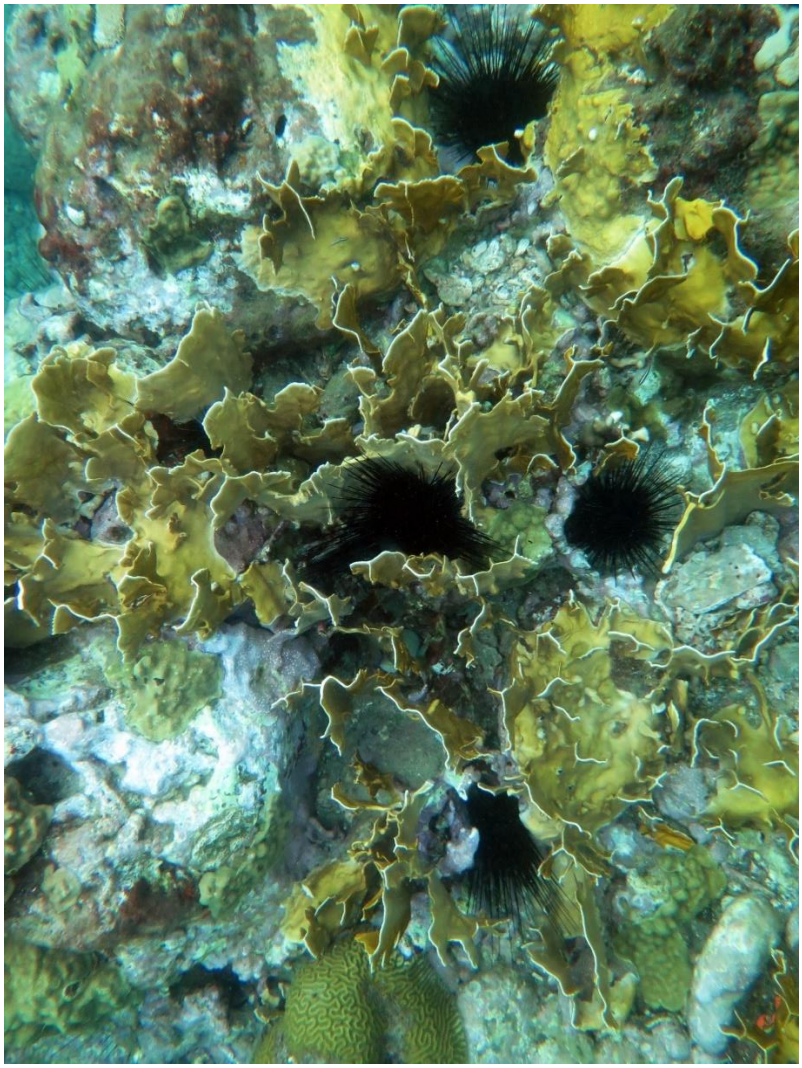
CRUISE REPORT
C-289 – Caribbean Reef Expedition

Scientific data collected aboard
SSV Corwith Cramer

St. Croix, USVI – St. George's, Grenada – Little Bay, Montserrat – St. John, USVI – St. Croix, USVI

24 November to 23 December 2019



Long-spined sea urchins (*Diadema antillarum*) nestled within fire coral (*Millepora* spp.) on a coral reef in Rendezvous Bay, Montserrat. Photo Credit: Dr. Heather Page.

Sea Education Association
Woods Hole, Massachusetts

Citation:
Page, Heather N. 2020. Final Report for S.E.A. Cruise C-289. Sea Education Association, P.O. Box 6, Woods Hole, MA 02543, USA.

To obtain unpublished data, contact the Chief Scientist or the SEA Data Archivist:

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Table of Contents C-289

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	Greg Wisener	Captain
	Tristan Feldman	Chief Mate
	Christine McCormick	2nd Mate
	Jen Smola	3rd Mate
	Andrea Williams	Chief Engineer
	Cody Schmieding	Steward
	Natalie Marshall	Asst. Steward
Scientific Staff		
	Heather Page	Chief Scientist
	Anna Wietelmann	1st Asst. Scientist
	Jessica Sevilla	2nd Asst. Scientist
	Ella Cedarholm	3rd Asst. Scientist
	Kersten Snurle	Reef Hand
Maritime Studies Staff		
	Ben Kochan	Maritime Studies Professor
	Matthew McKenzie	Maritime Policy Professor
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	Muriel Bingham	Stonybrook University
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	Rikki Borkowski	Colgate University
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	Kiernan Crough	College of the Atlantic
	Jemma Dickson	College of the Atlantic
	James Dinulos	Dartmouth College
	Courtney Dunham	Mount Holyoke College
	Thomas Glanville	Tennessee Technical University
	Elizabeth Harris	Missouri State University
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	Carla Szeplaki	Eckerd College
	Valeriia Vakhitova	Middlebury College
	Francesca Whitecross	Gap Year Student
	Alexandra Wright	College of the Atlantic

Cruise Narrative

Faculty and students from the SEA Semester *Caribbean Reef Expedition* (C-289) spent six weeks in Woods Hole, MA followed by ten days in St. Croix, USVI. The cruise track for C-289 (Figure 1) departed from Christiansted, St. Croix, U.S. Virgin Islands (USVI) on 24 November 2019 and arrived in Christiansted 30 days later at the conclusion of the program. During the four-week voyage, we had four port stops: 1) St. George's, Grenada, 2) Little Bay, Montserrat, 3) Falmouth Harbor, Antigua, and 4) St. John, USVI.

Our cruise track traversed the Lesser Antilles (Figure 1), following similar cruise tracks from previous SEA Semester *Caribbean Reef Expedition* programs. We collected physical, chemical, and biological oceanographic data with 38 individual deployments from 23 discrete geographic stations along our cruise track (Table 1). While the major theme of this SEA Semester was examining the seawater chemistry and biology of coral reefs located in the Lesser Antilles, oceanographic data was collected along our cruise track and compared to data from SEA cruises C-276 (2017) and C-283 (2018) to study changes in oceanographic features over time.

While underway, sea surface temperature, salinity, fluorescence (chlorophyll-*a* and CDOM) and transmissivity levels were recorded continuously. Surface samples of chlorophyll-*a*, pH, total alkalinity, and nutrients (phosphate and nitrate) were typically collected every twelve hours (n = 20 geographic stations) (Figure 2). Barometric pressure, wind direction and speed, current direction and speed (Figure 3), bathymetry, and geographic position were also recorded continuously. We routinely observed and enumerated marine mammals, seabirds, flying fish, clumps of *Sargassum* spp., and floating plastic debris; these hourly observations lasted six minutes and occurred only during daylight hours 0700-1900. Periodically, opportunistic sightings also were recorded when notable megafauna or marine debris were present.

The density structure of the water column (maximum depth 1400 m) was determined using a Seabird CTD with attached *in situ* chlorophyll-*a* fluorescence, dissolved oxygen, and photosynthetically active radiation (PAR) sensors (n = 3 geographical stations). In addition, four hydrocasts of the carousel equipped with the CTD and 12 Niskin bottles were deployed to examine the vertical distribution of nutrients (phosphate and nitrate), pH, alkalinity, and chlorophyll-*a* (Tables 1 and 2; Figure 4) Also, a free-standing CTD equipped with an oxygen sensor was deployed once to a depth of 1800 m at the end of the cruise. Water clarity and light attenuation along our cruise track was measured at three geographic stations to estimate depth of the 1% light level by deploying a secchi disc (Table 3).

