomy (Polychaeta and Oligochaeta)

Dr. Louis Kornicker, Smithsonian Institution (Ostracoda)

Dr. Marilyn Schotte, Smithsonian Institution (Isopoda)

Dr. James D. Thomas, Smithsonian Institution (Amphipoda)

Dr. Richard Heard, Gulf Coast Marine Laboratory, Biloxi, MS (Cumacea).

Dr. Austin Williams, National Marine Fisheries Service (Decapoda)

**TABLE 1. Grab Collection Stations: raw data, diversity ( $H'$ ) and evenness ( $J'$ ): January 1996.**

STATION REPLICATE	1	1	3	1	8	3	1	8a	3	1	9	3	1	10a	3	1	11	3	1	13a	3	1	14	3	1	17	3	1	18a	3	1	19a	3	TOT		
TAXON																																				
Phylum CNIDARIA																																				
Order ATHECATA																																				
Unidentified athecate hydroid											1																							1		
Order ACTINIARIA																																				
Unidentified actinian	5								1			1									7	10	7											31		
Order CERIANTHARIA																																				
Unidentified cerianthid								1													2								2					5		
Phylum PLATYHELMINTHES																																				
Order PROSERIATA																																				
Family MONOCELIDIDAE																																				
Unidentified monocelid?																						2												2		
Unidentified proseriate?																										4								4		
Order KALYPTORHYNCHA																																				
Unidentified kalyptorhynch																								1										1		
Phylum NEMERTINA																																				
Order ARCHAENEMERTEA																																				
Family CEPHALOTHRICIDAE																																				
Cephalothricid sp. JLN 113																													2					2		
Cephalothricid sp. JLN 114	1																																	1		
?Cephalothricid sp.																										6	7			2			1	16		
Order PALEONEMERTEA																																				
Family CARINOMIDAE																																				
<i>Carinoma tremaphoros</i> ?					2				1	4										1										1				9		
<i>Carinomella lactea</i>			1	2						3											4	4					10		6					30		
Family TUBULANIDAE																																				
<i>Tubulanus pellucidus</i>	4	5				4			1			1	2	3	4			1					1	3					6	2			37			
Unidentified paleonemertine?																					2							2					4			
Order HETERONEMERTEA																																				
Family LINEIDAE																																				
Unidentified lineid	1								1											1										2				5		
Order HOPLONEMERTEA																																				
Family AMPHIPORIDAE																																				
Unidentified amphiporid																							1											1		
Family TETRASTEMMIDAE																																				
<i>Tetrastemma worki</i>																						2		2						2				6		
Family ZYGONEMERTIDAE																																				
<i>Zygonemertes</i> sp. JLN 359											1			2							1	1	1	3						4		1	14			
<i>Zygonemertes</i> sp.																											2							2		
Hoplonemertine sp. JLN 131														2																				2		
Unidentified hoplonemertine			2																		1													3		
Unidentified nemertine		1				2															2									2	3			10		
Phylum MOLLUSCA																																				
Class GASTROPODA																																				
Family CAECIDAE																																				
<i>Caecum pulchellum</i>	3	8	6			12	8		11	1	2		1					3	4		68	60	132	12	15	16	247	275	102	10		20	2		2	1021
<i>Caecum imbricatum</i>																											11	14	8						33	
<i>Caecum textile</i>																											4	1							5	
Family POTAMIDIDAE																																				
<i>Batillaria minima</i>												1															18	34	40				4		97	
Family BULLIDAE																																				
<i>Bulla striata</i>									1			1	1																						3	
Family GASTROPTERIDAE																																				
?Gasteropteron sp.											1																									1

TABLE 1. Grab Collection Stations: raw data, diversity ( $H'$ ) and evenness ( $J'$ ): January 1996.

