12-31-1991

# 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 1991

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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 1991

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Submitted: 31 December 1991

## A. INTRODUCTION

This report documents the August 1991 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 first monitoring effort of the series carried out by Nova University Oceanographic Center. As of this sampling period, the turning basin is complete and in operation; mitigation areas in John U. Lloyd Park exhibit considerable vegetative expansion of cord grass, growth of mangrove seedlings, and natural recruitment of additional mangrove propagules (including black and white mangroves).

Sampling was carried out during the last week of August and extended through September 1991 due to weather constraints and because precise locations of several stations could not be confirmed until the former contractor was consulted.

### A.1. History

Benthic macroinvertebrate communities at the Southport Turning Basin site and adjacent areas of John U. Lloyd State Recreation Area were initially monitored in March, May, and September, 1988, before basin dredging and mangrove mitigation began. Only results of the September 1988 sampling have been reported. Nineteen stations were occupied during the September 1988 and January 1989 sampling periods as follows: eight stations in two transects north of the proposed turning basin and 11 stations in four transects in John U. Lloyd State Recreation Area on the east side of the Intracoastal Waterway (ICWW)(Figure 1). Tree removal for mitigation began on the east side of the ICWW in late 1988, but scraping to intertidal level did not begin until after the January 1989 sampling period. Dredging of the turning basin began in the summer of 1989. Between January and August 1989, dredging destroyed several stations sites along the northern margin of the turning basin. These stations were relocated approximately 10m to the north for the August 1989 sampling period. Also in August 1989, four additional stations were added (two on the west side and two on the east side of the ICWW). In January 1990, the turning basin approached final size; planting of mangrove seedlings and cord grass was underway in some mitigation areas. By the August 1990 sampling period, extensive mitigation

and emplacement of rip-rap was completed along the east side of the ICWW; dredging continued in the turning basin but the margin was almost completely lined with rip-rap. Monitoring was carried out biannually by S. Dobkin through January 1991.

## B. METHODOLOGY

Figure 1 illustrates locations of stations occupied for the August 1991 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 for each individual 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 ($p_1=p_2=p_3...$), 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 $cm^2$ grab sampler[1] at stations 1, 8, 8a, 9, 10a, 11, 13a, 14, 17, 18 and 19a, with three replicate samples at

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1. Contract specifications call for a 225 $cm^3$ 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.

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 7). Small numbers of 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.

Sampling and handling protocols differ slightly from those of the previous contractor. All changes improve sampling accuracy in conformity with contract specifications, as follows:

1) Mixed rocky and unconsolidated substrates at several stations adjacent to rip-rap along the ICWW require that the grab sampler be operated by a diver in order to ensure consistent sample size.

2) Shallow-water stations (10a, 17 and 19a) are sampled via hand-emplaced grab sampler rather than shovel. This ensures that all samples collected at stations specified for grab sampler will cover equal areas of substrate.

3) The previous contractor sieved and sorted through one-third of each sample. We sieve all samples completely. Samples including up to approximately 0.5 liter of sediment retained on the 0.5 mm screen are sorted completely. When a larger volume is retained, we sort through half the sample (and double the recorded number of each taxon). This protocol guarantees more accurate enumeration of collected organisms.

B.2. CRAB COLLECTIONS

Three 1.0-$m^2$ 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.

Protocols differ slightly from previous sampling periods, as follow:

1) Contract specifications require that "Arboreal crabs are to be noted and abundance recorded within a specified observation area..." The previous contractor recorded arboreal crabs only as "few," "moderate" or "abundant" without indicating the quantitative range of each term. Observations were made in a circle of trees "approximately 3-4 meters in diameter." Because these crabs crawl out of sight (into the canopy and around the far side of trunks and branches) upon approach, we have reduced the observation area in order to make more accurate counts. We count crabs on trees arising from a 1.0-$m^2$ quadrat selected randomly within about 2.0 m of the burrow-census quadrats. Arboreal censuses are carried out first at each site to minimize disturbance.

B.3 HAND COLLECTIONS

Hand collections are taken at stations 9, 13, and 17, with three replicates at each station. 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. Some algae-covered rocks were examined in the laboratory and their associated fauna sorted there.

Sampling protocols differ somewhat from those of the previous contractor in order to conform more closely with contract specifications, as follows:

1) Contract specifications require that "hand collections are to be performed within a measured area..." The previous contractor made no mention of the area sampled. Our samples consist of 1.0m transects 0.1m wide and parallel to the local waterline. Replicates at each station are taken at about the same distance from the water's edge and no more than about one meter apart.

Each replicate sample covers an area of 0.1$m^2$. Intertidal environments are often highly patchy and vertically zoned with distinct assemblages of organisms occupying immediately adjacent areas of substrate. While a larger area would reduce inter-replicate variability due to local environmental patchiness and zonation (e.g., such samples would include fauna on rocks

with and without algal cover, and both high and low intertidal zone assemblages), it would also severely expand sampling time, especially in densely populated areas. For example, a 1.0 $m^2$ quadrat may be large enough to include both low intertidal oysters and high intertidal periwinkle snails, but requires either counting several thousand barnacles or implementing statistically sophisticated subsampling protocols.

2) Contract specifications state that "organisms collected within a specified sampling area shall be enumerated..." The previous contractor explicitly does not count the several species of barnacles listed. Resulting diversity indices, therefore, do not accurately reflect community structure. Our samples include an enumeration of all visible organisms as well as qualitative notes on additional organisms observed on adjacent substrates.

Barnacles present a difficult quantification/identification problem. Where relatively large numbers occur, all specimens cannot be collected without significantly modifying the local habitat (i.e., removing most rocks within a sampling area). As a result, as many recognizably different taxa were distinguished and enumerated in the field and a representative sample of each was collected for identification. The same set of "field-distinguished" taxa were observed at stations 9 and 13, and specimens were collected only at station 9 to minimize habitat modification. Microscopic analyses by an expert in barnacle taxonomy revealed that one "field-distinguished" form actually represents two species (*Balanus amphitrite* and *B. reticulatus*), whereas two other "field-distinguished" forms represent juvenile and adult members of a single species (*Chthamalus fragilis*). The numbers recorded for each species at station 9 (Table 5) are extrapolated from the collected and accurately identified subsample--they, therefore, provide only an estimate of the true diversity here. Because no specimens were collected at station 13, we have refrained from extrapolating to this site. It is likely, however, that the taxon called "unidentified balanid" in Table 5 actually includes both *B. amphitrite* and *B. reticulatus*. Future monitoring periods will include a larger subsampling effort to more accurately reflect true barnacle diversity.

## C. RESULTS

### C.1. GRAB SAMPLES

A total of 3,981 specimens were sorted and identified from the 33 grab samples (11 stations with three replicates each). Table 1 lists raw data, Shannon-Weaver Diversity Indices (H') and evenness (J') for all samples by station and by replicate. Table 2 summarizes numbers of specimens by major taxonomic group; Table 3 summarizes relative abundances of major taxonomic groups (percent occurrence).

Polychaete worms dominate the overall fauna (43.7%) followed by peracarid crustaceans (16.2%) and molluscs (15.2%). Individual stations vary considerably from these values, usually due to the presence of a particular species found in large numbers at one or a few stations. Several taxa occur in at least small numbers at many or most stations, including the gastropod *Caecum pulchellum* (8 stations), the polychaetes *Aricidea philbinae* (9 stations), *Prionospio heterobranchiata* (8), *Pseudopolydora* sp. (7), *Mediomastus* sp. (9), and *Glycera abranchiata* (7), and an unidentified tubificid oligochaete (9). All stations in the Intracoastal Waterway (ICWW) were taken between 3 and 5 m from the water's edge. 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. Faunal totals: 422 specimens, 51 species. Shannon-Weaver Diversity Index (H'): 3.162. Evenness (J'): 0.804.

Polychaetes dominate the station (57.4%) followed by oligochaetes (17.5%) and molluscs (14.7%). The most abundant species are the polychaetes *Prionospio heterobranchiata* and *Mediomastus* sp., the oligochaetes *Tectidrilus verrucosus, Tubificoides motei*, and an unidentified tubificid, and the gastropod mollusc *Caecum pulchellum.*

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. Faunal totals: 150 specimens, 21 species. H': 2.306. J': 0.757.

Polychaetes exhibit greater dominance here than at the previous station (65.3%), followed by relatively (and absolutely) smaller numbers of oligochaetes (10.7%) and molluscs (9.3%). The most abundant taxa are the polychaetes *Aricidea taylori* and *Mediomastus* sp.