Surface phytoplankton samples (n = 4 geographical stations) were collected with a near-surface (1-3 m) drift net (30cm frame, 63 µm mesh) deployed from the *Cramer* quarterdeck. Relative abundance of diatoms and dinoflagellates were recorded based on 100 counts of collected phytoplankton, and dominant diatom and dinoflagellate taxonomic groups were identified (Table 4).

Surface plankton assemblages along with the floating macrophyte *Sargassum* spp., and marine debris were sampled regularly (n = 21 geographical stations) with a neuston net (333 µm mesh) (Table 5 and Figure 5). These net deployments revealed the biogeographic patterns of the marine

insect *Halobates*, eel larvae (Leptocephali), spiny lobster larvae (Phyllosoma), lantern fish (Myctophidae), and pteropods, and general zooplankton diversity and taxonomic composition in relation to numerous environmental parameters.

Additionally, we sampled zooplankton diversity and abundance at depth by towing a plankton net with a circular frame that is 1m diameter (335 μm mesh) at a depth of 580 m at night (n=1 geographic station) (Table 1). This was done for educational purposes as well as training for professional science crew.

During our visit in St. Croix and during three port stops we conducted snorkel-based surveys of five coral reefs (Table 6): 1) Isaac Bay, St. Croix, 2) Cane Bay, St. Croix, 3) Flamingo Bay, Grenada, 4) Rendezvous, Montserrat, and 5) Little Bay, Montserrat. Environmental data including sea surface temperature and salinity as well as various chemical properties (pH, alkalinity, nitrate, phosphate, and *E. coli* bacteria) were measured. Sea surface temperature and salinity were measured by towing an RBR along the reef while discrete bottle samples were taken for laboratory analysis of chemistry and bacteria (Table 7).While snorkeling, we recorded seafloor substrate cover (e.g., coral, macroalgae, sand, rock), coral health (live, bleached, diseased), and fish and invertebrate abundance and diversity (Figures 6-8; Table 8). We also collected microplastics in the water column above the reef, scooped sediments inside and outside the reef for analysis of grain size distributions, surveyed fish behavior, and measured reef rugosity (i.e., measurement of structural complexity). Apart from Little Bay, snorkel-based surveys were repeated three times; we only completed two surveys in Little Bay due to adverse weather conditions and issues with anchoring the *SSV Corwith Cramer*. Students conducted seventeen independent or collaborative hypothesis-driven research projects using this coral reef data.

The brief summary of data contained in this report is not intended to represent final data interpretation and should not be excerpted or cited without written permission from SEA.

Data Description

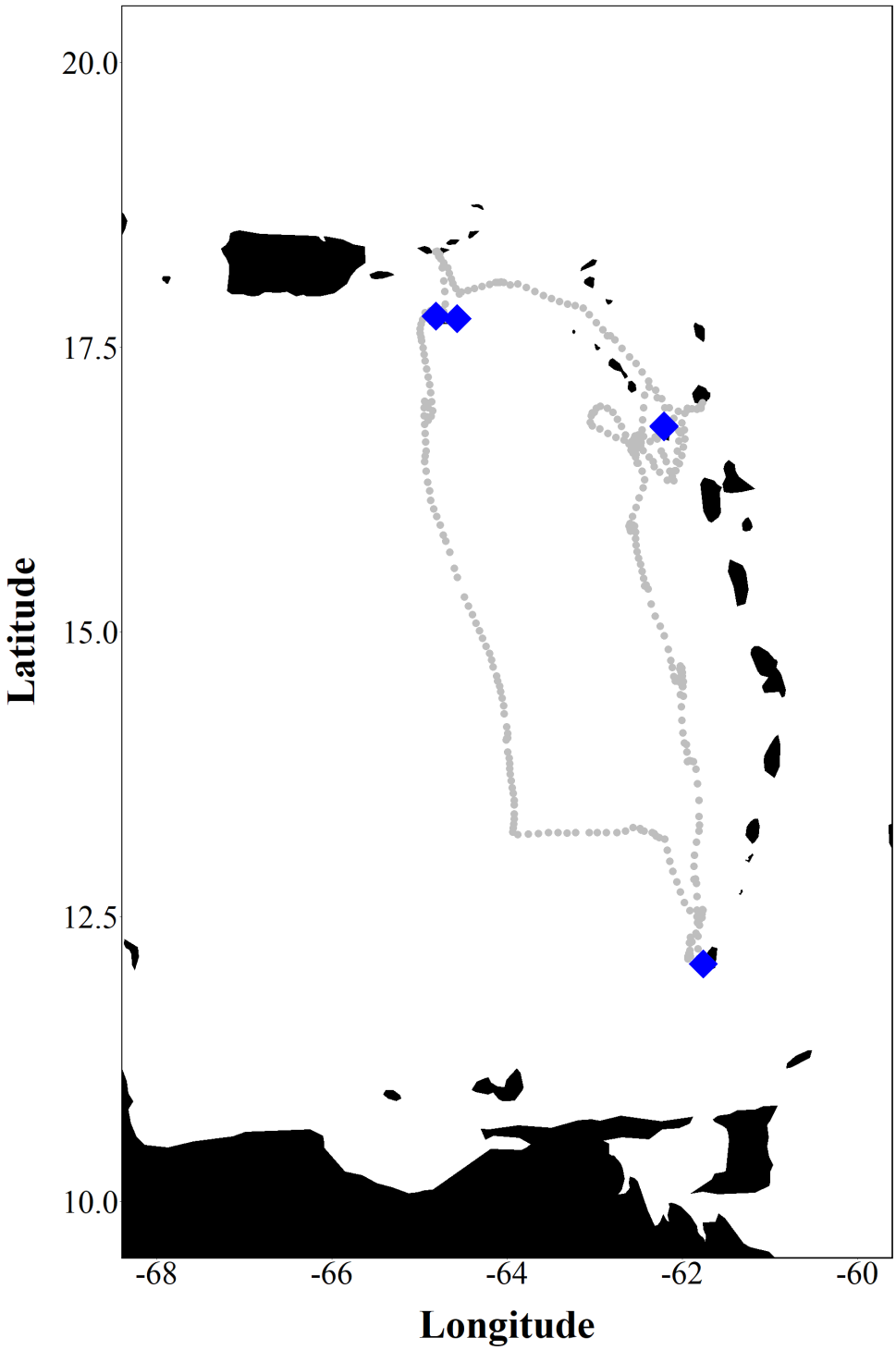

Figure 1. C-289 cruise track based on hourly positions (grey circles). We had port stops in St. Croix (USA), Grenada, Montserrat, Antigua, and St. John (USA) before docking and disembarking in St. Croix. Coral reef surveys were conducted at three of these port stops (blue diamonds): St. Croix, Grenada, and Montserrat.