STATION REPLICATE	1			8			8a			9			10a			11			13a			14			17			18a			19a			TOT
	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																																		
Unidentified tectibranch																					1										1			
Unidentified sacoglossan?																				5		2									7			
Unidentified cephalaspid?																				1											1			
Class BIVALVIA																																		
Family ARCIDAE																																		
Arcopsis adamsi		1																													1			
Family LUCINIDAE																																		
Lucina sp.							1			2	1	2		2							1	1				2					12			
?Parvilucina sp.																1															1			
Family LYONSIIDAE																																		
Lyonsia sp.																													4		4			
Family MYTILIDAE																																		
Brachidontes sp.																						1		4							5			
Family TELLINIDAE																																		
Macoma constricta		1								3	6	1	2	4	4				1	10	4	13	7	12			4		1		73			
Tellina sp.										1		1																			2			
Family CORBULIDAE																																		
Corbula sp.					2																										2			
Unidentified bivalve											1							1					2								4			
Phylum ANNELIDA																																		
Class POLYCHAETA																																		
Order ORBINIIDA																																		
Family ORBINIIDAE																																		
Leitoscoloplos robustus										2	2	2		2	4														7	3	7	29		
Leitoscoloplos sp.																													11		11			
Scoloplos rubra	1		2																												3			
Family PARAONIDAE																																		
Aricidea philbinae		1		6	4	4	2	1	19	19			12	6	10	1		2	4	8	50	163	96	121			2		89	16	18	654		
Aricidea taylori	1	10	20	40	18	8	30	9			2			10				4		6	18	18	57	27	20		12	4	1	4		319		
Cirrophorus sp.					6		1																								9			
Paraonis fulgens										2		3									1		1								5			
Order COSSURIDA																																		
Family COSSURIDAE																																		
Cossura soyeri		17	12	4	22	8	3	1																			2	2			71			
Order SPIONIDA																																		
Family SPIONIDAE																																		
Carazziella hobsonae																						1									1			
Malacoceros vanderhorsti											1																				1			
Polydora ligni																		2			3	1		1							7			
Polydora socialis																					1	1		1					1		4			
Prionospio cristata	1	2	2		6		1	1	2	2		1		2						7	1	2									33			
Prionospio heterobranchia																						1	1	1					4	1	8			
Prionospio perkinsi	1	8			4		1					1		2							2							2			21			
Pseudopolydora sp. B		2						1		4	1	1	2	2					2	4	34	8	7	9			2		1		80			
Scoletepis texana				2																											2			
Spio pettiboneae		2								1								3													6			
Family CIRRATULIDAE																																		
Cauleriella sp. A	1	3			10																	13	1	23			2		2		68			
Cirriformia sp. A		3	4																	8		2	3	2				24			46			
Monticellina dorsobranchialis	1				2		2	1	6											2								4		12	2	13	45	
Unidentified cirratulid		6	16		8												1	2					1					2				36		
Order CAPITELLIDA																																		
Family CAPITELLIDAE																																		

TABLE 1. Grab Collection Stations: raw data, diversity ( $H'$ ) and evenness ( $J'$ ): January 1996.

[illegible]

TABLE 1. Grab Collection Stations: raw data, diversity (H') and evenness (J'): January 1996.

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	1	2	3	
TAXON																																		
Family SABELLIDAE																																		
Chone cf. americana															3																2	5		
Fabricinuda trilobata			6									2						1	8		7					2	153	2	14			195		
Laonome sp.							1				1						2	5	27	14	38							28	1	2		119		
Class OLIGOCHAETA																																		
Family TUBIFICIDAE																																		
Ctenodrilus serratus																					1											1		
Limnodriloides baculatus										2											1											3		
Limnodriloides barnardi																1	2		3	2	3						2			1		14		
Limnodriloides monotheucus		1																														1		
Limnodriloides rubicundus		3			2							20	4				5	8	11	10	3	2				18			10			96		
Limnodriloides sp.		5	2		2		2										18															29		
Pectinodrilus molestus																									244	134	36						414	
Smithsonidrilus hummelincki	2	8	14		12			4	2		1						32	24	41	14	6	8				2						170		
Smithsonidrilus sp.																		1														1		
Tectidrilus bori	4	17	6		4			1	1						2												2				2	39		
Tectidrilus squalidus		11	2		14	6	12	2	5																				6			58		
Thalassodrilides gurwitschi											1	3	48	8	2					14	7	11				2			48	15	8	167		
Tubificoides bermudae			2																													2		
Tubificoides motei	1	47	44		20	12	4	7	14	4					2					1					8	2	12					178		
Tubificoides parviductus		6	2		6																											14		
Unidentified tubificid			4		4	2			2									1							2		2		1			18		
Phylum SIPUNCULA																																		
Order GOLFINGIIFORMES																																		
Family PHASCOLIONIDAE																														1		7	8	
Phascolion cryptum																																		
Order ASPIDOSIPHONIFORMES																																		
Family ASPIDOSIPHONIDAE																																		
Aspidosiphon cf. muelleri																									68	75	226			2			371	
Phylum ARTHROPODA																																		
Subphylum CRUSTACEA																																		
Class OSTRACODA																																		
Subclass MYODOCOPA																																		
Family Sarsiellidae																																		
Eusarsiella spinosa																		1	1		1											3		
Eusarsiella zostericola										2	4						1	4	4	4		2		1					1			23		
Family RUTIDERMATIDAE																																		
Rutiderma darbyi																									35	89	2						126	
Rutiderma gyre																													2			2		
Family PHILOMEDIDAE																																		
Harbansus paucichelatus		1																														1		
Subclass PODOCOPA																																		
Family CYTHERIDIDAE																																		
Cyprideis americana																											6					6		
Peratocytheridea setipunctata						4				10		6	2				6	10		23	13	13	1			94		22				204		
Class MALACOSTRACA																																		
Order MYSIDACEA																																		
Unidentified mysid										2										1	1											4		
Order TANAIIDACEA																																		
Family KALLIAPSEUDIDAE																																		
Kalliapseudes aliciae																								1	492	26	98			8	2	15	642	
Family PARATANAIDAE																																		
Leptochelia rapax										3	2	1		14	6		1		2		11	7	3	15	7	4	2		6	70		9	163	

