Cruise Report

W-131

Scientific Activities Undertaken Aboard SSV *Westward*

West Palm Beach - Montego Bay - Roatan - Miami

7 February to 18 March, 1994

Sea Education Association

Woods Hole, Massachusetts

TABLE OF CONTENTS

Appendices

Preface

This report outlines the scientific and academic program conducted aboard SSV *Westward* during February and March, 1994. It consists of summaries of research stations occupied, data collected, and highlights some of the results obtained during oceanographic operations. It also contains a list, and conclusions of, student projects completed during the trip. The report represents a preliminary analysis of data collected during W-131.

W-131 was an extremely successful cruise, mainly due to the energies of the students and staff, all of whom worked tirelessly and cheerfully during the entire trip. Through seasickness, gear breakdowns, attacks by Secchi-disk-eating monsters, and attempts by various pieces of equipment to achieve escape velocity, from Force 0 in the Windward Passage to Force 8 at Explorer Seamount, the entire ship's complement drove themselves towards completion of the ship's mission - and had great fun doing so.

The dedication of the outstanding staff was the bedrock upon which the entire program's success rests. Captain John Wigglesworth kept finding imaginative ways to keep the ship moving in all conditions - including setting the genoa as a "gollywobbler" in the light-air Windward Passage. John's rock-steady leadership of the ship, even while taking a rookie chief scientist under his wing, and his keen interest in the success of both the nautical and scientific programs are what made this trip a success. John even found time to pass the lab practical exam!

First Mate Sean Bercaw filled the ship with energy and enthusiasm while maintaining an interest in science and a breadth of oceanographic knowledge that kept us scientists on our toes. Second Mate Robin Walbridge quickly adjusted to Sea Semester life and ably took on the roles of both teacher and watch leader. Third Mate Virginia Land made watchstanding and learning new skills enjoyable and challenging at the same time.

Engineer Craig Smith was a lifesaver, twice nursing a sick hydro winch to health, once in the middle of Windward Passage on station! We could not have completed the scientific mission without Craig's downright heroic efforts. Steward Amy McKee made it impossible to skip a meal, and made the galley the happenin' place to be. Words cannot describe how well she kept the quality chow flowing (fresh bread almost daily!) and the morale high.

First Assistant John Cooke kept the samples flowing and the laughter emanating from the lab, and made running the lab look easy. Second Assistant Leah Feinberg was always available to help students with their projects, and to guide me through the intricacies of sample flow in the lab. Third Assistant Mike Atkins made it easy to forget this was his first (of many more, I hope) SEA cruise. Mike's imaginative curiosity and energy were infectious.

Visitor Tammy Jackson took no time at all to fit right in as a shipmate. Her research presentation was absolutely inspirational, and helped set a professional tone for all the presentations.

Above all, it was the students who made W-131 such a resounding success. They navigated the ship, collected the data, cooked the food, and tended the engine room, all the while managing to complete their nautical assignments and engineering systems chases, take exams, stay awake in classes, and complete an outstanding group of science projects.

Memories of Monster and Keeper, Jelly, Froggie, Skeeter, Snoop Doggie Dog, Sea-legs, Buffy and all the rest ... whales, porpoises, and dolphinfish who seemed to know when it was time to end class ... sailing off anchor into the sunset after a soiree on the *Cramer* in Port Royal, are what I'm taking home from W-131. The spirit of class W-131 will stay on the *Westward* and make this cruise one that all the rest will have to live up to.

William R. Howard, Ph.D.
Chief Scientist

Itinerary of SSV *WESTWARD* Cruise W-131

Port	Arrive	Depart
West Palm Beach, FL, USA		2/7/94
Montego Bay, Jamaica	2/23/94	2/25/94
Roatan, Honduras	3/7/94	3/9/96
Miami, FL, USA	3/18/94	

Academic Program

A 24-hour science watch was kept throughout the six-weeks of *Westward* cruise W-131. Teams of three students and one science staff member tended the lab and carried out scientific operations during these watches. Students received hands-on training in the use of biological, geological, chemical and physical oceanographic sampling gear and in processing the data. Research data gathered during the cruise was used for individual student projects and for long-term SEA research programs. Routine underway oceanographic observations were made for ongoing projects as well as student projects. Meteorological observations were made and transmitted to the National Oceanographic and Atmospheric Administration. During the last three weeks of the cruise the students themselves acted as science watch leaders with minimal help from the scientific staff. On-watch exercises, and a whole-ship mission to gather data for the U.S. Navy, provided challenges that required the application of both nautical and oceanographic skills and coordination of deck and lab operations.

