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Wetlands, Coastal & Nonpoint Source Branch
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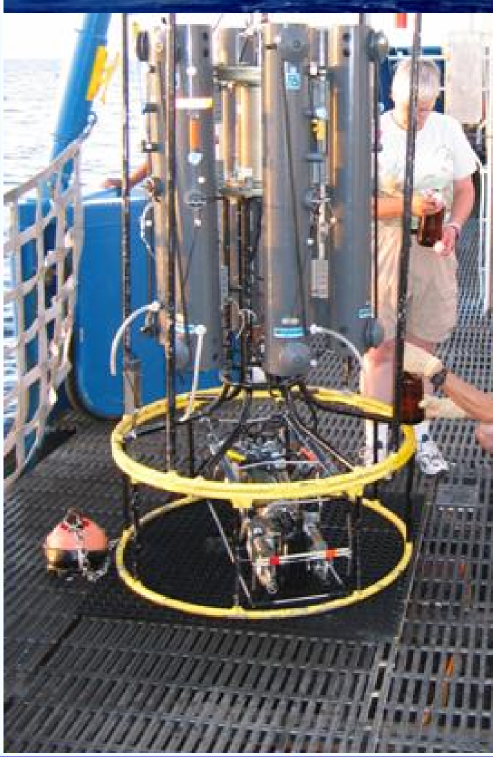
Fernandina ODMDS Status and Trends August 2005



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ACKNOWLEDGEMENTS

Samples were collected August 8-10, 2005 from the Fernandina Ocean Dredged Material Disposal Site (Christopher McArthur, Site Manager; Gary W. Collins, Chief Scientist). Sample tracking and custody were performed by Phyllis Meyer. On-board sample processing on the invertebrate samples was led by the Chief Scientist, along with the assistance of Christopher McArthur and Drew Kendall. Processing of the chemical samples and the sediment particle size samples was performed by Phyllis Meyer and Mel Parsons. Water quality profiling and sampling were led by Christopher McArthur.

The Region 4 Oceans Protection Team would like to express their sincere appreciation to Ken Potts, along with Craig Vogt and Dave Redford for all the sacrifices they made to acquire the new vessel, OSV Bold, for EPA. This survey effort could not have been possible without their efforts and that of Captain Dave Sullivan and the entire crew of the Bold.

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INTRODUCTION

Ocean disposal of dredged materials can affect the environment of a disposal site by disturbing the benthic community and potentially causing long-term reduction of oxygen in the pore waters of the sediments and the overlying waters. Natural oceanographic processes can also be responsible for transporting disposed materials offsite into nearby habitats.

As part of Region 4's strategy to monitor the effects of dredged material disposal within the marine environment, routine surveys of the benthos and water column within and adjacent to our sites are conducted so that their status may be assessed. In addition, the data is archived so that over time, trends which may occur can be observed. These status and trends surveys are consistent with the requirements of 40 C.F.R. 228.9. The present study being discussed was conducted aboard the Ocean Survey Vessel (OSV) Bold between August 8-9, 2005.

BACKGROUND

The Fernandina Beach ODMDS was designated by EPA in 1987. The ODMDS received over 6 million cubic yards of dredged material from new work at the Kings Bay Entrance Channel in 1988. Since then it has received annual maintenance material from the channel of up to 1 million cubic yards per year with periodic disposal events from the Fernandina Harbor Inner Channel and Turning Basin on the order of 1 million cubic yards.

A Site Management and Monitoring Plan was developed for the Fernandina Beach ODMDS in 1998 and amended in 2001. Annual bathymetry surveys have been conducted at the site by the Corps of Engineers. The last status and trends survey conducted at this ODMDS was in September, 1989.

Survey Area and Location

The study area is within and surrounding the Fernandina, FL ODMDS located offshore Amelia Island. The survey area is approximately 3 X 4 nautical miles (nmi) in area. Twelve stations were selected in order to analyze the sediment grain size, chemical, and biological characteristics of two areas – one where disposal has occurred and the other one undisturbed by disposal. Of these 12, four (4) received water quality sampling. Depths in this area range from 30 to 60 feet. The ODMDS boundary corner coordinates are:

30 33.00' N/081 16.86' W
30 31.00' N/081 16.86' W
30 31.00' N/081 19.13' W

30 33.00' N/081 19.13' W

The ODMDS, survey area and station locations are shown in Figure 1.

METHODS AND MATERIALS

Method Rationale: Characterization of the benthic community and sediment size/chemistry at selected stations, followed by analysis of community parameters via statistical treatment, allows for identification and interpretation of changes in the community structure. Such community statistics can be used to draw inferences regarding perturbations to the benthic macroinvertebrate community and subsequently allow for judgments regarding the likelihood of impact from dredged material disposal.

Sampling Stations

The boundaries of the Fernandina ODMDS measure approximately 2 X 2 nmi. Twelve stations (see Table 1 and Figure 1) were established by selecting half within and half outside of the site. Past locations (1989) were used when their locations were appropriate to provide an even distribution of sites, relative to those areas in which past dumping has occurred. Only two of the twelve stations from 1989 were not used again in 2005. Table 1 lists which stations from 1989 were re-sampled and the previous nomenclature used to identify them. The two most distant stations within each treatment (within vs. outside the site) were selected for water quality sampling.

Water Quality

To characterize the general water quality associated with the dump site, the following water column parameters were sampled: conductivity, dissolved oxygen (DO), salinity, temperature, density, turbidity, % light transmission and Chlorophyll a.

All measurements were accomplished utilizing the ship's CTD. At the surface and bottom, Go Flow® bottles attached to the CTD/rosette frame were deployed to obtain grab samples for the laboratory analysis. Once the rosette was back aboard the ship, the bottles were emptied directly into the appropriate sample containers, labeled, and refrigerated until demobilization. Laboratory analysis of the water includes nutrients, metals, PAHs, PCBs and pesticides.

Seafloor Sampling

Bottom sampling at all twelve stations was accomplished by deployment of a Young grab (surface area = 0.04 m^2; depth of 10 cm) from the stern of the ship. After retrieval of the grab and confirmation of an adequate sample, the device was sub-sampled in order to obtain discrete samples for sediment particle size analyses, sediment chemical analyses, and benthic macroinvertebrate identification. The sampling device and handling/preservative protocol for each type of sample follows below:

Sediment Particle Size

Two separate samples for particle size were collected from the Young grab by acrylic 5 cm diameter coring tubes. The subsamples were placed into whirl packs, labeled, and frozen for return to the lab. Two replicate samples were obtained at each station; one was analyzed at SESD by laser defraction (USEPA, 2001a) and the other was analyzed by Vittor and Associates by using the wet sieve method (ASTM D-422). In addition, SESD provided data from three stations by wet sieving the fraction of the sample larger than 2 mm (USEPA, 2001b).

Sediment Chemistry

Analyses for the following parameters were conducted at the SESD lab in Athens, Georgia: heavy metals scan, nutrients which includes total phosphorous (TP), NO2+NO3, NH3, and TKN, extractable organic compounds, pesticides, and PCBs. The sample was transferred to a glass pan and thoroughly mixed. The sample was alloquated into two 236.6 ml. glass containers and preserved by storing at 4 C until analyzed. One container was analyzed for extractable organic compounds and the other was analyzed for metals and nutrients

Benthic Macroinvertebrate Infauna

Sediment from a separate deployment of the grab were collected to obtain benthic macroinvertebrate organisms. On-board processing involved washing the sample through a #35 screen (0.5mm). The sample retained on the screen after washing was preserved in 10% seawater formalin with staining solution. Benthic containers were labeled both internally and externally and stored for transfer to contract lab facilities. The details of sorting and identification of infaunal taxa are described in Vittor, 2006.

All sampling procedures and sample preservation for analyses were according to the Science and Ecosystem Support Division (SESD) Standard Operating Procedures (SOP), (US EPA 1996, 2002).

RESULTS AND DISCUSSION

Water Quality

The results of the water quality profiles are summarized in Table 2. Although the data showed the site's water column to be fairly well-mixed, there was a sharp enough change to discern a small-scale pycnocline.

Turbidity across the survey area ranged from 0.34 to 2.25 NTUs, with nearly all maximum numbers occurring right above the pycnocline (see Fig. 2, Tables D4-D7).

Dissolved oxygen (DO) readings also showed a narrow range (see Fig. 3, Tables D4-D7), from 5.53 mg/L (typically near the bottom) to 6.46 mg/L (typically just above the pycnocline).

Temperature (Fig. 4, Tables D4-D7) and salinity (Fig. 5, Tables D4-D7) profiles also showed that the waters within and around the Fernandina ODMDS are fairly well-mixed. Temperatures ranged from 29.46 to 30.58 ^{O}C; salinities ranged from 32.65 to 35.58 ppt.

Although these profiles show the column to be fairly well mixed, it also shows that complete mixing has not occurred. This is particularly evidenced in the turbidity and DO profiles, but also demonstrated in the temperature and salinity profiles.

Chemical analyses of the water samples collected as part of this study showed all analytes to be at or below the detection limit with one exception. For all but one of the samples collected, bis(2-Ethylhexyl) Phthalate was shown to be present, ranging from 58 ug/l at the F10 Top station to 230 ug/l at the F12 Bottom station (see Table D2).

Seafloor Sampling

Sediment Particle Size.

The results of the sediment particle size analyses are given in Table 3. The most remarkable feature within the data set is the substantial presence of gravel (18- 39 %) at several stations within the ODMDS. The overall percentage of fine-grained material at any of the sampling locations is extremely low. Obviously, the disposal of dredged material within the Fernandina ODMDS is not resulting in an increase in overall fine-grained material being found in the offshore sediments.

Sediment Chemistry.

The sediment chemistry showed most contaminants to be below detection limits. The seven exceptions were arsenic, cadmium, chromium, copper, iron, lead and manganese. Table 4 shows the results of these metals analyses, comparing stations from within the ODMDS to those outside the ODMDS. With the exception of manganese, all metals show mean concentrations within the ODMDS as being lower than those outside the ODMDS. Because this data showed levels associated with dredged material disposal to be lower than ambient levels, no attempt was made to determine whether a statistical difference could be found between treatments. In the case of manganese, a quick look at the standard deviations of the two groups (see Table 4) shows the absence of a significant difference between inside vs. outside the ODMDS.

Benthic Macroinvertebrate Infauna.

The benthic infauna data is detailed and summarized in "Fernandina Beach, Florida ODMDS 2005 Benthic Community Assessment "(Vittor, 2006). Polychaetes dominated the total assemblage (58.9%), and also ranked first in number of taxa (45.1%) represented. In terms of abundance, the polychaetes were followed by bivalves (13.3%), malacostracans (10.2%) and gastropods (6.0%): by taxa, the polychaetes were followed by malacostracans (23.5%), bivalves (11.4%) and gastropods (9.0%). In general, the stations representing inside the ODMDS were dominated by a variety of polychaetes, while stations outside the ODMDS were dominated by a mixed assemblage of polychaetes, bivalves and gastropods.

The dominant taxa were the polychaete *Bhawania heteroseta* (5.2 %), the polychaete family Maldanidae [LPIL] (4.9%) and the polychaetes *Prionospio cristata* (4.6%), *Mediomastus* [LPIL] (3.9%) and *Polygordius* [LPIL] (3.1%).

Mean densities ranged from 625 organisms/m^2 at Station F07 to 3800 organisms/m^2 at Station F01. Although densities averaged 2025 outside the ODMDS compared to 7354.2 inside the ODMDS, there was not a significant difference in densities between stations inside vs. outside (Vittor, 2006).

The mean number of taxa ranged from 20 taxa/station at Stations F03 and F08 to 88 taxa/station at Station F05. Again, although taxa richness averaged 34.0 outside the ODMDS compared to 54.0 inside the ODMDS, there was not a significant difference in mean number of taxa between stations inside vs. outside (Vittor, 2006).

The results of cluster, ANOSIM and SIMPLER analyses are discussed in detail within Vittor, 2006. In summary, these results indicate that assemblages inside and outside the ODMDS are similar. Table 5 lists the infaunal community parameters by station.

CONCLUSIONS

When comparing the various study parameters between stations located within the ODMDS and those outside the ODMDS, no significant differences can be found. Table 6 summarizes the main parameters of this study, demonstrating that no physical, chemical nor biological difference can be seen.