TABLE 1. Grab Collection Stations: raw data, diversity (H') and evenness (J'): January 1996.

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>Leptochelia forresti</i>																					1											1		
Family TANAIIDAE																																		
<i>Sinelobus stanfordi</i>			2																	2	3			1								8		
Order ISOPODA																																		
Family HYSSURIDAE																																		
<i>Xenanthura brevitelson</i>												3										1	1			1						6		
Family SPHAEROMATIDAE																																		
<i>Exosphaeroma diminuta</i>																									45	17	10						72	
Family MUNNIDAE																																		
<i>Uromunna caribea</i>											1	2										8	1		6	6	10				7		41	
Family CORALLANIDAE																																		
<i>Excorallana</i> cf. <i>delaneyi</i>							1																							1		2		
Order AMPHIPODA																																		
Family COROPHIIDAE																																		
<i>Cerapus</i> n. sp.										15	3	11	12	122	6					6	7	1		1	46	66	62			31		2	391	
<i>Grandidierella bonnieroides</i>		1					1			1	1	4	2	2	2		2		10	6	25	36	11	34	3				12	21	2	6	182	
Unidentified amphipod A																						10	1	7						29	6	8	61	
Unidentified amphipod B										1	1	1									1	6	3							4			17	
Unidentified amphipod																									2	13		2					17	
Order CUMACEA																																		
<i>Cumella</i> sp. D																1													2				3	
<i>Cyclaspis varians</i>										13	8	19	2	12																1			55	
<i>Oxyurostylis smithi</i>		1			2	2				19	22	10			2				2	2	2	3	1	2					9	1	1		81	
Order DECAPODA																																		
Infraorder PENAEIDEA																																		
Family PENAEIDAE																																		
<i>Penaeus</i> sp. (juv.)																													2				2	
Infraorder CARIDEA																																		
Unidentified caridean	1						3			1						2	2			6	3	3	1					2	6				30	
Infraorder ANOMURA																																		
Unidentified paguroid (juv)										2	1							1	2		1	4	1	1	1	2			2				18	
Infraorder BRACHYURA																																		
Family XANTHIDAE																																		
Unidentified xanthid																		2																
Unidentified brachyuran	1									1							1							1						4			3	
Unidentified decapod fragments			2																														2	
Phylum ECHINODERMATA																																		
Class OPHIUROIDEA																																		
Unidentified ophiuroid							1		2							1				2	2	4	1	3		1			2	4			23	
Class HOLOTHUROIDEA																																		
Unidentified holothuroid																									6	10	2						2	20
UNKNOWN																															1		1	
TOTAL	48	241	200	138	186	60	106	50	26	172	100	139	178	216	72	20	47	56	181	260	513	594	279	489	1301	825	634	184	26	236	693	79	164	8513
Total # species (by replicate)	21	31	24	18	27	9	29	18	8	33	24	32	16	17	16	13	18	12	26	31	47	56	40	43	25	22	21	18	10	31	40	15	26	
H' (by replicate)	2.6987	2.7944	2.6535	2.3738	2.9715	2.1186	2.6417	2.3844	1.9915	2.867	2.5628	2.6071	2.0585	1.7728	2.5392	2.4151	2.6547	2.0748	2.2756	2.9444	2.914	2.9765	2.6453	2.8691	1.9362	2.2045	2.0156	1.937	2.243	2.8026	2.716	2.1147	2.7753	
J' (by replicate)	0.8864	0.8138	0.8349	0.8213	0.9016	0.9642	0.7845	0.8249	0.9577	0.8199	0.8064	0.7522	0.7425	0.6257	0.9158	0.9416	0.9185	0.835	0.6985	0.8574	0.7569	0.7394	0.7171	0.7628	0.6015	0.7132	0.6621	0.6701	0.975	0.8161	0.7363	0.7809	0.8518	
Total # species (by station)		47			34			35			48			28			30			58			69			33			44			49		148
H' (by station)		2.950			2.9538			2.8485			2.9395			2.4046			2.8444			2.9639			2.9706			2.2267			2.9479			2.8378		
J' (by station)		0.7662			0.8376			0.8012			0.7593			0.7216			0.8363			0.7299			0.7016			0.6368			0.779			0.7292		





Table 3. Crab census data. \*Numbers in parentheses indicate numbers of trees inside 1.0 square meter sampling area. January 1996.