Station 8a: West side of ICWW approximately 50 m north of station 8. Depth and bottom: similar to station 8. Faunal totals: 178 specimens, 28 species. H': 2.808. J': 0.843.

Polychaetes again dominate (67.4%) with low but similar relative numbers of oligochaetes, molluscs, peracarid crustaceans, and other organisms (all 6.7%). The most abundant organisms are the polychaetes *Aricidea taylori, Prionospio heterobranchiata* and *Mediomastus* sp.

Station 9: East side of ICWW at the SW corner of a mangrove island north of the northern entrance to Whiskey Creek. Depth: approximately 3 m. Bottom: Firm muddy sand. Faunal totals: 244 specimens, 34 species. H': 2.868. J': 0.813.

Polychaetes dominate the fauna (59.0%) followed by oligochaetes (13.9%) and ostracod crustaceans (12.7%). The most abundant taxa are the polychaetes *Aricidea philbinae, Prionospio heterobranchiata, Pseudopolydora* sp., and *Capitella capitata*, an unidentified podocopan ostracod and an undescribed species of amphipod in the genus *Cerapus*.

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. Faunal totals: 416 specimens, 19 species. H': 1.397. J': 0.474.

An unidentified podocopan ostracod is the most abundant organism (52.4%). The polychaete fauna (43.8%) is dominated by *Leitoscoloplos fragilis* and *Aricidea taylori*. No other group accounts for more than two percent of the fauna.

Station 11: At north corner of the northern entrance to Whiskey Creek. Depth: approximately 4 m. Bottom: Fine muddy sand with finely divided mangrove detritus among large rocks. Faunal totals: 222 specimens, 26 species. H': 2.549. J': 0.782.

Polychaetes overwhelmingly dominate the fauna at this station (78.4%) followed by much smaller numbers of molluscs (7.2%) and nemerteans (6.3%). The most abundant taxa are the polychaetes *Aricidea taylori, Mediomastus* sp. and *Branchiomma nigromaculata.*

Station 13a: East side of ICWW opposite the Florida Power & Light discharge canal. Depth: approximately 3 m. Bottom: Firm muddy sand. Faunal totals: 186 specimens, 23 species. H':

1.985. J': 0.633.

Polychaetes exhibit a greater level of dominance at this station (83.8%) than at any other. The next most abundant groups, oligochaetes, peracarid crustaceans and molluscs account for 5.9, 5.4, and 4.3% of the fauna, respectively. The most abundant taxa are the polychaetes *Aricidea taylori* and *Pseudopolydora* sp.

Station 14: East side of ICWW opposite northern margin of Southport Turning Notch. Depth: approximately 3 m. Bottom: Firm muddy sand. Faunal totals: 149 specimens, 21 species. H': 2.129. J': 0.699.

Polychaetes again overwhelmingly dominate the fauna (77.2%), followed by molluscs (10.1%) and peracarid crustaceans (6.7%). The most abundant taxa are the polychaetes *Aricidea taylori* and *Pseudopolydora* sp.

Station 17: Whiskey Creek on a line directly east of station 14. Depth: 0.2 m. Bottom: Fine muddy sand. Faunal totals: 1822 specimens, 21 species. H': 1.961. J': 0.644.

This station exhibits a fauna that differs strongly from all other stations. Peracarid crustaceans dominate (31.3%) followed by polychaetes (24.9%), molluscs (22.2%) and sipunculans (18.0%). The most important taxa include the gastropods *Caecum pulchellum* and *C. imbricatum*, the polychaetes *Syllis cornuta* and *Nematoneris hebes*, the sipunculan *Aspidosiphon albus*, the ostracod *Rutiderma darbyi*, and the tanaidacean crustacean *Kalliapseudes* sp. *Aspidosiphon albus* and *Kalliapseudes* sp. account for almost 50% of all specimens collected here and were found nowhere else.

Station 18: East side of ICWW opposite Southport Everglades container dock. Depth: approximately 3 m. Bottom: Fine muddy sand with finely divided mangrove detritus. Faunal totals: 144 specimens, 24 species. H': 2.679. J': 0.916.

Molluscs (38.9%) slightly outnumber polychaetes (30.6%), followed by oligochaetes (13.9%) and ostracods (6.9%). The most abundant taxon is the gastropod mollusc *Caecum pulchellum.*

Station 19a: Whiskey Creek on a line due east of station 18. Depth: 0.2 m. Bottom: Fine muddy sand. Faunal totals: 48 specimens, 10 species. H': 2.109. J': 0.916.

Polychaetes and ostracods are equally important (25.0%), followed by oligochaetes, sipunculans and peracarid crustaceans (each 16.7%). The most abundant taxa (keeping in mind their low absolute numbers) are the polychaete *Aricidea philbinae*, the sipunculan *Phascolion* sp., an unidentified podocopan ostracod, and the amphipod *Grandideriella bonnieroides*. The latter occurs in similarly small numbers at five other stations and represents an important taxon at station 19a because of the small total number of organisms collected here.

C.2. CRAB CENSUSES

Table 4 lists all crab census data including numbers of burrows, species and specimens, diversity indices and evenness values. Of ground-dwelling crabs, the grapsid *Sesarma curacaoense* is most abundant and occurs at all seven stations on the west side of the ICWW. (It also occurs in John U. Lloyd Park on the east side of the ICWW but not in quadrats sampled during this study.) The fiddler crab (Ocypodidae) *Uca thayeri* is next most abundant but occurs in a greater variety of habitats (8 stations on both side of the ICWW). Smaller numbers of other identified species are distributed as follows: *Uca speciosa* (3 stations north of the Turning Notch), *U. pugnax* and *U. pugilator* (2 and 1 stations, respectively, east of the ICWW), and the xanthid *Eurytium limosum* (2 stations north of the Turning Notch).

Tree crabs (*Aratus pisoni*) occur at all stations north of the Turning Notch (west of the ICWW). East of the ICWW, *A. pisoni* was recorded inside the designated sampling area only at station 16 where, in addition, very large numbers were observed on trees outside the sampling area. None were observed within the sampling areas at the other stations east of the ICWW although small numbers have been seen in some surrounding areas. All crab census results are summarized below.

Station 1a: Edge of red mangrove fringe adjacent to riprap at northeast corner of Southport Turning Notch. Crab census data: *Sesarma curacaoense* (7); *Aratus pisoni* (13 specimens in 3 trees/$m^2$). Number of burrows by replicate: 169, 80, 175. Shannon-Weaver Diversity Index (H'): 0 (only one species recorded). Evenness (J'): 0.

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

Crab census data: *S. curacaoense* (9), *Eurytium limosum* (3); *A. pisoni* (3 in 3 trees/$m^2$). Number of burrows by replicate: 164, 142, 97. H': 0.562. J': 0.811.

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* (5), *Uca speciosa* (3), *U. thayeri* (4); *A. pisoni* (4 in 4 trees/$m^2$). Number of burrows by replicate: 197, 156, 165. H': 1.076. J': 0.981.

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), *U. thayeri* (3); *A. pisoni* (11 in 5 trees/$m^2$). Number of burrows by replicate: 147, 115, 125. H': 0.562. J': 0.811.

Station 5: In dense red mangrove fringe 30 m north of station 4. Crab census data: *S. curacaoense* ( 12), *U. thayeri* (4), *U. speciosa* (1), unidentified juvenile *Uca* (1); *A. pisoni* (6 on 3 trees/$m^2$). Number of burrows by replicate: 149, 152, 153. H': 0.926. J': 0.668.

Station 6: In dense red mangrove fringe 3 m east of natural drainage canal and 10 m north of station 3. Crab census data: *S. curacaoense* (4), *U. thayeri* (2), *E. limosum* (3); *A.pisoni* (10 in 4 trees/$m^2$). Number of burrows by replicate: 161, 148, 155. H': 1.061. J': 0.966.

Station 7: In dense red mangrove fringe 30 m north of station 2. Crab census data: *S. curacaoense* (14), *U. thayeri* (1), *U. speciosa* (2), unidentified juvenile *Uca* (1); *A. pisoni* (8 in 3 trees/$m^2$). Number of burrows by replicate: 148, 199, 291. H': 0.761. J': 0.549.

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: *U. thayeri* (3). Number of burrows by replicate: 22, 26, 12. 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* (4), *U. pugnax* (6), *U. thayeri* (3). No tree crabs. Number of burrows by replicate: 45, 51, 32.

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: *Uca pugnax* (5), *U. thayeri* (1). No tree

crabs inside sampling area. Number of burrows by replicate: 42, 12 9.

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 thayeri* (2); *A. pisoni* (6; the record of the number of trees in sampling area has been lost).