Table 1. Oceanographic sampling stations. Abbreviations are NT – Neuston Tow; PN – Phytoplankton Tow; MT – 1-Meter Net Subsurface Tow; SS – Surface Station; HC – Hydrocast (carousel equipped with 12 Niskin bottles and CTD); CTD – CTD Profiler Deployment; SD – Secchi Disc Deployment

Station # (C289-)	Date (2019)	Lat (dec Deg N)	Lon (dec Deg W)	General Locale	NT	PN	MT	SS	HC	CTD	SD
001	25-Nov	17°37.3' N	64°59.6' W	SW of St. Croix	X			X			
002	26-Nov	16°52.3' N	64°53.3' W	S of St. Croix	X			X			
003	26-Nov	16°32.4' N	64°56.4' W	S of St. Croix	X			X			
004	28-Nov	14°05.9' N	63°59.9' W	W of St. Lucia	X	X		X	X		
005	28-Nov	13°31.2' N	63°53.3' W	W of St. Vincent and the Grenadines	X			X			
006	30-Nov	13°13.8' N	62°20.2' W	W of St. Vincent and the Grenadines	X		X	X			
007	1-Dec	12°29.2' N	61°49.1' W	W of St. Vincent and the Grenadines	X			X			
008	6-Jan	12°19.2' N	61°54.5' W	NW of Grenada	X			X			
009	4-Dec	12°48.6' N	61°51.7' W	NW of St. Vincent and the Grenadines	X			X			
010	5-Dec	13°51.5' N	61°52.3' W	W of St. Lucia	X	X		X		X	X
011	5-Dec	14°41.9' N	62°01.5' W	W of Martinique	X			X			
012	6-Dec	14°36.1' N	62°01.6' W	W of Martinique	X			X	X		
013	6-Dec	15°24.7' N	62°24.9' W	SW of Guadeloupe	X			X			
014	7-Dec	15°56.9' N	62°36.2' W	W of Guadeloupe	X	X		X		X	X
015	7-Dec	16°28.7' N	62°30.5' W	SW of Montserrat	X			X			
016	8-Dec	16°55.7' N	63°00.2' W	W of St. Kitts and Nevis	X			X	X		
017	8-Dec	16°29.6' N	62°20.2' W	SW of Montserrat	X			X			
018	9-Dec	16°46.3' N	61°59.1' W	E of Montserrat	X	X		X		X	X
019	10-Dec	16°40.5' N	62°30.2' W	W of Montserrat				X			
020	10-Dec	16°37.6' N	62°33.2' W	W of Montserrat	X			X	X		
021	18-Dec	17°35.9' N	62°49.9' W	N of St. Kitts and Nevis	X						
022	19-Dec	18°04.4' N	64°04.0' W	NE of St. Croix						X	
023	19-Dec	17°58.7' N	64°31.7' W	NE of St. Croix	X						

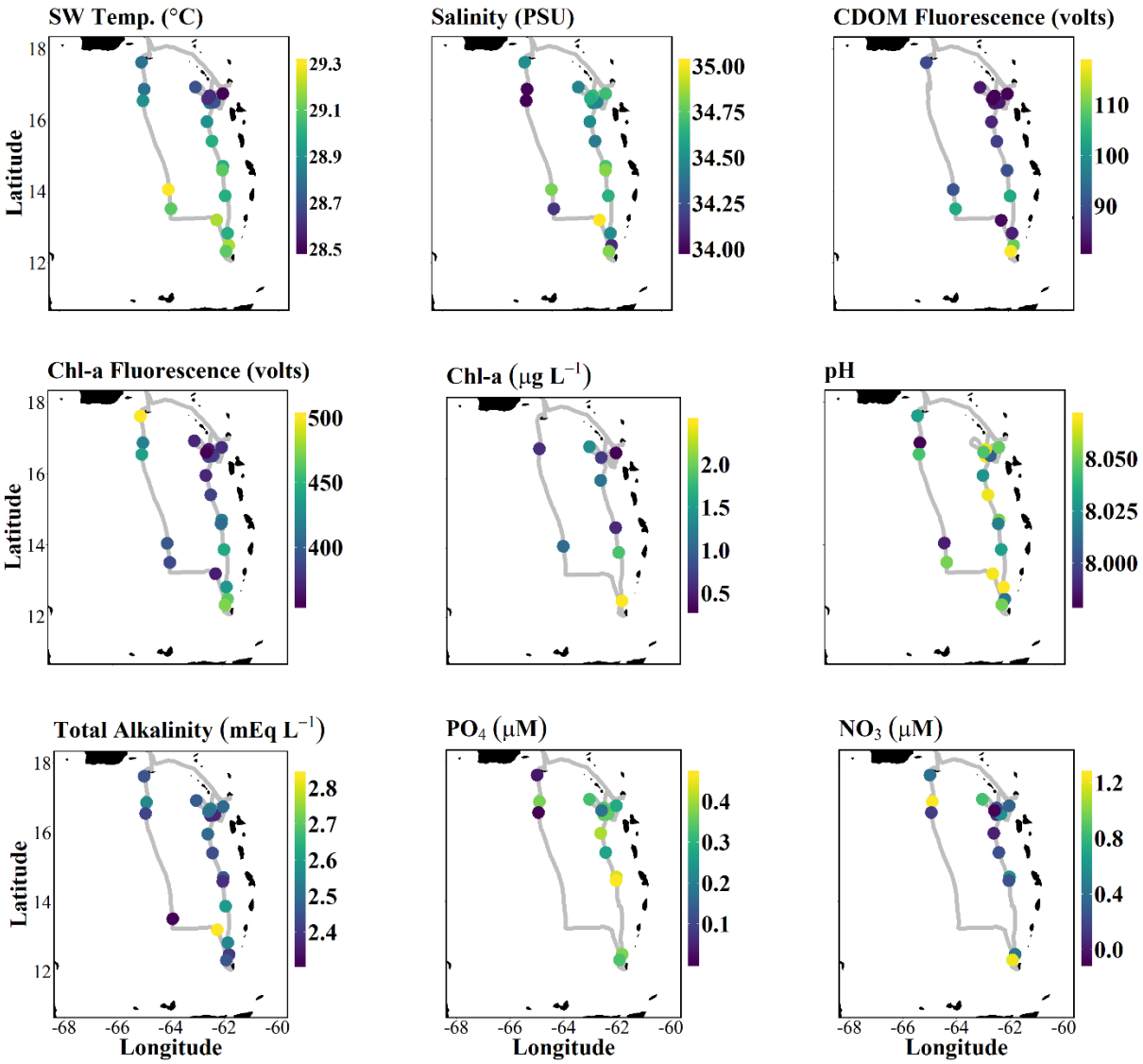

Figure 2. Sea surface conditions (colored points) from discrete sampling stations along C-289 cruise track (gray line). Latitude/longitude locations and general locales of surface stations (SS) are given in Table 1.