Formal instruction took the form of lectures given by the science staff and covered a variety of oceanographic topics. Cruise W-131 was the culmination of a twelve-week program in oceanography, beginning with a six-week course on shore in preparation for sea, and two three-week courses at sea. On shore each student carefully planned an independent research project, and carried it out at sea during the cruise. Students summarized their findings in research papers and seminar presentations. Letter grades for the shipboard program are determined by on-watch evaluations, project reports, a laboratory practical examination, and a written midterm examination. The whole program includes eleven credit hours in oceanography.

Scientific Program

This report is intended to document the scientific research program carried out during cruise W-131 of the SSV *Westward.* The cruise track was planned to permit interdisciplinary study of several distinct oceanographic regimes in the southern Sargasso Sea and Caribbean Sea (Figures 1 and 2). Research took the form of data collection for ongoing SEA research programs and individual student projects, though many data sets were used for both. The projects covered a range of physical, chemical, biological, and geological oceanographic topics with the intention of giving students a taste of what scientific study of natural systems (in this case the ocean) is like. In particular, the complex interactions among different oceanic "systems" were emphasized, and became apparent as the cruise progressed and different project data sets were compared. This report only touches upon the highlights of the data. The research summarized in this report represents, in part, ongoing work by individuals and agencies, and these results should not be excerpted or cited without the written permission of the Chief Scientist.