C.3. HAND SAMPLES

A total of 471 specimens representing 15 taxa were collected at the three hand collection stations. Table 5 lists all raw data, diversity indices and evenness values by station and by replicate. 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. Filamentous green algal mats cover portions of the shoreline. H': 1.460. J': 0.609.

The barnacle *Chthamalus fragilis* and the gastropod *Batillaria minima* are the most abundant organisms. Numbers of different barnacle species have been extrapolated from identified subsamples (see Methodology section). Replicate 3 differs from 1 and 2 in including several algae-covered rocks. (Replicates were taken randomly.) Barnacles are generally absent from such rocks, accounting for their reduced numbers in this replicate. Numerous barnacles were observed on rubble lacking algae immediately outside the measured area. Eunicid polychaetes were found only among the algal filaments. Similarly, an area adjacent to replicate 2 supported an extensive algal carpet.

Adjacent boulders (riprap) exposed to greater wave surge support dense barnacle populations and scattered and clustered flat oysters (*Isognomon alatus*) lower in the intertidal zone. A few *Littorina ziczac* (Gastropoda) occur near the tops of these rocks. A single pulmonate limpet, *Siphonaria pectinata*, was also observed on the riprap. Smaller rocks sheltered from direct surge among the riprap support numerous hermit crabs, *Clibanarius antillensis*, in *Batillaria* shells.

Station 13: Intertidal muddy sand with numerous small rocks and pebbles 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 row of four mangrove seedlings closest to water's edge. H': 0.759. J': 0.547.

The gastropod *Batillaria minima* and unidentified barnacles dominate all three replicates. "Unidentified balanid" barnacles (Table 5) probably represent both *B. amphitrite* and *B. reticulatus* (see Methodology section). The barnacles occur on the rocks; the gastropod on, under or adjacent to the rocks. Sampling followed a rainfall, perhaps accounting for the lack of other, motile organisms and for the low diversity indices.

Station 17: Intertidal muddy sand among red mangrove roots with partly buried rocks and extensive but not continuous filamentous green algal mat, 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': 1.379. J': 0.857.

Very young fiddler crabs (*Uca* sp.) and the springtail *Anurida maritima* together account for about three-quarters of the 26 organisms counted. Two additional *Nassarius vibex* snails and one swimming crab (*Callinectes* sp.) were observed immediately outside the sample transects.

## D. DISCUSSION

### D.1. GRAB COLLECTIONS

Stations along both sides of the ICWW (stations 1, 8, 8a, 9, 11, 13a, 14, 18) exhibit generally similar faunas dominated by polychaete worms (chiefly paraonids, spionids, and capitellids) accompanied by smaller relative numbers of oligochaetes (Tubificidae) and molluscs (chiefly *Caecum pulchellum*). As examples of this faunal similarity, the polychaetes *Prionospio heterobranchiata* and *Mediomastus* sp. and an unidentified tubificid oligochaete are found at all eight ICWW stations, *C.pulchellum* and the polychaete *Aricidea philbinae* occur at seven, and the polychaetes *Pseudopolydora* sp. and *Lumbrineris verrilli* occur at six. Station 18 varies somewhat in having a greater proportion of molluscs (mostly *C. pulchellum*) than polychaetes but species composition is similar to the other sites. Nemerteans, peracarid crustaceans, and other organisms (actinians, decapod crustaceans, and echinoderms taken together) each account for no

more than 8% of the fauna at any of these sites. Ostracod crustaceans contribute substantially only at station 9 (12.7%; adjacent to the shallow station 10a, where they are extremely abundant). Polychaete dominance is greatest (77.2-83.9%) at three adjacent stations on the east side of the ICWW (11, 13a, 14).

Despite the faunal similarities, differences exist. Station 1, immediately adjacent to the Turning Notch, exhibits a higher diversity (3.162) and far greater number of species (51) than any other site monitored and almost twice as many specimens as any other ICWW site. With the exception of station 9 with 34 species, all other ICWW stations have between 21 and 28 species. Estimated organism abundances are similar at most ICWW stations, varying between 144 and 178 specimens (stations 8, 8a, 13a, 14, 18). Stations 9 and 11, both well to the north of the Turning Notch have similar, somewhat higher numbers (244, 222). Diversity indices show no clear pattern. Apart from the peak recorded at station 1, values range from slightly over 2.8 at stations 8a and 9 to just below 2.0 at station 13a.

Stations outside the ICWW support substantially different faunas with relatively low diversity indices and numbers of species. Station 10a, in much shallower water than the ICWW stations, is dominated by an unidentified podocopan ostracod (52.4%) followed by a relatively low diversity polychaete fauna (43.8%). The two dominant polychaete species are *Leitoscoloplos fragilis*, found elsewhere only at the adjacent station 9, and *Aricidea philbinae* which is widespread at ICWW stations. Species richness is lower than at any ICWW station (19) and diversity is lowest of all stations monitored. However, the total number of specimens (416) approaches the highest number recorded in the ICWW. This station is located in the low intertidal zone, a more stressful habitat than in deeper water, where fewer species can survive but those that do typically occur in large numbers.

The two stations in Whiskey Creek differ substantially from each other. Peracarid crustaceans dominate station 17, followed by polychaetes, molluscs and sipunculans. The tanaidacean *Kalliapseudes* sp. accounts for the vast majority of peracarids, but two isopod species also occur only at this station. Similarly, *Aspidosiphon albus*, the only sipunculan found here, and *Caecum*

*imbricatum*, one of the two most abundant molluscs (the other is the widespread *C. pulchellum*), occur at no other monitoring site. The most important polychaetes, *Syllis cornuta* and *Nematoneris hebes*, occur at several other stations but only in small numbers. Species richness is low (21). Diversity is also low (1.961) due to the overwhelming dominance of a few taxa. Five of 21 species account for 88% of all organisms. Organism abundance, however, is more than four times greater than at any other station. Again, this is a shallow-water habitat subject to the same kinds of stresses that modify the community sampled at station 10a, reducing diversity but maintaining high abundances. Alternatively, communities at ICWW stations may be maintained at lower densities than at sheltered stations (e.g., 13, 17) perhaps due to sediment instability generated by wind- and boat-generated turbulence.

Station 19a, also in Whiskey Creek, supports a community characterized by low diversity and the lowest numbers of species and specimens of any monitored site. Organism numbers are extremely low (48) and no major taxonomic group exhibits substantial dominance. Most species recorded here occur at other stations although *Phascolion* sp., the only sipunculan, occurs nowhere else. Low values here remain unexplained.

Because the previous contractor did not supply identifications of some important taxonomic groups, detailed comparisons of faunal composition, species diversity, and species richness cannot be made with previous sampling periods. A few important comparisons can be made, however. Polychaetes continue to dominate the fauna at all ICWW sites except station 18. However, while molluscs (chiefly *Caecum pulchellum*) dominate the August 1991 sampling period here, amphipods were relatively most abundant during January and August 1989. Amphipods have also contributed substantial (though not dominating) relative numbers to other stations at other times (e.g., station 8, Aug. 1989; stations 11, 14 and 18, Jan. 1991). In August 1991, they account for no more than about 10% of polychaete numbers at any ICWW station. Tellinid bivalves have also occasionally contributed substantially to faunal totals (e.g., station 9, Jan. 1990) but do not do so in August 1991. By contrast, the most important mollusc recorded in August 1991, *Caecum pulchellum*, has never been mentioned in any of the previous reports. This is most likely due to the difficulty involved in distinguishing empty shells from intact specimens

in preserved samples.

Possible faunal variations over time at station 10a cannot be documented because ostracod crustaceans, the dominant organisms here in August 1991, were never documented as a group at any station during any previous monitoring period. The possibility exists that the most recent sampling effort documents their initial appearance in the area, but this is unlikely.

Sipunculans and tanaidaceans have remained important faunal components at station 17 throughout the monitoring period (Sept. 1988 to Aug. 1991). Although not identified previously, it seems likely that the tanaidacean collected in the most recent effort (*Kalliapseudes* sp.) is the same as reported earlier. It is also possible that sipunculans previously collected here, recorded as "unidentified" in Sept. 1988 and August 1989 and as *Phascolion strombus* in Jan. 1990 through Jan. 1991, may be the same as the currently dominant *Aspidosiphon albus*.

Comparisons of total numbers of organisms between August 1991 and earlier sampling efforts must be viewed with caution because the former contractor sieved and sorted through one-third of each grab replicate while we have sieved each grab sample completely and sorted through half or all of each (depending upon the volume retained--see Methodology section). Table 6 summarizes grab collection results available to us. Total numbers of specimens have been extrapolated to estimate total numbers per grab sample. The following comments refer chiefly to summertime records in order to avoid difficulties superimposed by seasonal variations.