When comparing this data to data collected from the 1989 study (see Vittor, 2006), the most significant differences seen through time are in the biological parameters. Taxa richness within the site was 29.5 taxa/station in 1989 vs. 54.0 taxa/station in 2005. Outside the site, taxa richness was 19.6 taxa/station in 1989 vs. 34.0 taxa/station in 2005. Densities within the ODMDS changed from 19152.2 in 1989 to 7354.2 in 2005. Outside the ODMDS, densities went from 7746 (1989) to 2025 (2005). However, as pointed out by Vittor, 2006, these differences are most likely due to a significant reduction in the number of samples collected from 1989 to 2005. Biological parameters from the 1989 data set were based on a total of 147 replicate samples (diver-collected hand-held cores; 0.0079 m^2) whereas the 2005 data set were based on a total of 12 replicate samples.

One important note omitted in Vittor, 2006 (most likely unknown) was the fact that those samples were collected Day 1 and 2 post passage of Hurricane Hugo over the area. Divers reported near zero visibility and being tossed about while attempting to collect the benthic cores. Obviously, the bottom sediments at that time were exposed to rare dynamic stresses that calls into question how useful the data from 1989 might be in comparing communities between the treatment areas.

In conclusion, the data shows that benthic communities within the disposal footprint of the Fernandina ODMDS compare favorably with those adjacent to the dump site, and at the most basic levels of comparison, no long term adverse impact from dumping of dredged material has occurred.

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USEPA. 2002. Standard Operation Procedures Ecological Assessment Branch. US Environmental Protection Agency, Region 4. Athens, GA.

Vittor. 2006 - Fernandina Beach, Florida ODMDS 2005 Benthic Community Assessment. Barry A. Vittor & Associates, Inc., Mobile, Alabama.

Table 1. Fernandina ODMDS Status and Trends Stations – August 2005.

2005 Station ID	(Degrees, minutes) Latitude(N)	Longitude(W)	Young Grabs(y/n)	CTD Casts(y/n)	1989 Station ID
F01	30° 34.00'	81° 18.00'	y	y	1
F02	30° 33.29'	81° 18.89'	y	n	2
F03	30° 33.28'	81° 16.58'	y	n	3
F04	30° 32.75'	81° 18.85'	y	n	-
F05	30° 32.75'	81° 17.15'	y	n	5
F06	30° 32.59'	81° 18.03'	y	y	4
F07	30° 32.00'	81° 19.70'	y	n	6
F08	30° 32.00'	81° 18.85'	y	n	-
F09	30° 32.00'	81° 18.00'	y	n	8
F10	30° 31.36'	81° 17.78'	y	y	9
F11	30° 30.26'	81° 16.60'	y	n	11
F12	30° 30.00'	81° 18.00'	y	y	12

Table 2. Fernandina ODMDS Water Quality endpoints – August 2005

	F01	**F06**	**F10**	**F11**
Temperature				
Minimum	**29.46**	**29.49**	**29.52**	**29.47**
Maximum	**30.58**	**30.41**	**30.26**	**30.21**
Salinity				
Minimum	**32.65**	**66.45**	**33.39**	**33.41**
Maximum	**35.43**	**35.48**	**35.53**	**35.58**
DO				
Minimum	**5.53**	**5.65**	**5.66**	**5.70**
Maximum	**6.29**	**6.30**	**6.46**	**6.41**
Turbidity				
Minimum	**0.35**	**0.36**	**0.34**	**0.34**
Maximum	**2.18**	**2.25**	**2.00**	**1.76**

Table 3. Fernandina ODMDS Sediment particle size – August 2005.
NOTE: station IDs omitted to demonstrate that each serves as a replicate for each treatment (inside vs. outside)

	Outside			Inside		
	silt/clay	*Sand*	*gravel*	*silt/clay*	*sand*	*gravel*
	1.15	98.85	0.00	0.33	97.53	2.13
	1.06	98.94	0.00	3.64	76.33	20.03
	0.21	99.79	0.00	1.11	80.81	18.09
	0.72	98.55	0.72	0.66	99.19	0.15
	0.29	98.71	1.00	0.20	98.70	1.10
	2.51	97.49	0.00	5.26	55.39	39.35
mean	0.99	98.72	0.29	1.87	84.66	13.48

Table 4. Metals Analyses - Fernandina ODMDS, August 2005

Arsenic

Outside	*Inside*
1.8	*1.4*
1.9	*2*
1.3	*1.2*
1.3	*1.2*
1.7	*0.5*
1.5	*3.2*
2	

	Outside	*Inside*
mean	1.64	*1.58*
std dev	0.28	*0.93*
var	0.080	*0.858*

Cadmium

Outside	*Inside*
0.17	*0.19*
0.18	*0.06*
0.17	*0.06*
0.06	*0.2*
0.19	*0.06*
0.06	*0.06*
0.1	

	Outside	*Inside*
mean	0.13	*0.11*
std dev	0.06	*0.07*
var	0.003	*0.005*

Chromium

Outside	*Inside*
5	*3*
4.8	*1.9*
4.2	*1.5*
3.7	*3.8*
3.9	*0.82*
2.8	*3.1*
6	

	Outside	*Inside*
mean	4.34	*2.35*
std dev	1.03	*1.13*
var	1.066	*1.271*

Copper

Outside	*Inside*
0.75	*0.36*
0.72	*0.37*
0.43	*0.38*
0.38	*0.4*
0.42	*0.125*
0.26	*0.56*
0.89	

	Outside	*Inside*
mean	0.55	*0.37*
std dev	0.23	*0.14*
var	0.055	*0.019*

Iron

Outside	*Inside*
2100	*1100*
1700	*1200*
920	*1100*
940	*970*
1100	*420*
970	*3000*
2200	

	Outside	*Inside*
mean	1419	1298
std dev	568	879
var	322414	772657

Lead

Outside	*Inside*
1.5	*1.1*
1.5	*0.81*
1	*0.78*
0.86	*1.1*
1.1	*0.7*
0.59	*1.5*
1.8	

	Outside	*Inside*
mean	1.19	*1.00*
std dev	0.42	*0.30*
var	0.180	*0.089*

Manganese

Outside	*Inside*
55	*22*
32	*41*
17	*43*
20	*21*
33	*15*
22	*65*
44	

	Outside	*Inside*
mean	31.86	*34.50*
std dev	13.80	*18.78*
var	190.476	*352.700*

Table 5. Infaunal Community Parameters – Fernandina ODMDS, August 2005.

2005:

Station	Taxa Richness	Density	Diversity	Evenness
Outside the ODMDS				
F01	50	3800	3.06	0.78
F02	32	1500	3.28	0.95
F03	20	1175	2.78	0.93
F07	21	625	3.00	0.98
F11	45	2800	3.35	0.88
F12	36	2250	3.08	0.86
Mean	34	2025	3.09	0.90
Inside the ODMDS				
F04	27	1325	2.80	0.85
F05	88	8425	3.80	0.85
F06	87	14325	3.60	0.81
F08	20	1025	2.66	0.89
F09	25	1150	3.06	0.95
F10	77	17875	3.54	0.81
Mean	54	7354.2	3.24	0.86

1989:

Station	Taxa Richness	Density	Diversity	Evenness
Outside the ODMDS				
1	104	7432	3.44	0.74
2	93	5383	2.84	0.63
6	56	3544	2.74	0.68
11	142	10236	3.76	0.76
12	89	12135	1.93	0.43
Mean	96.8	7746	2.94	0.65
Inside the ODMDS				
5	112	9240	2.76	0.58
7	78	3662	3.28	0.75
8	143	6481	4.13	0.83
9	220	70303	3.31	0.61
10	105	6075	2.68	0.58
Mean	131.6	19152.2	3.23	0.57

Table 6. Comparative Summary – Fernandina ODMDS, August 2005.

		Inside ODMDS	Outside ODMDS
Grain Size Analyses			
Wet sieve		**2005(*1989*)**	**2005(*1989*)**
	% gravel	**13.48**(*12.42*)	**0.29**(*2.08*)
	% sand	**84.66**(*84.44*)	**98.72**(*93.77*)
	% silt/clay	**1.87**(*2.23*)	**0.99**(*3.49*)
Laser			
	% sand	**94.69**	**94.79**
	% silt/clay	**5.31**	**5.21**

Sediment chemistry		Mean conc. (ppm)	Mean conc. (ppm)
	Arsenic	**1.58**	**1.64**
	Cadmium	**0.11**	**0.13**
	Chromium	**2.35**	**4.34**
	Copper	**0.37**	**0.55**
	Iron	**1298.33**	**1418.57**
	Lead	**1**	**1.19**
	Manganese	**34.5**	**31.86**

Infauna analyses			
Taxa richness (#spp./station)			
	Minimum	**20**(78)	**20**(56)
	Maximum	**88**(220)	**50**(142)
	Mean	**54**(131.6)	**34**(96.8)
Density (#organisms/m2)			
	Minimum	**1025**(3662)	**625**(3544)
	Maximum	**17875**(70303)	**3800**(12135)
	Mean	**7354**(19152)	**2025**(7746)
Taxa diversity (H')			
	Mean	**3.24**(3.23)	**3.09**(2.94)
Taxa evenness (J')			
	Mean	**0.86**(0.67)	**0.9**(0.65)