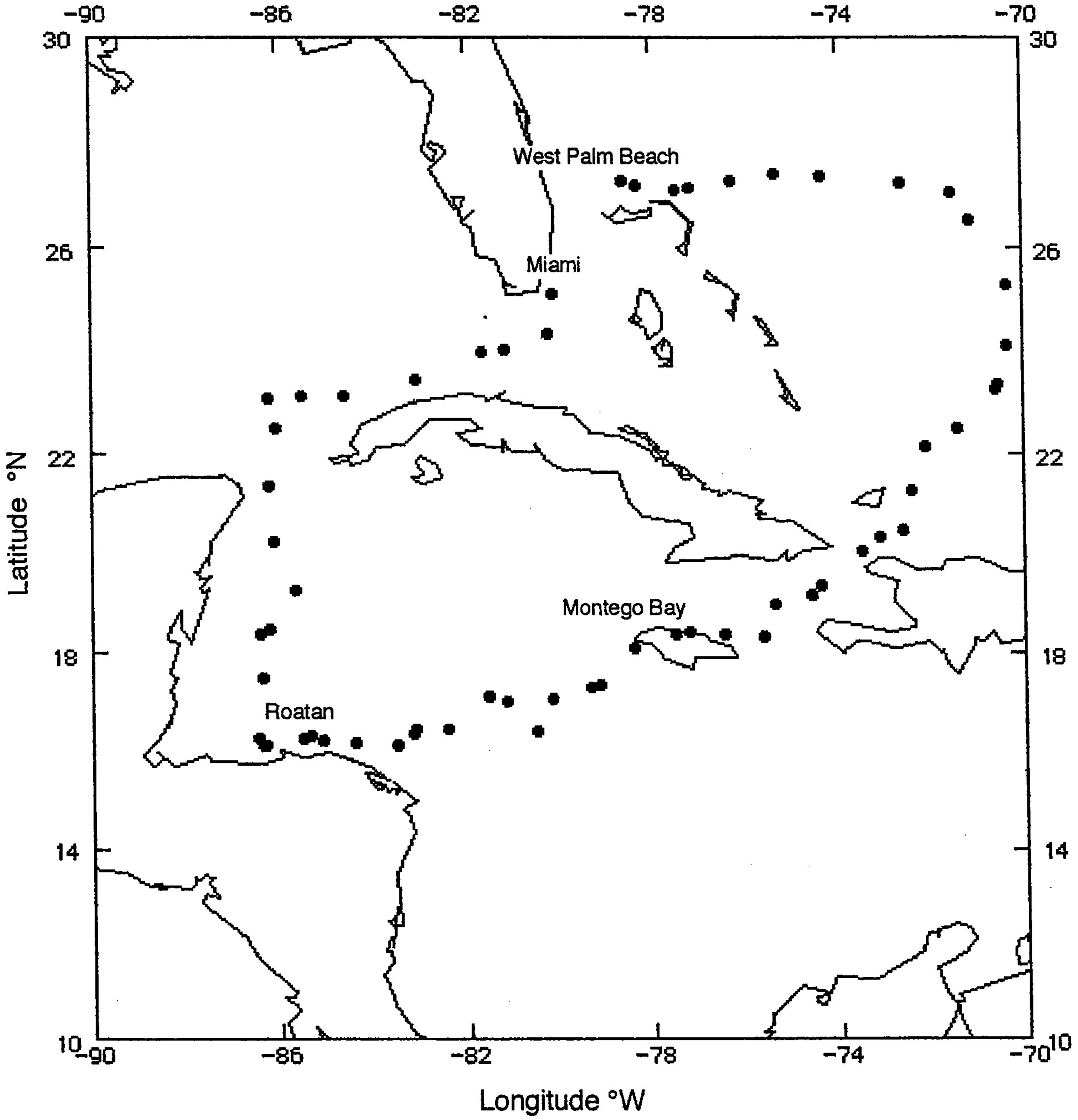


Figure 1. Cruise track of W-131, 2/7/94 – 3/18/94
(midnight and noon positions)

