

**CRUISE REPORT
C238**

**Scientific data collected aboard
*SSV Corwith Cramer***

**Christiansted, St. Croix, USVI – San Juan, Puerto Rico – Samana,
Dominican Republic – Port Antonio, Jamaica – Key West, Florida, USA**

25 November 2011 – 02 January, 2012



Dylan Anslow illustrates a Caribbean spiny lobster (aka lunch!). Photo by Jeff Schell

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Table 1. C238 Ship's crew and student participants

<u>Nautical Staff</u>	
Beth Doxsee	Captain
Matthew Glen	Chief Mate
Brian Barnes	2 nd Mate
Erin Bostrom	3 rd Mate
Seth Murray	Engineer
Lillian Corbin	Stewards
Beth Stivison	Sailing Intern
Jesse Kehr	Sailing Intern
Hadley Owen	Sailing Intern
Chris Trestick	Sailing Intern
Raquel Hernandez	Sailing Intern
Lauren Hansen	Sailing Intern
<u>Scientific Staff</u>	
Jeff Schell	Chief Scientist
Skye Moret	1 st Scientist
Randy Jones	2 nd Scientist
Julia Twichell	3 rd Scientist
<u>Academic Staff</u>	
Carl Herzog	Maritime Studies Professor
Rick Jones	Science Illustration – Vassar College
Scott Elliot	Videographer
Nicholas Steinbauer	Web Design - Deckhand
Victoria Smith	Alumni Coordinator - Deckhand
Patrice Francis	Scientific Observer – Jamaica
<u>Students</u>	
Dylan Anslow	Stanford University
Sarah Banks	Warren Wilson College
April Collier	Lesley University
Mary Claire Erskine	Oberlin College
Ellie Howell	Bryn Mawr College
Gus Hoffmann	Lewis and Clark College
Malcolm Johnson	Wichita State University
Libby Meier	University of Chicago
Laura Page	University of Mary Washington
Larissa Pauli	Colgate University
Marissa Rosenfeld	Rochester Institute of Technology
Onji Scott	Embry Riddle Aeronautical University
Ian Scotton	University of King's College
Jill Thompson	University of Northern Iowa

Table 2. C238 Calendar of Events

Red – nautical science assignments, **Blue** – oceanography assignments,
Green – oceanography work, **Brown** – maritime studies work

DATE (2011)	PORT OF CALL	EVENT
25 Nov	St. Croix	Embark Students , Begin Orientation
26 Nov	Depart St. Croix	Field Trip: Jump Up cultural celebration Watch Bill Assignments / Safety Drills
28-30 Nov		Creature Feature Presentations
01 Dec		Arrive San Juan, Puerto Rico
02 Dec		Field Trip: El Yunque rainforest
03 Dec		Beach Surveys
05 Dec		OC Skills Checklist due, Natural History Illustration due
08 Dec	Arrive Samana, Dominican Republic	Deck Safety checklist and LAN due
09 Dec		Field Trip: Los Haitises National Park / EcoMar Whale Museum / Mrs. Mabel Phipps English class Watch Change and begin Phase II, OC Methods due
10-11 Dec		Reef, Beach, and Harbor Surveys
12 Dec		Depart Dominican Republic
17 Dec	Arrive Port Antonio, Jamaica	OC Results due
18 Dec		Field Trip Options: Rio Grande Valley natural history hike - or - Maroon Community/UNESCO World Heritage site visit
19-20 Dec		Reef & Beach Surveys / Nutrient Analyses
21 Dec		OC Skills Checklist due, Natural History Illustration due
23 Dec	Depart Port Antonio, Jamaica	Deck Skills checklist due Watch Change and begin Phase III
24 Dec		OC Poster presentations
26-30 Dec		Change Paper Presentations and Addendum, Sheet Anchor, Natural History Illustration, OC Final Paper
01 Jan	Arrive Key West, USA	Disembark Students
02 Jan		

Cruise Data Description C238

The cruise track for C238 (Figure 1) departed from Christiansted, St. Croix, USVI and finished in Key West, FL, USA. During the nearly six week voyage we had three port stops; the first in San Juan, Puerto Rico followed by Samana, Dominican Republic, and the third in Port Antonio, Jamaica.

Our cruise track traversed several major oceanographic provinces (Figure 1): a) eastern Caribbean Sea, b) the western North Atlantic Ocean or Sargasso Sea, including Navidad Bank, c) the shelf and coastal waters of the Greater Antilles (island of Hispaniola) including Formigas Bank and the d) western Caribbean Sea and Florida Straits.* Comparison of the physical, chemical, biologic and geologic features of these regions represented the major oceanographic theme of this sea semester. A total of 39 scientific stations and 88 individual deployments (Table 3) were completed in pursuit of the following investigations:

1. Physical oceanographic studies focused on the distribution of surface and sub-surface (to 600 m) water masses and the delineation of boundaries. Specifically, North Atlantic sub-tropical mode water (18°C Water) was studied in relation to the phase of the North Atlantic Oscillation (NAO).
2. Chemical oceanographic studies focused on the geographic distribution of nutrients (phosphate and nitrate), extracted chlorophyll-*a*, and pH. Sea surface pH was related to abundance, size, and shell characteristics of pteropods.
3. Biological studies focused on the geographic distribution of zooplankton, several meroplanktonic larvae including lobster (phyllosoma), eel larvae (leptocephali) and invasive lionfish larvae (*Pterois volitans*). Studies of pelagic *Sargassum* weed, associated fauna, and localized nutrient concentrations were examined using a modified Dip Net.
4. Geological studies focused on sediment distribution and shoaling in Samana Bay in relation to water depth, tidal cycle, and distance from shore.

During our port stops in Samana and Port Antonio we conducted reef surveys to measure water quality in relation to human development of local watersheds. Reef surveys measured coverage of living reef, dead reef, and macrophyte growth; abundance and diversity of fish and mobile invertebrates; water visibility, nutrients (phosphate and nitrate), extracted chlorophyll-*a*, dissolved oxygen, and abundance of *Escherichia coli* bacteria. Data available upon request.

Additional work during our port stops involved the collection of marine debris from nearby beaches. Collected debris was described, enumerated, and then discarded at local waste management facilities. A sub-sample of collected plastic was examined for the presence or absence of bacterial communities using a standard EPA testing kit (Coliquant). Data available upon request.

Sea surface temperature, salinity, and chlorophyll-*a* fluorescence levels; along with barometric pressure, winds, bathymetry, and geographic position were recorded continuously along the cruise track.* Large scale surface hydrography is summarized with surface plots for some parameters (Figure 2 a-c) while

other data is available upon request. Surface samples (50) of nutrients (phosphate), pH, and chlorophyll-*a* were collected routinely along the cruise track (Table 4).

But for the occasional eddy and our crossing of the Florida Current, surface currents along the C238 cruise track were weak (< 500mm/s, or 1.0 knot) and variable in direction. Regional views of surface currents highlight the presence of eddies and meanders near constricted island passages, atop shallow banks, and associated with regional currents (Figures 4a-d). The only sub-surface feature of note was the Florida Current (Figure 5).

The density structure and profiles of dissolved oxygen, nutrients (phosphate), chlorophyll-*a* and pH of the water column (maximum depth 600m) were determined using a 12 bottle carousel package with attached CTD sensor (6 stations, Table 5). Additional *in situ* sensors included chlorophyll-*a*, transmissivity and PAR. Additional free-CTD deployments were also conducted (maximum depth 600m, 13 stations, Table 6). Sub-surface water masses are revealed with a cross-section plot along the cruise track (Figure 6a-b).

Surface plankton assemblages along with the floating macrophyte *Sargassum* spp., marine debris, and tar balls were sampled regularly with a neuston net (23 stations, 335 µm mesh, Table 7). Plankton assemblages at discrete depths were collected using a 1-meter diameter circular net (4 stations, 335 µm mesh, tow depth 150m, Table 8). Identification and counts of broad taxonomic categories were conducted for all net tows (Table 9).

Discrete samples of *Sargassum* clumps were collected with a dip net (7 stations, 335 µm mesh) and assessed for color, epibiont community structure and abundance and diversity of mobile, macrofauna (Table 10).

Four sediment samples were collected along an east to west transect through Samana Bay using a shipek grab. In addition a series of Fisher Scoop stations (15) were conducted along perpendicular transects to survey sedimentation patterns across the inner harbor of Santa Barbara de Samana (Table 11).

Periodically during the cruise, for demonstration purposes only, 3 secchi disc deployments were conducted to assess water transparency and were compared to data from the PAR sensor (Table 12).

Additional CTD, CHIRP, ADCP and biological data not reported here are available on request through Sea Education Association (SEA) and the Chief Scientist. The information in this report is not intended to represent final interpretation of the data and should not be excerpted or cited without written permission from SEA.

As part of SEA's educational program, undergraduates conducted independent oceanographic research during the cruise. Projects explored regionally, relevant topics in the disciplines of physical, chemical, and biological oceanography (Table 13). Student research efforts culminated in a written report and public presentation to the ship's company. These papers are available on request from SEA.

* No scientific samples or data were collected or recorded in the Exclusive Economic Zones of Cuba or Mexico.

Jeff Schell, Chief Scientist, C238

Figure 1. Final cruise track for C238 based on hourly (local time) positions. Regional oceanographic biomes (Eastern Caribbean, Sargasso Sea, Greater Antilles, Western Caribbean, and Florida Straits), interesting bathymetric features (Puerto Rico Trench, Navidad Bank and Formigas Bank), and coastal features (Samana Bay) surveyed during the cruise.

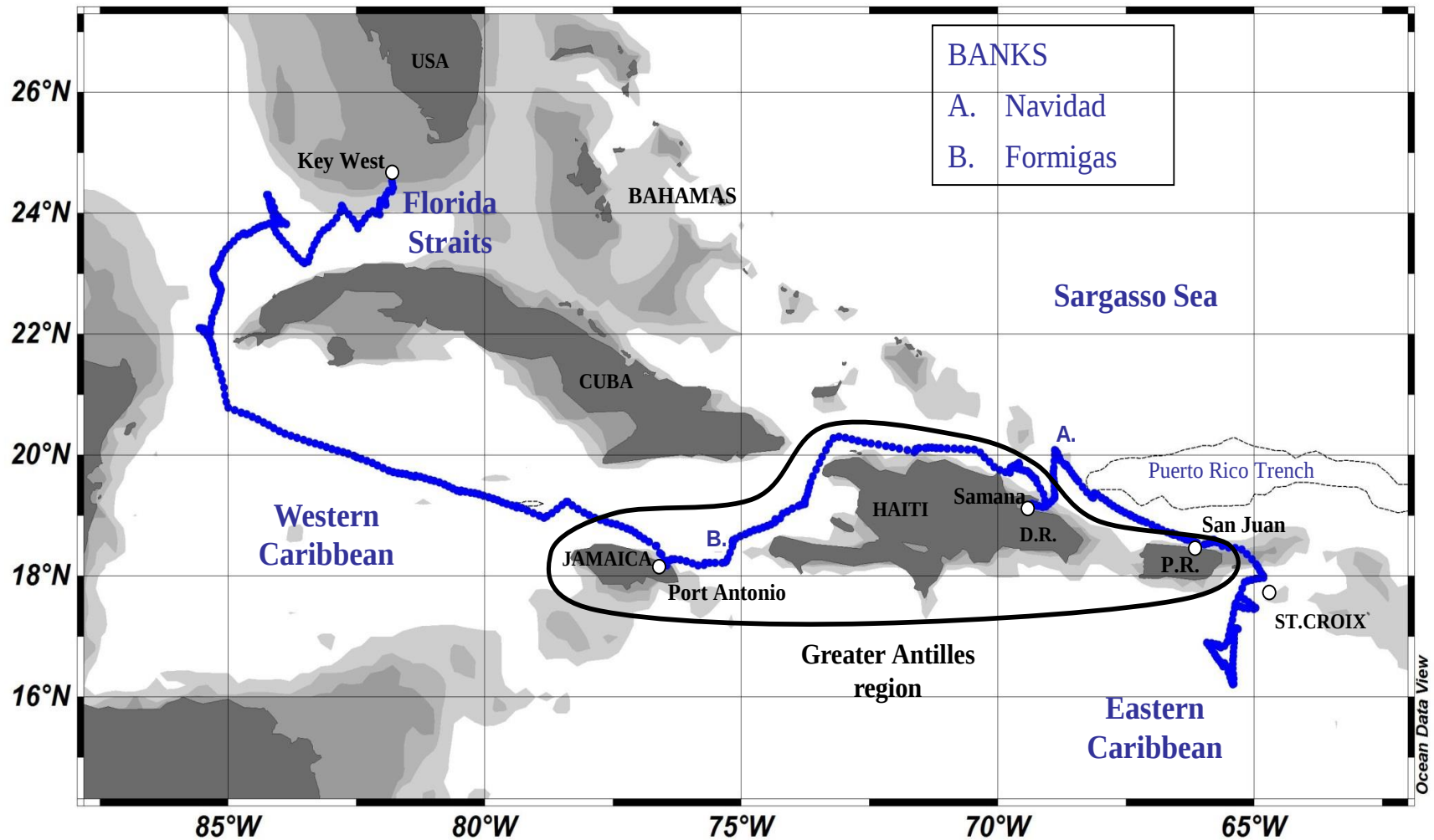


Table 3. Summary of oceanographic sampling stations for C238.