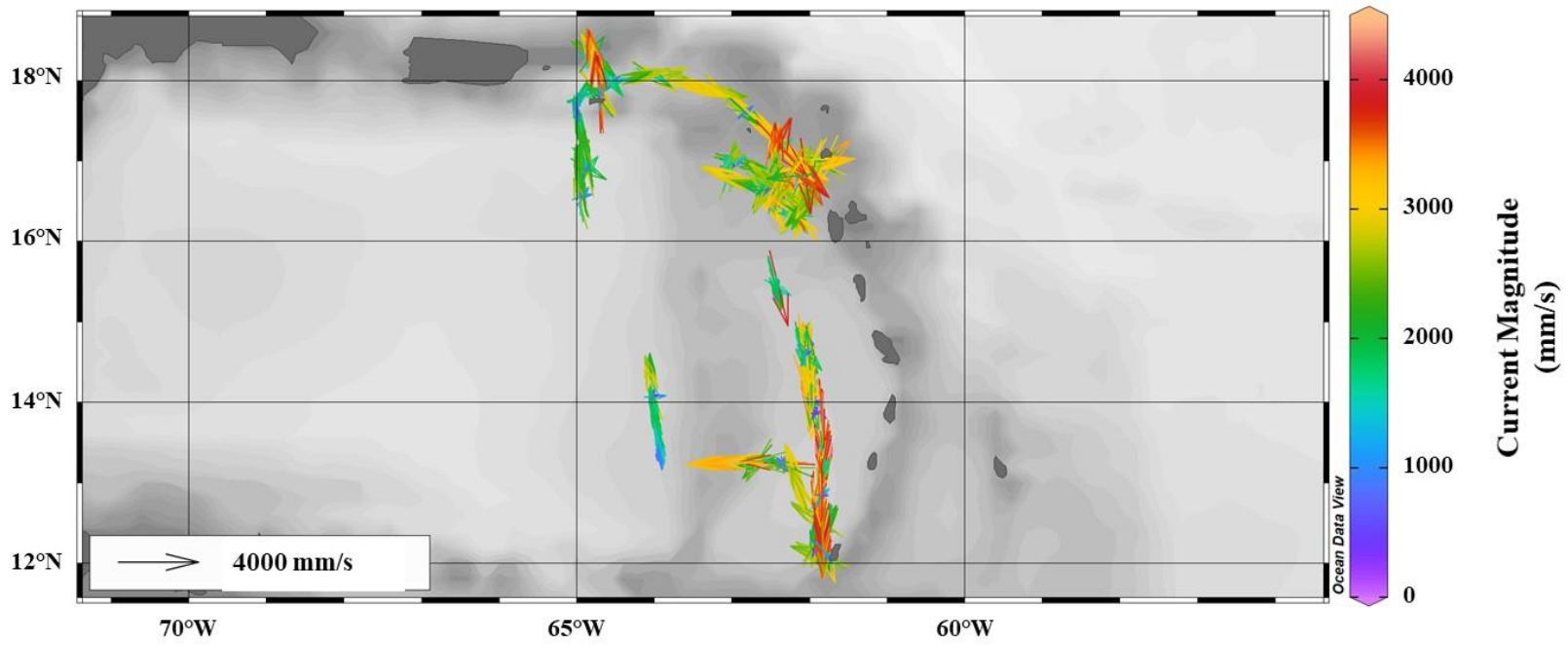

Figure 3. Surface currents along the C-289 cruise track measured using a hull-mounted acoustic doppler current profiler (ADCP). Data were not collected where there are gaps.

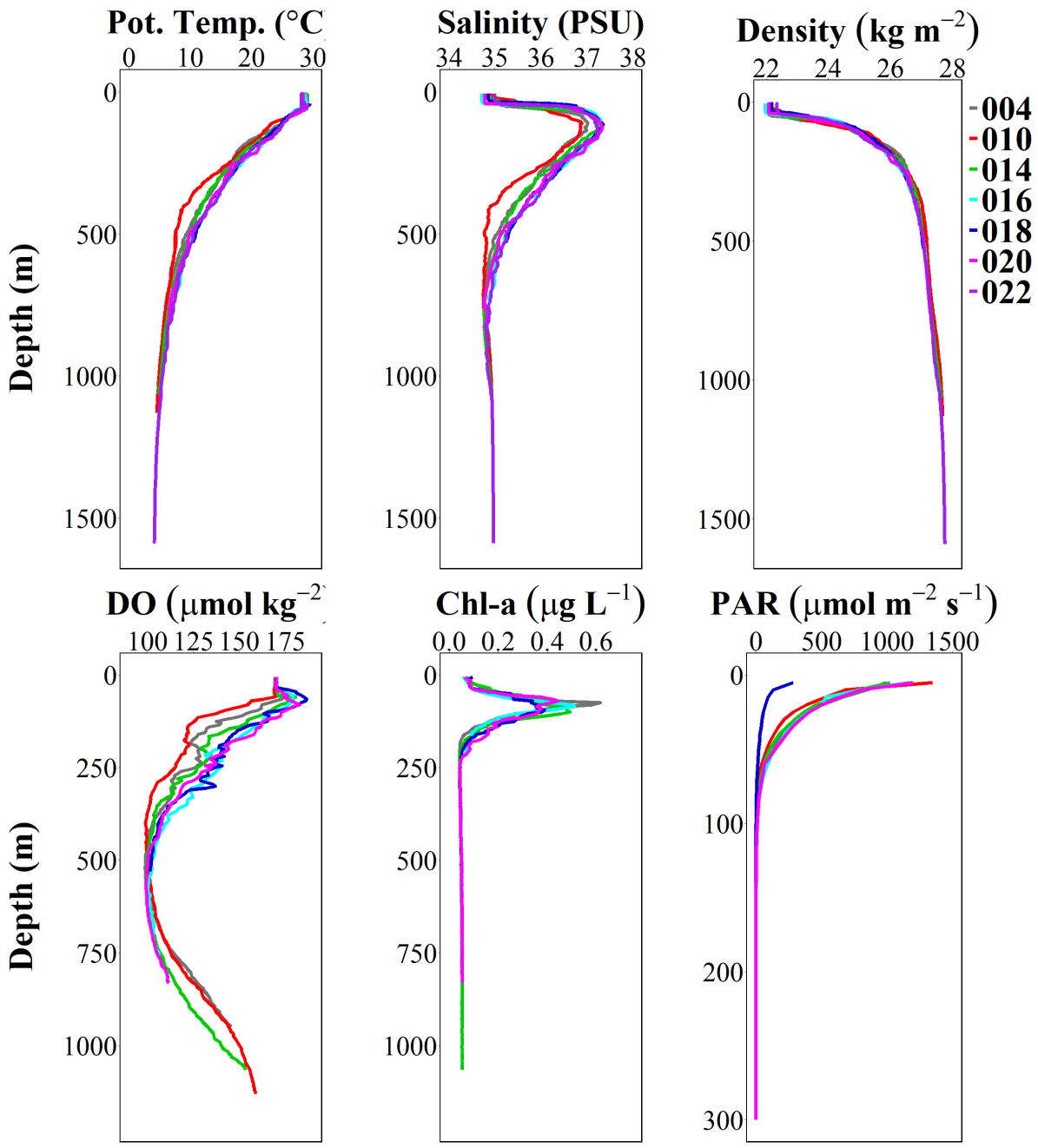

Figure 4. Depth profiles of potential temperature, salinity, density, dissolved oxygen (DO), chlorophyll-a, and photosynthetically active radiation (PAR) collected during C-289 hydrocast (HC) and CTD deployments. Temperature, salinity, and density were measured using a Seabird 19Plus V2 CTD. Additional instrumentation on the carousel allowed for profiling of DO, chlorophyll-*a* fluorescence, and PAR.