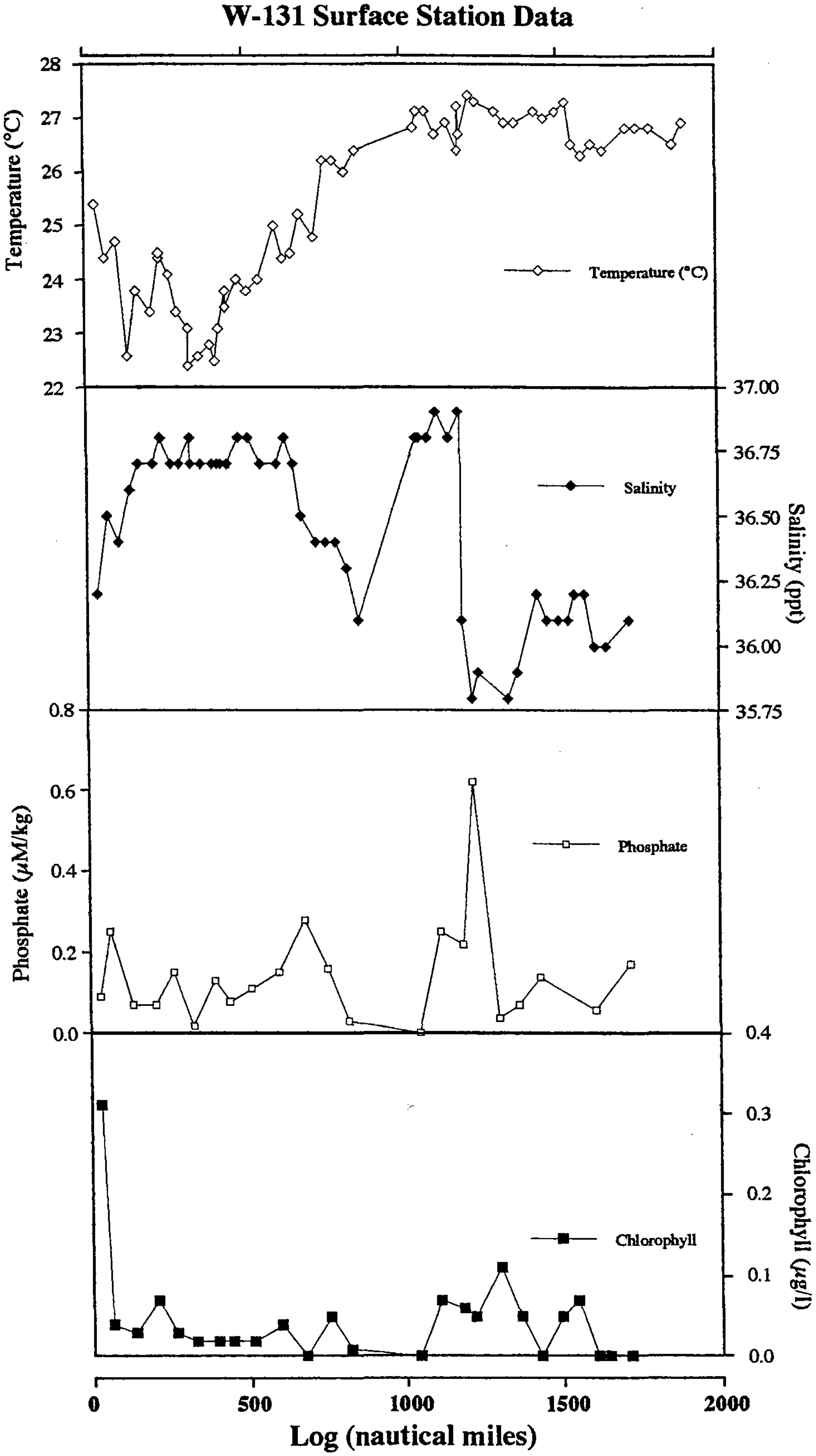


Figure 2. Surface properties along the W-131 cruise track

SSV *Westward* Midnight and Noon Locations, W-131

Date	**Time**	**Latitude (d,m)**		**Longitude (d,m)**		**Log (nm) or location**
08-February-94	0000	26	46.0	80	1.9	Palm Beach, Florida
08-February-94	1200	26	46.0	80	1.9	Palm Beach, Florida
09-February-94	0000	27	18.6	78	32.4	60.5
09-February-94	1200	27	13.2	78	15.0	85.5
10-February-94	0000	27	9.0	77	24.0	122.0
10-February-94	1200	27	11.4	77	4.8	154.5
11-February-94	0000	27	18.0	76	12.6	195.7
11-February-94	1200	27	25.8	75	15.6	246.6
12-February-94	0000	27	25.2	74	18.0	299.3
13-February-94	0000	27	16.8	72	33.6	370.5
13-February-94	1200	27	5.4	71	28.2	432.4
14-February-94	0000	26	33.6	71	5.4	455.0
15-February-94	0000	25	18.6	70	15.6	544.0
15-February-94	1200	24	8.4	70	18.0	616.0
16-February-94	0000	23	22.2	70	30.0	649.1
16-February-94	1200	23	17.4	70	30.6	652.2
17-February-94	0000	22	30.6	71	21.6	706.5
17-February-94	1200	22	9.6	72	4.2	752.0
18-February-94	0000	21	16.8	72	22.2	813.1
18-February-94	1200	20	30.6	72	31.8	852.2
19-February-94	0000	20	22.8	73	3.6	859.9
19-February-94	1200	20	6.0	73	25.8	891.5
20-February-94	0000	19	24.6	74	18.6	946.9
20-February-94	1200	19	13.2	74	31.2	983.2
21-February-94	0000	19	1.8	75	18.0	1024.3
21-February-94	1200	18	21.0	75	34.2	1055.8
22-February-94	0000	18	25.2	76	23.4	1089.0
22-February-94	1200	18	28.2	77	8.4	1022.5
23-February-94	0000	18	41.6	77	45.3	1169.5
23-February-94	1200	18	41.6	77	45.3	Montego Bay
24-February-94	0000	18	41.6	77	45.3	Montego Bay
24-February-94	1200	18	41.6	77	45.3	Montego Bay
25-February-94	0000	18	41.6	77	45.3	Montego Bay
25-February-94	1200	18	41.6	77	45.3	Montego Bay
26-February-94	0000	18	41.6	78	45.3	Montego Bay
26-February-94	1200	18	7.2	78	19.2	1232.9
27-February-94	1200	17	22.2	79	4.8	1290.8
28-February-94	0000	17	21.0	79	16.2	1299.0
28-February-94	1200	17	6.6	80	6.6	1338.4
01-March-94	0000	16	25.8	80	26.4	1385.1
01-March-94	1200	17	3.6	81	6.0	1411.7
02-March-94	0030	17	7.8	81	30.0	1448.1
02-March-94	1200	16	28.2	82	22.8	1501.3
03-March-94	0000	16	27.6	83	4.2	1528.2
03-March-94	1200	16	23.4	83	7.2	1528.8
04-March-94	0000	16	10.2	83	28.2	1566.2
04-March-94	1200	16	11.4	84	22.2	1614.6
05-March-94	0000	16	13.8	85	3.0	1648.0
05-March-94	1200	16	19.8	85	16.2	1665.2