Of those sites sampled since September 1988, stations 8 and 9 exhibit apparent continuous declines in numbers of specimens collected; stations 11 and 14 decline from September 1988 through August 1990 but show considerable increases in August 1991. Station 17 has exhibited the highest numbers of specimens of any station during most sampling periods with an estimated peak abundance in August 1990. By contrast, station 1 declines from September 1988 through August 1990 with a substantial recovery in August 1991. Station 18 exhibits a net increase in numbers of specimens collected since the beginning of the project (although this trend is confused by unusually high wintertime values in January 1989 and 1991, but not 1990). Finally, station 19a exhibits no clear trend in numbers of specimens over time, varying from an initial

high in September 1988 to extreme lows in January 1989 and August 1991, with relatively high values in August 1990 and January 1991.

Of those sites sampled beginning in August 1989, station 8a shows a general decline in total numbers of specimens, station 10a shows an increase, and station 13a exhibits no trend.

D.2. CRAB CENSUSES

Crab census stations on the west side of the ICWW north of the Turning Notch, with the exception of those destroyed by dredging operations as reported by the previous contractor, have been essentially unaffected by dredging and emplacement of riprap, and have maintained the same community structure since monitoring began. Crab populations are dominated by the grapsid *Sesarma curacaoense* accompanied by smaller numbers of the ocypodid *Uca thayeri* and the xanthid *Eurytium limosum*. The August 1991 sampling period also includes a few *Uca speciosa*, a species not previously reported on this side of the ICWW. Although this sampling period may record the first appearance of this species in this area, it is more likely that crabs identified as *Uca* sp. in previous reports actually include at least some specimens of *U. speciosa*. Crab numbers reported in August 1991 maintain levels reported during previous summer samplings. The tree crab, *Aratus pisoni* was widespread among stations west of the ICWW during previous sampling periods and was observed at all stations here in August 1991.

The August 1991 sampling at station 10 (on a small mangrove island north of Whiskey Creek) records only a few *Uca thayeri*, a decline in both species richness and diversity from previous sampling efforts. It is not certain, however, if the August 1991 station location is precisely the same as previously. Similarly, it is not clear that the spot identified as station 12 in August 1991 is the same as that used previously. Earlier sampling efforts 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.

Station 13 continues to maintain a population of *Uca pugilator* and *U. thayeri* as reported during earlier sampling efforts. Earlier reports have also included one-time records of *U. leptodactyla, U. rapax* and the xanthid *Panopeus herbsti*. The August 1991 sampling effort adds *U. pugnax* for the first time. Caution must be exercised here, however. Members of the *pugilator*-

*pugnax-rapax* complex in the genus *Uca* are distinguishable only with difficulty, if at all, and several crustacean taxonomists have advised us that these crabs are in need of taxonomic revision.

The crab community at station 15 has changed substantially. The August 1991 sampling includes only *Uca pugnax* and *U. thayeri* whereas previous reports have almost uniformly included *Sesarma curacaoense, U. thayeri* and *Eurytium limosum*. This station lies in the narrow strip of red mangroves between the ICWW and North Ocean Drive. Because of its small area (especially in comparison with the extensive continuous forest west of the ICWW), resident crab populations are more likely to have been affected by the surrounding mitigation dredging and riprap emplacement.

By contrast, a similar decline in crab populations from previous records at station 16 is not as understandable. This station is located well within the red mangrove forest between North Ocean Drive and Whiskey Creek. The August 1991 sampling includes only two specimens of *U. thayeri*. Previous records include this species and/or (at various times) *U. rapax, U. speciosa, S. curacaoense, E. limosum* and unidentified *Uca*. Again, station location may not be precisely the same as previously. Alternatively, drainage patterns within the forest may have been modified by the dredging of canals associated with mitigation east of North Ocean Drive.

D.3. HAND COLLECTIONS

Hand collections are not directly comparable with previous efforts because sampling area has varied. Station 9, however, has clearly maintained a similar, typical intertidal fauna throughout much of the monitoring period. The August 1991 record includes most of the species recorded in January 1989 (e.g., *Batillaria minima, Littorina ziczac, Isognomon alatus, Balanus amphitrite* and *Chthamalus* sp.). The common intertidal gastropod, *Batillaria minima*, has also been recorded at station 13 since August 1990. We have no records for specimens collected by hand at station 17 since January 1989.

Preparations are currently being made for the January 1992 monitoring period.

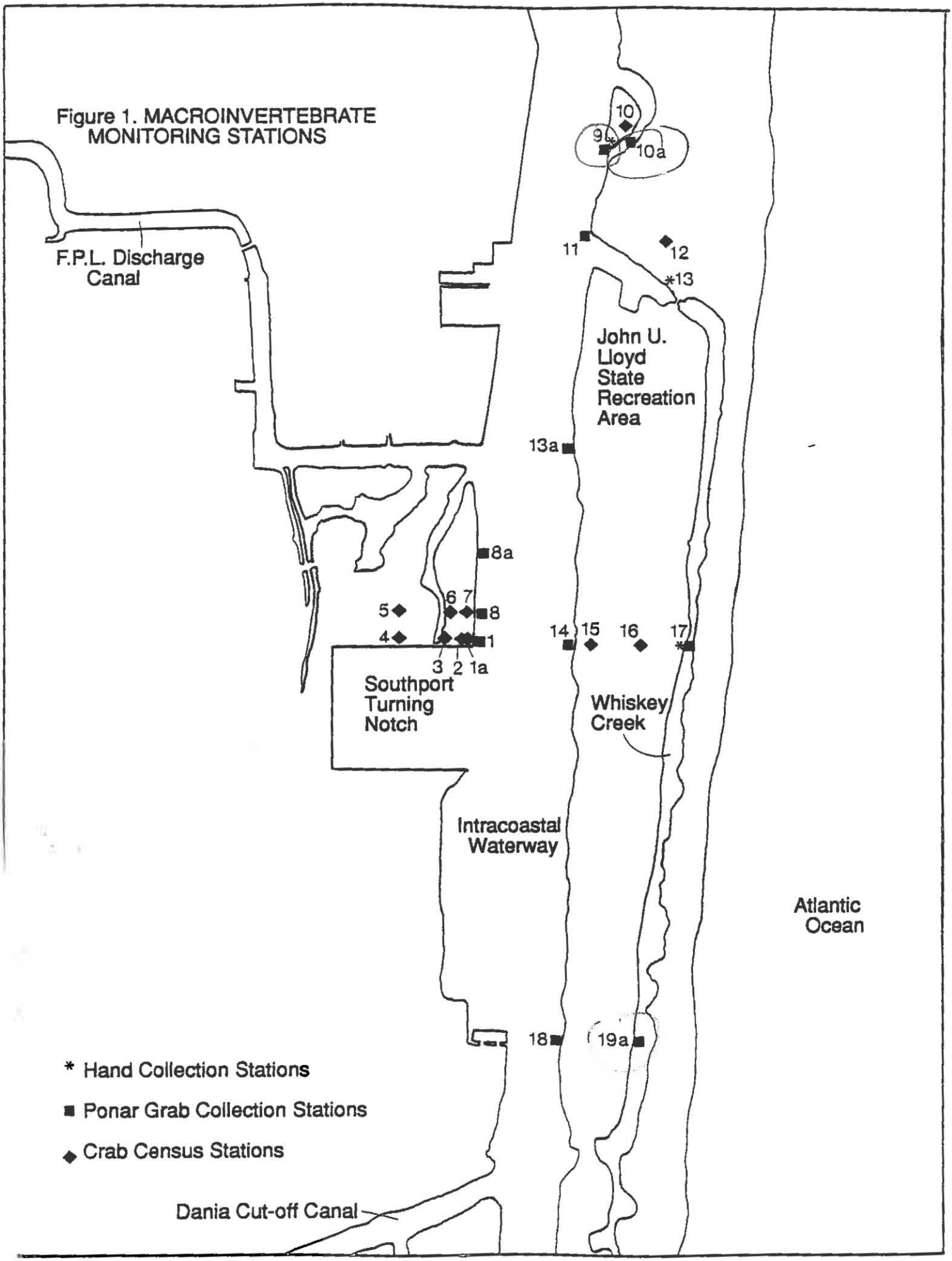
Figure 1. MACROINVERTEBRATE MONITORING STATIONS
F.P.L. Discharge Canal
John U. Lloyd State Recreation Area
Southport Turning Notch
Whiskey Creek
Intracoastal Waterway
Atlantic Ocean
Dania Cut-off Canal
10
9
10a
11
12
*13
13a
8a
5
6
7
8
4
1
3
2
1a
14
15
16
17
18
19a
* Hand Collection Stations
■ Ponar Grab Collection Stations
◆ Crab Census Stations