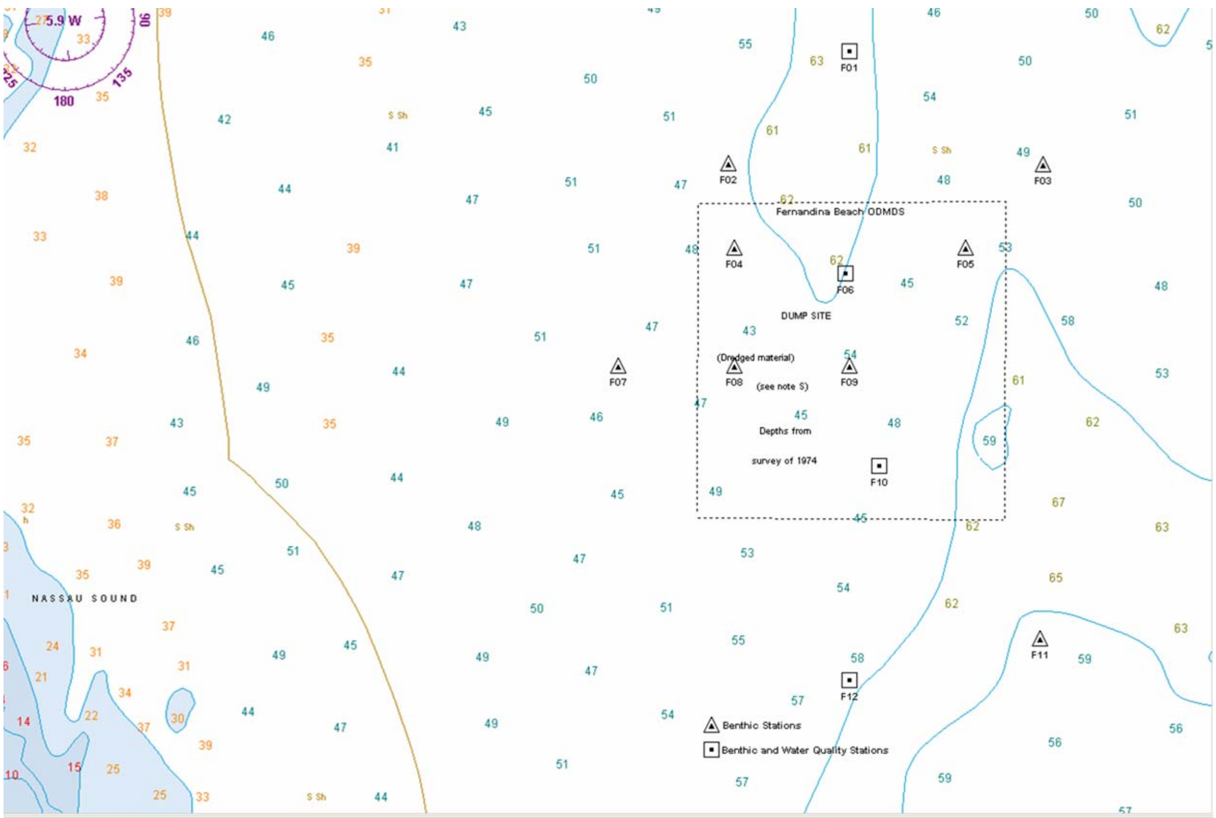

Figure 1. Fernandina sample stations, August, 2005

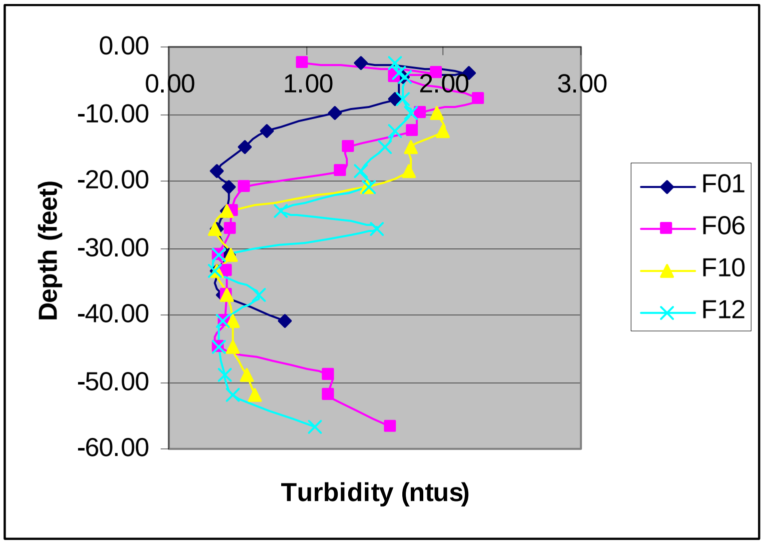

Figure 2. Turbidity Profiles – Fernandina ODMDS, August 2005

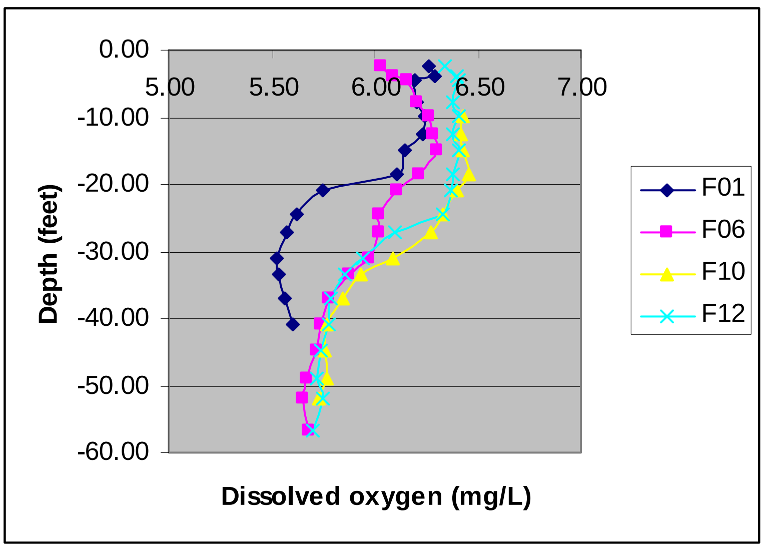

Figure 3. Oxygen Profiles – Fernandina ODMDS, August 2005

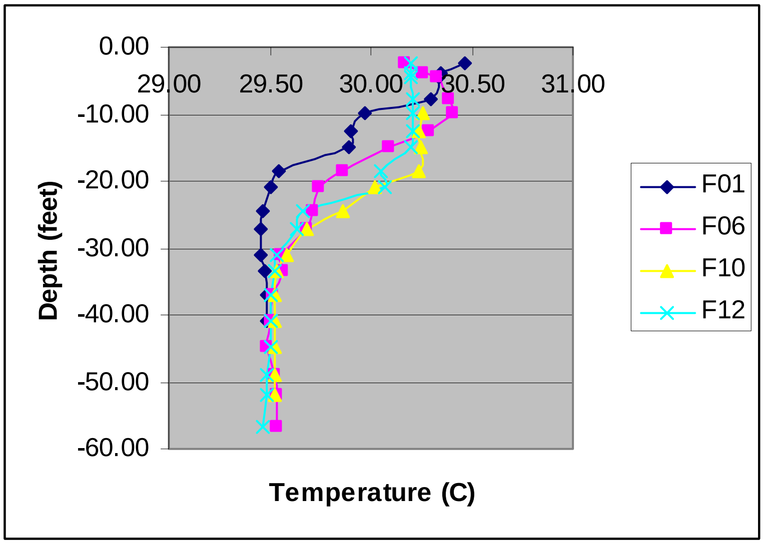

Figure 4. Temperature Profiles – Fernandina ODMDS, August 2005

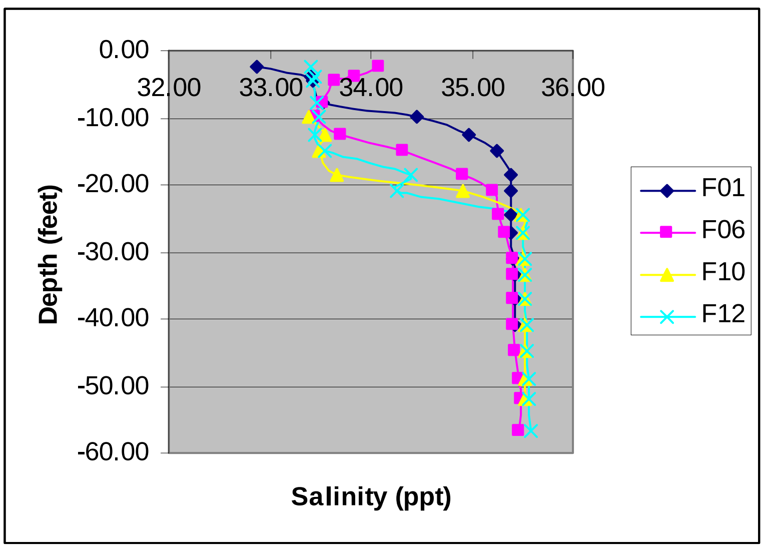

Figure 5. Salinity Profiles – Fernandina ODMDS, August 2005

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APPENDIX A

SCIENTIFIC PARTY

Name	Survey Responsibility	Organization
1) Gary Collins	Chief Scientist	EPA/ Atlanta
2) Christopher McArthur	Water Quality	EPA/ Atlanta
3) Mel Parsons	Sediment Processing	EPA/Athens
4) Phyllis Meyer	Sample Tracking	EPA/Athens
5) Drew Kendall	Invertebrate Processing	EPA/Atlanta

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Appendix B

Sediment Particle Size Distribution – Laser Analysis and Wet Sieve

Table B1. – Laser Analysis

FERNANDINA ODMDS PSD LASER ANALYSIS

Sta.	CLAY < 3.91 um	SILT 3.91 - 62.5 um	VERY FINE SAND 62.5 - 125.0 um	FINE SAND 125 - 250 um	MEDIUM SAND 250 - 500 um	COARSE SAND 500 - 1000 um	VERY COARSE SAND 1000 - 2000 um
F01	1.41	5.96	9.13	25.1	30.2	23.3	4.9
F02	1.19	5.26	17.05	52.1	8.3	9.4	6.7
F03	0.56	1.93	10.81	61.3	19.7	5.7	0
F03D	0.64	2.35	10.51	58.3	21.7	6.5	0
F04	0.31	1.31	4.56	36.92	33	18	5.9
F05	0.22	1.2	0.74	6.67	22.97	37.4	30.8
F06	2.27	18.33	9.3	31.3	12.2	13.2	13.4
F07	0.59	2.21	9.7	59.6	17.6	5.9	4.4
F08	0.56	1.85	10.79	67.2	14.7	4.9	0
F09	0.26	1.04	2.08	37.32	35.1	18.8	5.4
F10	0.53	4	2.77	13.3	23.2	24.5	31.7
F11	0	0.39	1.19	7.96	25.96	52.9	11.6
F12	2.31	11.69	22.7	55.3	4.6	3.4	0

Table B2. Wet Sieve Method (excerpted from Vittor, 2006)

Station	%Gravel	%Sand	%Silt+Clay	Textural Description	Inman's Statistics Median phi	Inman's Statistics Sorting Coeff
Outside the ODMDS						
F01	0	98.85	1.15	sand	2.067	0.995
F02	0	98.94	1.06	sand	2.517	0.874
F03	0	99.79	0.21	sand	2.451	0.516
F07	0.72	98.55	0.72	sand	2.490	0.439
F11	1.00	98.71	0.29	sand	1.038	0.88
F12	0	97.49	2.51	sand	3.226	0.688
	0.29	98.72	0.99			
Inside the ODMDS						
F04	2.13	97.53	0.33	sand	2.183	0.815
F05	20.03	76.33	3.64	gravelly sand	0.722	1.743
F06	18.09	80.81	1.11	gravelly sand	1.015	1.987
F08	0.15	99.19	0.66	sand	2.591	0.572
F09	1.10	98.70	0.20	sand	2.181	0.845
F10	39.35	55.39	5.26	sandy gravel	*	*
	13.48	84.66	1.87			

*Cannot calculate due to the high percentage of gravel

1989 Data

Station	%Gravel	%Sand	%Silt+Clay	Textural Description
Outside ODMDS				
1	2.3	89.54	8.32	silty sand
2	3.82	93.52	1.84	slightly gravelly sand
6	1.12	95.64	2.52	sand
11	2.66	95.75	1.04	slightly gravelly sand
12	0.48	94.38	3.71	sand
	2.08	93.77	3.49	
Inside ODMDS				
5	5.13	91.63	2.55	slightly gravelly sand
7	0.94	97.4	1.19	sand
8	21.76	75.58	1.83	gravelly sand
9	32.16	63.8	2.21	gravelly sand
10	2.12	93.81	3.35	slightly gravelly sand
	12.42	84.44	2.23	

APPENDIX C

Sediment Chemistry – Metals, Extractables, Pesticides and PCBs

Table C1. Sediment Metals Analyses - Fernandina ODMDS, August 2005.
(concentrations reported as mg/kg, dry weight)

	F01	F02	F03D	F03	F04	F05	F06	F07	F08	F09	F10	F11	F12
Aluminum	1100	880	470	500	420	280	390	550	510	190	620	290	1200
Antimony	0.25 [u]	0.25 [u]	0.25 [u]	0.25 [u]	0.25 [u]	0.25 [u]	0.25 [u]	0.25 [u]	0.25 [u]	0.25 [u]	0.25 [u]	0.25 [u]	0.25 [u]
Arsenic	1.8	1.9	1.3	1.3	1.4	2	1.2	1.7	1.2	0.5	3.2	1.5	2
Beryllium	0.3 [u]	0.13	0.3 [u]	0.3 [u]	0.3 [u]	0.12 [u]	0.078	0.3 [u]	0.3 [u]	0.3 [u]	0.12 [u]	0.3 [u]	0.3 [u]
Cadmium	0.17	0.18	0.17	0.12 [u]	0.19	0.12 [u]	0.12 [u]	0.19	0.2	0.12 [u]	0.12 [u]	0.12 [u]	0.2 [u]
Chromium	5	4.8	4.2	3.7	3	1.9	1.5	3.9	3.8	0.82	3.1	2.8	6
Copper	0.75	0.72	0.43	0.38	0.36	0.37	0.38	0.42	0.4	0.25 [u]	0.56	0.26	0.89
Iron	2100	1700	920	940	1100	1200	1100	1100	970	420	3000	970	2200
Lead	1.5	1.5	1	0.86	1.1	0.81	0.78	1.1	1.1	0.7	1.5	0.59	1.8
Manganese	55	32	17	20	22	41	43	33	21	15	65	22	44
Nickel	1.1	2 [u]	0.99 [u]	0.99 [u]	0.99 [u]	***3*** [u]	2 [u]	0.99 [u]	0.99 [u]	1 [u]	***4*** [u]	0.99 [u]	1.1
Selenium	0.5 [u]	0.5 [u]	0.5 [u]	0.5 [u]	0.5 [u]	0.5 [u]	0.5 [u]	0.5 [u]	0.5 [u]	0.5 [u]	0.5 [u]	0.5 [u]	0.5 [u]
Silver	0.5 [u]	0.99 [u]	0.5 [u]	0.5 [u]	0.5 [u]	0.05	1 [u]	0.5 [u]	0.5 [u]	0.5 [u]	0.05 [u]	0.5 [u]	0.5 [u]
Thallium	0.25 [u]	0.25 [u]	0.25 [u]	0.25 [u]	0.25 [u]	0.25 [u]	0.25 [u]	0.25 [u]	0.25 [u]	0.25 [u]	0.25 [u]	0.25 [u]	0.25 [u]
Total Mercury	0.047 [u]	0.049 [u]	0.047 [u]	0.046 [u]	0.046 [u]	0.046 [u]	0.046 [u]	0.046 [u]	0.046 [u]	0.046 [u]	0.049 [u]	0.046 [u]	0.046 [u]
Zinc	4.8	4.5	2.9	2.7	2.6	***3*** [u]	***2*** [u]	3.3	3	1.2	***4*** [u]	2.2	5.8

* Numbers in bold and italic type were non-detects that exceeded the target detection limit.

U-Analyte not detected at or above reporting limit. The number is the minimum quantitation limit.

Table C2. Sediment Extractables Analyses - Fernandina ODMDS, August 2005.