SSV *Westward* Midnight and Noon Locations, W-131

Date	**Time**	**Latitude (d,m)**		**Longitude (d,m)**		**Log (nm) or location**
06-March-94	0000	16	18.0	85	27.0	1690.5
06-March-94	1200	16	9.0	86	14.4	1735.5
07-March-94	0000	16	18.7	86	32.3	Coxen's Hole
07-March-94	1200	16	18.7	86	32.3	Coxen's Hole
08-March-94	0000	16	9.0	86	27.7	1760.1
08-March-94	1200	16	24.7	86	17.3	Port Royal
09-March-94	0000	16	24.7	86	17.3	Port Royal
09-March-94	1200	16	24.7	86	17.3	Port Royal
10-March-94	0000	16	18.0	86	22.2	1823.3
10-March-94	1200	17	30.6	86	16.2	1901.2
11-March-94	0000	18	24.6	86	18.6	1940.8
11-March-94	1200	18	31.2	86	8.4	1963.4
12-March-94	0000	19	16.8	85	34.2	2004.5
12-March-94	1200	20	16.8	86	1.8	2048.5
13-March-94	0000	21	23.4	86	6.6	2100.5
13-March-94	1200	22	31.2	86	0.0	2131.9
14-March-94	0000	23	6.6	86	6.6	2158.5
14-March-94	1200	23	10.2	84	31.8	2226.3
15-March-94	0000	23	10.2	85	27.0	2256.8
15-March-94	1200	23	29.4	83	0.6	2300.0
16-March-94	0000	24	2.4	81	34.2	2335.5
16-March-94	1200	24	4.8	81	5.4	2356.3
17-March-94	0000	24	22.2	80	10.2	2386.9
18-March-94	1200	25	9.6	80	3.0	2440.0
17-March-94	0000	25	46.5	80	6.9	Miami, Florida

Ship's Complement for SSV *Westward* Cruise W-131

Nautical Staff

John Wigglesworth	Captain
Sean Bercaw	First Mate
Robin Walbridge	Second Mate
Virginia Land	Third Mate
Craig Smith	Engineer
Amy McKee	Steward

Scientific Staff

William Howard	Chief Scientist
John Cooke	First Assistant Scientist
Leah Feinberg	Second Assistant Scientist
Michael Atkins	Third Assistant Scientist

Students

Leigh Alford	Cornell University
Basma Ali	Boston College
Katie Church	Connecticut College
Lynette deVries	Colgate University
David Evans	Brown University
Jennifer Fick	Carleton College
Richard Flynn	Eckerd College
William Glennon	University of Northern Colorado
Nan Hazelton	Middlebury College
Matthew Holstein	Dartmouth College
Katherine Hughes	Colorado College
Leslie Johnson	Randolph Macon Women's College
David Kirk	Bates College
Sayzie Koldys	Skidmore College
Michael Mansour	Bowdoin College
John McCabe	Hobart College
Shelley Morse	Middlebury College
Sarah Richer	Mt. Holyoke College
Jack Shaw	Kansas State University
Antonia Simon	International School of Brussels
Shelene Solomon	University of the South
Jessica Speer	Brown University
Christopher Wang	Colgate University
Timothy Weaver	Bates College