Table 2. Summary of C-289 hydrocast (HC) data. Station locations and general locales are given in Table 1. Analyses conducted as given in footnote as the bottom of table on following page.[1]

Station (C289-) Depths	Bottle	Depth (m)	Temp (°C)	Salinity (psu)	pH	TA (mEq/kg)	Chl-*a* (µg/L)	PO_4 (µM)	NO_3^{2-} (µM)
Station	12	25	29.0612	34.9963	8.00	2.754			
004	11	50	29.1418	35.1737		2.706			
	10	99	25.3787	36.9707	7.94				
Cast	09	150	21.5889	36.9062	7.85	2.602			
Depth	08	199	18.1866	36.4602					
(m)	07	249	16.6590	36.2518	7.78	2.569			
951	06	299	14.8941	35.9400					
	05	397	11.7623	35.3999					
Water	04	496	9.4672	35.0723	7.58	2.493			
Depth	03	943	5.1455	34.9012	7.60	2.514			
(m)	02	944	5.1347	34.9038					
2974	01	946	5.1197	34.9047					
Station	12	24	28.9129	35.1305			1.126		
012	11	25	28.9132	35.1319	8.02	2.478		-0.014	0.851
	10	50	28.6605	35.7872			3.248		
Cast	09	74	26.4809	36.5509			4.907		
Depth	08	76	26.3974	36.5733	7.96	2.579		0.032	0.539
(m)	07	98	24.2334	36.9623			0.756		
991	06	99	24.0616	36.9822	7.91	2.582		0.078	2.543
	05	199	17.6162	36.3771					
Water	04	297	13.5681	35.6789			-0.013		
Depth	03	298	13.5568	35.6796	7.68	2.491		1.078	3.963
(m)	02	497	8.8945	34.9486			-0.013	1.842	3.983
2877	01	991	5.1963	34.8892	7.61	2.559		1.734	3.969

Table 2 cont'd.

Station (C289-) Depths	Bottle	Depth (m)	Temp (°C)	Salinity (psu)	pH	TA (mEq/kg)	Chl-*a* (µg/L)	PO_4 (µM)	NO_3^{2-} (µM)
Station	12	25	28.6085	34.7157			0.537		
016	11	25	28.6074	34.7163	8.04				
	10	50	29.1423	36.3241			1.123		
Cast	09	74	26.6697	37.1393			3.404		
Depth	08	75	26.6138	37.1613	8.04	2.678			
(m)	07	99	25.4773	37.2991			2.199		
757	06	100	25.4520	37.3040	8.03	2.726		0.063	0.109
	05	199	21.0813	36.9648			-0.013	0.483	2.936
Water	04	297	16.6926	36.2835			-0.013	0.699	3.912
Depth	03	298	16.6636	36.2851	7.81	2.235		0.601	3.912
(m)	02	497	10.6299	35.2931	7.70	2.660		1.406	3.939
1083	01	751	6.6247	34.7676	7.62	2.481		2.042	3.922
Station	12	25	28.4335	34.7807			0.917		
020	11	25	28.4333	34.7807	8.06	2.467		-0.071	-0.369
	10	49	29.1613	36.3411			1.958		
Cast	09	50	29.1743	36.3517	8.03	2.538		0.000	-0.355
Depth	08	74	27.6539	36.9653			4.482		
(m)	07	75	27.5371	37.0074	8.01	2.557		0.052	-0.308
831	06	99	25.7439	37.2432			3.106		
	05	100	25.7151	37.2447	8.01	2.663		-0.024	0.186
Water	04	198	21.1681	36.9701			0.005		
Depth	03	199	21.1487	36.9688	7.88	2.591		0.222	2.318
(m)	02	397	13.0951	35.6939					
1438	01	795	6.6809	34.8198	7.55	2.647	-0.013	2.042	4.109

[1]Temperature and salinity data were determined from a SeaBird 19Plus V2 CTD on each of the hydrocast deployments. Seawater pH was measured using spectrophotometric analysis using m-*cresol* purple indicator. Total alkalinity was quantified by titrating the seawater sample with a strong acid (HCl). Extracted chlorophyll-*a* samples were filtered through 0.45 µm filters and measured with a Turner Designs Model 10-AU benchtop fluorometer. Phosphate (PO_4) and nitrate (NO_3) were assessed using colorimetric spectrophotometry.

Table 3. Summary of C-289 secchi disc deployment data. Station locations and general locales are given in Table 1.

Station (C289-)	Chl-*a* Fluor. (volts)	CDOM Fluor. (volts)	Trans. (volts)	Cloud Cover (%)	Wave Height (m)	Secchi Depth (m)	Calculated 1% Light Penetration Depth (m)
010	465	103	380	5	1.2	27	71
014	377	88	447	25	1.2	34	90
018	363	81	430	60	1.8	27	72

Table 4. Summary of phytoplankton communities collected in C-289 phytoplankton nets (PN). No data was collected for Station 004 since we did have a research clearance on hand. We performed 100-counts to obtain percent diatoms (Diat.) and dinoflagellates (Dino.). Station locations and general locales are given in Table 1.

Station (C289-)	Chl-*a* Fluor. (volts)	% Diat.	% Dino.	Dominant Diatom Taxonomic Groups	Dominant Dinoflagellate Taxonomic Groups
010	434.31	40	60	Families Fragilasiophyceae, Bacillariophyceae, and Coscinodiscophycae	Order Goryaulacales: Families Certiaceae and Goniodomataceae
014	373.43	68	32	n/a	Ceratium and Radiolaria
018	357.00	41	59	Order Baeillariales (Pennate): Family Fragilariophyceae (solitary)	Order Gonyalacales: Family Ceratiaceae (Ceratium spp.)

Table 5. C-289 neuston tow (NT) data. Abbreviations are Phyll – phyllosoma (spiny lobster larvae); Lept – leptocephali (eel larvae); Myct – myctophids (lanternfish larvae); Ceph – cephalopods; Halo – *Halobates* (marine insect). Details of nekton and gelatinous organisms greater than 2cm in size and zooplankton 100-count data are available from SEA upon request.

Station (C289-)	Tow Distance (m)	Zoopl. Biomass (mL)	Phyll (#)	Lept (#)	Myct (#)	Ceph (#)	Halo (#)	Nekton >2cm (#)	Gelatinous >2cm (#)	Sargassum Biomass (g)	Plastic Pellets (#)	Plastic Pieces (#)	Tar (#)
001	1783.6	8.8	2	0	0	0	15	8	15	38.3	0	1	0
002	2393.3	1.6	0	0	0	0	0	0	0	44.0	0	0	0
003	2202.1	11.0	3	0	15	0	11	17	11	141.0	0	1	0
004	1460.4	1.0	0	0	0	0	2	0	2	11.0	0	0	0
005	1676.5	28.0	0	1	0	0	4	8	4	72.0	0	0	0
006	1859.8	29.0	1	8	5	0	9	0	9	12.0	0	0	0
007	2259.7	4.5	0	0	0	0	17	0	17	0.0	0	0	0
008	1821.4	35.0	0	5	2	0	60	3	60	0.0	0	24	0
009	2276.3	37.5	0	2	8	0	1	5	1	99.0	0	8	0
010	1186.3	4.0	0	0	0	0	0	0	0	6.0	0	1	0
011	1375.9	10.0	0	3	1	0	4	0	4	21.0	3	1	0
012	1951.3	3.0	0	0	0	0	0	1	0	14.0	0	0	0
013	2258.0	6.0	0	0	0	0	2	0	2	14.0	0	1	0
014	1143.0	1.8	0	0	0	0	2	0	2	27.0	0	3	0
015	1454.8	4.0	0	0	0	0	1	2	1	0.2	0	0	0
016	1726.7	1.0	0	0	0	0	0	0	0	23.0	0	4	0
017	2394.9	3.8	0	0	5	0	2	2	2	0.0	0	0	0
018	2193.4	1.3	0	0	0	0	0	1	0	2.0	0	0	0
020	1160.3	1.1	0	0	0	0	1	0	1	1.5	0	0	0
021	1483.3	2.8	0	0	6	0	6	0	6	0.0	0	0	0
023	1643.3	6.0	0	1	10	0	7	10	7	12.5	0	0	0