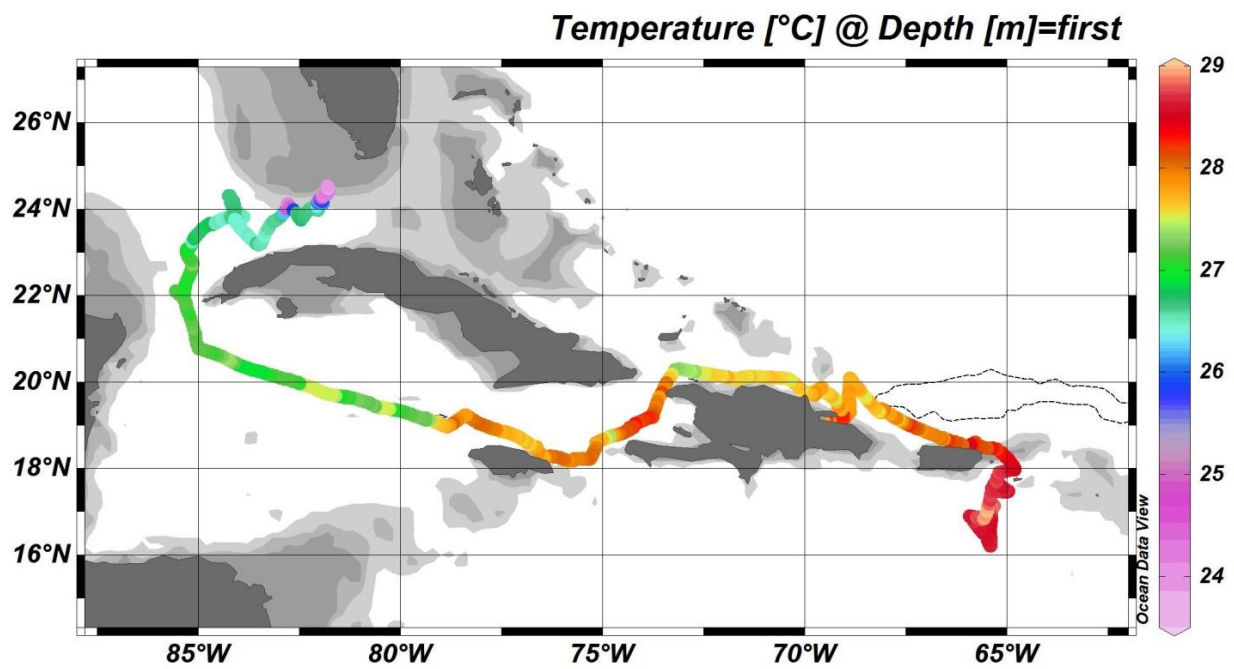
Station # (C238-)	Date (2011)	Time (local +4 GMT)	Log (nm)	Lat (dec Deg N)	Lon (dec Deg W)	Location	Station Type
001	27-Nov	1002	55.9	17.45	-65.28	East Caribbean	CTD
001	27-Nov	1147	56.2	17.43	-65.26	East Caribbean	NT
002	27-Nov	2153	72.6	17.14	-65.37	East Caribbean	NT
003	28-Nov	1214	125.0	16.31	-65.41	East Caribbean	NT
004	28-Nov	2102	148.5	16.56	-65.59	East Caribbean	MN
004	28-Nov	2205	148.6	16.53	-65.60	East Caribbean	NT
005	29-Nov	1008	195.4	16.86	-65.70	East Caribbean	HC
006	29-Nov	1647	221.0	17.17	-65.46	East Caribbean	DN
007	29-Nov	2115	255.0	17.55	-65.37	East Caribbean	CTD
007	29-Nov	2225	255.0	17.53	-65.37	East Caribbean	MN
008	30-Nov	0955	300.5	17.66	-65.31	East Caribbean	HC
008	30-Nov	1044	300.9	17.65	-65.31	East Caribbean	NT
008	30-Nov	1105	301.4	17.64	-65.30	East Caribbean	DN
009	1-Dec	0824	418.8	18.60	-65.80	Puerto Rican Continental Shelf	CTD
009	1-Dec	0839	418.8	18.60	-65.80	Puerto Rican Continental Shelf	DN
009	1-Dec	0917	419.0	18.60	-65.80	Puerto Rican Continental Shelf	NT
010a	5-Dec	0937	440.7	18.47	-66.13	Inner Harbor, San Juan	NT
010b	5-Dec	1025	443.7	18.53	-66.11	3nm N of San Juan Harbor	NT
010c	5-Dec	1158	448.9	18.58	-66.17	6nm N of San Juan Harbor	NT
011	5-Dec	2133	470.5	18.71	-66.61	Puerto Rican Trench	CTD
011	5-Dec	2225	470.5	18.70	-66.60	Puerto Rico Trench	NT
012	6-Dec	1028	514.4	19.00	-67.40	Puerto Rican Trench	HC
013	6-Dec	2110	556.9	19.37	-68.12	Puerto Rico Trench	MN
013	6-Dec	2226	558.0	19.32	-68.13	Puerto Rico Trench	NT
014	6-Dec	0725	582.9	19.73	-68.58	Sargasso Sea	DN
015	7-Dec	1038	589.9	19.84	-68.68	Navidad Bank	HC
016	7-Dec	1653	607.9	20.09	-68.89	Navidad Bank	NT
017a	8-Dec	1155	694.8	19.15	-69.13	Entrance - Samana Bay	NT
017b	8-Dec	1309	701.2	19.17	-69.22	Mid - Samana Bay	NT
017c	8-Dec	1427	705.3	19.18	-69.29	Samana Bay near anchorage	NT
018	8-Dec	1930	706.0	19.19	-69.33	Samana Bay anchorage	FS
019a	9-Dec	0020	anchored	19.19	-69.33	Samana anchorage, low tide	CTD
019b	9-Dec	0400	anchored	19.19	-69.33	Samana anchorage, flood tide	CTD
019c	9-Dec	0758	anchored	19.19	-69.33	Samana anchorage, high tide	CTD
019d	9-Dec	1100	anchored	19.19	-69.33	Samana anchorage, ebb tide	CTD
019e	9-Dec	1630	anchored	19.19	-69.33	Samana anchorage, flood tide	CTD
020a	10-Dec	0907	anchored	19.20	-69.32	Channel, Samana Harbor	FS
020b	10-Dec	0922	anchored	19.20	-69.32	Channel, Samana Harbor	FS
020c	10-Dec	0940	anchored	19.19	-69.32	Channel, Samana Harbor	FS
020d	10-Dec	0950	anchored	19.19	-69.32	Channel, Samana Harbor	FS
020e	10-Dec	0957	anchored	19.19	-69.32	Channel, Samana Harbor	FS
020f	10-Dec	1005	anchored	19.20	-69.33	Channel, Samana Harbor	FS
020f2	10-Dec	1012	anchored	19.20	-69.33	Channel, Samana Harbor	FS
020h	10-Dec	1022	anchored	19.19	-69.33	Channel, Samana Harbor	FS
020i	10-Dec	1030	anchored	19.19	-69.33	Channel, Samana Harbor	FS
020i2	10-Dec	1035	anchored	19.19	-69.33	Channel, Samana Harbor	FS
020j	10-Dec	1039	anchored	19.18	-69.33	Channel, Samana Harbor	FS

Station # (C238-)	Date (2011)	Time (local +4 GMT)	Log (nm)	Lat (dec Deg N)	Lon (dec Deg W)	Location	Station Type
020k	10-Dec	1048	anchored	19.18	-69.32	Channel, Samana Harbor	FS
020l	10-Dec	1058	anchored	19.19	-69.32	Channel, Samana Harbor	FS
021a	12-Dec	1225	707.0	19.18	-69.32	Samana Bay near anchorage	RBR
021a	12-Dec	1225	708.0	19.18	-69.32	Samana Bay near anchorage	SG
021b	12-Dec	1302	709.0	19.18	-69.29	South of Punta de los Flechas	RBR
021b	12-Dec	1302	709.0	19.18	-69.29	South of Punta de los Flechas	SG
021c	12-Dec	1353	711.0	19.17	-69.22	Mid - Samana Bay	RBR
021c	12-Dec	1353	711.0	19.17	-69.22	Mid - Samana Bay	SG
021d	12-Dec	1430	713.0	19.16	-69.17	Entrance - Samana Bay	RBR
021d	12-Dec	1430	713.0	19.16	-69.17	Entrance - Samana Bay	SG
022	12-Dec	2113	752.4	19.62	-69.29	Navidad Bank	NT
023	13-Dec	0916	791.3	19.87	-69.59	Greater Antilles Islands	HC
024	14-Dec	0718	905.2	20.13	-71.38	Greater Antilles Islands	DN
025	14-Dec	1001	914.0	20.10	-71.61	Greater Antilles Islands	CTD
025	14-Dec	1109	916.3	20.07	-71.60	Greater Antilles Islands	NT
026	15-Dec	1017	1087.2	19.28	-73.76	Greater Antilles Islands	CTD
026	15-Dec	1114	1082.5	19.26	-73.76	Greater Antilles Islands	MN
026	15-Dec	1210	1084.3	19.56	-73.76	Greater Antilles Islands	NT
027	15-Dec	2141	1126.1	18.93	-74.34	Greater Antilles Islands	CTD
027	15-Dec	2234	1126.3	18.92	-74.34	Greater Antilles Islands	NT
028	16-Dec	0958	1184.3	18.59	-75.17	Greater Antilles Islands	HC
028	16-Dec	1145	1185.1	18.55	-75.17	Greater Antilles Islands	DN
029	16-Dec	2101	1226.7	18.22	-75.71	Greater Antilles Islands	NT
030a	21-Dec	1220	1290.0	18.26	-76.49	Leaving Port Antonio, Jamaica	NT
030b	21-Dec	1429	1291.2	18.39	-76.58	Leaving Port Antonio, Jamaica	NT
030c	21-Dec	1618	1302.3	18.52	-76.66	Leaving Port Antonio, Jamaica	NT
031	22-Dec	1004	1417.3	19.23	-78.39	West Caribbean	CTD
032	22-Dec	2107	1481.7	19.16	-79.38	West Caribbean	NT
033	23-Dec	1000	1552.1	19.41	-80.46	West Caribbean	SD
033	23-Dec	1015	1552.1	19.41	-80.46	West Caribbean	CTD
034	23-Dec	2105	1601.0	19.66	-81.35	West Caribbean	NT
034	24-Dec	1001	1671.2	19.97	-82.50	West Caribbean	SD
035	28-Dec	2116	2077.5	24.18	-84.20	Florida Straits	NT
036	29-Dec	0811	2109.7	24.08	-84.11	Florida Straits	NT
037	30-Dec	1020	2228.7	24.13	-82.79	Florida Straits	SD
037	30-Dec	1020	2228.7	24.13	-82.79	Florida Straits	DN
038	30-Dec	2116	2278.8	24.00	-82.11	Florida Straits - Navy Box (SW)	CTD
038	30-Dec	2203	2279.0	24.01	-82.08	Florida Straits - Navy Box (SW)	NT
039	31-Dec	0324	2299.8	24.21	-82.02	Florida Straits - Navy Box (NE)	CTD
039	31-Dec	0407	2300.1	24.21	-81.99	Florida Straits - Navy Box (NE)	NT