(concentrations reported are ug/kg, dry weight)

	F01	F02	F03D	F03	F04	F05	F06	F07	F08	F09	F10	F11	F12
(3-and/or 4-)Methylphenol	**110**	100	**110**	**110**	100	100	99	**110**	**110**	100	100	100	***110***
1,2,4-Trichlorobenzene	65	63	64	65	63	62	60	65	65	61	60	61	67
2,4-Dimethylphenol	**43**	**42**	**43**	**43**	**42**	**41**	**40**	**43**	**44**	**41**	**40**	**41**	**45**
2-Methylnaphthalene	**43**	**42**	**43**	**43**	**42**	**41**	**40**	**43**	**44**	**41**	**40**	**41**	**45**
2-Methylphenol	43	42	43	43	42	41	40	43	44	41	40	41	45
Acenaphthene	**65**	**63**	**64**	**65**	**63**	**62**	**60**	**65**	**65**	**61**	**60**	**61**	**67**
Acenaphthylene	**43**	**42**	**43**	**43**	**42**	**41**	**40**	**43**	**44**	**41**	**40**	**41**	**45**
Anthracene	**43**	**42**	**43**	**43**	**42**	**41**	**40**	**43**	**44**	**41**	**40**	**41**	**45**
Benzo(a)Anthracene	**43**	**42**	**43**	**43**	**42**	**41**	**40**	**43**	**44**	**41**	**40**	**41**	**45**
Benzo(b)Fluoranthene	**43**	**42**	**43**	**43**	**42**	**41**	**40**	**43**	**44**	**41**	**40**	**41**	**45**
Benzo(ghi)Perylene	**43**	**42**	**43**	**43**	**42**	**41**	**40**	**43**	**44**	**41**	**40**	**41**	**45**
Benzo(k)Fluoranthene	**43**	**42**	**43**	**43**	**42**	**41**	**40**	**43**	**44**	**41**	**40**	**41**	**45**
Benzo-a-Pyrene	**43**	**42**	**43**	**43**	**42**	**41**	**40**	**43**	**44**	**41**	**40**	**41**	**45**
Benzyl Butyl Phthalate	43	42	43	43	42	41	40	43	44	41	40	41	45
bis(2-Ethylhexyl) Phthalate	65	63	64	65	63	62	60	65	65	61	60	61	67
Chrysene	**43**	**42**	**43**	**43**	**42**	**41**	**40**	**43**	**44**	**41**	**40**	**41**	**45**
Dibenzo(a,h)Anthracene	**43**	**42**	**43**	**43**	**42**	**41**	**40**	**43**	**44**	**41**	**40**	**41**	**45**
Dibenzofuran	43	42	43	43	42	41	40	43	44	41	40	41	45
Diethyl Phthalate	43	42	43	43	42	41	40	43	44	41	40	41	45
Dimethyl Phthalate	43	42	43	43	42	41	40	43	44	41	40	41	45
Di-n-Butylphthalate	43	42	43	43	42	41	40	43	44	41	40	41	45
Di-n-Octylphthalate	87	84	86	86	84	83	80	87	87	81	81	82	89
Fluoranthene	**43**	**42**	**43**	**43**	**42**	**41**	**40**	**43**	**44**	**41**	**40**	**41**	**45**
Fluorene	**43**	**42**	**43**	**43**	**42**	**41**	**40**	**43**	**44**	**41**	**40**	**41**	**45**
Hexachlorobenzene (HCB)	43	42	43	43	42	41	40	43	44	41	40	41	45
Hexachlorobutadiene	87	84	86	86	84	83	80	87	87	81	81	82	89
Hexachlorocyclopentadiene (HCCP)	43	42	43	43	42	41	40	43	44	41	40	41	45
Hexachloroethane	65	63	64	65	63	62	60	65	65	61	60	61	67
Indeno (1,2,3-cd) Pyrene	43	42	43	43	42	41	40	43	44	41	40	41	45
Naphthalene	**220**	**210**	**210**	**220**	**210**	**210**	**200**	**220**	**220**	**200**	**200**	**200**	**220**
n-Nitrosodiphenylamine/Diphenylamine	43	42	43	43	42	41	40	43	44	41	40	41	45

Table C2. Continued

	F01	F02	F03D	F03	F04	F05	F06	F07	F08	F09	F10	F11	F12
Pentachlorophenol	150	150	150	150	150	140	140	150	150	140	140	140	160
Phenanthrene	**87**	**84**	**86**	**86**	**84**	**83**	**80**	**87**	**87**	**81**	**81**	**82**	**89**
Phenol	130	120	130	130	130	120	120	130	130	120	120	120	130
Pyrene	**43**	**42**	**43**	**43**	**42**	**41**	**40**	**43**	**44**	**41**	**40**	**41**	**45**

NOTE: all values were 'U' flagged. U-Analyte not detected at or above reporting limit. The number is the minimum quantitation limit.

* Numbers in bold type were non-detects that exceeded the target detection limit.

Table C3. Sediment PCB/Pesticide Analyses - Fernandina ODMDS, August 2005.

(concentrations reported as ug/kg, dry weight)

	F01	F02	F03D	F03	F04	F05	F06	F07	F08	F09	F10	F11	F12
4,4'-DDD (p,p'-DDD)	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.4**	2	**2.1**	**2.2**	2	2	2	**2.2**
4,4'-DDE (p,p'-DDE)	0.85	0.85	0.85	0.86	0.84	0.85	0.78	0.86	0.86	0.82	0.81	0.8	0.89
4,4'-DDT (p,p'-DDT)	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	2	**2.1**	**2.2**	2	2	2	**2.2**
Aldrin	0.99	0.85	0.85	0.86	0.84	0.85	0.78	0.86	0.86	0.82	0.81	0.8	0.89
alpha-BHC	0.85	0.85	0.85	0.86	0.84	0.85	0.78	0.86	0.86	0.82	0.81	0.8	0.89
alpha-Chlordane /2	0.85	0.85	0.85	0.86	0.84	0.85	0.78	0.86	0.86	0.82	0.81	0.8	0.89
beta-BHC	2.5	2.5	2.4	2	1.5	2.6	2.2	0.86	2.2	0.9	2.7	1.4	3.6
cis-Nonachlor /2	0.85	0.85	0.85	0.86	0.84	0.85	0.78	0.86	0.86	0.82	0.81	0.8	0.89
delta-BHC	0.85	1	1	1	1.2	0.85	0.78	0.99	0.86	0.92	0.81	0.93	1.2
Dieldrin	0.85	0.85	0.85	0.86	0.84	0.85	0.78	0.86	0.86	0.82	0.81	0.8	0.89
Endosulfan I (alpha)	0.85	0.85	0.85	0.86	0.84	0.85	0.78	0.86	0.86	0.82	0.81	0.8	0.89
Endosulfan II (beta)	2.1	2.1	2.1	2.1	2.1	2.1	2	2.1	2.2	2	2	2	2.2
Endosulfan Sulfate	2.1	2.1	2.1	2.1	2.1	2.1	2	2.1	2.2	2	2	2	2.2
Endrin	2.1	2.1	2.1	2.1	2.1	2.1	2	2.1	2.2	2	2	2	2.2
Endrin Ketone	2.1	2.1	2.1	2.1	2.1	2.1	2.6	2.1	2.2	2	2	2	2.2
gamma-BHC(Lindane)	0.85	0.85	0.85	0.86	0.84	0.85	0.78	0.86	0.86	0.82	0.81	0.8	0.89
gamma-Chlordane /2	0.85	0.85	0.85	0.86	0.84	0.85	0.78	0.86	0.86	0.82	0.81	0.8	0.89
Heptachlor	0.91	1.1	0.85	0.86	0.84	0.91	0.78	0.86	0.86	0.82	0.81	0.8	0.89
Heptachlor Epoxide	0.85	0.85	0.85	0.86	0.89	0.85	0.78	0.86	0.86	0.82	0.81	0.8	0.89
Methoxychlor	4.2	4.3	4.2	4.3	4.2	4.3	3.9	4.3	4.3	4.1	4	4	4.4
PCB Congener #8	**1.8**	**1.4**	0.7	0.82	**2.9**	0.43	**2.6**	**1.5**	0.66	0.43	**1.1**	0.4	**2.8**
PCB Congener #18	0.43	0.43	0.42	0.43	0.42	0.43	0.39	0.43	0.43	0.41	0.4	0.4	0.44
PCB Congener #28	0.78	0.75	0.83	0.74	0.57	0.52	0.7	0.56	0.5	0.46	0.59	0.5	0.63
PCB Congener #44	0.43	0.43	0.42	0.43	0.42	0.43	0.39	0.43	0.43	0.41	0.4	0.4	0.44
PCB Congener #49	0.43	0.43	0.42 [UJ]	0.43	0.42	0.43	0.39	0.43	0.43	0.41	0.4	0.4	0.44
PCB Congener #52	0.43	0.43	0.42	0.43	0.42	0.43	0.39	0.43	0.43	0.41	0.4	0.4	0.44
PCB Congener #66	0.43	0.43	0.42	0.43	0.42	0.43	0.39	0.43	0.43	0.41	0.4	0.4	0.44
PCB Congener #77	0.43	0.43	0.42	0.43	0.42	0.43	0.39	0.43	0.43	0.41	0.4	0.4	0.44
PCB Congener #87	0.43	0.43	0.42 [UJ]	0.43	0.42	0.43	0.42	0.43	0.43	0.41	0.4	0.4	0.44
PCB Congener #101	0.43	0.43	0.42	0.43	0.42	0.43	0.39	0.43	0.43	0.41	0.4	0.4	0.44
PCB Congener #105	0.43	0.43	0.42	0.43	0.42	0.43	0.39	0.43	0.43	0.41	0.4	0.4	0.44
PCB Congener #118	0.43	0.43	0.42 [UJ]	0.43	0.42	0.43	0.39	0.43	0.43	0.41	0.4	0.4	0.44
PCB Congener #126	0.43	0.43	0.42	0.43	0.42	0.43	0.39	0.43	0.43	0.41	0.4	0.4	0.44

Table C3. Continued.

	F01	F02	F03D	F03	F04	F05	F06	F07	F08	F09	F10	F11	F12
PCB Congener #128	0.43	0.43	0.42	0.43	0.42	0.43	0.39	0.43	0.43	0.41	0.4	0.4	0.44
PCB Congener #138	0.43	0.43	0.42	0.43	0.42	0.43	0.39	0.43	0.43	0.41	0.4	0.4	0.44
PCB Congener #153	0.43	0.43	0.42	0.43	0.42	0.43	0.39	0.43	0.43	0.41	0.4	0.4	0.44
PCB Congener #156	0.43	0.43	0.42 UJ	0.43	0.42	0.43	0.39	0.43	0.43	0.41	0.4	0.4	0.44
PCB Congener #169	0.43	0.43	0.42	0.43	0.42	0.43	0.39	0.43	0.43	0.41	0.4	0.4	0.44
PCB Congener #170	0.43	0.43	0.55	0.43	0.42	0.43	0.39	0.43	0.43	0.41	0.4	0.4	0.44
PCB Congener #180	0.43	0.43	0.091	0.43	0.42	0.43	0.39	0.43	0.43	0.41	0.4	0.4	0.44
PCB Congener #183	0.43	0.43	0.42 UJ	0.43	0.42	0.43	0.39	0.43	0.43	0.41	0.4	0.4	0.44
PCB Congener #184	0.43	0.43	0.42 UJ	0.43	0.42	0.43	0.39	0.43	0.43	0.41	0.4	0.4	0.44
PCB Congener #187	0.43	0.43	0.42	0.43	0.42	0.43	0.39	0.43	0.43	0.41	0.4	0.4	0.44
PCB Congener #195	0.43	0.43	0.42	0.43	0.42	0.43	0.39	0.43	0.43	0.41	0.4	0.4	0.44
PCB Congener #206	0.45	0.5	0.44	0.43	0.42	0.43	0.41	0.45	0.46	0.41	0.43	0.4	0.52
PCB Congener #209	0.43	0.15 J	0.33 J	0.43	0.42	0.43	0.39	0.24 J	0.16 JN	0.12 JN	0.4	0.4	0.44
Toxaphene	**85**	**85**	**85**	**86**	**84**	**85**	**78**	**86**	**86**	**82**	**81**	**80**	**89**
trans-Nonachlor /2	0.85	0.85	0.85	0.86	0.84	0.85	0.78	0.86	0.86	0.82	0.81	0.8	0.89

NOTE: all values reported, unless otherwise flagged, were flagged with 'U'.

U-Analyte not detected at or above reporting limit. The number is the minimum quantitation limit.