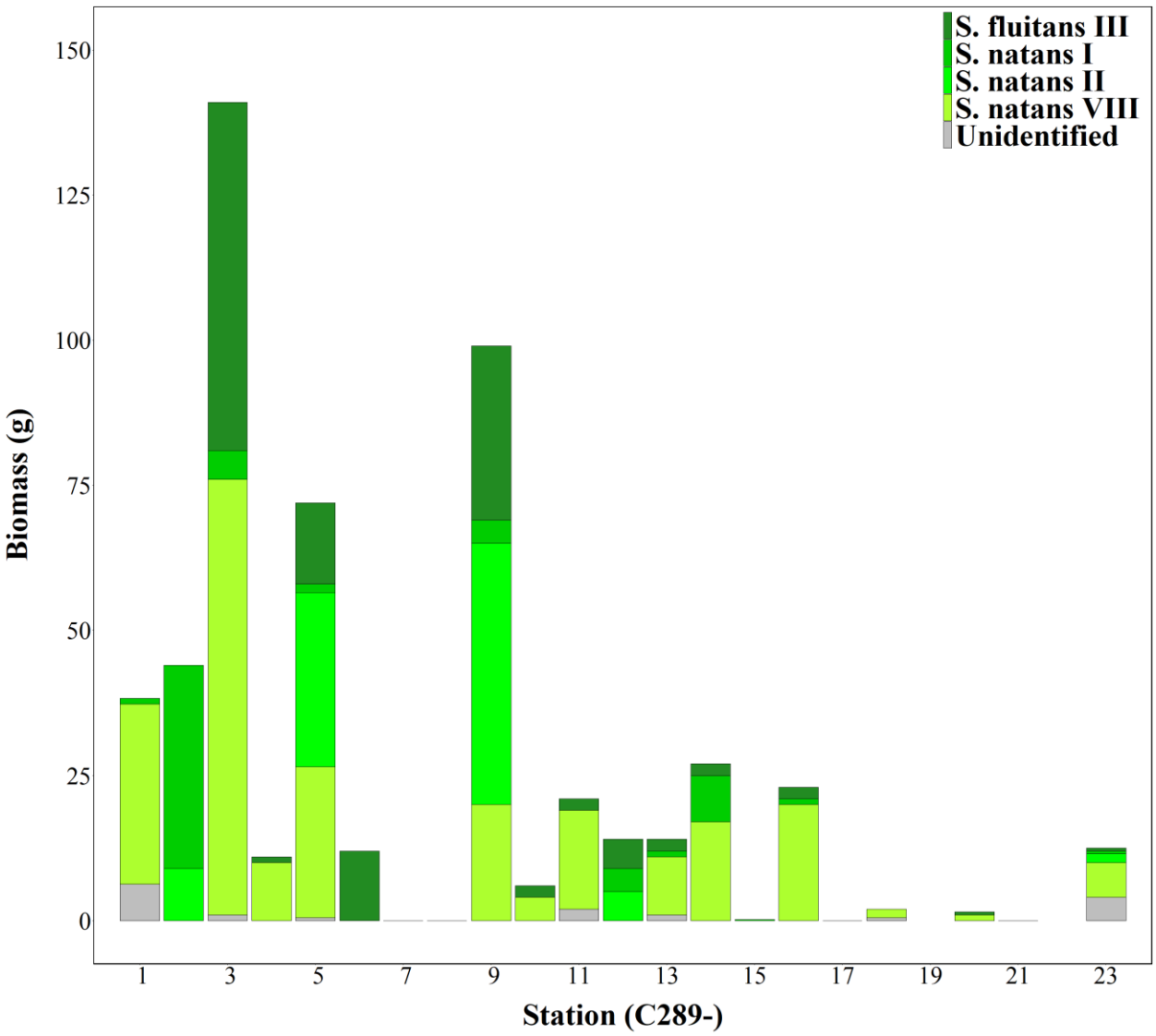

Figure 5. Community composition of *Sargassum* species collected in C-289 neuston tows. Pieces and clumps of *Sargassum* species were removed from net contents, identified, separated, and weighed using a spring balance scale.

Table 6. Coral reef sites studied during C-289 voyage.

Island	Reef Site Name	Latitude	Longitude
St. Croix	Isaac Bay	17°45'00.69"N	64°34'14.38"W
St. Croix	Cane Bay	17°46'27.00"N	64°48'42.71"W
Grenada	Flamingo Bay	12°05'03.83"N	61°45'45.39"W
Montserrat	Rendezvous Bay	16°48'30.19"N	62°12'23.41"W
Montserrat	Little Bay	16°48'02.73"N	62°12'24.93"W

Table 7. Environmental conditions (Mean ± SD) on coral reefs studied during C-289 voyage. Temperature and salinity were measured by towing an RBR on the reef. Discrete samples along inshore-offshore transects (n = 3 transects per reef) were collected for laboratory analysis of chlorophyll-*a*, pH, total alkalinity (TA), phosphate, nitrate, and bacteria (*E. coli*). These chemical analyses followed the same protocol outlined in the footnote on Table 2. Latitude/longitude locations of coral reefs are given in Table 6.

Island	Reef	Temp (°C)	Salinity (PSU)	Chl-*a* (µg/L)	pH	TA (mEq/L)
St. Croix	Isaac Bay	28.539 ± 0.035	34.863 ± 0.058	0.094 ± 0.052	na	na
St. Croix	Cane Bay	28.921 ± 0.080	34.446 ± 0.064	0.093 ± 0.034	na	na
Grenada	Flamingo Bay	29.110 ± 0.031	34.934 ± 0.210	1.135 ± 0.259	8.02 ± 0.05	2.437 ± 0.105
Montserrat	Rendezvous Bay	28.146 ± 0.532	34.627 ± 0.864	1.036 ± 0.412	8.07 ± 0.09	2.526 ± 0.310
Montserrat	Little Bay	27.917 ± 0.093	34.758 ± 0.659	1.738 ± 0.386	8.04 ± 0.02	2.500 ± 0.046

Table 7 cont'd.

Island	Reef	Phosphate (µM)	Nitrate (µM)	*E. coli* (24-hr CFU/mL)	*E. coli* (48-hr CFU/mL)
St. Croix	Isaac Bay	-0.059 ± 0.034	0.505 ± 0.556	0.15 ± 0.20	0.15 ± 0.21
St. Croix	Cane Bay	-0.034 ± 0.036	0.025 ± 0.121	0.21 ± 0.24	0.90 ± 0.57
Grenada	Flamingo Bay	-0.011 ± 0.033	0.738 ± 0.151	0.29 ± 0.39	na
Montserrat	Rendezvous Bay	-0.032 ± 0.032	0.108 ± 0.072	0.30 ± 0.39	0.48 ± 0.51
Montserrat	Little Bay	0.084 ± 0.088	-0.036 ± 0.153	1.41 ± 0.58	1.73 ± 0.61

