PRELIMINARY CRUISE REPORT

U.S. Dept. of State CRUISE No.:	F2019-077
SHIP NAME:	*SSV Corwith Cramer*
OPERATING INSTITUTE OR AGENCY:	Sea Education Association
PROJECT TITLE:	**Cruise C290**
CRUISE DATES (INCLUSIVE):	10 February to 18 March, 2020

CHIEF SCIENTIST:	
Name	Jeffrey M. Schell
Affiliation	Sea Education Association
Address	P.O. Box 6, Woods Hole, MA 02543
Phone	1-508-444-1905
Fax	800-977-8516
E-mail	Jschell@sea.edu

CLEARANCE COUNTRIES:	**Requested:** Puerto Rico, U.S. Virgin Islands, Grenada, St. Vincent and the Grenadines, St. Lucia, Dominica, Montserrat, St. Kitts and Nevis, Antigua and Barbuda, Martinique-Guadeloupe-Saint Martin (French), Saba-Saint Eustatius-Sint Maarten (Dutch), Anguilla, and British Virgin Islands (U.K.) **Not Received:**
FOREIGN PARTICIPANTS:	None

DESCRIPTION OF SCIENTIFIC PROGRAM (include page-sized chart showing cruise track):

Data Description C290

The cruise track for C290 (Figure 1) departed from San Juan, Puerto Rico, USA and concluded in Christiansted, St Croix, USVI 38 days later. During the nearly six-week voyage we had five port stops; the first in St. George's, Grenada followed by Port Elizabeth, Bequia then Portsmouth, Dominica and Marigot, St. Martin and finally St John, USVIs.

Our cruise track traversed several major oceanographic provinces (Figure 1): a) the cooler more saline waters of the NE Caribbean Sea and b) the warmer and less saline waters of the SE Caribbean Sea. These large scale atmospheric and oceanic conditions showed considerable variability at the 10-100nm scale due to the island wake effect disrupting wind and current

patterns.

We collected data with 83 individual deployments from 43 discrete geographic stations along our cruise track. Comparison of the physical, chemical, geological and biological features of these regions represented the major scientific theme of this Sea Semester.

1. Physical oceanographic studies focused on the characterization of the island wake effect around each Caribbean island. Evidence of cyclonic and anticyclonic eddies were evaluated with ACDP data while associated areas of upwelling and downwelling were assessed with our continuous seawater flow-thru system measuring temperature and salinity and examination of mixed layer depth and thermocline position using CTD deployments.
2. Chemical oceanographic studies focused on the characterization of the island mass effect around each Caribbean island. Broad scale patterns of mass effect were assessed using chlorophyll-a fluorescence measurements from our continuous seawater flow-thru system. In addition, 4 times daily we collected surface water and determined the geographic distribution of nutrients (phosphate), extracted chlorophyll-*a*, *Escherichii coli* bacteria and pH. These chemical parameters were related to patterns in physical hydrography at various scales: nearshore to offshore transitions, ocean fronts and eddies associated with the island passages and water column stratification.
3. Biological studies focused on the characterization of the island mass effect around each Caribbean island. The geographic distribution and abundance of charismatic megafauna (seabirds, sea turtles, flying fish, and marine mammals), several nektonic organisms (lantern fish – Family *Myctophidae*, and gelatinous organisms >2cm – i.e salps), meroplanktonic larvae including spiny lobster (phyllosoma) and eels (leptocephali), the floating macrophyte – *Sargassum* spp., the marine insect *Halobates*, and the density (mL/m2) and diversity (i.e. Shannon-Weiner index) of the aggregate zooplankton and phytoplankton communities were related to patterns in physical and chemical properties at various scales: nearshore to offshore transitions, ocean fronts and eddies associated with the island passages and water column stratification.

Sea surface temperature, salinity, fluorescence (chlorophyll-*a* and CDOM) and transmissivity levels; along with barometric pressure, winds, bathymetry, and geographic position were recorded continuously along the cruise track. Surface samples (n=93) of nutrients (phosphate), chlorophyll-*a*, and pH were collected in conjunction with all noon and midnight neuston net tows, as well as dawn (0500) and dusk (1700) collections.

Routinely we visually observed and enumerated marine mammals, seabirds, flying fish, sea turtles, *Sargassum* abundance, and floating plastic debris. These hourly observations occurred only during daylight hours 0700-1900 and lasted only six minutes (n=140). Periodically, opportunistic sightings were also recorded when notable megafauna or marine debris were present (n=262). On several occasions we deployed a hydrophone to record the marine soundscape in hopes of identifying presence of marine mammals (17 stations).

The density structure of the water column (maximum depth 1900 m) was determined using a Seabird CTD with attached *in situ* chlorophyll-*a* fluorescence and dissolved oxygen sensors (7

stations). On five occasions a carousel equipped with a CTD, PAR sensor, and 12 nisken bottles was deployed allowing the collection of water samples at depth which were analyzed for nutrients (phosphate), chlorophyll-*a*, and pH.

Surface neuston net tows (27 stations, 335 µm mesh net) a single sub-surface net tow (1 station, 335 µm mesh 1-meter diameter net) were conducted regularly to examine plankton assemblages along with the floating macrophyte *Sargassum* spp., marine debris and tar balls. These net deployments revealed the biogeographic patterns of the marine insect *Halobates*, eel (leptocephali) and spiny lobster (phyllosoma) larvae, lantern fish (Myctophidae), pteropods, and general zooplankton diversity and taxonomic composition in relation to numerous environmental parameters.

Discrete samples of *Sargassum* clumps and marine plastic debris were collected with a dip net (4 stations, 335 µm mesh). Shrimp, crab, fish, and snail specimens were rinsed from collected samples. Abundance and diversity of associated biota were related to mass (g) and species form of *Sargassum* and geographic location. Three distinct morphological forms of *Sargassum* were recognized (*S. fluitans III*, *S. natans I*, and *S. natans VIII*) and clear differences in associated fauna were observed; even when different *Sargassum* forms were collected from the same station location.

Water clarity and light attenuation along our cruise track was also measured. We routinely deployed a secchi disc (14 stations) to estimate depth of the 1% light level.

On five occasions we collected seafloor sediment using a shipek grab to determine grain size distribution and examine benthic invertebrate assemblages.

During our port stop in Grenada we conducted a visual survey of coral reef habitats: 1) Flamingo Bay, Grenada. While snorkeling we recorded seafloor cover (coral, seagrass/algae, sand/rock), coral health (live, bleached, diseased), and fish and invertebrate abundance and diversity.

Jeffrey Schell, Associate Professor – Chief Scientist, C290

SCHEDULE OF DATA DELIVERY:	
Data Description	Date of Expected Delivery to Dept. of State
Final Cruise Report	18 September 2020

Figure 1: CRUISE TRACK for C290 (insert here):