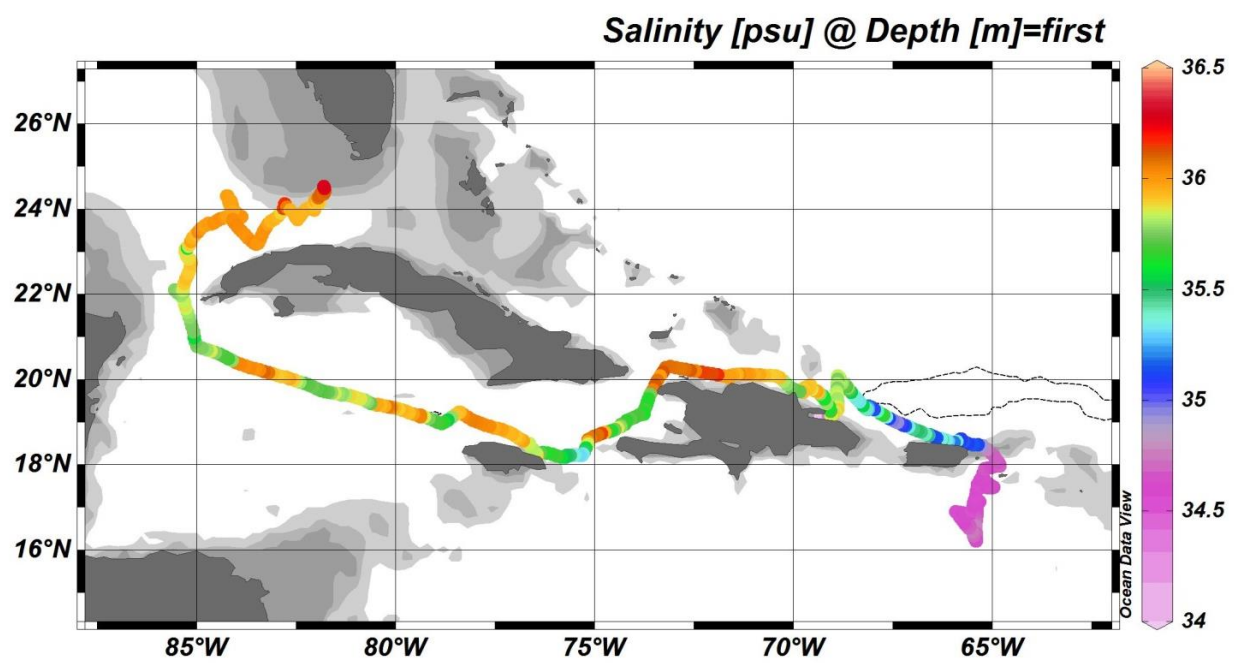
Duplicate station numbers indicate multiple oceanographic deployments that either occurred concurrently in the same location or were deployed sequentially (lettered) in the same general location after the vessel was hove to. General Locations are categorized by traditional oceanic biomes or significant geologic feature. Abbreviations for oceanographic equipment deployed are: NT – neuston tow, DN – dip net, MN – meter net, CTD – conductivity, temperature and depth profiler, RBR – towable CTD, HC – hydrocast with 12 Niskin bottles and CTD, SG – shipek grab, FS – fisher scoop, and SD – secchi disc.

Figure 2a-c. Surface water hydrography for C238.

a. Temperature (seawater flow thru system with in-line thermistor)



b. Salinity



c. Chlorophyll-a fluorescence

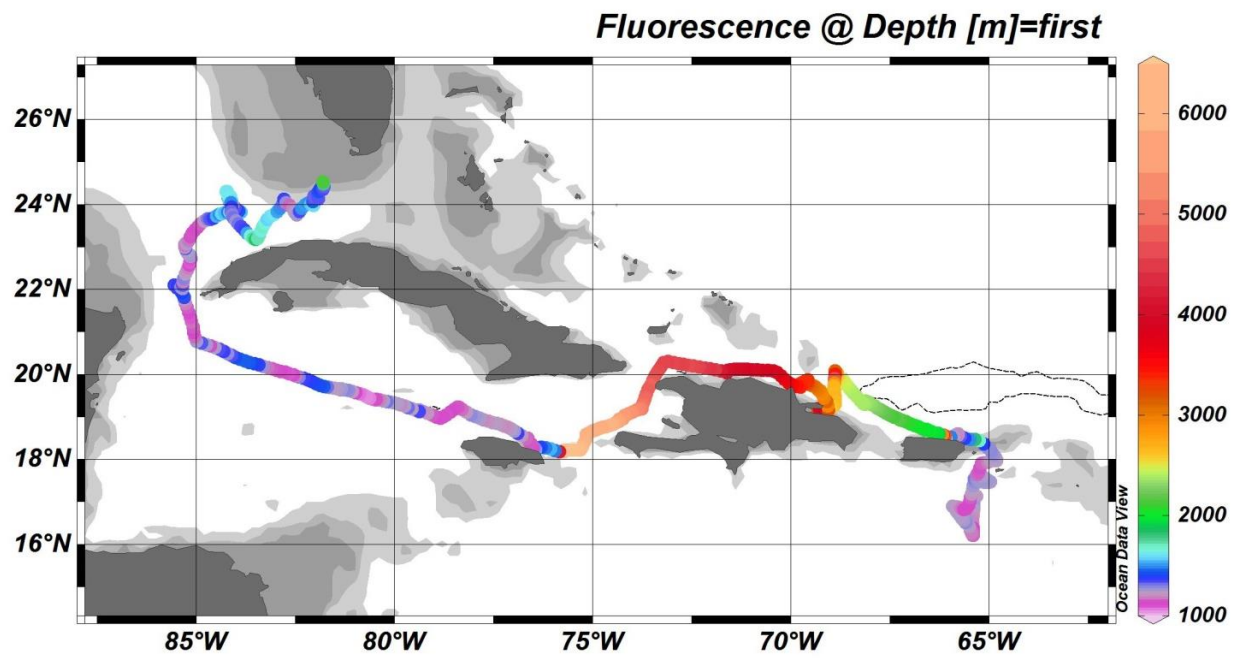


Table 4. Surface station location and surface sensor data for C238.

Station # (C238)	Date (2011)	Local Time (+4 GMT)	Log (nm)	Lat (dec Deg N)	Lon (dec Deg W)	Temp (°C)	Salinity (ppt)
SS-001	27-Nov	1234	58.8	17.40	-65.29	28.8	34.490
SS-002	27-Nov	2219	73.2	17.13	-65.38	28.8	34.520
SS-003	28-Nov	1233	125.5	16.30	-65.41	28.6	34.695
SS-004	28-Nov	2222	148.6	16.52	-65.60	28.5	34.646
005-HC #13	29-Nov	1034	195.4	16.85	-65.70	28.7	34.572
006-DNa	29-Nov	1647	228.3	17.17	-65.46	28.8	34.510
006-DNb	29-Nov	1703	229.8	17.19	-65.46	28.8	34.510
006-DNc	29-Nov	1707	230.2	17.19	-65.46	28.8	34.520
SS-006	29-Nov	2240	255.0	17.53	-65.37	28.6	34.540
SS-007	30-Nov	1053	300.9	17.65	-65.31	28.6	34.562
008-DNa	30-Dec	1105	301.4	17.64	-65.30	28.6	34.550
008-DNc	30-Dec	1120	301.8	17.64	-65.30	28.7	34.560
009-DNa	1-Dec	0839	418.8	18.60	-65.80	28.1	35.060
009-DNc	1-Dec	0944	419.9	18.58	-65.80	28.1	35.050
SS-008	1-Dec	0917	419.0	18.60	-65.80	28.1	35.065
SS-009a	5-Dec	0952	441.0	18.48	-66.13	28.3	35.045
SS-009b	5-Dec	1037	443.9	18.54	-66.11	28.1	35.278
SS-009c	5-Dec	1212	449.2	18.57	-66.16	28.0	35.357
SS-010	5-Dec	2248	471.2	18.69	-66.59	27.9	35.134
SS-011	6-Dec	2238	558.2	19.31	-68.14	27.8	35.259
014-DNa	7-Dec	0725	582.9	19.73	-68.58	27.4	35.530
014-DNb	7-Dec	0753	584.5	19.75	-68.60	27.5	35.660
014-DNc	7-Dec	0758	584.8	19.76	-68.61	27.5	35.692
015-HC #13	7-Dec	1100	589.9	19.84	-68.68	27.7	35.672
SS-012	7-Dec	1700	608.1	20.08	-68.89	27.7	35.820
SS-013a	8-Dec	1200	694.9	19.15	-69.14	27.2	32.616
SS-013b	8-Dec	1312	701.3	19.17	-69.22	27.6	32.574
SS-013c	8-Dec	1335	705.3	19.18	-69.29	27.9	32.814
SS-014	12-Dec	2127	752.8	19.62	-69.28	27.5	35.580
023-HC #13	13-Dec	1045	791.3	19.86	-69.58	27.7	35.898
015-DNa	14-Dec	0718	905.2	20.13	-71.38	27.6	35.973
015-DNb	14-Dec	0723	905.3	20.12	-71.38	27.5	35.964
015-DNc	14-Dec	0728	905.5	20.12	-71.38	27.5	35.962
SS-016	14-Dec	1116	916.3	20.06	-71.60	27.6	35.967
SS-017	15-Dec	1233	1084.9	19.21	-73.76	28.1	35.628
SS-018	15-Dec	2250	1137.0	18.91	-74.34	28.2	35.724
028-HC #13	16-Dec	1028	1184.4	18.58	-75.17	27.8	36.050
028-DNa	16-Dec	1145	1185.1	18.55	-75.17	27.7	35.966
028-DNb	16-Dec	1210	1185.2	18.53	-75.17	27.7	35.956
028-DNc	16-Dec	1153	1185.1	18.54	-75.17	27.7	35.965
SS-019	16-Dec	2110	1229.8	18.21	-75.71	27.9	35.495
SS-020a	21-Dec	1236	1280.0	18.25	-76.49	27.7	35.809
SS-020b	21-Dec	1429	1291.2	18.39	-76.58	27.8	35.817
SS-020c	21-Dec	1625	1302.5	18.51	-76.66	27.8	35.824
SS-021	22-Dec	2107	1481.7	19.16	-79.38	26.2	36.030
SS-022	23-Dec	2105	1601.0	19.63	-81.35	26.2	35.750
SS-023	28-Dec	2120	2077.6	24.17	-84.19	25.7	35.940

Station # (C238)	Date (2011)	Local Time (+4 GMT)	Log (nm)	Lat (dec Deg N)	Lon (dec Deg W)	Temp (°C)	Salinity (ppt)
SS-024	29-Dec	0817	2109.8	24.08	-84.11	26.6	35.970
SS-025	30-Dec	1209	2279.2	24.00	-82.07	26.6	35.930
SS-026	31-Dec	0413	2300.2	24.20	-81.98	25.7	35.930

Table 4 continued. Surface station water chemistry and surface sensor data for C238.

Station # (C238)	chl-a Fluor (volts x30)	Chl-a (µg/l)	Xmiss (volts)	PO ₄ (µM)	pH
SS-001	996.4	0.019	3852	0.032	7.982
SS-002	1219.5	0.036	4645	0.032	8.032
SS-003	1091.8	0.020	3747	0.051	8.045
SS-004	1251.1	0.044	3812	0.000	8.030
005-HC #13	1154.2	0.021	3817		8.033
006-DNa	1178.1		3811	0.051	
006-DNb	1203.0		3810	0.037	
006-DNc	1193.5		3810	0.046	
SS-006	1274.2	0.026	3811	0.009	8.019
SS-007	1126.8	0.016	3834	0.056	8.037
008-DNa	1139.5		3834	0.042	
008-DNc	1138.1		3834	0.046	
009-DNa	1227.2		3826	0.070	
009-DNc	1177.1		3525	0.065	
SS-008	1208.2	0.025	3825	0.079	8.032
SS-009a	2526.7	1.532	340	0.213	7.984
SS-009b	4472.5	0.122	1016	0.037	8.042
SS-009c	3288.1	0.055	1229	0.023	8.073
SS-010	1932.7	0.115	3838	0.042	8.045
SS-011	2317.8	0.013	3850	0.046	8.074
014-DNa	2388.1		3850	0.042	
014-DNb	2411.1		3849	0.056	
014-DNc	2401.5		3847	0.051	
015-HC #13	2401.5	0.040	3847		
SS-012	3102.8	0.101	3799	0.060	8.023
SS-013a	3329.6	0.094	3708	0.134	7.924
SS-013b	3218.8	0.170	3673	0.088	7.936
SS-013c	3319.5	0.122	3653	0.079	7.927
SS-014	2909.0	0.037	3821	0.032	8.047
023-HC #13	3327.4	0.047	3852		
015-DNa	3923.9		3848	0.051	
015-DNb	3924.8		3849	0.046	
015-DNc	3930.0		3849	0.083	
SS-016	3987.9	0.028	3827	0.046	8.053
SS-017	4933.7	0.027	3833	0.079	8.047
SS-018	5423.7	0.062	3808	0.111	8.054
028-HC #13	5667.5	0.024	3822		8.037
028-DNa	5678.3		3812	0.051	
028-DNb	5693.1		3810	0.065	

Station # (C238)	chl-a Fluor (volts x30)	Chl-a (µg/l)	Xmiss (volts)	PO ₄ (µM)	pH
028-DNc	5687.0		3811	0.074	
SS-019	6246.2	0.016	3827	0.032	8.034
SS-020a	1078.7	0.155	3641		
SS-020b	1110.9	0.182	3741		
SS-020c	1231.8	0.128	3769		
SS-021	1273.4	0.111	3806		
SS-022	1220.6	0.068	3809		
SS-023	1599.2		3819		
SS-024	1557.8		3841		
SS-025	1540.1		3822		
SS-026	1291.2		3828		

Sea surface temperature, salinity, *in vivo* chlorophyll-*a* fluorescence, and transmissivity were measured from a seawater flow-thru system (intake ~ 1-3m depth) using in-line sensors. Discrete surface water samples were collected two different ways indicated by the station labeling. For neuston tows(SS-) and hydrocast stations (HC-) a standard plastic bucket was used to collect water from the sea surface. For dip net stations (DN-) a plastic cod end jar was rigged in the net frame to collect surface water associated with clumps of *Sargassum* (appended letters a & b are replicate clumps and c for control water).