Visitors

Tammy Jackson	University of Maine

Student Research Projects

Leigh Alford	Family Myctophidae: Distribution of taxa in water masses north of the Bahamas, the southern Sargasso Sea, and the Caribbean Sea
Basma Ali	Plastic pollution and its effects on marine organisms
Katie Church	18 Degree Water: The key to understanding stratification of the earth's oceans
Lynette deVries and Nan Hazelton	Comparison of sediment composition and grain sizes of Pedro Bank and Rosalind Bank
David Evans	A correlative analysis of sea-surface temperatures and tropical cyclones
Jennifer Fick	Controls on carbonate content of surface sediments at Pedro Bank and Rosalind Bank
Richard Flynn	Water circulation and disruption over the Gaunaja Bank
William Glennon	The distribution of dead and living benthic foraminifera in relation to water column properties at Pedro Bank and Rosalind Bank in the southwestern Caribbean Sea
Matthew Holstein	W-131 bottom profile: Florida Shelf to Little Bahama Bank and Jamaica to Guanaja Bank
Katherine Hughes	Pelagic macrotar distribution in the southern Sargasso Sea and Caribbean Sea in relation to past data and Marpol 5 legislation
Leslie Johnson	A study of the motile macrofauna diversity of *Sargassum* communities based on clump size and geographic condition
David Kirk	Apparent oxygen utilization (AOU) in comparison with phosphate and oxygen concentrations in the southern Sargasso and Caribbean Seas
Sayzie Koldys	The distribution of *Panulirus argus* in the Caribbean and Sargasso Seas
Michael Mansour	Distribution of *Trichodesmium* in relation to phosphate, surface salinity, and surface temperature
John McCabe	The velocity and direction of the Cayman Current and its relation to sea-surface topography
Shelley Morse	Comparison of phytoplankton distribution in the surface water and chlorophyll maximum of the Sargasso Seas

Sarah Richer	Changes in chlorophyll-*a* and phosphate levels due to the effects of Guanaja Bank
Jack Shaw	Spatial and vertical distribution of phosphate in the Caribbean and Sargasso Seas: Implications for carbon distribution
Antonia Simon	Population densities of the ciguatera-causing dinoflagellate *Gambierdiscus toxicus*
Shelene Solomon	The inconspicuous multitude: A comprehensive analysis of the zooplankton of Sargasso and Caribbean Seas
Jessica Speer	An analysis of the Deep Chlorophyll Maximum in the Caribbean and Sargasso Seas
Christopher Wang	The search for AAIW: An analysis of CTD data on the W-131 cruise track
Timothy Weaver	Size distribution and abundance of leptocephali in the southern Sargasso and Caribbean Seas

Oceanography Lectures at sea

Date	Topic	Speaker
February		
9	BT Deployment/Interpretation	Cooke
10	Niskin Bottle Demo	Staff
11	Winkler Titration Chemistry	Cooke
14	The Antilles Current	Howard
15	Neuston Creatures	Feinberg
16	Sound in the Ocean	Howard
17	Ocean Waves	Howard
18	Marine Plants	Atkins
21	Phytoplankton	Atkins
28	Scientific Papers and Data Presentation	Howard
March		
1	Laboratory Practical Exam	Staff
2	Coral Reef Ecology	Cooke
11	Tracers of Deep Ocean Circulation	Howard
12	Project Presentations	Students
14	Project Presentations	Students
15	Project Presentations	Students

Research Summary

The cruise track of W-131 covered three main oceanographic transects: from West Palm Beach passing north of Little Bahama Bank and east to about 71 degrees West, then southward to the Caicos Passage, and through the Windward Passage to the first port stop in Montego Bay, Jamaica. Lack of research clearances prevented us from sampling in the Windward Passage. From Jamaica the cruise track went west over Pedro and Rosalind Banks on the Nicaragua Rise. A strong cold front blew us off Explorer Seamount before we could complete a transect of the overlying waters. A carbonate bank east of Guanaja Island in the Honduran Bay Islands was chosen for a study of island (previously seamount) mass effects after a futile search for Niobe Seamount. On the final track from Roatan to Miami, little scientific sampling was done as students worked on their reports, and we waited to exit Cuban and Mexican waters where we had no research clearances. A whole-ship mission, handing the ship the over to students for a two-day project requiring them to find and sample (using CTD, Niskin bottle, meter net, and phytoplankton net) a 25 square-nautical-mile transect near Key West, then use the Gulf Stream to get the ship to Miami, capped off the scientific mission, and exemplified the synergy between science and deck operations that characterized the entire trip. The multidisclipinary nature of the science program on W-131 is embodied in the scope of results of the students' final science projects, proudly summarized below.