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

| STATION | | 1 | | | 8 | | | 8a | | | 9 | | | 10a | | | 11 | | | 13a | | | 14 | | | 17 | | | 18 | | | 19a | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phylum CNIDARIA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CLASS ZOANTHARIA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Order ACTINIARIA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unidentified actinian | | | | | 2 | | | | | | | 1 | | | | | | | 1 | | | | | | | | | | | | | | | 4 |
| Phylum NEMERTINA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Order ARCHINEMERTEA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family CEPHALOTHRICIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cephalothricid sp. (JLN 114) | | | | | | | | | | | | | | | | 2 | | | | | | | | | | | | | | | | | | 2 |
| Order PALEONEMERTEA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family CARINOMIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Carinomella lactea? | 6 | | | 4 | | 2 | | 2 | 6 | | 2 | 2 | | | | | | | | | | | | | | | | | | | | | | 24 |
| Family HUBRECHTIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hubrechtella dubia? | | 10 | | | | | | | | | 3 | | | | | | | | | | | | | | | | | | | | | | | 13 |
| Family TUBULANIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tubulanus pellucidus? | | 4 | | | | | 2 | | | | | | | | | 6 | | | | | | | | | 2 | | | | | | | | | 14 |
| Tubulanus rhabdotus | | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 |
| Order HETERONEMERTEA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family LINEIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lineid sp. A | | | | | | 4 | | | | | | | | | | 2 | | | | | | | | | | | | | | | | | | 6 |
| Unidentified nemertine | | 2 | | | | | | | | | | | | | | | | 4 | | | | | | 2 | | | | | | 6 | | | | 14 |
| Phylum MOLLUSCA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Class POLYPLACOPHORA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family ISCHNOCHITONIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ischnochiton sp. | | | | | | | | | | | | | | | | | | | | | | | | | 2 | | | | | | | | | 2 |
| Class GASTROPODA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Subclass PROSOBRANCHIA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Order ARCHEOGASTROPODA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family VITRINELLIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cyclostremiscus suppressus | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 4 | | | | 4 |
| Pleuromalaxis balesi | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 | | | | 2 |
| Family CAECIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Caecum imbricatum | | | | | | | | | | | | | | | | | | | | | | | | | 138 | | 72 | | | | | | | 210 |
| Caecum pulchellum | 2 | | 34 | 2 | 2 | | 4 | 6 | | | | | | | | 10 | | 2 | 2 | 1 | 4 | 1 | | 12 | 124 | | 66 | | 8 | 34 | | | | 314 |
| Meioceras nitidum | | | | | | | | | | | | | | | | 2 | | | | | | | | | 2 | | | | | | | | | 4 |

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

| STATION | | 1 | | | 8 | | | 8a | | | 9 | | | 10a | | | 11 | | | 13a | | | 14 | | | 17 | | | 18 | | | 19a | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 CERITHIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cerithium sp. | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | 1 |
| Diastoma varium | | | | | | | | | | | | | | | | | 2 | | | | | | | | | | | | | | | | | 2 |
| Order CAENOGASTROPODA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family PYRAMIDELLIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Turbonilla sp. | | | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 |
| Subclass OPISTHOBRANCHIA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family BULLIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bulla striata | | | 4 | 10 | | | | | | 1 | 1 | 2 | | | | | | | | | | | | | | | | | | | | | | 18 |
| Bulla sp.? | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | 1 |
| Family HAMINOEIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Haminoea antillarum | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | 1 |
| Haminoea elegans | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 | | 2 | | | | 4 |
| Haminoea succinea | 2 | | 6 | | | | | | | 1 | 3 | | | | | | | | | | | | | | | | | | | | | | | 12 |
| Unidentified gastropod | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 | | | | 2 |
| Class BIVALVIA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Order PTEROIDA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family LUCINIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unidentified lucinid | | | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 |
| Family TELLINIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tellina consobrina | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 | | | | | 2 |
| Tellina mera | | | 2 | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | 3 |
| Tellina sp.? (broken) | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | 1 |
| Macoma sp. | | | 4 | | | | | | 2 | | | | 2 | | 3 | | | | | | | | | | | | | | | | | | | 11 |
| Family SOLECURTIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tagelus divisus | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | 1 |
| Family VENERIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Anomalocardia auberiana | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | 1 |
| Order MYOIDA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family CORBULIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Corbula contracta | | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 |
| Unidentified juvenile bivalve | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 |

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

| STATION | | 1 | | | 8 | | | 8a | | | 9 | | | 10a | | | 11 | | | 13a | | | 14 | | | 17 | | | 18 | | | 19a | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phylum ANNELIDA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Class POLYCHAETA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Order ORBINIIDA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family ORBINIIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Leitoscoloplos fragilis | | | | | | | | | | 5 | 1 | | 7 | 26 | 32 | | | | | | | | | | | | | | | | | | 71 |
| Leitoscoloplos sp. | | | | | | | | | | | | | | 2 | 2 | | | | | | | | | | | | | | | | | | 4 |
| Family PARAONIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aricidea philbinae | 6 | | 2 | | | | | 4 | | 6 | 7 | 29 | 7 | 31 | 60 | 28 | 4 | 20 | 9 | 1 | 66 | 14 | 44 | 2 | | | | 2 | 6 | 4 | | 6 | | 358 |
| Aricidea taylori | 10 | 4 | | 30 | 6 | 20 | 2 | 12 | 18 | 1 | 2 | | | | | | | | | | | | | | | | | | | | | | | 105 |
| Order SPIONIDA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family SPIONIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dispio uncinata | | | 2 | | | | | | | | | | | | | | | | | 2 | | | | | | | | | | | | | | 4 |
| Polydora socialis | 2 | 2 | | | | | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | 10 |
| Prionospio heterobranchiata | 26 | 12 | 14 | 4 | | 4 | 2 | 4 | 8 | 5 | 5 | 10 | | | | 2 | | 2 | | 1 | 1 | | 10 | 1 | | | | 2 | 2 | 2 | | | | 117 |
| Prionospio multibranchiata | 2 | 2 | | | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 6 |
| Pseudopolydora sp. | | | | 2 | | | | 6 | | 8 | 11 | 7 | 1 | 1 | 1 | 2 | 2 | | 1 | 16 | 32 | 2 | 14 | 7 | | | | | | | | | | 113 |
| Spio pettiboneae | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 |
| Unidentified spionid | | | 2 | | | | | 2 | | 1 | | | | | | | | | | | 5 | | | | | | | | | 2 | | | | 12 |
| Family CIRRATULIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Caulleriella killariensis | 4 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | 2 | | | 2 | | | | 10 |
| Cirriformia sp. A | 2 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 4 |
| Cirriformia sp.? | | 4 | | | | | 2 | | | | | | | | | | | | | | | | | | | | | | | | | 4 | | 10 |
| Unidentified cirratulid | 10 | | 2 | | | | | | | | | | | | | 8 | 2 | | | | | | | | | | | | | | | | | 22 |
| Order CAPITELLIDA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family CAPITELLIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Capitella capitata | 6 | | | | | | | | | 1 | 1 | 19 | | 1 | 3 | | | | | | 1 | | | | | | | | | | 2 | | | 34 |
| Dasybranchus lumbricoides | | | | | | | | | | | 4 | | | | | | | | | | | | | | | | | | | | | | | 4 |
| Decamastus sp. | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | 1 |
| Heteromastus filiformis | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Mediomastus californiensis | | | | | | | | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | 2 |
| Mediomastus sp. | 48 | 38 | | 4 | 2 | 14 | 10 | 26 | | 2 | 1 | | | | | 24 | | 4 | | 2 | | | 6 | | 2 | | | | | 2 | | | | 185 |
| Notomastus hemipodus | | | | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 |