Discrete water samples were collected for phosphate (PO₄), pH and extracted chlorophyll-*a*. Phosphate was measured by colorimetric analysis with an Ocean Optics Chem2000 digital spectrophotometer. Extracted chlorophyll-*a* (Chl-*a*) concentration was measured with a Turner Designs Model 10-AU Fluorometer following methods outlined in Parsons, Maita and Lalli, *A Manual of Chemical and Biological Methods for Seawater Analysis*, Pergamon Press 1984. Chlorophyll-*a* samples were filtered through 0.45 µm filters. Seawater pH was determined using the indicator dye *m*-cresol purple and spectrophotometric measurement. A blank space indicates that no sample was collected for that analysis.

Figure 4a. Surface current vector plot for eastern Caribbean and portions of the Sargasso Sea during C238. Note, 500 mm/s is approximately 1.0 knot. Sub-surface currents are weak to negligible throughout these regions. Variability in current direction are suggestive of meso-scale (10-100s nm radii) eddies and meanders associated with the ephemeral Antilles Current.

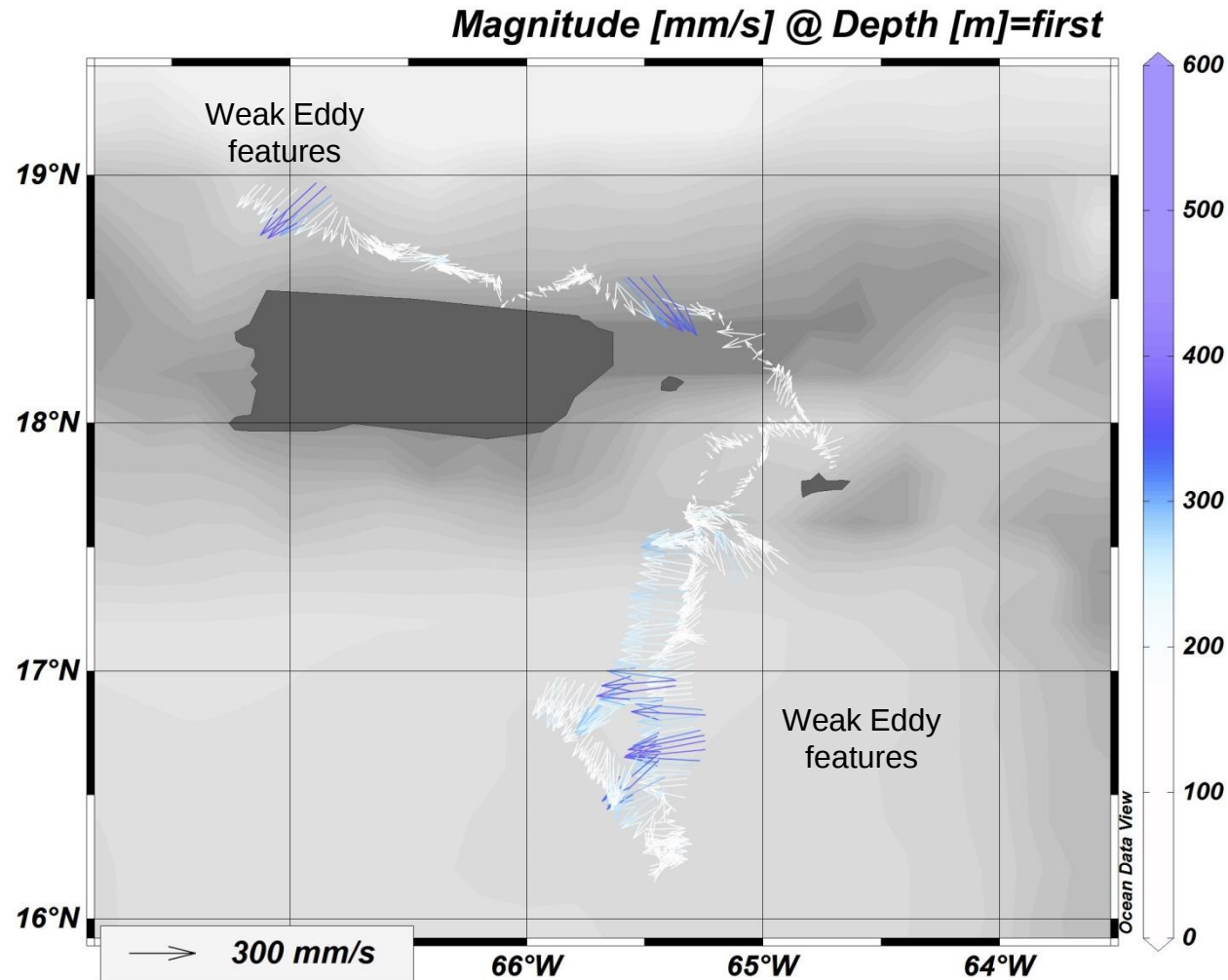


Figure 4b. Surface current vector plot for the central portion of the Greater Antilles region during C238. Note, 500 mm/s is approximately 1.0 knot. Current magnitudes greater than 1 knot were consistently associated with some bathymetric constriction such as an island passage, shelf or shallow bank suggestive of either wind-driven circulation dominating the event or tidal flow. The weak circulation over Navidad Bank may support retention of larval and juvenile stages of reef fish and invertebrate species.

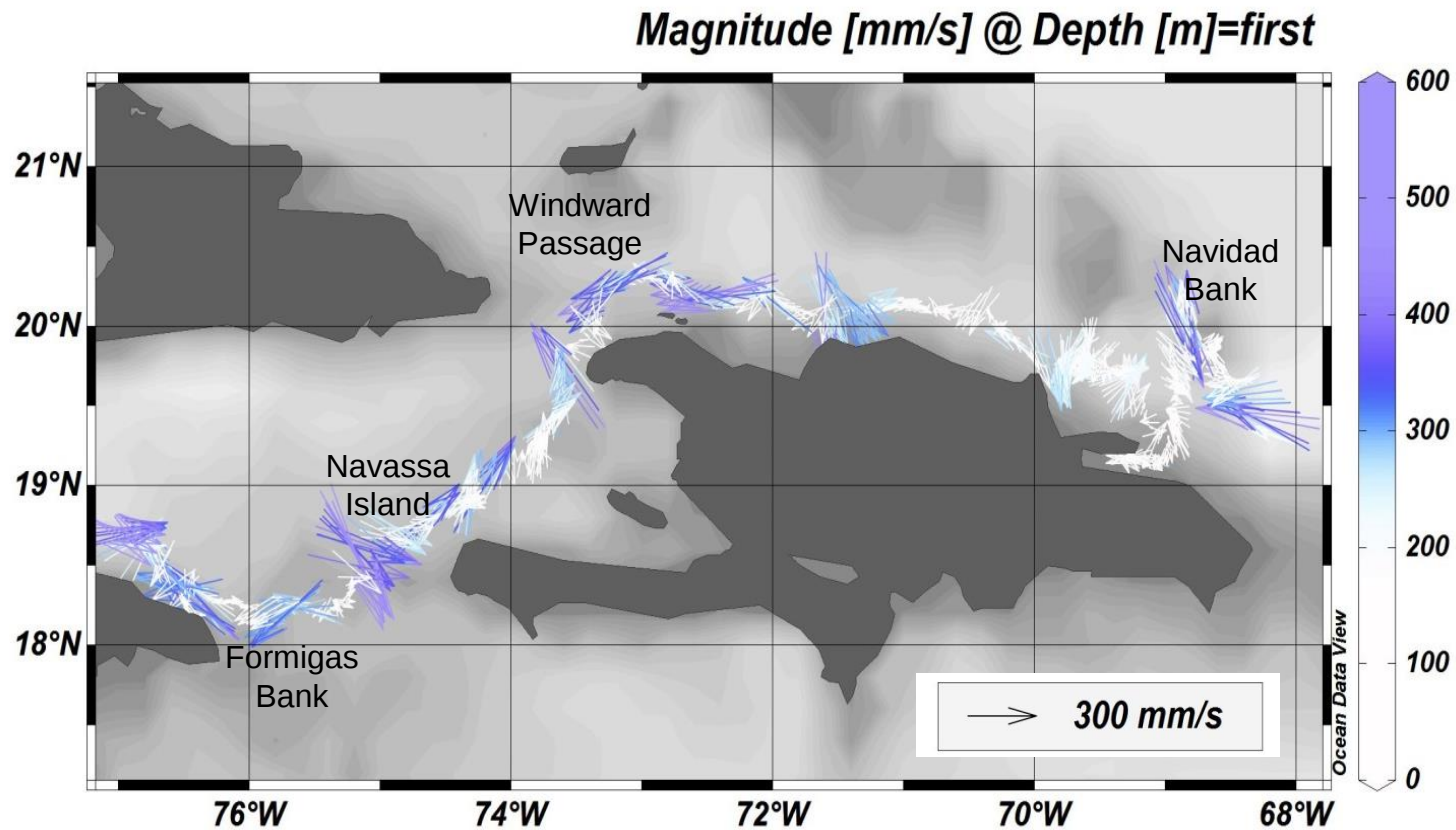


Figure 4c. Surface current vector plot for the Western Caribbean region during C238. Note, 500 mm/s is approximately 1.0 knot. Sub-surface currents remained weak to negligible throughout this region. Variability in current direction are suggestive of meso-scale (10-100s nm radii) eddies associated with the confluence of flow arising from the Eastern Caribbean and the Windward Passage organizing into the Caribbean Current.