In biological oceanography, a study of the leptocephalus (eel) larvae found a random distribution of larval sizes throughout the cruise track, which took us close to the presumed spawning grounds of the Anguilliform eels and presumably, smaller larvae (Tim Weaver). Myctophid fishes showed greater diversity in the Sargasso Sea than in the Caribbean or Bahamas regions, and revealed possible "indicator" species for distinguishing Sargasso Sea myctophid faunas from Caribbean and Bahamian regions (Leigh Alford). Most of the phyllosoma larvae (of the spiny lobster *Panulirus argus*) sampled during W-131 were found near the Bahamas, all in late stages of development, with relatively few caught in the Caribbean (Sayzie Koldys). A study of zooplankton diversity and biomass revealed a greater density of organisms caught in neuston tows in the Sargasso Sea than in the Caribbean, with a greater density in Caribbean subsurface meter-net tows, and greater faunal diversity overall in the Sargasso Sea (Shel Solomon). The diversity of motile macrofauna associated with *Sargassum* weed clumps appears to be independent of temperature, salinity, and clump volume (Leslie Johnson).

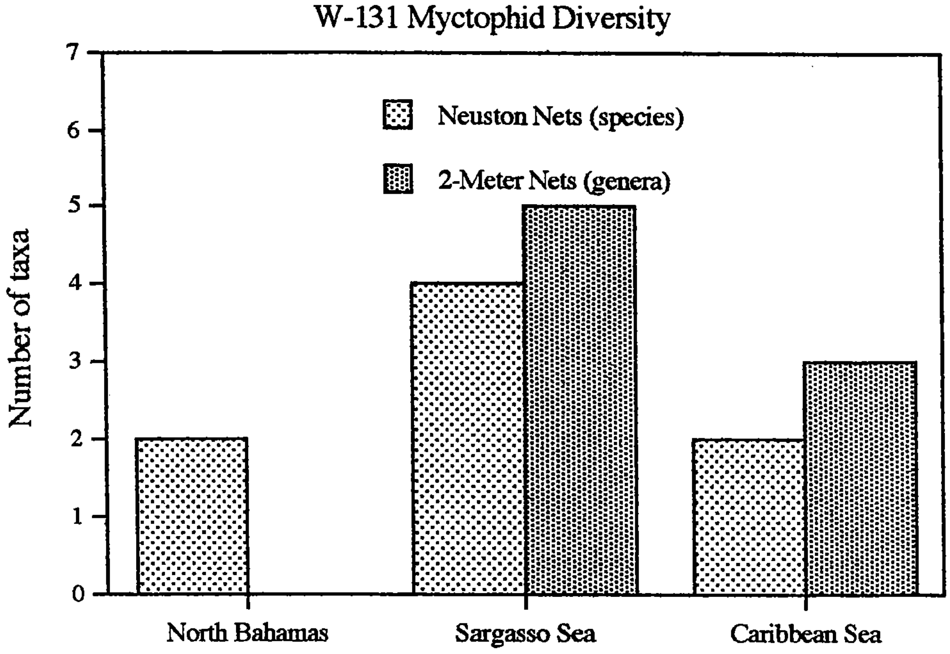


Figure 3. Diversity of myctophid fishes in three regions sampled on the W-131 track.

The distribution of the cyanobacter (blue-green alga) *Trichodesmium* suggests temperature and salinity optimal ranges higher than previously published studies had indicated, and a tendency towards higher abundances in low-phosphate waters (Michael Mansour). A study of the vertical distribution of phytoplankton communities showed that they tended to be dominated by dinoflagellates in surface waters and by diatoms near the depths of deep chlorophyll maxima (Shelley Morse).