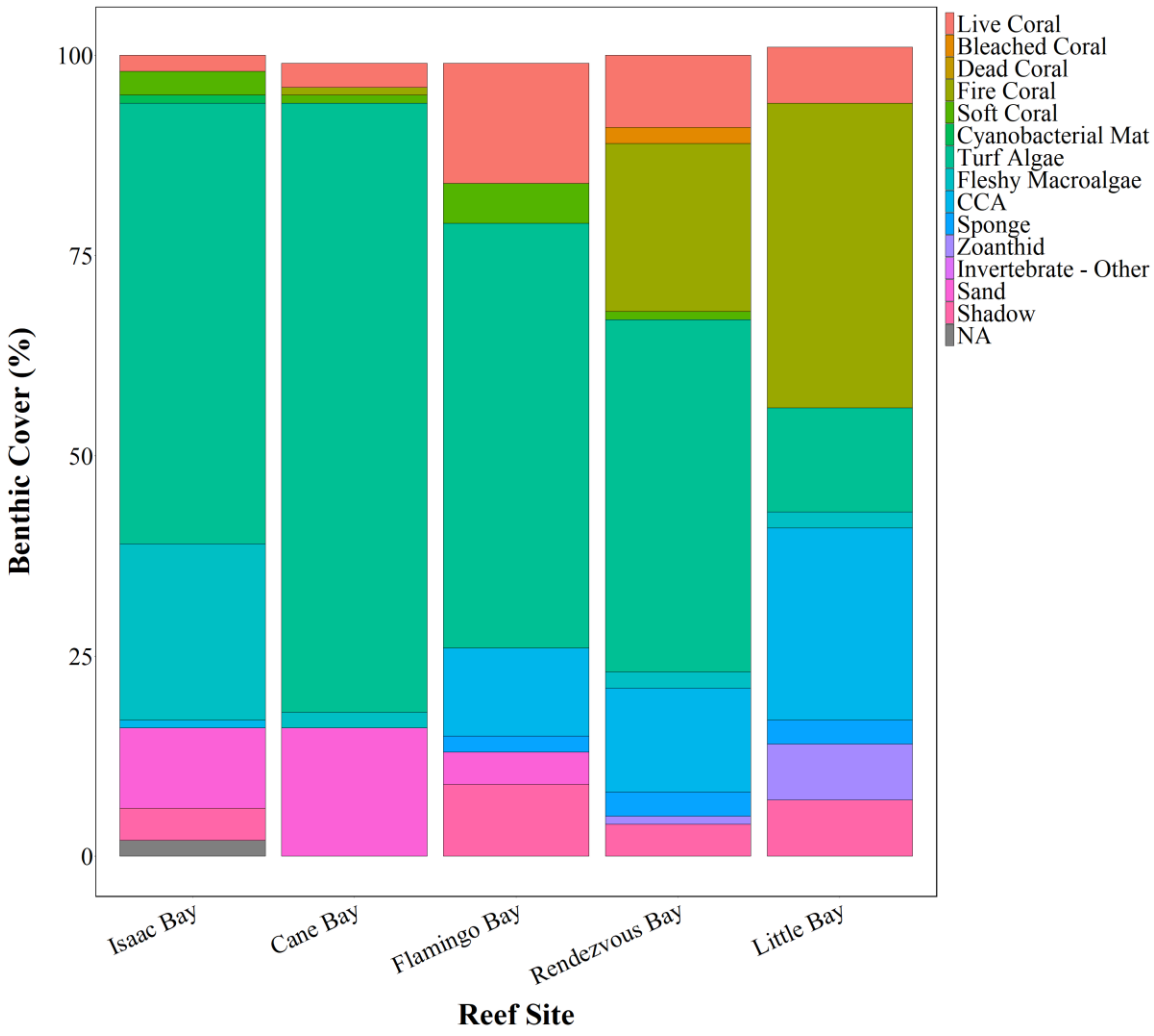

Figure 6. Benthic community composition for reef sites studied during C-289 voyage. Photo-quadrats (n = 20 per transect) were taken along 20 m transects (n = 2-3 transects per reef); twenty random points were overlaid on each photograph and the substrate underneath each point was identified. Latitude/longitude locations of reef sites are given in Table 6.

Table 8. Coral species belonging to classes Anthozoa and Hydrozoa (*Millepora* spp.) observed in the Caribbean at reef sites studied during C-289 voyage.

Mounding and Boulder	**Meandroid, Solitary, and "Flower"**	**Plates and Agariciids**	**Branching and Nodular**
Orbicella spp.	*Dichocoenia stokesii*	*Agaricia* spp.	*Madracis auretenra*
Porites astreoides	*Diploria labyrinthiformis*		*Porites* (digitate)
Siderastrea radians	*Manicina areolate*		*Millepora* spp.
Siderastrea siderea	*Pseudodiploria clivosa*		
	Pseudodiploria strigosa		

Table 9. Fish communities observed at reef sites studied during C-289 voyage. Fishes were surveyed using three different methods: Stationary Point Count (SPC), Belt Transect (Belt) (20 m long by 1 m wide), and Roving Diver Survey (Roving). The total number of species and individuals were used to calculate species richness. Latitude/longitude locations of reef sites are given in Table 6.

Survey Type	Island	Site	# Spp.	# Ind.	Spp. Rich.	Top Three Most Abundant Species (# Individuals)
SPC	St. Croix	Isaac Bay	16	73	1.87	Ocean Surgeonfish (17), Blue Tang (8), Slippery Dick (7)
SPC	St. Croix	Cane Bay	17	153	1.37	Bluehead Wrasse (37), Slippery Dick (32), French Grunt (25)
SPC	Grenada	Flamingo Bay	22	105	2.15	Coney (15), Yellowtail Damselfish (15), Blue Chromis (14)
SPC	Montserrat	Rendezvous Bay	14	76	1.61	Slippery Dick (17), Blue Tang (13), Doctorfish (10)
SPC	Montserrat	Little Bay	16	68	1.94	Tomtate (25), Ocean Surgeonfish (6), Bluehead Wrasse (6)
Belt	St. Croix	Isaac Bay	23	115	2.14	Slippery Dick (32), Blue Tang (14), Threespot Damselfish (10)
Belt	St. Croix	Cane Bay	19	119	1.74	Yellowhead Wrasse (25), Slippery Dick (18), French Grunt (16)
Belt	Grenada	Flamingo Bay	20	117	1.85	Blue Chromis (16), Bicolor Damselfish (15), Bluehead Wrasse (13)
Belt	Montserrat	Rendezvous Bay	10	117	0.92	Bar Jack (53), Bicolor Damselfish (18), Ocean Surgeonfish (13)
Belt	Montserrat	Little Bay	12	145	1.00	Tomtate (80), Yellowtail Damselfish (15), Ocean Surgeonfish (12)
Roving	St. Croix	Isaac Bay	23	104	2.26	Blue Tang (20), Slippery Dick (11), Ocean Surgeonfish (10)
Roving	St. Croix	Cane Bay	17	228	1.13	Slippery Dick (65), Ocean Surgeonfish (40), Yellowhead Wrasse (39)
Roving	Grenada	Flamingo Bay	25	163	1.96	Blue Chromis (44), Stoplight Parrotfish (21), Princess Parrotfish (16)
Roving	Montserrat	Rendezvous Bay	17	117	1.57	Ocean Surgeonfish (19), Yellowtail Damselfish (17), Sergeant Major (16)
Roving	Montserrat	Little Bay	16	54	2.18	Ocean Surgeonfish (14), Blue Tang (7), Yellowtail Damselfish (6)