UJ-Analyte not detected at or above reporting limit. Reporting limit is an estimate.
J- Identification of analyte is acceptable; reported value is an estimate
N-Presumptive evidence analyte is present

* Numbers in bold type were non-detects that exceeded the target detection limit.

APPENDIX D

Water Quality/CTD Data/Water Chemistry - Metals, Extractables, Pesticides and PCBs

Table D1. Water Metals Analyses - Fernandina ODMDS, August 2005.
(ug/l, except iron mg/l)

	F01		F06			F10		F12	
	top	bottom	top	top dupe	bottom	top	bottom	top	bottom
Aluminum	100	100	100	100	100	100	100	100	100
Antimony	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Arsenic	33 [J]	40 [J]	41 [J]	41 [J]	38 [J]	43 [J]	40 [J]	41 [J]	40 [AJ]
Beryllium	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Cadmium	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Chromium	50	50	50	50	50	50	50	50	50
Copper	12	13	11	12	12	11	12	11	12
Iron	0.26	0.32	0.14	0.2	0.16	0.1	0.11	0.1	0.1
Lead	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Manganese	50	50	50	50	50	50	50	50	50
Nickel	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Selenium	86 [J]	120 [J]	110 [J]	110 [J]	100 [J]	120 [J]	110 [J]	110 [J]	110 [AJ]
Silver	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Thallium	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Total Mercury	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Zinc	15	16	14	15	15	13	14	13	14

Unless otherwise flagged, analyte is “u” flagged, not detected at or above reporting limit
J-Identification of analyte is acceptable; reported value is an estimate.
A- analyte analyzed in replicate. Reported value is ‘average’ of replicates.

Table D2. Water Extractables Analyses – Fernandina ODMDS, August 2005.

(concentrations reported as ug/L)

	F01-T	F01-B	F06-T	F06-B	F06-TD	F10-T	F10-B	F12-T	F12-B
(3-and/or 4-)Methylphenol	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
1,2,4-Trichlorobenzene	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
2,4-Dimethylphenol	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
2-Methylnaphthalene	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
2-Methylphenol	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
Acenaphthene	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
Acenaphthylene	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
Anthracene	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
Benzo(a)Anthracene	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
Benzo(b)Fluoranthene	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
Benzo(ghi)Perylene	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
Benzo(k)Fluoranthene	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
Benzo-a-Pyrene	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
Benzyl Butyl Phthalate	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
Bis(2-Ethylhexyl) Phthalate	160	160	98	100	100	58	88	9.8	230
Chrysene	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
Dibenzo(a,h)Anthracene	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
Dibenzofuran	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
Diethyl Phthalate	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
Dimethyl Phthalate	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
Di-n-Butylphthalate	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
Di-n-Octylphthalate	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
Fluoranthene	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
Fluorene	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
Hexachlorobenzene (HCB)	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
Hexachlorobutadiene	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
Hexachlorocyclopentadiene (HCCP)	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
Hexachloroethane	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
Indeno (1,2,3-cd) Pyrene	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
Naphthalene	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
n-Nitrosodiphenylamine/Diphenylamine	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8

Table D2.
Continued

	F01-T	F01-B	F06-T	F06-B	F06-TD	F10-T	F10-B	F12-T	F12-B
Pentachlorophenol	20	20	20	20	20	20	20	20	20
Phenanthrene	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
Phenol	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8
Pyrene	9.9	9.8	9.8	9.8	9.9	9.8	9.9	9.8	9.8

NOTE: all values were 'U' flagged.

U-Analyte not detected at or above reporting limit. The number is the minimum quantitation limit.

Table D3. Water PCB/Pesticide Analyses - Fernandina, August 2005.
(concentrations reported as ug/L)

	F01-T	F01-B	F06-T	F06-B	F06D-T	F10-T	F10-B	F12-T	F12-B
4,4'-DDD (p,p'-DDD)	0.05	NA	0.05	0.05	0.05	0.049	0.049	0.05	0.05
4,4'-DDE (p,p'-DDE)	0.02	NA	0.02	0.02	0.02	0.02	0.02	0.02	0.02
4,4'-DDT (p,p'-DDT)	0.066	NA	0.05	0.05	0.05	0.066	0.064	0.073	0.05
Aldrin	0.02	NA	0.02	0.02	0.02	0.02	0.02	0.02	0.02
alpha-BHC	0.02	NA	0.02	0.02	0.022	0.02	0.02	0.02	0.02
alpha-Chlordane /2	0.02	NA	0.02	0.02	0.02	0.02	0.02	0.02	0.02
beta-BHC	0.02	NA	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Cis-Nonachlor /2	0.02	NA	0.02	0.02	0.02	0.02	0.02	0.02	0.02
delta-BHC	0.02	NA	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Dieldrin	0.02	NA	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Endosulfan I (alpha)	0.02	NA	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Endosulfan II (beta)	0.05	NA	0.05	0.05	0.05	0.049	0.049	0.05	0.05
Endosulfan Sulfate	0.05	NA	0.05	0.05	0.05	0.049	0.049	0.05	0.05
Endrin	0.05	NA	0.05	0.05	0.05	0.049	0.049	0.05	0.05
Endrin Ketone	0.05	NA	0.05	0.05	0.05	0.049	0.049	0.05	0.05
gamma-BHC (Lindane)	0.02	NA	0.02	0.02	0.02	0.02	0.02	0.02	0.02
gamma-Chlordane /2	0.02	NA	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Heptachlor	0.02	NA	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Heptachlor Epoxide	0.02	NA	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Methoxychlor	0.1	NA	0.099	0.099	0.1	0.099	0.098	0.1	0.1
PCB Congener #8	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.1**	0.01
PCB Congener #18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.1**	0.01
PCB Congener #28	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.1**	0.01
PCB Congener #44	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.1**	0.01
PCB Congener #49	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.1**	0.01
PCB Congener #52	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.1**	0.01
PCB Congener #66	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.1**	0.01
PCB Congener #77	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.1**	0.01
PCB Congener #87	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.1**	0.01
PCB Congener #101	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.1**	0.01
PCB Congener #105	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.1**	0.01
PCB Congener #118	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.1**	0.01
PCB Congener #126	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.1**	0.01
PCB Congener #128	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.1**	0.01
PCB Congener #138	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.1**	0.01
PCB Congener #153	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.1**	0.01
PCB Congener #156	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.1**	0.01
PCB Congener #169	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.1**	0.01
PCB Congener #170	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.1**	0.01
PCB Congener #180	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.1**	0.01
PCB Congener #183	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.1**	0.01
PCB Congener #184	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.1**	0.01
PCB Congener #187	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.1**	0.01
PCB Congener #195	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.1**	0.01
PCB Congener #206	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.1**	0.01
PCB Congener #209	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.1**	0.01

Toxaphene	2	NA	2	2	2	2	2	2	2
Table D3 contnued.									
	F01-T	F01-B	F06-T	F06-B	F06D-T	F10-T	F10-B	F12-T	F12-B
trans-Nonachlor /2	0.02	NA	0.02	0.02	0.02	0.02	0.02	0.02	0.02

NOTE: all values were 'u' flagged.

U-Analyte not detected at or above reporting limit. The number is the minimum quantitation limit.

* Numbers in bold type were non-detects that exceeded the target detection limit.

Table D4. Water Quality Station F01 - Fernandina ODMDS, August 2005.

Depth (feet)	Temperature (degrees C)	Salinity (ppt)	% Oxy (mg/l)	Turb (ntu's)
3.50	30.47	32.87	6.26	1.40
6.60	30.35	33.41	6.29	2.18
7.90	30.34	33.43	6.19	1.70
11.50	30.30	33.52	6.20	1.64
14.30	29.97	34.46	6.24	1.21
19.10	29.90	34.98	6.23	0.71
22.80	29.89	35.24	6.15	0.56
28.60	29.54	35.38	6.11	0.35
33.00	29.50	35.38	5.75	0.43
38.60	29.47	35.39	5.62	0.42
42.90	29.46	35.39	5.57	0.35
48.50	29.46	35.40	5.52	0.43
54.10	29.48	35.43	5.53	0.35
57.50	29.49	35.43	5.56	0.39
64.50	29.49	35.43	5.60	0.85

Table D5. Water Quality Station F06 - Fernandina ODMDS, August 2005.

Depth (feet)	Temperature (degrees C)	Salinity (ppt)	% Oxy (mg/l)	Turb (ntu's)
1.90	30.17	34.07	6.03	0.98
2.10	30.26	33.85	6.09	1.95
2.40	30.33	33.64	6.16	1.65
6.30	30.39	33.53	6.20	2.25
10.20	30.41	33.45	6.26	1.83
13.00	30.29	33.71	6.28	1.78
15.90	30.09	34.32	6.30	1.31
19.70	29.86	34.91	6.21	1.25
23.10	29.74	35.20	6.11	0.55
25.60	29.71	35.27	6.02	0.47
29.40	29.68	35.33	6.02	0.45
33.90	29.55	35.41	5.97	0.36
35.50	29.56	35.40	5.87	0.42
39.00	29.51	35.41	5.78	0.42
44.60	29.50	35.41	5.74	0.41
49.40	29.49	35.42	5.72	0.36
53.40	29.52	35.46	5.67	1.17
55.90	29.53	35.48	5.65	1.17
56.70	29.53	35.47	5.68	1.61

Table D6. Water Quality Station F10 - Fernandina ODMDS, August 2005.

Depth (feet)	Temperature (degrees C)	Salinity (ppt)	% Oxy (mg/l)	Turb (ntu's)
9.50	30.26	33.39	6.43	1.95
10.40	30.24	33.55	6.42	2.00
11.80	30.25	33.49	6.43	1.76
13.50	30.24	33.66	6.46	1.75
17.10	30.02	34.91	6.40	1.44
19.90	29.86	35.48	6.33	0.42
22.70	29.68	35.51	6.27	0.34
26.40	29.58	35.50	6.09	0.45
29.90	29.53	35.52	5.93	0.35
33.70	29.52	35.52	5.84	0.42
37.10	29.52	35.53	5.77	0.46
39.70	29.52	35.52	5.76	0.47
44.50	29.52	35.53	5.77	0.57
46.40	29.52	35.52	5.73	0.63

Table D7. Water Quality Station F12 - Fernandina ODMDS, August 2005.

Depth (feet)	Temperature (degrees C)	Salinity (ppt)	% Oxy (mg/l)	Turb (ntu's)
2.40	30.20	33.41	6.34	1.65
3.80	30.20	33.44	6.40	1.68
4.60	30.20	33.42	6.41	1.72
7.70	30.21	33.47	6.38	1.70
9.80	30.21	33.48	6.41	1.76
12.40	30.21	33.45	6.38	1.65
14.80	30.20	33.55	6.41	1.58
18.50	30.05	34.40	6.38	1.40
20.90	30.07	34.25	6.37	1.45
24.60	29.66	35.51	6.33	0.81
27.10	29.63	35.50	6.10	1.52
30.90	29.53	35.53	5.94	0.37
33.30	29.52	35.53	5.85	0.34
37.00	29.50	35.53	5.79	0.65
40.90	29.50	35.54	5.78	0.40
44.80	29.50	35.54	5.74	0.37
49.00	29.49	35.56	5.72	0.41
51.80	29.49	35.57	5.75	0.46
56.80	29.47	35.58	5.70	1.07

APPENDIX E

Benthic Data Extracted from Vittor, 2006.

Table 3. Summary of overall abundance of major benthic macroinfaunal taxonomic groups for the Fernandina ODMDS stations, 2005.

Taxa	**Total No. Taxa**	**% Total**	**Total No. Individuals**	**% Total**
	2	0.8	65	2.9
	115	45.1	1,326	58.9
	29	11.4	299	13.3
	23	9.0	136	6.0
	1	0.4	2	0.1
	2	0.8	4	0.2
	60	23.5	230	10.2
	5	2.0	8	0.4
	1	0.4	1	0.0
	1	0.4	1	0.0
	2	0.8	56	2.5
Other Taxa	14	5.5	123	5.5
Total	**255**		**2,251**	

Table 4. Summary of abundance of major benthic macroinfaunal taxonomic groups by station for the Fernandina ODMDS stations, 2005.