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

| STATION | | 1 | | | 8 | | | 8a | | | 9 | | | 10a | | | 11 | | | 13a | | | 14 | | | 17 | | | 18 | | | 19a | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Order PHYLLODOCIDA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family SYLLIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Exogone atlantica | | | | | | | | | | | 2 | | | | | | | | | | | | | | | | | | | | | | | 2 |
| Exogone dispar | | 4 | | | | | | | | | | | | | | | | | 1 | 5 | 1 | | | | 8 | | 6 | | | | | | | 25 |
| Odontosyllis enopla | | | | | | | | | | | | | | | | | 2 | | | | | | | | | | | | | | | | | 2 |
| Sphaerosyllis longicauda | | | 4 | | | | | | 2 | | | | | | | | | | | | | | | | | | | | | | | | | 6 |
| Sphaerosyllis piriferopsis | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 | | | | 2 |
| Sphaerosyllis riseri | | | 2 | | | | | | | | | | | | | | | | | | | | | | | | 6 | 2 | | 2 | | | | 12 |
| Sphaerosyllis taylori | | 2 | | | | | | | 4 | | | | | | | | | | | | | | | | | | | | | | | | | 6 |
| Sphaerosyllis sp. | | | | | | | | | | | | | | 3 | | | | | | | | | | | | | | | | | | | | 3 |
| Streptosyllis pettiboneae | 4 | | | | | | | | | | | | | | | | | | | | 1 | | 4 | | | | | | | | | | | 9 |
| Syllis comuta | | | | | | | 2 | 2 | | | | | | | | 12 | 4 | | | | 3 | | | 1 | 152 | 28 | 148 | | | | | | | 352 |
| Unidentified syllid | | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 |
| Family NEREIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Laeonereis culveri | | | | | | | | | | | | | | 3 | | | | | | | | | | | | | | | | | | | | 3 |
| Family GLYCERIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Glycera abranchiata | 2 | | | | | | | 2 | | 1 | 1 | 1 | 1 | | 1 | 4 | 2 | 4 | | 2 | 3 | | 6 | 1 | | | | | | | | | | 31 |
| Order AMPHINOMIDA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family AMPHINOMIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Paramphinome sp. | | | | | | | | | | | | | | | | | | | | | | | | | | | 4 | | | | | | | 4 |
| Order EUNICIDA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family EUNICIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Nematonereis hebes | | | | | | | | | 2 | | | | | | | | 2 | | | | 2 | | | | 24 | 12 | 52 | | | | | | | 94 |
| Family LUMBRINERIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lumbrineris verrilli | | 4 | 4 | | 4 | 4 | | 2 | | 3 | 2 | 2 | | | | | | | | | | | 2 | | | | | | | 10 | | | | 37 |
| Lumbrineris sp. | | | | | | | | | | | | | | | | | | 2 | | | | | | | | | | | 2 | | | | | 4 |
| Family ARABELLIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Arabella mutans | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 | | | | | | | 2 |
| Family DORVILLEIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ophryotrocha sp. A | | | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 |
| Pettiboneia sp. A | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 |
| Order TEREBELLIDA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family TRICHOBRANCHIDA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Terebellides stroemi | | | | | | | | | | | | | | | | 2 | | | | | | | | | | | | | | | | | | 2 |

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

| STATION | | 1 | | | 8 | | | 8a | | | 9 | | | 10a | | | 11 | | | 13a | | | 14 | | | 17 | | | 18 | | | 19a | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Order SABELLIDA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family SABELLIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Branchiomma nigromaculata | 2 | | | | | | | | | | 2 | 2 | | | | 6 | 32 | 4 | | | | | | 1 | 2 | | 6 | | | | | | | 57 |
| Fabriciola trilobata | | | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 |
| Unidentified sabellid | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | 2 | | | | 3 |
| Class OLIGOCHAETA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family TUBIFICIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bathydrilus adriaticus | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | 1 |
| Limnodriloides baculatus | | | | | | | | | | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | 2 |
| Limnodriloides barnardi | | | | | | | | | | | | 1 | | | | | | | 1 | 1 | 1 | | | | | | | | | | | | 2 | 6 |
| Limnodriloides rubicundis | | | | | | | | | | | 3 | 9 | | | | | | | | | | | | | | | | | | | | 2 | 14 |
| Unidentified limnodriloidine | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 4 | 4 | |
| Parakaketio longiprostatus | | | | | | | | | | | | 2 | | | | | | | | | | | | | | | | | | | | | | 2 |
| Smithsondrilus sp. | 4 | | 2 | | | 2 | | | | 2 | 4 | 1 | | | | 2 | | | | | | | | | | | | | | | | | | 17 |
| Tectidrilus verrucosus | 18 | | 8 | 2 | | 2 | | | | | | | | | | | | | | | | | | | | | | 2 | 2 | 2 | | | | 36 |
| Tubificoides motei | 10 | 2 | 8 | | 2 | 2 | | 4 | | | | | | | | | | | | | | | | 1 | | | | | | 8 | | | | 37 |
| Unidentified tubificid | 10 | 10 | 2 | 6 | | | | 8 | | 2 | | 7 | | | | 4 | | 2 | 1 | 2 | 5 | | 2 | | 12 | | | | 2 | 4 | | | | 79 |
| Phylum SIPUNCULA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Class PHASCOLOSOMATIDEA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Order ASPIDOSIPHONIFORME | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family ASPIDOSIPHONIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aspidosiphon albus | | | | | | | | | | | | | | | | | | | | | | | | | 160 | 40 | 128 | | | | | | | 328 |
| Class SIPUNCULIDEA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Order GOLFINGIIFORMES | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family PHASCOLIONIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phascolion sp. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 8 | | 8 |
| Phylum ARTHROPODA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Subphylum CRUSTACEA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Class OSTRACODA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Subclass MYODOCOPA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Order MYODOCOPINA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family RUTIDERMATIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rutiderma darbyi | 2 | | | | | | | | | | | | | | | | | | | | | | | | 20 | | 26 | | | | | | | 48 |

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

| STATION | | 1 | | | 8 | | | 8a | | | 9 | | | 10a | | | 11 | | | 13a | | | 14 | | | 17 | | | 18 | | | 19a | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Subclass PODOCOPA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unidentified podocopan | | | | | | | | | | | 4 | 27 | 1 | 129 | 88 | | | | | | | | | | 6 | | | | | 10 | | | 12 | 277 |
| Class MALACOSTRACA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Order MYSIDACEA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unidentified mysid | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | 2 | 3 |
| Order CUMACEA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unidentified cumacean | | | | | | | | | | | | 1 | | | | 2 | | | | | 1 | | | | | | | | | | | | | 4 |
| Order TANAIDACEA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family KALLIAPSEUDIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Kalliapseudes sp. | | | | | | | | | | | | | | | | | | | | | | | | | 230 | 34 | 280 | | | | | | | 544 |
| Family PARATANAIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Leptochelia sp. | | | | | | | | | | | | | | 1 | | | | | | | 1 | | | 6 | | | | | | | | | | 8 |
| Order ISOPODA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unidentified isopod A | | | | | | | | | | | | | | | | | | | | | | | | | 10 | 2 | 8 | | | | | | | 20 |
| Unidentified isopod B | | | | | | | | | | | | | | | | | | | | | | | | | 4 | | 2 | | | | | | | 6 |
| Order AMPHIPODA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family AMPITHOIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cymadusa compta | | 2 | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | 3 |
| Family COROPHIIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cerapus n. sp. | | | 2 | | | | | 4 | 4 | 1 | | 13 | | | | | | | | | 6 | | 2 | 1 | | | | | | | | | | 33 |
| Grandidierella bonnieroides | 6 | | | | | | | 2 | 2 | | | | 2 | | | | | | | 1 | | | | | | | | | 4 | | 4 | | 2 | 23 |
| Family LILLJEBORGIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unident. liljeborgid (juv) | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | 1 |
| Order DECAPODA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Infraorder PENAEIDEA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family PENAEIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Penaeus sp. | | | | | | | | | 2 | | | | 1 | | | | | | | | | | | | | | | | | | | | | 3 |
| Infraorder CARIDEA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family ALPHEIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alpheus floridanus | | 2 | | | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 4 |
| Alpheus sp. A | | | | | | | | | | | | | | | | 2 | | | | | | | | | | | | | | | | | | 2 |
| Family PROCESSIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Processa cf. vicina | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | 1 |