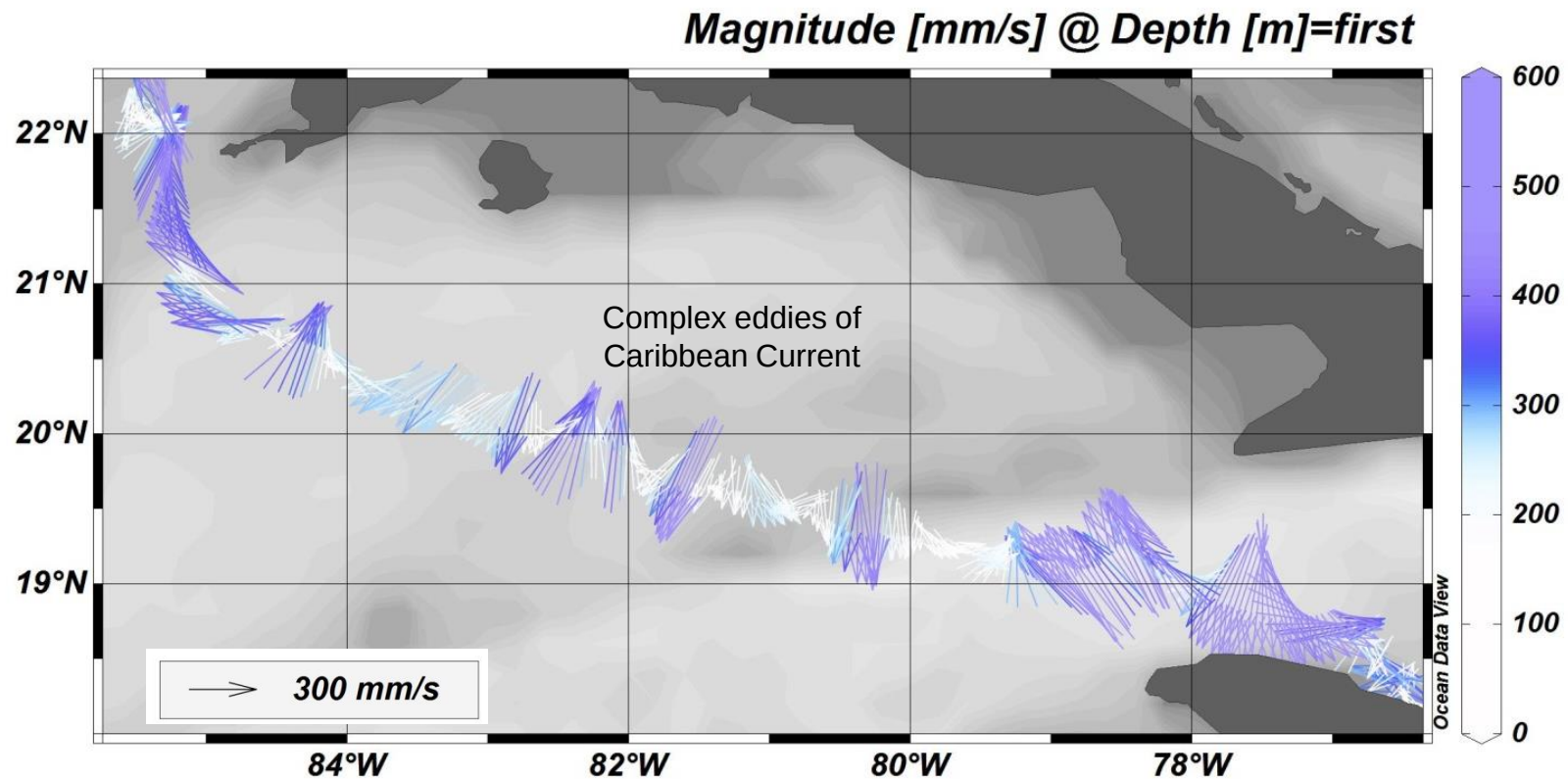


Figure 4d. Surface current vector plot for the Florida Straits during C238. Note, 2000 mm/s is approximately 4.0 knots. In contrast to the earlier part of the cruise track the Florida Current was easily discernible as a surface current and was used to great advantage to make our way toward Key West.

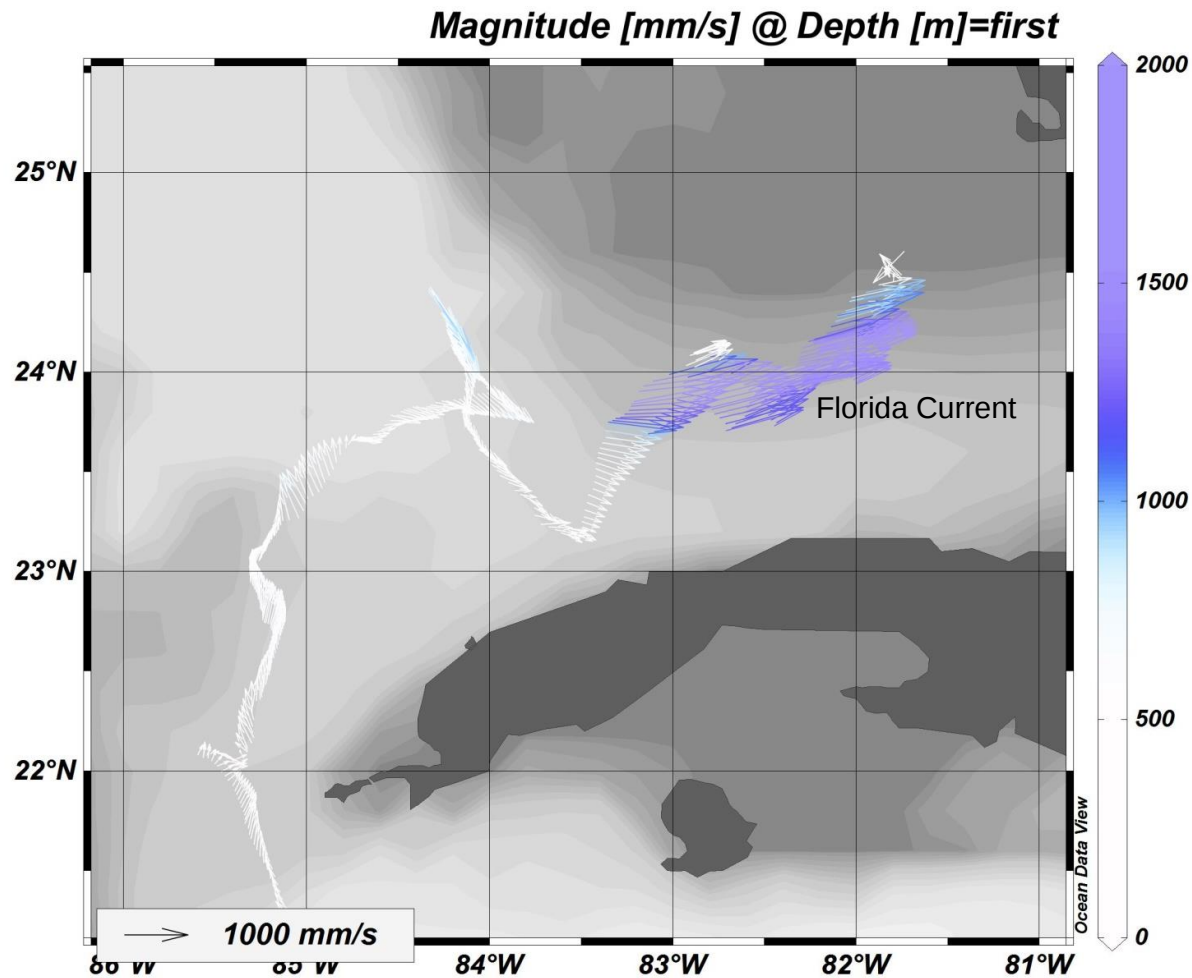


Figure 5. Florida Current sub-surface cross-section for C238. Note, 2000 mm/s is approximately 4.0 knots.

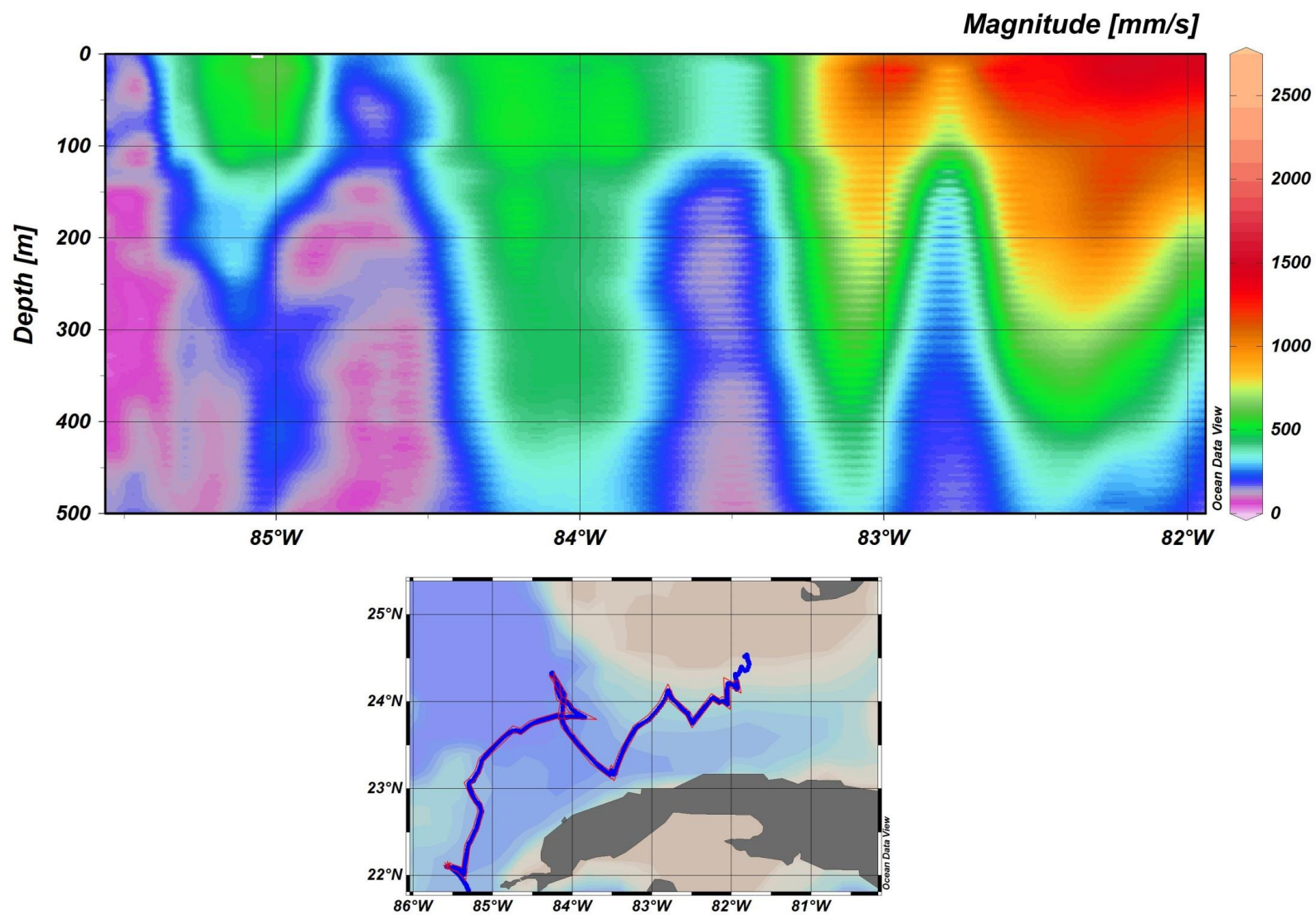


Table 5. Hydrocast station data for C238. Physical characteristics of the water column were measured with a Seabird SEACAT Profiler Model SBE 19plus Conductivity-Temperature-Depth unit and three attached sensors: transmissivity (SN- CST-143PR), chlorophyll-*a* fluorescence (SN-2105), and PAR (SN-70187). Water samples were collected from indicated depths.

Station # (C238-) General Locale Date and Time	Bottle #	Depth (m)	O ₂ Winkle (mL/L)	Chl a (ug/l)	pH	Chl- Fluor
005 Eastern Caribbean 29-Nov 1008	1	500.0	2.93		7.641	4.444
	2	400.2	3.26			4.465
	3	399.6			7.736	4.465
	4	300.5	3.91			4.477
	5	299.7			7.855	4.476
	6	200.1	3.66			4.488
	7	199.4			7.891	4.487
	8	150.5	3.71	0.001	7.912	4.478
	9	99.7		0.017	7.958	4.453
	10	75.4		0.123	7.977	4.409
	11	49.5		0.087	8.019	4.383
	12	25.5		0.102	7.995	4.362
	13	0.0		0.021	8.033	
008 Eastern Caribbean 30-Nov 0955	1	500.0	2.79			4.438
	2	400.3	3.32			4.461
	3	399.4				4.461
	4	300.2	4.04			4.476
	5	299.0				4.475
	6	200.2	3.93			4.485
	7	199.3				4.484
	8	150.5	3.77	0.016		4.480
	9	100.1		0.119		4.448
	10	74.9		0.508		4.399
	11	49.9		0.208		4.389
	12	24.9		0.078		4.376
	13	0.0		0.173		
012 Puerto Rican Trench 06-Dec 1028	1	499.7	3.02			4.429
	2	399.1	3.83			4.449
	3	397.0				4.447
	4	301.1	4.28			4.470
	5	299.8				4.470
	7	198.7	4.10			4.485
	8	149.3	4.32	0.110		4.475
	10	75.1		0.630		4.410
	11	49.9		0.063		4.396
	12	25.6		0.035		4.378
	13	0.0		0.039		
015 Navidad Bank 07-Dec 1038	1	500.5	3.13			4.405
	2	399.9	3.82			4.434
	3	397.4				4.433
	4	298.5	4.39			4.450
	5	297.1				4.448
	6	200.5	3.98			4.465
	7	200.5				4.466

Station # (C238-) General Locale Date and Time	Bottle #	Depth (m)	O ₂ Winkle (mL/L)	Chl a (ug/l)	pH	Chl- Fluor
023 Greater Antilles Islands 13-Dec 0916	8	150.8	4.02	0.026		4.460
	9	98.6		0.204		4.427
	10	74.7		0.153		4.409
	11	49.8		0.067		4.383
	12	25.1		0.042		4.378
	13	0.0		0.040		
	1	500.3	1.38			4.322
	2	399.9	2.02			4.348
	3	398.7				4.349
	4	300.1				4.372
	5	298.6	2.00			4.370
	6	200.2	2.43			4.389
	7	199.9				4.378
028 Greater Antilles Islands 16-Dec 0958	8	149.4	1.75	0.021		4.387
	9	99.9		0.121		4.364
	10	75.3		0.088		4.341
	11	50.2		0.136		4.313
	12	25.1		0.043		4.300
	13	0.0		0.047		
	1	500.3	1.77		7.722	4.409
	2	400.0	2.12			4.431
	3	399.7			8.016	4.432
	4	300.2	2.34			4.446
	5	299.7			7.785	4.445
	6	200.3	2.40			4.450
	7	200.6			7.943	4.449
	8	150.0	2.41	0.043	7.885	4.433
	9	100.3		0.277	8.288	4.396
	10	74.8		0.106	8.038	4.383
	11	49.8		0.034	8.039	4.372
	12	24.6		0.029	7.885	4.363
	13	0.0		0.024	8.037	

Discrete water samples were collected for dissolved oxygen, phosphate (PO₄), pH and extracted chlorophyll-*a*. Dissolved oxygen was measured using the Winkler titration method. Phosphate was measured by colorimetric analysis with an Ocean Optics Chem2000 digital spectrophotometer. Extracted chlorophyll-*a* (Chl-*a*) concentration was measured with a Turner Designs Model 10-AU Fluorometer following methods outlined in Parsons, Maita and Lalli, *A Manual of Chemical and Biological Methods for Seawater Analysis*, Pergamon Press 1984. Chlorophyll-*a* samples were filtered through 0.45 µm filters. Seawater pH was determined using the indicator dye *m*-cresol purple and spectrophotometric measurement. A blank space indicates that no sample was collected for that analysis.