Station	Taxa	Total No. Taxa	% Total	Total No. Individuals	% Total
F01	Annelida	33	66.0	110	72.4
	Mollusca	2	4.0	10	6.6
	Arthropoda	8	16.0	8	5.3
	Echinodermata	1	2.0	17	11.2
	Other Taxa	6	12.0	7	4.6
	Total	**50**		**152**	**100.0**
F02	Annelida	14	43.8	27	45.0
	Mollusca	8	25.0	14	23.3
	Arthropoda	4	12.5	6	10.0
	Echinodermata	0	0.0	0	0.0
	Other Taxa	6	18.8	13	21.7
	Total	**32**		**60**	**100.0**
F03	Annelida	6	30.0	12	25.5
	Mollusca	9	45.0	28	59.6
	Arthropoda	2	10.0	3	6.4
	Echinodermata	1	5.0	2	4.3
	Other Taxa	2	10.0	2	4.3
	Total	**20**		**47**	**100.0**
F07	Annelida	10	47.6	10	40.0
	Mollusca	3	14.3	5	20.0
	Arthropoda	5	23.8	7	28.0
	Echinodermata	0	0.0	0	0.0
	Other Taxa	3	14.3	3	12.0
	Total	**21**		**25**	**100.0**
F11	Annelida	21	46.7	37	33.0
	Mollusca	12	26.7	32	28.6
	Arthropoda	7	15.6	11	9.8
	Echinodermata	1	2.2	5	4.5
	Other Taxa	4	8.9	27	24.1
	Total	**45**		**112**	**100.0**
F12	Annelida	12	33.3	34	37.8
	Mollusca	14	38.9	38	42.2
	Arthropoda	5	13.9	7	7.8
	Echinodermata	0	0.0	0	0.0
	Other Taxa	5	13.9	11	12.2
	Total	**36**		**90**	**100.0**

Table 4 continued:

Station	Taxa	Total No. Taxa	% Total	Total No. Individuals	% Total
F04	Annelida	18	66.7	41	77.4
	Mollusca	3	11.1	3	5.7
	Arthropoda	4	14.8	4	7.5
	Echinodermata	0	0.0	0	0.0
	Other Taxa	2	7.4	5	9.4
	Total	**27**		**53**	**100.0**
F05	Annelida	51	58.0	236	70.0
	Mollusca	17	19.3	52	15.4
	Arthropoda	11	12.5	24	7.1
	Echinodermata	4	4.5	10	3.0
	Other Taxa	5	5.7	15	4.5
	Total	**88**		**337**	**100.0**
F06	Annelida	44	50.6	262	45.7
	Mollusca	14	16.1	179	31.2
	Arthropoda	24	27.6	109	19.0
	Echinodermata	2	2.3	14	2.4
	Other Taxa	3	3.4	9	1.6
	Total	**87**		**573**	**100.0**
F08	Annelida	9	45.0	27	65.9
	Mollusca	4	20.0	7	17.1
	Arthropoda	4	20.0	4	9.8
	Echinodermata	0	0.0	0	0.0
	Other Taxa	3	15.0	3	7.3
	Total	**20**		**41**	**100.0**
F09	Annelida	13	52.0	21	45.7
	Mollusca	2	8.0	2	4.3
	Arthropoda	8	32.0	17	37.0
	Echinodermata	1	4.0	5	10.9
	Other Taxa	1	4.0	1	2.2
	Total	**25**		**46**	**100.0**
F10	Annelida	42	54.5	574	80.3
	Mollusca	13	16.9	71	9.9
	Arthropoda	14	18.2	38	5.3
	Echinodermata	1	1.3	5	0.7
	Other Taxa	7	9.1	27	3.8
	Total	**77**		**715**	**100.0**

Table 5. Weight-weight biomass of major benthic macroinfaunal groups by station for the Fernandina ODMDS stations, 2005.

Station	Taxa Group	Biomass (gm/m^2)	Station	Taxa Group	Biomass (gm/m^2)
F01	**Annelida**	0.3906	F04	**Annelida**	0.1115
	Mollusca	0.0036		**Mollusca**	0.0027
	Arthropoda	0.0059		**Arthropoda**	0.0409
	Echinodermata	0.0018		**Echinodermata**	0.0000
	Other Taxa	0.0132		**Other Taxa**	0.0018
	Total	0.4151		**Total**	0.1569
F02	**Annelida**	0.0524	F05	**Annelida**	0.1944
	Mollusca	0.1133		**Mollusca**	0.6008
	Arthropoda	0.0121		**Arthropoda**	0.0198
	Echinodermata	0.0000		**Echinodermata**	0.0305
	Other Taxa	0.0201		**Other Taxa**	0.0968
	Total	0.1979		**Total**	0.9423
F03	**Annelida**	0.0049	F06	**Annelida**	0.2361
	Mollusca	0.0400		**Mollusca**	1.1612
	Arthropoda	0.0001		**Arthropoda**	0.1493
	Echinodermata	0.0001		**Echinodermata**	0.0405
	Other Taxa	0.0014		**Other Taxa**	0.0026
	Total	0.0465		**Total**	1.5897
F07	**Annelida**	0.0132	F08	**Annelida**	0.0226
	Mollusca	0.0042		**Mollusca**	0.0033
	Arthropoda	2.1344		**Arthropoda**	0.0022
	Echinodermata	0.0000		**Echinodermata**	0.0000
	Other Taxa	0.0026		**Other Taxa**	0.0080
	Total	2.1544		**Total**	0.0361
F11	**Annelida**	0.1003	F09	**Annelida**	0.0506
	Mollusca	0.0211		**Mollusca**	0.0058
	Arthropoda	0.0376		**Arthropoda**	0.0311
	Echinodermata	0.0036		**Echinodermata**	0.0060
	Other Taxa	0.0238		**Other Taxa**	0.0001
	Total	0.1864		**Total**	0.0936
F12	**Annelida**	0.0313	F10	**Annelida**	0.8488
	Mollusca	0.0342		**Mollusca**	0.4472
	Arthropoda	0.0011		**Arthropoda**	0.1416
	Echinodermata	0.0000		**Echinodermata**	0.0416
	Other Taxa	0.3261		**Other Taxa**	0.0726
	Total	0.3927		**Total**	1.5518

Table 6. Distribution and abundance and of benthic macroinfaunal taxa for the Fernandina ODMDS stations, 2005.

Taxa	Phylum	Class	No. of Individuals	% Total	Cumulative %	Station Occurrence	% Station Occurrence
Bhawania heteroseta	Ann	Poly	117	5.20	5.20	3	25
Maldanidae (LPIL)	Ann	Poly	111	4.93	10.13	4	33
Prionospio cristata	Ann	Poly	103	4.58	14.70	3	25
Mediomastus (LPIL)	Ann	Poly	87	3.86	18.57	6	50
Polygordius (LPIL)	Ann	Poly	69	3.07	21.63	7	58
Prionospio (LPIL)	Ann	Poly	66	2.93	24.57	6	50
Anadara transversa	Mol	Biva	65	2.89	27.45	3	25
Armandia maculate	Ann	Poly	65	2.89	30.34	7	58
Magelona sp. H	Ann	Poly	56	2.49	32.83	3	25
Crassinella lunulata	Mol	Biva	55	2.44	35.27	5	42
Odostomia (LPIL)	Mol	Gast	51	2.27	37.54	1	8
Ophiuroidea (LPIL)	Ech	Ophi	51	2.27	39.80	7	58
Gouldia cerina	Mol	Biva	46	2.04	41.85	4	33
Goniadides carolinae	Ann	Poly	39	1.73	43.58	3	25
Tubificidae (LPIL)	Ann	Olig	38	1.69	45.27	5	42
Nereididae (LPIL)	Ann	Poly	37	1.64	46.91	7	58
Branchiostoma (LPIL)	Cho	Lept	31	1.38	48.29	8	67
Globosolembos smithi	Art	Mala	31	1.38	49.67	1	8
Tellina (LPIL)	Mol	Biva	29	1.29	50.96	5	42
Apoprionospio pygmaea	Ann	Poly	27	1.20	52.15	6	50
Enchytraeidae (LPIL)	Ann	Olig	27	1.20	53.35	3	25
Capitellidae (LPIL)	Ann	Poly	26	1.16	54.51	7	58
Exogone lourei	Ann	Poly	26	1.16	55.66	4	33
Parapionosyllis longicirrata	Ann	Poly	26	1.16	56.82	3	25
Paraprionospio pinnata	Ann	Poly	26	1.16	57.97	5	42
Rhynchocoela (LPIL)	Rhy	-	25	1.11	59.08	7	58
Cirratulidae (LPIL)	Ann	Poly	23	1.02	60.11	6	50
Acteocina bidentata	Mol	Gast	22	0.98	61.08	6	50
Pleuromeris tridentate	Mol	Biva	20	0.89	61.97	2	17
Aricidea (LPIL)	Ann	Poly	19	0.84	62.82	5	42
Bivalvia (LPIL)	Mol	Biva	19	0.84	63.66	5	42
Lumbrineris latreilli	Ann	Poly	18	0.80	64.46	3	25
Autolytus (LPIL)	Ann	Poly	16	0.71	65.17	2	17
Dulichiella sp. A	Art	Mala	16	0.71	65.88	2	17
Laonice cirrata	Ann	Poly	16	0.71	66.59	3	25
Neomegamphopus (LPIL)	Art	Mala	16	0.71	67.30	4	33
Phyllodocidae (LPIL)	Ann	Poly	15	0.67	67.97	5	42
Turbellaria (LPIL)	Pla	Turb	14	0.62	68.59	3	25
Ampharetidae (LPIL)	Ann	Poly	13	0.58	69.17	3	25
Aspidosiphon gosnoldi	Sip	-	13	0.58	69.75	4	33
Hesionidae (LPIL)	Ann	Poly	13	0.58	70.32	3	25
Caecum johnsoni	Mol	Gast	12	0.53	70.86	4	33
Liljeborgia sp. A	Art	Mala	12	0.53	71.39	4	33
Mooreonuphis pallidula	Ann	Poly	12	0.53	71.92	5	42
Magelona pettiboneae	Ann	Poly	11	0.49	72.41	3	25
Owenia fusiformis	Ann	Poly	11	0.49	72.90	5	42
Caecum pulchellum	Mol	Gast	10	0.44	73.35	4	33
Chone (LPIL)	Ann	Poly	10	0.44	73.79	2	17
Nephtys picta	Ann	Poly	10	0.44	74.23	5	42
Protohadzia schoenerae	Art	Mala	10	0.44	74.68	1	8
Aoridae (LPIL)	Art	Mala	9	0.40	75.08	1	8
Goneplacidae (LPIL)	Art	Mala	9	0.40	75.48	2	17

Table 6 continued:

Taxa	Phylum	Class	No. of Individuals	% Total	Cumulative %	Station Occurrence	% Station Occurrence
Goniada littorea	Ann	Poly	9	0.40	75.88	5	42
Schistomeringos pectinata	Ann	Poly	9	0.40	76.28	2	17
Acteocina candei	Mol	Gast	8	0.36	76.63	4	33
Apanthura cracenta	Art	Mala	8	0.36	76.99	1	8
Arabella mutans	Ann	Poly	8	0.36	77.34	1	8
Dentatisyllis carolinae	Ann	Poly	8	0.36	77.70	1	8
Ervilia concentrica	Mol	Biva	8	0.36	78.05	3	25
Lumbrineridae (LPIL)	Ann	Poly	8	0.36	78.41	4	33
Polycirrus eximius	Ann	Poly	8	0.36	78.76	3	25
Syllis gracilis	Ann	Poly	8	0.36	79.12	1	8
Tharyx acutus	Ann	Poly	8	0.36	79.48	1	8
Aspidosiphon albus	Sip	-	7	0.31	79.79	5	42
Lineidae (LPIL)	Rhy	Anop	7	0.31	80.10	4	33
Phyllodoce (LPIL)	Ann	Poly	7	0.31	80.41	3	25
Xanthidae (LPIL)	Art	Mala	7	0.31	80.72	2	17
Aglaophamus verrilli	Ann	Poly	6	0.27	80.99	2	17
Dipolydora socialis	Ann	Poly	6	0.27	81.25	4	33
Glycera Americana	Ann	Poly	6	0.27	81.52	3	25
Lucina multilineata	Mol	Biva	6	0.27	81.79	2	17
Magelona papillicornis	Ann	Poly	6	0.27	82.05	4	33
Photis (LPIL)	Art	Mala	6	0.27	82.32	3	25
Spiophanes missionensis	Ann	Poly	6	0.27	82.59	4	33
Tellinidae (LPIL)	Mol	Biva	6	0.27	82.85	1	8
Amphiuridae (LPIL)	Ech	Ophi	5	0.22	83.07	2	17
Bemlos brunneomaculatus	Art	Mala	5	0.22	83.30	2	17
Diplodonta (LPIL)	Mol	Biva	5	0.22	83.52	3	25
Ehlersia ferrugina	Ann	Poly	5	0.22	83.74	1	8
Eumida sanguinea	Ann	Poly	5	0.22	83.96	2	17
Eunicidae (LPIL)	Ann	Poly	5	0.22	84.18	2	17
Kupellonura sp. B	Art	Mala	5	0.22	84.41	3	25
Lumbrinerides acuta	Ann	Poly	5	0.22	84.63	2	17
Metharpinia floridana	Art	Mala	5	0.22	84.85	2	17
Paguridae (LPIL)	Art	Mala	5	0.22	85.07	2	17
Panoplax depressa	Art	Mala	5	0.22	85.30	1	8
Spionidae (LPIL)	Ann	Poly	5	0.22	85.52	2	17
Terebellidae (LPIL)	Ann	Poly	5	0.22	85.74	2	17
Tubulanus (LPIL)	Rhy	Anop	5	0.22	85.96	2	17
Americhelidium americanum	Art	Mala	4	0.18	86.14	4	33
Anodontia alba	Mol	Biva	4	0.18	86.32	1	8
Arabella multidentata	Ann	Poly	4	0.18	86.49	1	8
Cyclaspis varians	Art	Mala	4	0.18	86.67	2	17
Diopatra cuprea	Ann	Poly	4	0.18	86.85	2	17
Ensis directus	Mol	Biva	4	0.18	87.03	1	8
Eunice (LPIL)	Ann	Poly	4	0.18	87.21	1	8
Exogone atlantica	Ann	Poly	4	0.18	87.38	3	25
Glycera (LPIL)	Ann	Poly	4	0.18	87.56	3	25
Kurtziella rubella	Mol	Gast	4	0.18	87.74	2	17
Lepidonotus sp. A	Ann	Poly	4	0.18	87.92	2	17
Maera sp. D	Art	Mala	4	0.18	88.09	1	8
Melitidae (LPIL)	Art	Mala	4	0.18	88.27	2	17
Phascolion strombi	Sip	-	4	0.18	88.45	1	8
Phoronis (LPIL)	Pho	-	4	0.18	88.63	4	33
Pisione remota	Ann	Poly	4	0.18	88.80	1	8
Psammolyce arenosa	Ann	Poly	4	0.18	88.98	1	8