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	75	85	83	123	105	83	115	122	140	131	121	136	62	79	62	145	128	74	101	66	59	?	?	?				52	58	26	48	53	47	35	43	41	
CRAB CENSUS																																					
Family GRAPSIDAE																																					
<i>Sesarma curacaoense</i>	1	1			4		1				1								1																9		
<i>Aratus pisonii</i>																																		1		1	
Family OCYPODIDAE																																					
<i>Uca pugilator</i>																											3	5								8	
<i>Uca rapax</i>																															2		4	2		8	
<i>Uca thayeri</i>		1																															1			2	
<i>Uca</i> sp. (juv.)							2																								1	3				6	
Total # specimens	1	2	0	0	4	0	3	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	3	5	0	1	3	2	0	4	4	34	
Total # species (by station)		2			1			2			1			0			0			1			0			0		1			2			3			
H' (by station)		0.637			0.000			0.637			0.000			0.000			0.000			0.000			0.000			0.000			0.000		0.637			0.736			
J' (by station)		0.918			0.000			0.918			0.000			0.000			0.000			0.000			0.000			0.000			0.000		0.918			0.670			
TREE CRAB CENSUS																																					
Family GRAPSIDAE																																					
<i>Aratus pisonii</i> *		?			1(1)			0(2)			0(2)			3(1)			0(2)			2(2)			0			0		0(0)			0(1)			0(1)			

Tree crab data for station 1a and burrow data for station 10 lost.

TABLE 4. Hand collection stations: raw data, diversity (H') and evenness (J'). January 1996.

STATION	9			13			17			TOT
REPLICATE	1	2	3	1	2	3	1	2	3	
TAXON										
Phylum PORIFERA										
Unident. encrusting sponge A	4									
Unident. encrusting sponge B		12	8							
Phylum ANNELIDA										
Class POLYCHAETA										
Family EUNICIDAE										
Unidentified eunicid		1								
Phylum SIPUNCULA										
Fam. PHASCOLOSOMATIDAE										
<i>Phascolosoma</i> sp.	1		8							
Phylum MOLLUSCA										
Class GASTROPODA										
Family POTAMIDIDAE										
<i>Batillaria minima</i>		3		47	10	35	2	1	7	
Family VERMETIDAE										
<i>?Petalconchus varians</i>	17	18	7							
Class BIVALVIA										
Family MYTILIDAE										
<i>Brachidontes exustus</i>	2			1		6				
Family ISOGNOMONIDAE										
<i>Isognomon alatus</i>								13		
<i>Isognomon bicolor</i>	1	1	1							
Family OSTREIDAE										
<i>Crassostrea virginica</i>				1		3				
Phylum ARTHROPODA										
Subphylum CRUSTACEA										
Class CIRRIPIEDIA										
Family BALANIDAE										
<i>Balanus</i> sp. (juv.)			1			2				
Family CHTHAMALIDAE										
<i>Chthamalus</i> sp. (juv.)	8	3	7							
Class MALACOSTRACA										
Order DECAPODA										
Family XANTHIDAE										
Unident. juv. xanthid				1						
Family GRAPSIDAE										
<i>Pachygrapsus transversus</i>		1								
Subphylum UNIRAMIA										
Class INSECTA										
Order COLLEMBOLA										
Family ANURIDIDAE										
<i>Anurida maritima</i>		~150	1	2	4	3		2	2	
Phylum CHORDATA										
Class ASCIDIACEA										
Unident. colonial tunicate	12	5								
Total # of specimens	45	44	33	52	14	49	2	16	9	
Total # species (by replicate)	7	9	7	5	2	5	1	3	2	
H' (by replicate)	1.550	0.896	1.663	0.445	0.598	0.970	0.000	0.602	0.530	
J' (by replicate)	0.407	0.170	0.476	0.113	0.227	0.249	0.000	0.217	0.241	
Total # species (by station)		13			6			3		
H' (by station)		1.532			0.777			1.003		
J' (by station)		0.597			0.434			0.913		