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

| STATION | | 1 | | | 8 | | | 8a | | | 9 | | | 10a | | | 11 | | | 13a | | | 14 | | | 17 | | | 18 | | | 19a | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 PALAEMONIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Periclimenes sp. | | | | | | | | | | | | | | | | 2 | | | | | | | | | | | | | | | | | | 2 |
| Infraorder THALASSINIDEA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family UPOGEBIIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Upogebia affinis | | 2 | | | | | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | 4 |
| Infraorder ANOMURA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family DIOGENIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Clibanarius cubensis | | | | | | | | | | | | | 2 | | | | | | | | | | | | | | | | | | | | | 2 |
| Family PAGURIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pagurus mclaughlinae | | | | | | | | | | | | | | | | | | | | | | | 2 | | | | | | | | | | | 2 |
| Pagurus cf. stimpsoni | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 | | | | | | 2 |
| Infraorder BRACHYURA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family PORTUNIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unidentified portunid | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | 1 |
| Family PINNOTHERIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pinnixa sp. | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Family XANTHIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Panopeus sp. | | | | | | | | | 2 | | | | | | | 2 | | | | | | | | | | | | | | | | | | | 4 |
| Subphylum CHELICERATA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Class PYCNOGONIDA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unidentified pycnogonid | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | 1 |
| Phylum ECHINODERMATA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Class OPHIUROIDEA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family AMPHIURIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Amphiodia trychna* | | | | | | 2 | | 4 | | | | | | | | | | | | | | | 2 | | | | | 2 | | | | | | 10 |
| Class HOLOTHUROIDEA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unidentified holothuroid (juv) | 4 | | | 2 | 4 | | | | 2 | | | | | | | | | 2 | | | | | | | | | | | | | | | | 14 |
| TOTAL | 194 | 116 | 112 | 68 | 26 | 56 | 32 | 92 | 54 | 40 | 63 | 141 | 24 | 201 | 191 | 126 | 50 | 46 | 17 | 36 | 133 | 17 | 100 | 32 | 898 | 116 | 803 | 14 | 28 | 102 | 4 | 20 | 24 | 3931 |
| Total # species (by replicate) | 26 | 22 | 22 | 11 | 10 | 10 | 9 | 17 | 12 | 15 | 23 | 23 | 9 | 13 | 9 | 21 | 8 | 10 | 8 | 13 | 16 | 3 | 12 | 13 | 17 | 5 | 15 | 7 | 8 | 19 | 1 | 4 | 6 | |
| H' (by replicate) | 2.716 | 2.514 | 2.566 | 1.876 | 2.098 | 1.875 | 1.977 | 2.456 | 2.133 | 2.415 | 2.849 | 2.446 | 1.870 | 1.194 | 1.281 | 2.548 | 1.334 | 1.893 | 1.588 | 1.974 | 1.674 | 0.578 | 1.893 | 2.022 | 1.975 | 1.375 | 1.903 | 1.946 | 1.909 | 2.417 | 0.000 | 1.280 | 1.474 | |
| J' (by replicate) | 0.834 | 0.813 | 0.830 | 0.782 | 0.911 | 0.814 | 0.900 | 0.867 | 0.859 | 0.892 | 0.909 | 0.780 | 0.851 | 0.465 | 0.583 | 0.837 | 0.641 | 0.822 | 0.764 | 0.769 | 0.604 | 0.526 | 0.762 | 0.788 | 0.697 | 0.854 | 0.703 | 1.000 | 0.918 | 0.821 | 0.000 | 0.923 | 0.822 | |
| Total # species (by station) | | 51 | | | 21 | | | 28 | | | 34 | | | 19 | | | 26 | | | 23 | | | 21 | | | 21 | | | 24 | | | 10 | | 117 |
| H' (by station) | | 3.162 | | | 2.306 | | | 2.808 | | | 2.868 | | | 1.397 | | | 2.549 | | | 1.985 | | | 2.129 | | | 1.961 | | | 2.679 | | | 2.109 | | |
| J' (by station) | | 0.804 | | | 0.757 | | | 0.843 | | | 0.813 | | | 0.474 | | | 0.782 | | | 0.633 | | | 0.699 | | | 0.644 | | | 0.843 | | | 0.916 | | |

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TABLE 2. Summary of Major Taxonomic Groups in Grab Collections.

| STATION | 1 | 8 | 8a | 9 | 10a | 11 | 13a | 14 | 17 | 18 | 19a | TOT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| NEMERTINA | 24 | 10 | 10 | 7 | 0 | 14 | 0 | 2 | 2 | 6 | 0 | 75 |
| MOLLUSCA | 62 | 14 | 12 | 9 | 8 | 16 | 8 | 15 | 404 | 56 | 0 | 604 |
| POLYCHAETA | 242 | 98 | 120 | 144 | 182 | 174 | 156 | 115 | 454 | 44 | 12 | 1741 |
| OLIGOCHAETA | 74 | 16 | 12 | 34 | 0 | 8 | 11 | 3 | 12 | 20 | 8 | 198 |
| SIPUNCULA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 328 | 0 | 8 | 336 |
| OSTRACODA | 2 | 0 | 0 | 31 | 218 | 0 | 0 | 0 | 52 | 10 | 12 | 325 |
| PERACARIDA | 10 | 0 | 12 | 16 | 3 | 2 | 10 | 10 | 570 | 4 | 8 | 645 |
| OTHER | 8 | 12 | 12 | 3 | 5 | 8 | 1 | 4 | 0 | 4 | 0 | 57 |
| | | | | | | | | | | | | |
| TOTALS | 422 | 150 | 178 | 244 | 416 | 222 | 186 | 149 | 1822 | 144 | 48 | 3981 |

TABLE 3. Summary of Major Taxonomic Groups by Percent Occurrence in Grab Collections.

| STATION | 1 | 8 | 8a | 9 | 10a | 11 | 13a | 14 | 17 | 18 | 19a | TOT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| NEMERTINA | 5.69 | 6.67 | 5.62 | 2.87 | 0.00 | 6.31 | 0.00 | 1.34 | 0.11 | 4.17 | 0.00 | 1.88 |
| MOLLUSCA | 14.69 | 9.33 | 6.74 | 3.69 | 1.92 | 7.21 | 4.30 | 10.07 | 22.17 | 38.89 | 0.00 | 15.17 |
| POLYCHAETA | 57.35 | 65.33 | 67.42 | 59.02 | 43.75 | 78.38 | 83.87 | 77.18 | 24.92 | 30.56 | 25.00 | 43.73 |
| OLIGOCHAETA | 17.54 | 10.67 | 6.74 | 13.93 | 0.00 | 3.60 | 5.91 | 2.01 | 0.66 | 13.89 | 16.67 | 4.97 |
| SIPUNCULA | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 18.00 | 0.00 | 16.67 | 8.44 |
| OSTRACODA | 0.47 | 0.00 | 0.00 | 12.70 | 52.40 | 0.00 | 0.00 | 0.00 | 2.85 | 6.94 | 25.00 | 8.16 |
| PERACARIDA | 2.37 | 0.00 | 6.74 | 6.56 | 0.72 | 0.90 | 5.38 | 6.71 | 31.28 | 2.78 | 16.67 | 16.20 |
| OTHER | 1.90 | 8.00 | 6.74 | 1.23 | 1.20 | 3.60 | 0.54 | 2.68 | 0.00 | 2.78 | 0.00 | 1.43 |
| | | | | | | | | | | | | |
| TOTALS | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

TABLE 4. 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 | | 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 | |
| CRAB BURROWS | 169 | 80 | 175 | 164 | 142 | 97 | 197 | 156 | 165 | 147 | 115 | 125 | 149 | 152 | 153 | 161 | 148 | 155 | 148 | 199 | 291 | 22 | 26 | 12 | 0 | 0 | 0 | 45 | 51 | 32 | 42 | 12 | 9 | 180 | 170 | 149 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CRAB CENSUS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family GRAPSIDE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sesarma curacaoense | 1 | 4 | 2 | 2 | 4 | 3 | | 2 | 3 | 1 | 5 | 3 | 4 | 3 | 5 | 1 | 2 | 1 | 4 | 4 | 6 | | | | | | | | | | | | | | | 60 |
| Family XANTHIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Eurytium limosum | | | | 1 | 1 | 1 | | | | | | | | | | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | 6 |
| Family OCYPODIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Uca pugilator | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | 2 | 1 | | | | | | | 4 |
| Uca pugnax | | | | | | | | | | | | | | | | | | | | | | | | | | | | 6 | | | | | 5 | | | | 11 |
| Uca speciosa | | | | | | | | 2 | 1 | | | | | 1 | | | | | | | 2 | | | | | | | | | | | | | | | | 6 |
| Uca thayeri | | | | | | | 1 | 1 | 2 | | 2 | 1 | 1 | 1 | 2 | 1 | 1 | | | | 1 | 1 | 1 | 1 | | | | | 1 | 2 | 1 | | | | | 2 | 23 |
| Uca sp. (juv.) | | | | | | | | | | | | | 1 | | | | | | 1 | | | | | | | | | | | | | | | | | | 2 |
| Total # specimens | 1 | 4 | 2 | 3 | 5 | 4 | 1 | 5 | 6 | 1 | 7 | 4 | 6 | 5 | 7 | 3 | 4 | 2 | 5 | 4 | 9 | 1 | 1 | 1 | 0 | 0 | 0 | 7 | 3 | 3 | 1 | 0 | 5 | 0 | 0 | 2 | 112 |
| Total # species (by station | | 1 | | | 2 | | | 3 | | | 2 | | | 4 | | | 3 | | | 4 | | | 1 | | | 0 | | | 3 | | | 2 | | | 1 | | |
| H' (by station) | | 0 | | | 0.562 | | | 1.076 | | | 0.562 | | | 0.926 | | | 1.061 | | | 0.761 | | | 0 | | | 0 | | | 1.058 | | | 0.451 | | | 0 | | |
| J' (by station) | | 0 | | | 0.811 | | | 0.961 | | | 0.811 | | | 0.668 | | | 0.966 | | | 0.549 | | | 0 | | | 0 | | | 0.962 | | | 0.65 | | | 0 | | |
| TREE CRAB CENSUS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family GRAPSIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aratus pisoni | 13 (3) | | | 3 (3) | | | 4 (4) | | | 11 (5) | | | 6 (3) | | | 10 (4) | | | 8 (3) | | | 0 | | | 0 | | | 0 | | | 0 | | | 6 (?) | | | |