Table 6 continued:

Taxa	Phylum	Class	No. of Individuals	% Total	Cumulative %	Station Occurrence	% Station Occurrence
Pythinella cuneata	Mol	Biva	4	0.18	89.16	1	8
Rildardanus laminose	Art	Mala	4	0.18	89.34	1	8
Scoloplos rubra	Ann	Poly	4	0.18	89.52	3	25
Spiochaetopterus oculatus	Ann	Poly	4	0.18	89.69	3	25
Spiophanes bombyx	Ann	Poly	4	0.18	89.87	2	17
Aonides mayaguezensis	Ann	Poly	3	0.13	90.00	1	8
Aspidosiphon (LPIL)	Sip	-	3	0.13	90.14	2	17
Asteropterygion oculitristis	Art	Ostr	3	0.13	90.27	3	25
Calyptraea centralis	Mol	Gast	3	0.13	90.40	2	17
Cnidaria (LPIL)	Cni	-	3	0.13	90.54	2	17
Dentalium laqueatum	Mol	Scap	3	0.13	90.67	1	8
Diplodonta punctata	Mol	Biva	3	0.13	90.80	1	8
Glyceridae (LPIL)	Ann	Poly	3	0.13	90.94	3	25
Heterocrypta granulate	Art	Mala	3	0.13	91.07	2	17
Latreutes parvulus	Art	Mala	3	0.13	91.20	2	17
Maera (LPIL)	Art	Mala	3	0.13	91.34	1	8
Montacutidae (LPIL)	Mol	Biva	3	0.13	91.47	1	8
Mytilidae (LPIL)	Mol	Biva	3	0.13	91.60	2	17
Paleanotus sp. A	Ann	Poly	3	0.13	91.74	2	17
Sabellidae (LPIL)	Ann	Poly	3	0.13	91.87	2	17
Scoletoma (LPIL)	Ann	Poly	3	0.13	92.00	2	17
Sipuncula (LPIL)	Sip	-	3	0.13	92.14	3	25
Tectonatica pusilla	Mol	Gast	3	0.13	92.27	3	25
Turbonilla (LPIL)	Mol	Gast	3	0.13	92.40	1	8
Turridae (LPIL)	Mol	Gast	3	0.13	92.54	2	17
Albunea paretii	Art	Mala	2	0.09	92.63	1	8
Amakusanthura magnifica	Art	Mala	2	0.09	92.71	2	17
Ampelisca vadorum	Art	Mala	2	0.09	92.80	1	8
Anomia simplex	Mol	Biva	2	0.09	92.89	2	17
Apocorophium simile	Art	Mala	2	0.09	92.98	1	8
Apseudes sp. A	Art	Mala	2	0.09	93.07	1	8
Aricidea taylori	Ann	Poly	2	0.09	93.16	2	17
Armandia agilis	Ann	Poly	2	0.09	93.25	2	17
Brachiopoda (LPIL)	Bra	-	2	0.09	93.34	1	8
Brania wellfleetensis	Ann	Poly	2	0.09	93.43	2	17
Caecum floridanum	Mol	Gast	2	0.09	93.51	1	8
Cirrophorus (LPIL)	Ann	Poly	2	0.09	93.60	2	17
Cirrophorus ilvana	Ann	Poly	2	0.09	93.69	1	8
Crepidula plana	Mol	Gast	2	0.09	93.78	1	8
Decapoda (LPIL)	Art	Mala	2	0.09	93.87	1	8
Euceramus praelongus	Art	Mala	2	0.09	93.96	2	17
Eudevenopus honduranus	Art	Mala	2	0.09	94.05	1	8
Eusarsiella sp. L	Art	Ostr	2	0.09	94.14	1	8
Filogranula sp. A	Ann	Poly	2	0.09	94.22	1	8
Gibberosus myersi	Art	Mala	2	0.09	94.31	2	17
Golfingia (LPIL)	Sip	-	2	0.09	94.40	1	8
Litocorsa antennata	Ann	Poly	2	0.09	94.49	2	17
Lucinidae (LPIL)	Mol	Biva	2	0.09	94.58	1	8
Magelona (LPIL)	Ann	Poly	2	0.09	94.67	1	8
Mediomastus californiensis	Ann	Poly	2	0.09	94.76	2	17
Mesanthura (LPIL)	Art	Mala	2	0.09	94.85	1	8
Metatiron tropakis	Art	Mala	2	0.09	94.94	2	17
Mitrella lunata	Mol	Gast	2	0.09	95.02	1	8
Neomegamphopus kalanii	Art	Mala	2	0.09	95.11	1	8

Table 6 continued:

Taxa	Phylum	Class	No. of Individuals	% Total	Cumulative %	Station Occurrence	% Station Occurrence
Nephtyidae (LPIL)	Ann	Poly	2	0.09	95.20	2	17
Nephtys simony	Ann	Poly	2	0.09	95.29	1	8
Nucula aegeenis	Mol	Biva	2	0.09	95.38	1	8
Onuphis eremita oculata	Ann	Poly	2	0.09	95.47	2	17
Pectinidae (LPIL)	Mol	Biva	2	0.09	95.56	2	17
Pinnotheridae (LPIL)	Art	Mala	2	0.09	95.65	2	17
Podarke obscura	Ann	Poly	2	0.09	95.74	1	8
Polyplacophora (LPIL)	Mol	Poly	2	0.09	95.82	1	8
Processa hemphilli	Art	Mala	2	0.09	95.91	1	8
Sabellaria vulgaris	Ann	Poly	2	0.09	96.00	2	17
Semele (LPIL)	Mol	Biva	2	0.09	96.09	2	17
Sigatica semisulcata	Mol	Gast	2	0.09	96.18	1	8
Sthenelais sp. A	Ann	Poly	2	0.09	96.27	1	8
Tanaissus sp. A	Art	Mala	2	0.09	96.36	2	17
Tellina iris	Mol	Biva	2	0.09	96.45	1	8
Acuminodeutopus naglei	Art	Mala	1	0.04	96.49	1	8
Ampelisca (LPIL)	Art	Mala	1	0.04	96.53	1	8
Ampelisca agassizi	Art	Mala	1	0.04	96.58	1	8
Ampelisca parapacifica	Art	Mala	1	0.04	96.62	1	8
Antalis (LPIL)	Mol	Scap	1	0.04	96.67	1	8
Aricidea catherinae	Ann	Poly	1	0.04	96.71	1	8
Aricidea minuta	Ann	Poly	1	0.04	96.76	1	8
Aricidea wassi	Ann	Poly	1	0.04	96.80	1	8
Asteroidea (LPIL)	Ech	Aste	1	0.04	96.85	1	8
Automate (LPIL)	Art	Mala	1	0.04	96.89	1	8
Axiothella (LPIL)	Ann	Poly	1	0.04	96.93	1	8
Batea catharinensis	Art	Mala	1	0.04	96.98	1	8
Bowmaniella (LPIL)	Art	Mala	1	0.04	97.02	1	8
Carditidae (LPIL)	Mol	Biva	1	0.04	97.07	1	8
Ceratocephale oculata	Ann	Poly	1	0.04	97.11	1	8
Corbula contracta	Mol	Biva	1	0.04	97.16	1	8
Diodora (LPIL)	Mol	Gast	1	0.04	97.20	1	8
Dispio uncinata	Ann	Poly	1	0.04	97.25	1	8
Divaricella quadrisulcata	Mol	Biva	1	0.04	97.29	1	8
Ebalia stimpsonii	Art	Mala	1	0.04	97.33	1	8
Eulimidae (LPIL)	Mol	Gast	1	0.04	97.38	1	8
Eurypanopeus depressus	Art	Mala	1	0.04	97.42	1	8
Eusarsiella cresseyi	Art	Ostr	1	0.04	97.47	1	8
Eusarsiella spinosa	Art	Ostr	1	0.04	97.51	1	8
Exogone (LPIL)	Ann	Poly	1	0.04	97.56	1	8
Fabricinuda trilobata	Ann	Poly	1	0.04	97.60	1	8
Glycera dibranchiate	Ann	Poly	1	0.04	97.65	1	8
Goniada (LPIL)	Ann	Poly	1	0.04	97.69	1	8
Hepatus (LPIL)	Art	Mala	1	0.04	97.73	1	8
Heteromastus filiformis	Ann	Poly	1	0.04	97.78	1	8
Heteromysis (LPIL)	Art	Mala	1	0.04	97.82	1	8
Kalliapseudes macsweenyi	Art	Mala	1	0.04	97.87	1	8
Leitoscoloplos (LPIL)	Ann	Poly	1	0.04	97.91	1	8
Leptochela serratorbita	Art	Mala	1	0.04	97.96	1	8
Leptosynapta (LPIL)	Ech	Holo	1	0.04	98.00	1	8
Levinsenia gracilis	Ann	Poly	1	0.04	98.05	1	8
Lioberus castaneus	Mol	Biva	1	0.04	98.09	1	8
Lucina (LPIL)	Mol	Biva	1	0.04	98.13	1	8
Lumbrineris (LPIL)	Ann	Poly	1	0.04	98.18	1	8

Table 6 continued:

Taxa	Phylum	Class	No. of Individuals	% Total	Cumulative %	Station Occurrence	% Station Occurrence
Macromphalina floridana	Mol	Gast	1	0.04	98.22	1	8
Melinna maculate	Ann	Poly	1	0.04	98.27	1	8
Mesochaetopterus (LPIL)	Ann	Poly	1	0.04	98.31	1	8
Metatiron triocellatus	Art	Mala	1	0.04	98.36	1	8
Muricidae (LPIL)	Mol	Gast	1	0.04	98.40	1	8
Nephtys (LPIL)	Ann	Poly	1	0.04	98.45	1	8
Nereis succinea	Ann	Poly	1	0.04	98.49	1	8
Odontosyllis enopla	Ann	Poly	1	0.04	98.53	1	8
Onuphidae (LPIL)	Ann	Poly	1	0.04	98.58	1	8
Opisthodonta sp. B	Ann	Poly	1	0.04	98.62	1	8
Oxyurostylis (LPIL)	Art	Mala	1	0.04	98.67	1	8
Paranaitis speciosa	Ann	Poly	1	0.04	98.71	1	8
Pectinaria gouldii	Ann	Poly	1	0.04	98.76	1	8
Philine sagra	Mol	Gast	1	0.04	98.80	1	8
Pinnidae (LPIL)	Mol	Biva	1	0.04	98.84	1	8
Pinnixa (LPIL)	Art	Mala	1	0.04	98.89	1	8
Pinnotheres (LPIL)	Art	Mala	1	0.04	98.93	1	8
Pionosyllis gesae	Ann	Poly	1	0.04	98.98	1	8
Pista palmate	Ann	Poly	1	0.04	99.02	1	8
Polycirrus (LPIL)	Ann	Poly	1	0.04	99.07	1	8
Polynoidae (LPIL)	Ann	Poly	1	0.04	99.11	1	8
Portunus gibbesii	Art	Mala	1	0.04	99.16	1	8
Processa (LPIL)	Art	Mala	1	0.04	99.20	1	8
Protohaustorius sp. B	Art	Mala	1	0.04	99.24	1	8
Rictaxis punctostriatus	Mol	Gast	1	0.04	99.29	1	8
Sabaco americanus	Ann	Poly	1	0.04	99.33	1	8
Sabellaria sp. A	Ann	Poly	1	0.04	99.38	1	8
Saccocirrus sp. A	Ann	Poly	1	0.04	99.42	1	8
Scaphandridae (LPIL)	Mol	Gast	1	0.04	99.47	1	8
Schistomeringos rudolphi	Ann	Poly	1	0.04	99.51	1	8
Sigambra tentaculata	Ann	Poly	1	0.04	99.56	1	8
Spio pettiboneae	Ann	Poly	1	0.04	99.60	1	8
Strombiformis (LPIL)	Mol	Gast	1	0.04	99.64	1	8
Strombiformis bilineatus	Mol	Gast	1	0.04	99.69	1	8
Syllidae (LPIL)	Ann	Poly	1	0.04	99.73	1	8
Syllis cornuta	Ann	Poly	1	0.04	99.78	1	8
Synasterope setisparsa	Art	Ostr	1	0.04	99.82	1	8
Synelmis ewingi	Ann	Poly	1	0.04	99.87	1	8
Upogebia (LPIL)	Art	Mala	1	0.04	99.91	1	8
Upogebia affinis	Art	Mala	1	0.04	99.96	1	8
Veneridae (LPIL)	Mol	Biva	1	0.04	100.00	1	8