Table 6. Free - CTD station data for C238. Physical characteristics of the water column were measured with a Seabird SEACAT Profiler Model SBE 19plus Conductivity-Temperature-Depth unit – however, two different models (SN 2737 & 4447) were used under differing circumstances, and an RBR-towable CTD was used in conjunction with a shipek grab for shallow stations in Samana Bay. On occasion three additional sensors were attached: transmissivity (SN- CST-143PR), chlorophyll-*a* fluorescence (SN-2105), and PAR (SN-70187).

Station # (C238)	Date (2011)	Local Time (+4 GMT)	Cast Depth (m)	Water Depth (m)	Locale	Volt. 0 sensor	Volt. 1 sensor	Volt. 2 sensor	Volt.3 sensor	Volt. 4 sensor	Volt. 5 sensor	CTD Unit #
001	27-Nov	1002	983.5	3507	East Caribbean							2737
007	29-Nov	2115	909.6	1767	East Caribbean							2737
009	1-Dec	0824	700.2	1006	Puerto Rican Continental Shelf							2737
011	5-Dec	2133	585.0	1912	Puerto Rican Trench							2737
019a	9-Dec	0020	12.3	15	Samana anch, peak low	Trans		Chl-a		PAR		4447
019b	9-Dec	0400	12.0	12	Samana anch, peak flood	Trans		Chl-a		PAR		4447
019c	9-Dec	0758	11.0	11	Samana anch, peak high	Trans		Chl-a		PAR		4447
019d	9-Dec	1100	11.0	11	Samana anch, ebb	Trans		Chl-a		PAR		4447
019e	9-Dec	1630	12.0	12	Samana anch, flood	Trans		Chl-a		PAR		4447
021	12-Dec	1225	11.4	13.5	Samana Bay near anchorage							RBR
021	12-Dec	1302	37.6	38	South of Punta de los Flechas							RBR
021	12-Dec	1353	23.9	24.7	Mid-Samana Bay							RBR
021	12-Dec	1430	73.9	74	Entrance Samana Bay							RBR
025	14-Dec	1001	660.1	1358	Greater Antilles Islands							2737
026	15-Dec	1017	420.0	462	Greater Antilles Islands							2737
027	15-Dec	2141	600.0	2623	Greater Antilles Islands							2737
031	22-Dec	1004	887.8	5772	West Caribbean							2737
033	23-Dec	1015	625.0	3036	West Caribbean							2737
038	30-Dec	2116	483.0	751	Florida Straits - Navy Box (SW)							2737
039	31-Dec	0324	195.0	625	Florida Straits - Navy Box (NE)							2737

Figure 6a-b. CTD cross-section plots for C238. Water column structure of temperature and salinity. VG gridding: X-axis 60, Y-axis 20. Location of North Atlantic Mode water (18°C) is indicated as well as summer formation of salinity maximum water.

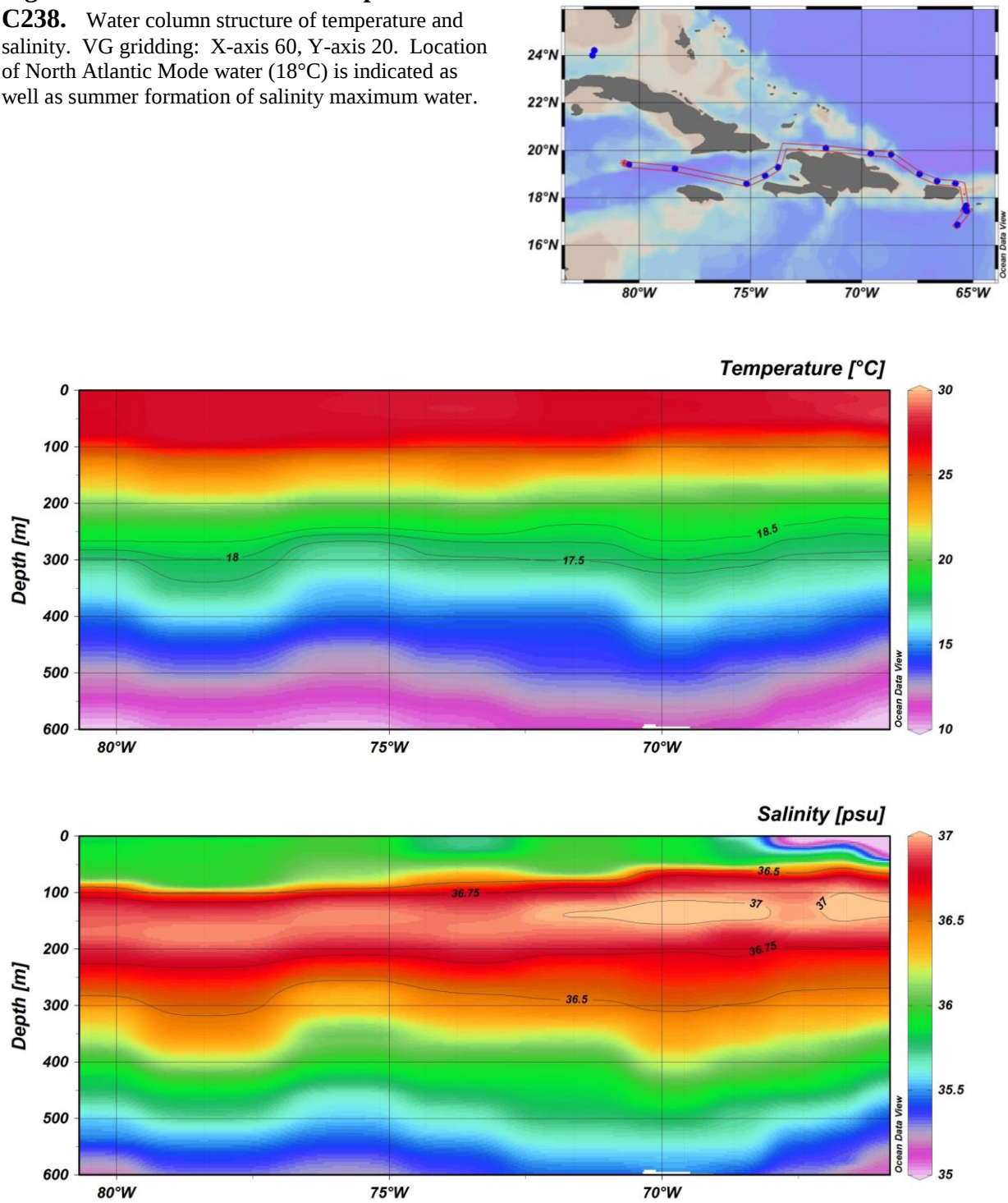


Table 7. Neuston station data for C238.

Station # (C238-)	Date (2011)	Local Time (+4 GMT)	Moon Phase (%)	Moon (set or risen)	Temp (°C)	Salinity (ppt)	chl-a Fluor (volts x30)	Surface Station #	Tow Area (m ²)	Zoop Biomass (ml)	Zoop Den (ml/m ²)	Locale
001	27-Nov	1147	7	risen	28.8	34.49	991	SS-001	4079	4.7	0.0012	East Caribbean
002	27-Nov	2153	7	set	28.8	34.51	1217	SS-002	1852	24.5	0.0132	East Caribbean
003	28-Nov	1214	14	risen	28.6	34.71	1118	SS-003	1748	25.0	0.0143	East Caribbean
004	28-Nov	2205	22	set	28.5	34.65	1257	SS-004	1751	109.0	0.0623	East Caribbean
008	30-Nov	1044	31	risen	28.6	34.60	1159	SS-007	1802	6.4	0.0035	East Caribbean
009	1-Dec	0917	41	risen	28.1	35.10	1208	SS-008	2427	14.5	0.0060	Puerto Rican Continental Shelf
010a	5-Dec	0937	78	set	28.1	35.25	1800	SS-009a	1907	7.2	0.0038	Inner Harbor, San Juan
010b	5-Dec	1025	78	set	28.1	38.29	4637	SS-009b	945	6.0	0.0063	3nm N of San Juan Harbor
010c	5-Dec	1158	78	set	28.0	35.37	3358	SS-009c	1833	35.0	0.0191	6nm N of San Juan Harbor
011	5-Dec	2225	78	risen	27.8	35.28	1927	SS-010	2277	23.0	0.0101	Puerto Rico Trench
013	6-Dec	2226	85	risen	27.9	35.25	2323	SS-011	2029	15.0	0.0074	Puerto Rico Trench
016	7-Dec	1653	91	risen	27.7	35.82	3128	SS-012	2945	18.2	0.0062	Navidad Bank
017a	8-Dec	1155	96	set	27.2	32.57	3072	SS-013a	2040	31.0	0.0152	Entrance - Samana Bay
017b	8-Dec	1309	96	set	27.6	32.54	3228	SS-013b	1373	36.0	0.0262	Mid - Samana Bay
017c	8-Dec	1427	96	set	27.9	33.01	3234	SS-013c	910	73.0	0.0802	Samana Bay near anchorage
022	12-Dec	2113	96	risen	27.5	35.60	2890	SS-014	2978	29.0	0.0097	Navidad Bank
025	14-Dec	1109	85	set	27.6	35.97	3764	SS-016	2134	4.5	0.0021	Greater Antilles Islands
026	15-Dec	1210	77	set	28.0	35.64	4920	SS-017	1738	2.0	0.0012	Greater Antilles Islands
027	15-Dec	2234	77	risen	28.1	35.72	5403	SS-018	1352	10.8	0.0080	Greater Antilles Islands

Station # (C238-)	Date (2011)	Local Time (+4 GMT)	Moon Phase (%)	Moon (set or risen)	Temp (°C)	Salinity (ppt)	chl-a Fluor (volts x30)	Surface Station #	Tow Area (m ²)	Zoop Biomass (ml)	Zoop Den (ml/m ²)	Locale
029	16-Dec	2101	67	set	27.9	35.49	6236	SS-019	1905	11.0	0.0058	Greater Antilles Islands
030a	21-Dec	1220	14	set	27.7	35.83	1160	SS-020a	921	1.0	0.0011	Leaving Port Antonio, Jamaica
030b	21-Dec	1429	14	set	27.8	35.80	1111	SS-020b	945	1.0	0.0011	Leaving Port Antonio, Jamaica
030c	21-Dec	1618	14	set	27.8	35.82	1128	SS-020c	1689	3.3	0.0020	Leaving Port Antonio, Jamaica
032	22-Dec	2107	7	set	27.2	36.03	1273	SS-021	1827	13.8	0.0076	West Caribbean
034	23-Dec	2105	0	set	27.1	35.75	1227	SS-022	1676	12.0	0.0072	West Caribbean
035	28-Dec	2116	16	risen	26.7	35.94	1630	SS-023	2408	15.5	0.0064	Florida Straits
036	29-Dec	0811	25	set	26.7	35.98	1566	SS-024	1852	3.5	0.0019	Florida Straits
038	30-Dec	2203	33	risen	26.6	35.94	1533	SS-025	2593	7.5	0.0029	Florida Straits - Navy Box (SW)
039	31-Dec	0407	43	set	25.7	35.93	1303	SS-026	1482	29.5	0.0199	Florida Straits - Navy Box (NE)

Table 7 continued. Neuston station data for C238.