TABLE 5. 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 MOLLUSCA | | | | | | | | | | 0 |
| Class GASTROPODA | | | | | | | | | | 0 |
| Family POTAMIDIDAE | | | | | | | | | | 0 |
| Batillaria minima | 47 | 28 | 13 | 36 | 32 | 32 | 2 | | 1 | 191 |
| Family NASSARIIDAE | | | | | | | | | | 0 |
| Nassarius vibex | 2 | | | | | | 2 | | | 4 |
| Family VERMETIDAE | | | | | | | | | | 0 |
| ?Petaloconchus varians | 3 | | | | | | | | | 3 |
| Phylum ANNELIDA | | | | | | | | | | 0 |
| Class POLYCHAETA | | | | | | | | | | 0 |
| Order EUNICIDA | | | | | | | | | | 0 |
| Family EUNICIDAE | | | | | | | | | | 0 |
| Unidentified eunicid | | | 3 | | | | | | | 3 |
| Phylum ARTHROPODA | | | | | | | | | | 0 |
| Subphylum CRUSTACEA | | | | | | | | | | 0 |
| Class CIRRIPEDIA | | | | | | | | | | 0 |
| Family BALANIDAE | | | | | | | | | | 0 |
| Balanus amphitrite | 7 | 9 | 1 | | | | | | | 17 |
| Balanus reticulatus | 5 | 6 | | | | | | | | 11 |
| Unidentified balanid | | | | 18 | 37 | 16 | | | | 71 |
| Family CHTHAMALIDAE | | | | | | | | | | 0 |
| Chthamalus fragilis | 54 | 68 | 4 | | 2 | | | | | 128 |
| Class MALACOSTRACA | | | | | | | | | | 0 |
| Order AMPHIPODA | | | | | | | | | | 0 |
| Family TALITRIDAE | | | | | | | | | | 0 |
| Unidentified talitrid | | | 4 | | | | | | | 4 |
| Order DECAPODA | | | | | | | | | | 0 |
| Family GRAPSIDAE | | | | | | | | | | 0 |
| Aratus pisoni(?) | | | | | | | | 2 | | 2 |
| Sesarma sp. (juv.) | | | | | | 1 | | | | 1 |
| Unidentified grapsid | | 1 | 2 | | | | | | | 3 |
| Family XANTHIDAE | | | | | | | | | | 0 |
| Panopeus sp. | 1 | 2 | 2 | | | | | | | 5 |
| Family OCYPODIDAE | | | | | | | | | | 0 |
| Uca sp. (juv.) | | | | | | | 4 | 3 | 3 | 10 |
| Subphylum UNIRAMIA | | | | | | | | | | 0 |
| Class INSECTA | | | | | | | | | | 0 |
| Order COLLEMBOLA | | | | | | | | | | 0 |
| Family ANURIDIDAE | | | | | | | | | | 0 |
| Anurida maritima | 5 | 1 | 3 | | | | 1 | 6 | 2 | 18 |
| Total # specimens | 124 | 115 | 32 | 54 | 71 | 49 | 9 | 11 | 6 | 471 |
| Total # species (by replicate) | 8 | 7 | 8 | 2 | 3 | 3 | 4 | 3 | 3 | 15 |
| H' (by replicate) | 1.346 | 1.161 | 1.785 | 0.637 | 0.799 | 0.723 | 1.273 | 0.995 | 1.011 | |
| J' (by replicate) | 0.647 | 0.597 | 0.858 | 0.918 | 0.728 | 0.658 | 0.918 | 0.906 | 0.921 | |
| Total # species (by station) | | 11 | | | 4 | | | 5 | | |
| H' (by station) | | 1.460 | | | 0.759 | | | 1.379 | | |
| J' (by station) | | 0.609 | | | 0.547 | | | 0.857 | | |

TABLE 6. Summary of Grab Collection data: September 1988 through August 1991.

| DATE | | Sep 88 | | | Jan 89 | | | Aug 89 | | | Jan 90 | | | Aug 90 | | | Jan 91 | | | Aug 91 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | #Indiv | # Spp. | H' | #Indiv | # Spp. | H' | #Indiv | # Spp. | H' | #Indiv | # Spp. | H' | #Indiv | # Spp. | H' | #Indiv | # Spp. | H' | #Indiv | # Spp. | H' |
| STA. # | | | | | | | | | | | | | | | | | | | | | |
| 1 | 534* | 20 | 2.343 | 69* | 7 | 1.681 | 372* | 19 | 2.458 | 96* | 10 | 1.965 | 99* | ? | ? | 117* | ? | ? | 422 | 51 | 3.162 |
| 8 | 789* | 22 | 2.651 | 519* | 22 | 2.717 | 552* | 19 | 2.211 | 111* | 14 | 2.405 | 132* | ? | ? | 282* | ? | ? | 150 | 21 | 2.306 |
| 8a | — | — | — | — | — | — | 1233* | 18 | 2.250 | 213* | 23 | 2.877 | 36* | ? | ? | 198* | ? | ? | 178 | 28 | 2.808 |
| 9 | 621* | 23 | 2.867 | 27* | 6 | 1.735 | 615* | 14 | 2.419 | 216* | 26 | 3.065 | ? | ? | ? | ? | ? | ? | 244 | 34 | 2.868 |
| 10a | — | — | — | — | — | — | 105* | 11 | 2.178 | 189* | 10 | 1.593 | 312* | ? | ? | 954* | ? | ? | 416 | 19 | 1.397 |
| 11 | 795* | 22 | 2.953 | 693* | 28 | 2.957 | 120* | 16 | 2.504 | 237* | 21 | 2.412 | 138* | ? | ? | 183* | ? | ? | 222 | 26 | 2.549 |
| 13a | — | — | — | — | — | — | 153* | 11 | 2.183 | 60* | 12 | 2.415 | 72* | ? | ? | 165* | ? | ? | 186 | 23 | 1.985 |
| 14 | 1425* | 26 | 2.758 | 177* | 14 | 2.335 | 129* | 14 | 2.357 | 195* | 25 | 2.996 | 48* | ? | ? | 171* | ? | ? | 149 | 21 | 2.129 |
| 17 | 957* | 12 | 1.605 | 135* | 8 | 1.250 | 1347* | 11 | 0.707 | 849* | 10 | 0.835 | 2346* | ? | ? | 1491* | ? | ? | 1822 | 21 | 1.961 |
| 18 | 69* | 8 | 2.261 | 279* | 14 | 1.769 | 129* | 17 | 2.098 | 54* | 13 | 2.505 | 72* | ? | ? | 336* | ? | ? | 144 | 24 | 2.679 |
| 19a | 279* | 20 | 2.723 | 51* | 10 | 2.150 | 60* | 11 | 2.320 | 75* | 13 | 2.377 | 201* | ? | ? | 183* | ? | ? | 48 | 10 | 2.109 |

*: 3x reported values to reflect previous contractor's sorting 1/3 of each sample. ?: data unavailable at this writing.

TABLE 7. 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, Harbor Branch Oceanographic Institute (Sipuncula)

Dr. Louis Kornicker, Smithsonian Institution (Ostracoda)

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

Dr. Raphael LeMaitre, Smithsonian Institution (Decapoda)

Dr. Julio Garcia-Gomez, Miami-Dade Community College (Decapoda)

Dr. Patsy A. McLaughlin, Sedro Woolley, WA (Cirripedia)

Dr. David L. Pawson, Smithsonian Institution (Echinodermata)