Taxa Key

Ann=Annelida	Cni=Cnidaria	Pla=Platyhelminthes
Olig=Oligochaeta	Anth=Anthozoa	Turb=Turbellaria
Poly=Polychaeta	Ech=Echinodermata	Rhy=Rhynchocoela
Art=Arthropoda	Holo=Holothuroidea	Anop=Anopla
Inse=Insecta	Ophi=Ophiuroidea	Sip=Sipuncula
Mala=Malacostraca	Mol=Mollusca	
Ostr=Ostracoda	Biva=Bivalvia	
Bra=Brachiopoda	Gast=Gastropoda	

Figure 3. Abundance of major macroinvertebrate taxa groups for the Fernandina ODMDS stations, 2005.

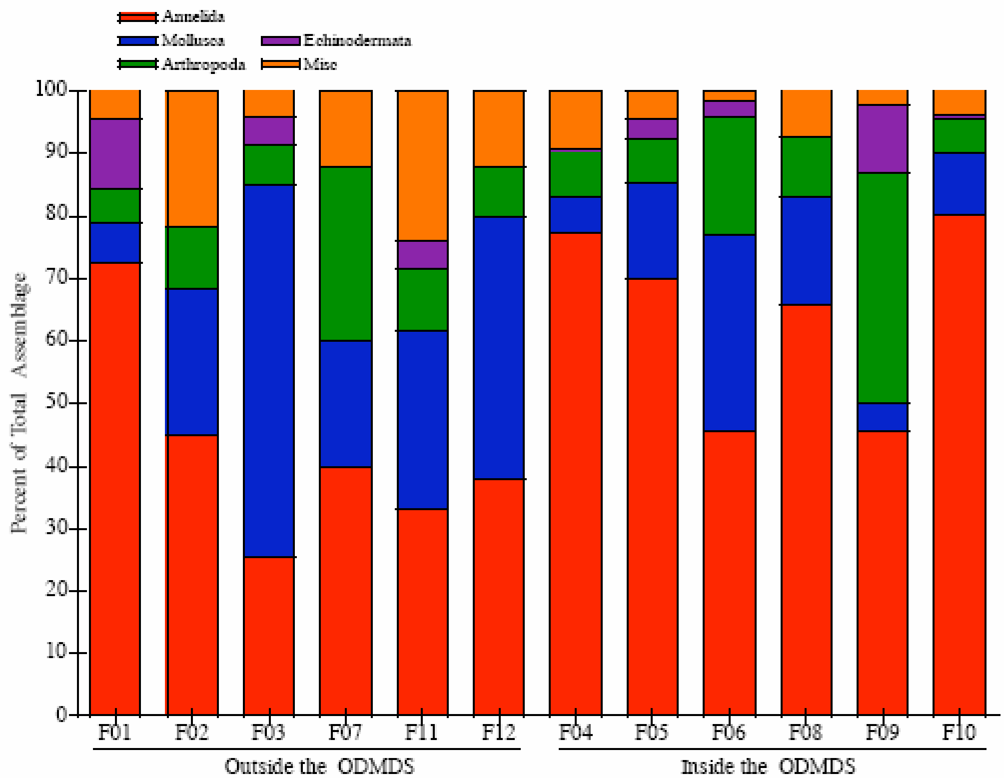
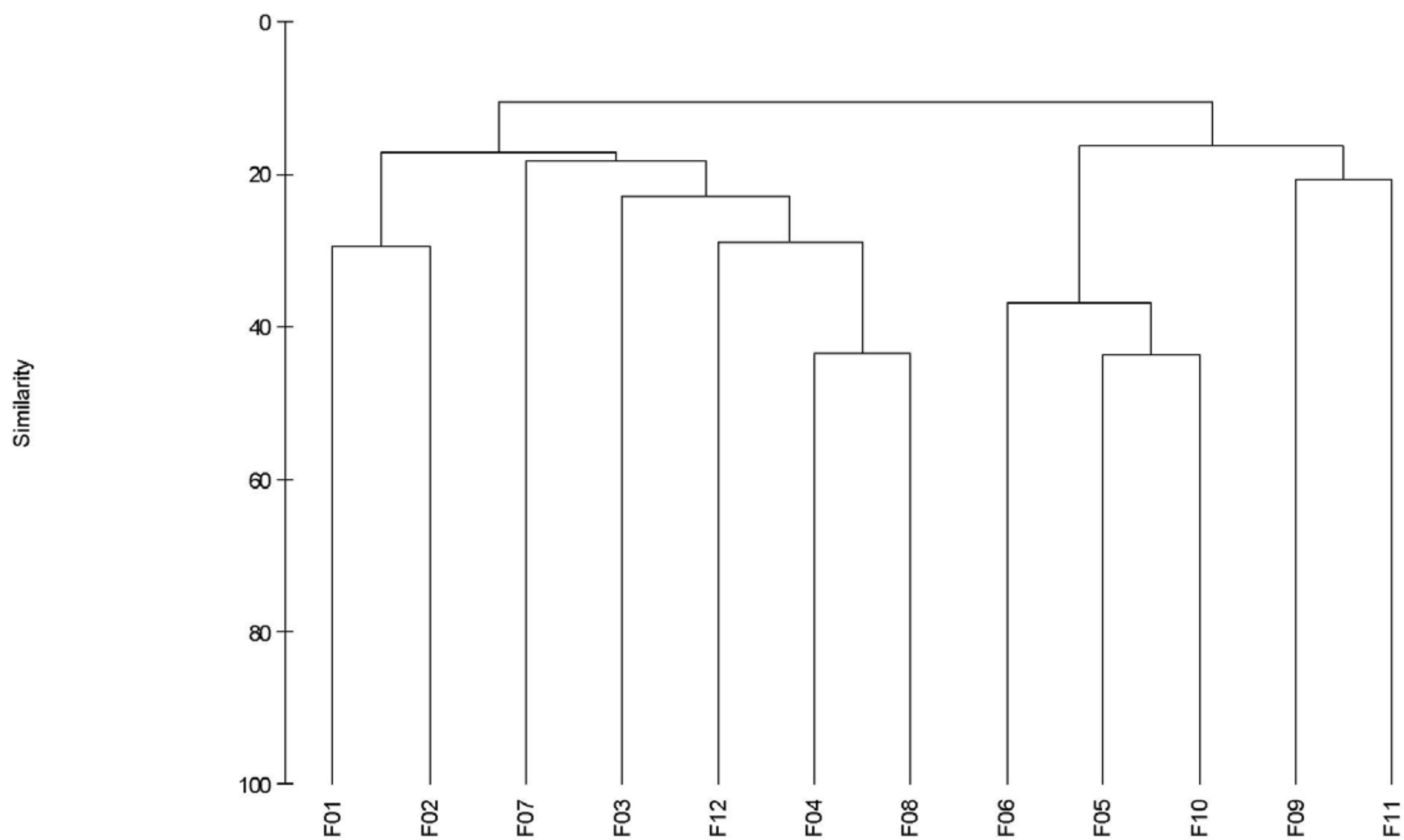


Figure 9. Cluster analysis for the Fernandina ODMDS stations, 2005.



APPENDIX F

Target Detection Limits

ANALYTE	Water ug/L (ppb)	Sediment mg/kg (ppm)
Antimony	2.5	2
Arsenic	5	1
Aluminum	500	50
Beryllium	30	0.5
Cadmium	2.5	0.5
Chromium	50	1
Copper*	4.8	1
Iron	500	25
Lead	5	0.5
Manganese	100	1
Mercury	0.2	0.05
Nickel*	74	2
Selenium	10	4
Silver*	1.9	1
Thallium	5	0.5
Zinc*	50	1
Ammonia	0.05	2.5
Nitrate+Nitrite	0.05	12.5
Phosphorus, Total	0.01	25
Phosphorus, Ortho	0.01	25
Sulfate	0.1	1
Sulfide	0.04	0.4
Kjeldahl Nitrogen	0.05	12.5
Total Solids/dry weight		0.01
Total Org. Carbon	5 (0.0005%)	0.001

ANALYTE	Water ug/L(ppb)	Soil/Sed* ug/kg(ppb)
2-Methylnaphthalene	10	20
Acenaphthene	10	10
Acenaphthylene	10	20
Anthracene	10	20
Benzo(a)anthracene	10	20
Benzo(a)pyrene	10	20
Benzo(b/k)fluoranthene	10	20
Benzo(g,h,i)perylene	10	20
Chrysene	10	20
Dibenz(a,h)anthracene	10	20
Fluoranthene	10	20
Fluorene	10	10
Indeno(1,2,3,c,d)pyrene	10	20
Naphthalene	10	20
Phenanthrene	10	20
Pyrene	10	20

ANALYTE	Water ug/L(ppb)	Soil/Sed* ug/kg(ppb)
(3- and/or 4-)Methylphenol	10	100
1,2,4-Trichlorobenzene	10	200
2,4-Dimethylphenol	10	20
2-Methylphenol	10	50
Benzyl Butyl Phthalate	10	200
Bis(2-ethylhexyl)phthalate	10	200
Di-n-butylpthalate	10	200
Di-n-octylphthalate	10	200
Dibenzofuran	10	200
Diethyl phthalate	10	200
Dimethyl Phthalate	10	200
Hexachlorobenzene	10	200
Hexachlorobutadiene	10	200
Hexachlorocyclopentadiene	10	200
Hexachloroethane	10	200
N-Nitrosodiphenylamine	10	200
Pentachlorophenol	20	100
Phenol	10	100

ANALYTE	Water ug/L (ppb)	Sediment ug/kg (ppb)
Aldrin	0.5	20
Heptachlor*	0.05	20
Hept. Epoxide*	0.05	20
alpha-BHC	0.5	20
beta-BHC	0.5	20
gamma-BHC*	0.1	20
delta-BHC	0.5	20
Endosulfan- I*	0.05	20
Dieldrin*	0.5	1
p,p'-DDT*	0.1	2
p,p'-DDD*	0.1	2
p,p'-DDE*	0.1	2
Endrin*	0.05	20
Endosulfan -II*	0.05	20
Endosulfan- SO4*	0.5	20
Endrin Ketone	0.5	20
Methoxychlor	1	50
g-chlordane*	0.1	5
a-chlordane*	0.1	5
trans-nonachlor*	0.1	20
cis-nonachlor	0.5	20
Toxaphene*	2	50
PCB (as Congeners - see list)	0.02	1

PCB Congenge r	Water ug/L (ppb)	Sediment ug/kg (ppb)
8	0.02	1
18	0.02	1
28	0.02	1
44	0.02	1
49	0.02	1
52	0.02	1
66	0.02	1
77	0.02	1
87	0.02	1
101	0.02	1
105	0.02	1
118	0.02	1
126	0.02	1
128	0.02	1
138	0.02	1
153	0.02	1
156	0.02	1
169	0.02	1
170	0.02	1
180	0.02	1
183	0.02	1
184	0.02	1
187	0.02	1
195	0.02	1
206	0.02	1
209	0.02	1