Station # (C238-)	Halo (#)	Lepto (#)	Phyllo (#)	Mycto (#)	Gelatinous >2cm (#)	Nekton >2cm (#)	Plastic Pellets (#)	Plastic Pieces (#)	Tar (#)	Snatans (g)	Sfluitans (g)
001	0	0	0	0	0	0	0	3	0	0	53
002	12	0	1	57	0	64	0	1	0	0	27
003	2	0	0	0	0	4	0	2	0	0	790
004	6	2	1	8	0	19	0	2	0	0	2532
008	3	0	0	0	0	0	0	20	0	0	169
009	4	0	0	0	0	48	0	6	0	0	442
010	0	0	0	0	0	1	1	68	0	0	5
010	50	0	0	0	0	0	0	6	0	0	3
010	0	0	0	0	0	3	0	8	0	0	805
011	3	0	0	12	2	14	0	26	0	0	636
013	6	0	0	8	0	10	0	7	0	0	63
016	4	0	0	0	0	0	0	8	0	0	205
017	0	0	0	0	0	1	0	21	0	0	39
017	0	0	0	0	0	0	0	3	0	0	0
017	0	0	0	0	0	0	0	4	0	0	0
022	0	0	0	5	1	15	0	2	0	0	416
025	0	0	0	0	0	2	0	5	0	0	273
026	0	0	0	0	0	0	0	9	0	0	39
027	0	0	0	0	1	5	0	0	0	0	8
029	1	0	1	17	0	23	0	4	0	0	67

Station # (C238-)	Halo (#)	Lepto (#)	Phyllo (#)	Mycto (#)	Gelatinous >2cm (#)	Nekton >2cm (#)	Plastic Pellets (#)	Plastic Pieces (#)	Tar (#)	Snatans (g)	Sfluitans (g)
030	0	0	0	0	0	0	0	5	5	0	31
030	1	0	0	0	0	0	0	3	8	0	1
030	0	0	0	0	0	0	0	2	0	0	130
032	3	0	0	20	1	26	0	10	1	1	43
034	0	0	0	0	0	9	0	8	0	0	0
035	4	0	6	22	2	39	0	9	0	0	40
036	20	0	0	0	0	0	0	5	0	0	38
038	15	0	0	1	0	1	0	8	0	1	181
039	4	0	0	3	1	3	0	4	0	0	1

Tow area was calculated using distance in meters between successive (every minute) GPS positions. Net opening was 1.0 m wide by 0.5 m tall with a net mesh of 335 μm . Zooplankton density is recorded as wet volume displacement per tow area (ml/m^2). *Halobates* sp., eel larvae (leptocephali), spiny lobster larvae (phyllosoma), and Lantern fish (Family Myctophidae), were sorted from net contents and recorded as numbers caught per tow.

Micronekton and gelatinous organisms >2cm in length, and plant and algae material was removed using a 1 cm mesh sieve and biomass (ml) or length (cm) was recorded. Floating plastic was also removed from net contents, sorted as pellets or pieces and recorded as numbers collected per tow. Floating tar was sorted from the nets contents and recorded as numbers collected per tow. Floating *Sargassum* weed was removed, identified to species and measured in grams using a spring scale. Qualitative description of micronekton and gelatinous organisms removed from the zooplankton biomass is available upon request.

Table 8. Meter net station data for C238.

Station # (C238-)	Date (2011)	Local Time (+4 GMT)	Net Type (1m / 2m)	Tow Type (Oblique / Discrete)	Tow Depth (m)	Tow Volume (m3)	Distance Method (GPS / T Log / Flow)	Locale
004	28-Nov	2102	1m	Discrete (target 150m)	124	1312	Flow Meter	East Caribbean
007	29-Nov	2225	1m	Discrete (target 150m)	153	658	Flow Meter	East Caribbean
013	6-Dec	2110	1m	Discrete (target 150m)	98	1592	Flow Meter	Puerto Rico Trench
026	15-Dec	1114	1m	Discrete (target 150m)	138	835	Flow Meter	Greater Antilles Islands

Table 8. Meter net station data for C238 continued.

Station # (C238-)	Zoop Biomass (ml)	Zpl Density (ml/m3)	Halo (#)	Lepto (#)	Phyllo (#)	Mycto (#)	Gelatinous >2cm (#)	Nekton >2cm (#)	Plastic Pellets (#)	Plastic Pieces (#)	Tar (#)
004	47	0.0358	0	5	0	4	11	16	0	1	0
007	49	0.0744	0	3	4	3	0	11	0	0	0
013	49	0.0308	0	4	0	0	60	24	0	0	0
026	30	0.0359	0	2	2	0	4	10	0	5	0

Meter nets (1 m diameter frame, 335µm mesh net) were towed at discrete target depth for ~ 30' at 2 knots. Tow volume was calculated using an attached flow meter and net area based on net diameter. Zooplankton density is recorded as wet volume displacement per tow area (ml/m³). *Halobates* sp., eel larvae (leptocephali), spiny lobster larvae (phyllosoma), and Lantern fish (Family Myctophidae), were sorted from net contents and recorded as numbers caught per tow. Blank spaces represents stations where no data was collected for that parameter. Qualitative description of micronekton and gelatinous organisms removed from the zooplankton biomass is available upon request.

Table 9. Zooplankton 100 count station data for C238.

Station	Date	Time	Cnid	Siph	Cten	Salp	Ptero	Nudi	Hete	OSna	Squi	Poly	Chae	Cope	Gam	Hyp	Mega	Zoea
001-NT	27-Nov	1147	0	4	0	0	8	0	0	6	0	1	0	33	0	0	0	0
002-NT	27-Nov	2153	0	0	0	3	2	0	0	4	0	0	2	73	0	3	0	0
003-NT	28-Nov	1214	0	16	0	0	0	0	0	0	0	0	0	51	0	0	1	0
004-NT	28-Nov	2205	0	0	0	0	26	0	0	0	0	0	1	57	0	3	0	0
008-NT	30-Nov	1044	3	12	1	4	11	0	3	0	0	0	0	14	0	0	0	0
009-NT	1-Dec	0917	1	5	0	0	18	0	0	2	0	0	2	18	0	0	0	0
010-NTa	5-Dec	0937	0	5	0	0	1	0	1	0	0	0	0	44	0	0	0	35
010-NTb	5-Dec	1025	0	3	0	0	0	0	0	1	0	0	4	90	0	0	0	0
010-NTc	5-Dec	1158	1	2	0	0	2	0	0	3	0	0	0	46	0	0	0	0
011-NT	5-Dec	2225	0	2	0	0	1	0	0	0	0	2	3	80	0	3	0	0
013-NT	6-Dec	2226	0	8	0	7	11	0	0	0	0	0	4	59	0	4	0	0
016-NT	7-Dec	1653	0	27	0	1	1	0	0	11	0	0	0	26	0	15	1	6
017-NTa	8-Dec	1155	0	0	0	0	0	0	0	1	0	0	1	88	0	0	0	0
017-NTb	8-Dec	1309	0	0	0	0	1	0	0	3	0	1	0	86	0	0	0	2
017-NTc	8-Dec	1427	0	0	0	0	0	0	0	0	0	0	1	98	0	0	0	0
022-NT	12-Dec	2113	4	0	0	0	4	0	0	1	0	0	2	58	1	1	0	0
025-NT	14-Dec	1109	0	13	0	0	20	0	0	1	0	0	0	61	0	0	0	0
026-NT	15-Dec	1210	3	10	0	1	20	0	0	1	0	0	1	49	0	0	0	0
027-NT	15-Dec	2234	0	1	0	0	12	0	0	2	0	1	7	75	0	0	0	0
029-NT	16-Dec	2101	2	2	2	0	3	0	0	2	0	0	1	69	0	6	0	0
030-NTa	21-Dec	1220	1	5	0	0	15	0	0	6	0	0	0	58	1	0	3	1
030-NTb	21-Dec	1429	0	5	0	0	4	0	3	0	0	0	2	115	0	1	0	0
030-NTc	21-Dec	1618	0	1	0	1	4	0	1	0	0	0	0	80	0	0	0	0
032-NT	22-Dec	2107	2	9	0	2	6	0	0	5	0	0	4	59	0	3	1	0
034-NT	23-Dec	2105	0	4	4	1	1	0	0	0	0	0	9	59	0	2	0	0
035-NT	28-Dec	2116	0	9	0	0	3	0	0	1	0	0	2	80	0	4	0	1
036-NT	29-Dec	0811	1	8	2	1	3	0	0	6	0	1	2	75	0	0	0	0
038-NT	30-Dec	2203	0	15	0	1	7	0	0	3	0	0	5	104	0	6	0	0
039-NT	31-Dec	0407	0	1	0	1	3	0	4	0	0	0	3	76	0	2	0	0

Station	Date	Time	Cnid	Siph	Cten	Salp	Ptero	Nudi	Hete	OSna	Squi	Poly	Chae	Cope	Gam	Hyp	Mega	Zoea
004-MN	28-Nov	2102	0	1	0	1	3	0	0	0	0	0	5	66	0	3	0	0
007-MN	29-Nov	2225	0	2	0	0	1	0	0	0	0	0	4	95	1	0	0	0
013-MN	6-Dec	2110	0	1	0	0	6	0	0	0	0	1	7	75	0	0	0	0
026-MN	15-Dec	1114	0	5	1	2	2	0	2	0	0	0	4	79	0	0	0	0

Table 9 continued. Zooplankton 100 count station data for C238.

Station	Date	Time	Shri	Lobs	Mysi	Euph	Stom	Ostr	Clad	Isop	Fish Larv	Fish Eggs	Othe	Othe	Othe	Total #	SWDI
001-NT	27-Nov	1147	32	0	1	0	0	2	33	0	0	0	0	0	0	120	0.72
002-NT	27-Nov	2153	1	0	3	8	0	1	0	0	0	0	0	0	0	100	0.49
003-NT	28-Nov	1214	20	0	1	0	0	0	10	0	0	1	0	0	0	100	0.58
004-NT	28-Nov	2205	12	0	11	0	0	0	0	0	0	0	0	0	0	110	0.56
008-NT	30-Nov	1044	36	0	0	0	0	4	11	0	1	0	0	0	0	100	0.84
009-NT	1-Dec	0917	24	0	2	0	0	0	29	0	2	0	0	0	0	103	0.78
010-NTa	5-Dec	0937	5	0	0	0	0	0	0	0	3	7	0	0	0	101	0.61
010-NTb	5-Dec	1025	0	0	0	0	0	1	1	0	0	0	0	0	0	100	0.20
010-NTc	5-Dec	1158	4	0	0	0	0	0	11	0	0	1	0	0	0	70	0.52
011-NT	5-Dec	2225	6	0	0	0	0	0	3	0	0	0	0	0	0	100	0.38
013-NT	6-Dec	2226	3	0	0	0	0	1	3	0	0	0	0	0	0	100	0.44
016-NT	7-Dec	1653	7	0	0	0	0	0	1	0	1	3	0	0	0	100	0.83
017-NTa	8-Dec	1155	1	0	0	0	0	0	3	0	0	6	0	0	0	100	0.23
017-NTb	8-Dec	1309	0	0	0	0	0	0	3	0	0	1	2	1	0	100	0.30
017-NTc	8-Dec	1427	0	0	0	0	0	0	1	0	0	0	0	0	0	100	0.05
022-NT	12-Dec	2113	6	0	0	0	0	1	0	1	0	22	0	0	0	101	0.60
025-NT	14-Dec	1109	5	0	0	0	0	0	0	0	0	0	0	0	0	100	0.47
026-NT	15-Dec	1210	5	0	0	0	0	0	6	0	3	1	0	0	0	100	0.70
027-NT	15-Dec	2234	3	0	1	1	0	0	0	0	1	0	0	0	0	104	0.46
029-NT	16-Dec	2101	0	0	2	2	0	1	0	0	0	9	0	0	0	101	0.57