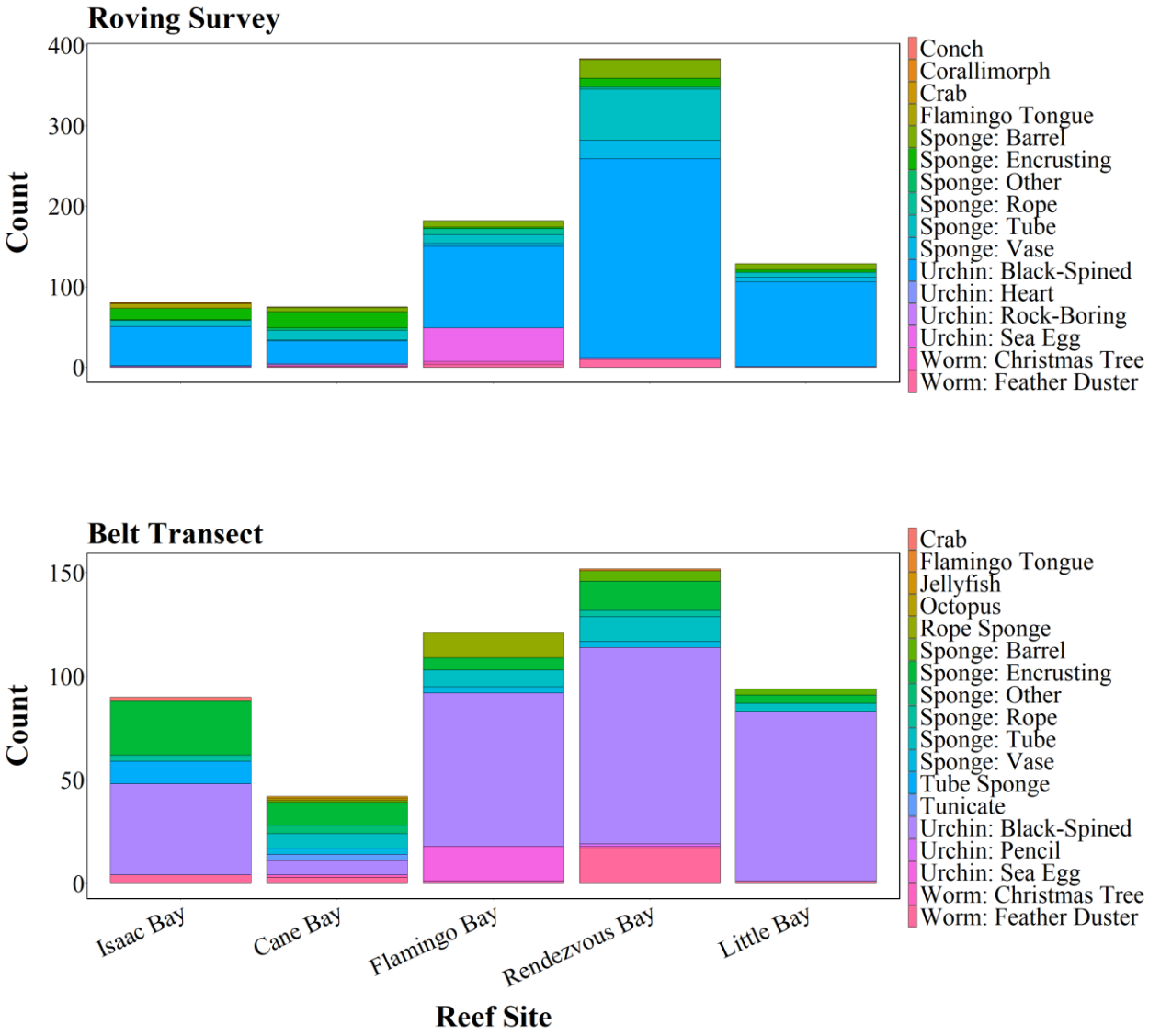

Figure 7. Invertebrate communities observed at reef sites studied during C-289 voyage. For roving survey, students noted every invertebrate observed while snorkeling the reef over the course of 10 minutes. The belt transect was 1 m wide by 20 m long. Both surveys showed highest invertebrate abundance in Rendezvous Bay, Montserrat and lowest abundance in Cane Bay, St. Croix. Latitude/longitude locations of reef sites are given in Table 6.

Student Oceanographic Reports from Caribbean Reef Expedition C-289

Depth profiles of dissolved oxygen, pH, alkalinity, phosphate, and nitrate from hydrocasts
Jemma Dickson, Elizabeth Harris, Valeriia Vakhitova, and Francesca Whitecross

Analysis and comparisons of ADCP and 6-minute observations for C-289
Courtney Dunham, Thomas Glanville, and Carla Szeplaki

Sea surface chemistry from flow-through data and Sargassum abundance and distribution
Rebecca Alisandratos, Brett Bohnert, Caroline Caton, and Kiernan Crough

Depth profiles of temperature, salinity, density, and light from hydrocasts and CTD casts
Muriel Bingham, Daniel Karparis, Emily Klimczak, and Isabel Slaymaker

Sea surface chemistry (pH, alkalinity, nitrate, phosphate, and chl-a) for C-289
James Dinulos, Rebecca Hueckel, and Alexandra Wright

Phytoplankton, zooplankton, and plastic distribution
Rikki Borkowski, Julian Scent, and Sabrina Sorace

Student Coral Reef Projects from Caribbean Reef Expedition C-289

The relationship between chlorophyll-a levels and the abundance and species richness of fish on Caribbean coral reefs
Rebecca Alisandratos (Hunter College)

Prevalence of black band disease, white band disease, and stony coral tissue loss disease in the Lesser Antilles and their ecological effects on corallivorous fish species
Muriel Bingham (Stonybrook University)

Effects of macroalgae on fish biodiversity
Brett Bohnert (Grinnell College)

Reef flattening effects on fish abundance among four countries in the Lesser Antilles
Rikki Borkowski (Colgate University)

Effect of herbivorous fish and invertebrate abundance and species richness on macroalgae cover on Lesser Antilles coral reefs
Caroline Caton (U. of Illinois at Urbana-Champaign)

A survey of yellow band disease on Caribbean coral reefs in correlation to* Escherichia coli *concentrations
Jemma Dickson (College of the Atlantic)

The relationship between oceanic total alkalinity, coastal proximity, and live coral cover in Caribbean coral reef environments
James Dinulos (Dartmouth College)

Grain size analysis and interpretation of Lesser Antilles' shallow-water coral reefs
Thomas Glanville (Tennessee Technical University)

Coral bleaching in the Caribbean
Elizabeth Harris (Missouri State University)

Are coral reefs a sink or source of CO_2: A measurement of air-sea flux in the Caribbean's Lesser Antilles
Rebecca Hueckel (Humboldt State University)

Are sponges starting to replace coral as the dominant species on Caribbean coral reefs?
Emily Klimczak (SUNY College of Environmental Science and Forestry)

Abundance of microplastics in Caribbean reefs and their correlation with coral diseases
Sabrina Sorace (Eckerd College)

Comparative analysis on the effects of seawater pH and nutrient availability in water on the coral:algae ratio in the Caribbean islands
Valeriia Vakhitova (Middlebury College)

Effects of Marine Protected Areas on coral reef health in St. Croix
Kiernan Crough and Alexandra Wright (College of the Atlantic)

Comparison of acidity, nutrients, and bacteria between protected marine areas and non-protected marine areas in the Caribbean
Courtney Dunham (Mount Holyoke College), Daniel Karparis (U. of Maine Orono), and Isabel Slaymaker (Tufts University)

Range, distribution, and faunal interactions of* Ophiothela mirabilis *in the Lesser Antilles
Ciara Olmstead (Mount Holyoke College) and Carla Szeplaki (Eckerd College)

Fear in Fish: does fish behavior change in reefs with high levels of human activity?
Julian Scent (College of the Atlantic) and Francesca Whitecross (Gap Year Student)