Station	Date	Time	Shri	Lobs	Mysi	Euph	Stom	Ostr	Clad	Isop	Fish Larv	Fish Eggs	Othe	Othe	Othe	Total #	SWDI
030-NTa	21-Dec	1220	25	0	0	0	0	0	0	0	1	0	0	0	0	116	0.65
030-NTb	21-Dec	1429	0	0	0	0	0	0	1	0	0	0	2	0	0	133	0.28
030-NTc	21-Dec	1618	2	0	0	0	0	1	1	1	0	0	8	0	0	100	0.38
032-NT	22-Dec	2107	5	0	10	13	0	4	0	0	0	0	0	0	0	123	0.82
034-NT	23-Dec	2105	1	0	0	16	0	0	0	0	2	0	1	0	0	100	0.62
035-NT	28-Dec	2116	3	0	1	3	0	5	0	0	0	0	0	0	0	112	0.52
036-NT	29-Dec	0811	3	0	0	0	1	0	0	0	0	0	0	0	0	103	0.49
038-NT	30-Dec	2203	9	0	2	3	0	3	0	0	0	0	0	0	0	158	0.58
039-NT	31-Dec	0407	1	0	8	0	0	1	0	0	0	0	0	0	0	100	0.44
004-MN	28-Nov	2102	5	0	0	3	0	7	0	0	0	13	0	0	0	107	0.61
007-MN	29-Nov	2225	1	1	0	0	0	5	1	0	0	0	0	0	0	111	0.29
013-MN	6-Dec	2110	0	0	1	0	0	4	4	0	1	0	0	0	0	100	0.44
026-MN	15-Dec	1114	0	0	0	0	0	3	0	0	1	0	1	0	0	100	0.41

Abbreviations for zooplankton categories:

Cnid med – cnidarian medusa, Siph – siphonophore bracts and floats, Cten – ctenophores, Salp – salps and doliolids, Pter – pteropods, Nudi – nudibranch, Het – heteropods, OSna – pelagic snails, Ceph – cephalopods, Poly – polychaetes, Chae – chaetognaths Cop – copepods, Gam – gammarid amphipods, Hyp – hyperiid amphipods, Mega – Crab megalopae, Zoea – Crab zoea, Shri – Shrimp larval stage, Lobs – lobster larval stage, Mys – mysids, Euph – euphausiids, Stom – Stomatopod larval stage, Ost – ostracods, Clad – cladocerans, Iso – isopods, larval fish and fish eggs, Oth – unidentified plankton categories, SWDI – Shannon-Weiner Diversity Index

Table 10. Dip net station data for C238.

Station # (C238-)	Date (2010)	Time (local +4 GMT)	Temp (deg C)	Salinity (psu)	chl-a Fluor (volts x30)	Collection Conditions / Notes	Replicate	Species: <i>Sargassum</i>	Munsell Color Description
006	29-Nov-11	1647	28.8	34.51	1178	Isolated clump	A	<i>S. fluitans</i>	5YR 5/8
						Isolated clump	B	<i>S. fluitans</i>	2.5YR 7/8
008	30-Nov-11	1105	28.6	34.55	1140	Narrow windrow	A	<i>S. fluitans</i>	5Y 8/6
009	1-Dec-11	0839	28.1	35.06	1227	Narrow windrow	A	<i>S. fluitans</i>	5Y 8/8
014	6-Dec-11	0725	27.4	35.53	2388	Isolated clump	A	<i>S. fluitans</i>	5Y 8/6
						Isolated clump	B	<i>S. fluitans</i>	5Y 8/6
024	14-Dec-11	0718	27.5	35.96	3927	Isolated clump	A	<i>S. fluitans</i>	5Y 8/4
						small windrow	B	<i>S. fluitans</i>	2.5Y 8/4
028	16-Dec-11	1145	27.7	35.97	5678	Isolated clump	A	<i>S. fluitans</i>	2.5Y 7/6
						Isolated clump	B	<i>S. fluitans</i>	2.5Y 7/8
037	30-Dec-11	1020	23.9	36.15	1341	No <i>Sargassum</i> - collected large gelatinous critters			

Table 10 continued. Dip net station data for C238.

Station # (C238-)	Replicate	Mass (g)	Hydroid % coverage	Bryozoan % coverage	Worm Tube #	Barnacle #	Anemone %	Shrimp #	Crab #	Fish #
006	A	30	5%	0%	0	0	0%	79	0	1
	B	75	25%	0%	0	0	0%	60	1	1
008	A	32	0.0%	10.0%	0	0	0%	15	0	0
009	A	120	5%	5%	0	0	50%	27	0	0
014	A	125	1.0%	25.0%	0	0	20%	41	1	1
	B	29	5.0%	15.0%	0	0	15%	21	0	0
024	A	32	25%	50%	0	0	5%	5	0	1
	B	86	60%	40%	0	0	1%	24	1	0
028	A	28	30.0%	40.0%	8	0	0%	35	1	0
	B	43	15.0%	60.0%	3	0	0%	46	1	0
037	No <i>Sargassum</i> - collected large gelatinous critters									

Table 11. Qualitative description of sediment samples from C238.

Station # (C238)	Date (2011)	Local Time (+4 GMT)	Gear	Location	Depth (m)	Color Description (# / words)	General size	Sediment Shape
018	8-Dec	1930	FS	Anchorage Samana	21.4	Moderate olive brown and Greyish olive (54 4/4 and 10Y 4/2), rare presence of 10Y 6/6 - dark yellowish orange	sandy, silty with some clay	rounded with some angular pieces (tend to be large)
020a	10-Dec	0907	FS	Anchorage Samana	12.5	Moderate olive brown and Olive grey (54 4/4 and 5Y 3/2), rare presence of 10YR 6/6- dark yellowish orange	sandy, some silt	angular with very angular shell parts
020b	10-Dec	0922	FS	Nearshore, Samana Bay	7.3	Moderate Olive Brown (5Y 4/4)	Mix: sandy and silty	angular
020c	10-Dec	0940	FS	Channel, Samana Harbor	15.5	Moderate Olive Brown (5Y 4/4)	silty	rounded
020d	10-Dec	0950	FS	Channel, Samana Harbor	8.2	Speckled: Light Olive Grey (5Y 6/1), Olive Grey (5Y 4/1), and Dark Grey (N3)	granular	angular
020e	10-Dec	0957	FS	Channel, Samana Harbor	10.0	Speckled: Light Olive Grey (5Y 5/2), Moderate Olive Brown (5Y 4/4), and Greyish Black (N2)	sandy	rounded
020f	10-Dec	1005	FS	Channel, Samana Harbor	6.0	Moderate Olive Brown (5Y 4/4)	granular	angular
020f2	10-Dec	1012	FS	Channel, Samana Harbor	11.0	Moderate Olive Brown (5Y 4/4) and Light Olive Grey (5Y 5/2)	silty and granular	well rounded with large angular pieces
020h	10-Dec	1022	FS	Channel, Samana Harbor	12.0	Varied. Mainly Moderate Yellow (5Y 7/6), flecked with Dustky Brown (5YR 2/2).	granular	angular
020i	10-Dec	1030	FS	Channel, Samana Harbor	12.0	Light Olive Brown (5Y 5/6) and Moderate Yellowish Brown (10YR 5/4)	sandy	rounded
020i2	10-Dec	1035	FS	Channel, Samana Harbor	12.2	Dusky Yellow (5Y 6/4) and Pale Olive (10Y 6/2)	granular and silty	well rounded, large grains angular

Station # (C238)	Date (2011)	Local Time (+4 GMT)	Gear	Location	Depth (m)	Color Description (# / words)	General size	Sediment Shape
020j	10-Dec	1039	FS	Channel, Samana Harbor	12.0	Moderate Olive Brown (5Y 4/4)	sandy and silty	rounded
020k	10-Dec	1048	FS	Channel, Samana Harbor	10.5	Yellowish gray (5Y 7/2) and [lighter version of] Moderate Olive Brown (5Y 4/4)	sandy	rounded, some angular
020l	10-Dec	1058	FS	Channel, Samana Harbor	33.0	Dusky Yellow (5Y 6/4) and Light Olive Gray (5Y 5/2)	silty with sand	angular (larger grains)
021a	12-Dec	1225	SG	Samana Bay	13.5	Light olive gray and dusky yellow (5Y 5/2, 5Y 6/4)	granular, coarse	angular
021b	12-Dec	1302	SG	South of Punta de los Flechas	38.0	[More intense and darker version of] Pale olive (10Y 6/2)	silty	rounded
021c	12-Dec	1353	SG	Samana Bay	24.7	light olive gray and very pale orange (5Y 5/2, 10YR 8/2)	granular	angular
021d	12-Dec	1430	SG	Samana Bay	74.0	yellowish gray (5Y 7/2)	silty, clay-like	rounded, embedded in clay (clay fine, well-rounded)

Table 11 continued. Grain size analysis for sediment samples from C238.

Station # (C238)	% 2000 um	%1000 um	%500 um	%250 um	%125 um	%63 um	%<63 est	total %
018	0.0	2.0	7.0	26.7	7.3	6.0	51.0	100.0
020a	0.0	1.9	2.2	4.4	13.7	7.8	70.0	100.0
020b	0.0	4.2	6.7	6.7	5.8	5.0	71.7	100.0
020c	0.0	1.0	1.0	2.0	5.5	8.0	82.5	100.0
020d	0.0	22.2	11.1	16.7	6.7	4.4	38.9	100.0
020e	0.0	11.7	16.1	37.5	13.9	6.1	14.7	100.0
020f	0.0	22.2	12.2	11.1	4.4	3.3	46.7	100.0

Station # (C238)	% 2000 um	%1000 um	%500 um	%250 um	%125 um	%63 um	%<63 est	total %
020f2	0.0	5.8	6.7	9.3	10.2	8.0	60.0	100.0
020h	0.0	45.5	18.2	18.2	9.1	4.5	4.5	100.0
020i	0.0	14.3	7.1	14.3	7.1	14.3	42.9	100.0
020i2	0.0	13.4	11.0	19.5	9.8	7.3	39.0	100.0
020j	0.0	4.0	4.0	8.0	8.0	12.0	64.0	100.0
020k	0.0	33.3	14.4	22.8	17.8	4.4	7.2	100.0
020l	0.0	2.9	2.9	2.9	2.9	2.9	85.7	100.0
021a	0.0	14.0	26.0	28.0	12.0	7.0	13.0	100.0
021b	0.0	3.5	1.0	4.0	12.0	17.0	62.5	100.0
021c	14.0	25.0	41.0	8.8	5.0	1.1	5.1	100.0
021d	0.0	0.6	0.8	3.0	8.2	8.5	78.9	100.0

Table 12. Secchi disc station data for C238.

Station # (C238)	Date (2011)	Local Time (+4 GMT)	Log (nm)	Temp (°C)	Salinity (ppt)	chl-a Fluor (volts x30)	Xmiss (volts)	Cloud Cover (%)	Wave Ht (ft)	Wind Sp (BF)	Secchi Depth (m)	Calc 1% (m)	Locale
033	23-Dec	1000	1552.1	27.5	35.95	1120	3815	13%	5.0	5	38.0	102	West Caribbean
034	24-Dec	1001	1671.2	27.2	35.81	1105	3812	50%	5.0	4	28.5	77	West Caribbean
037	30-Dec	1020	2228.7	23.9	36.15	1341	3814	12%	2.0	3	24.5	66	Florida Straits

Table 13. Student research topics for C238.

Title	Author(s)
Ecosystem Health / Water Quality	
<i>Plastic: Breeding grounds for bacteria A study of bacterial growth on plastic in seawater</i>	Onjale Scott
<i>The Proximity of Plastic Degradation to Human Populations Centers in Puerto Rico, the Dominican Republic, and Jamaica</i>	Laura Page
<i>Anthropogenic changes in water quality and their effect on reef ecosystem health in Samana Bay, DR and Port Antonio, Jamaica</i>	April Collier Gus Hynes Hoffmann Ian Scotton
Biodiversity / Fisheries	
<i>The Distribution and Density of Spiny Lobster Larvae Throughout the Caribbean Sea and their Implications for Population and Habitat Health</i>	Eleanor Howell
<i>Species Abundance and Phosphate in Sargassum Communities in Relation to Geographic Location, Current Speed, and Wind Force</i>	Jill Thompson Sarah Banks
<i>Grouper and Lionfish Smack-down</i>	Larissa Pauli Marissa Rosenfeld
Geologic Setting	
<i>Sediment Deposition in Samana Bay, D.R.</i>	Libby Meier
Climate Connections	
<i>Effects of Anthropogenic Climate Change on 18° Mode Water Mass Formation</i>	Mary Claire Erskine
<i>Charismatic Microfauna: The Effects of Ocean Acidification on Pteropods in the Caribbean</i>	Dylan Anslow Malcolm Johnson