Marine pollution-related studies included a survey of pelagic macrotar which showed an extremely patchy distribution of tar and concentrations lower than any year since 1982. Questions remain whether this decrease is due to uneven spatial and temporal distributions or to the positive effects of marine pollution legislation (Katherine Hughes). A study of the effects of plastic on marine organisms found that plastics mainly interact by providing encrusting surfaces for bryozoa and algae, though this finding does not necessarily imply a beneficial relationship between the pollutant and the biota (Basma Ali). A search for *Gambierdiscus toxicus*, the dinoflagellate implicated in the fish poisoning disease ciguatera, yielded none in Jamaica or Roatan, perhaps due to our sampling during a low in the annual cycle of *G. toxicus* abundance (Antonia Simon).

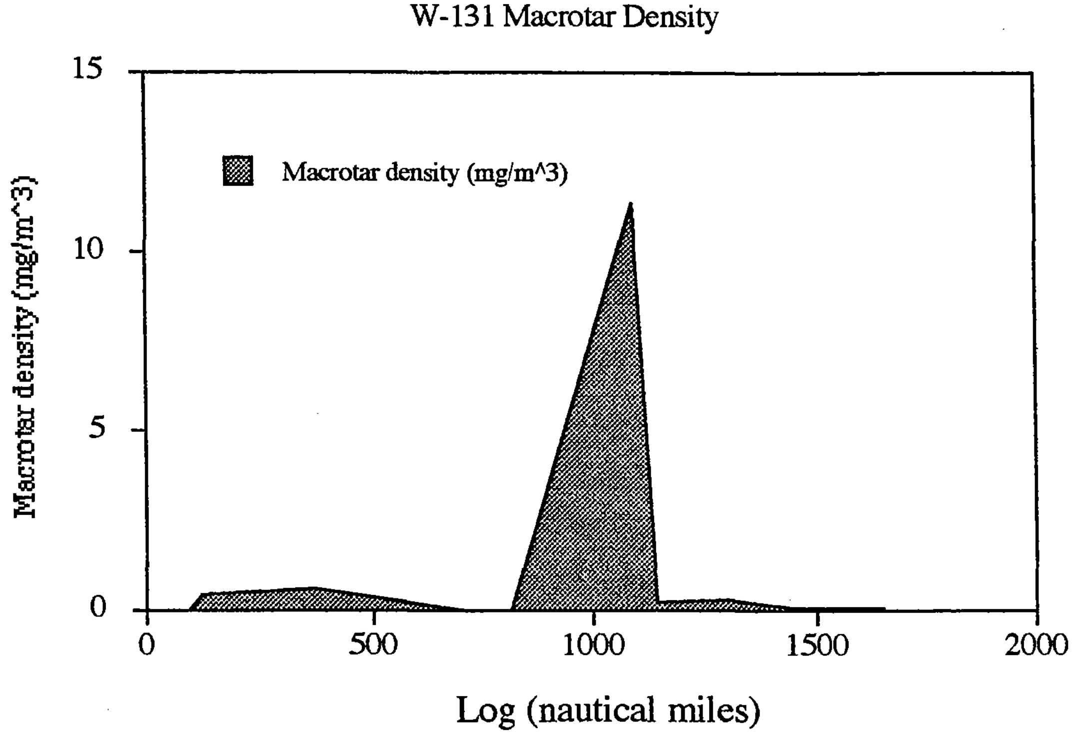


Figure 4. Surface macrotar distribution along the W-131 cruise track.

Two chemical oceanographic studies compared phosphate and oxygen concentrations in surface and deep waters along the W-131 track. Phosphate concentrations were near-zero in surface waters, increasing with depth to maxima at intermediate depths (Figure 5). The coupled constraints of phosphate and Apparent Oxygen Utilization (AOU) provide a means of estimating the nutrient-mediated partitioning of carbon (the "biological pump") between surface and deep waters (Jack Shaw). AOU distribution was similar to phosphate, together suggesting that Antarctic Intermediate Water (AAIW) could be traced into the Caribbean as an AOU maximum (Figure 5), and the suggestion that lower-than-expected (from Redfield ratio considerations) AOU:P ratios may indicate a greater role for ammonia oxidation in the Caribbean than Sargasso Sea (David Kirk). Pronounced deep chlorophyll maxima found in most of the stratified waters we sampled appear to be comprised of actively photosynthesizing phytoplankton communities (FIgure 6), based on the associations among chlorophyll, oxygen-AOU, and phosphate distributions at stations along the W-131 track (Jessica Speer). Shallower deep chlorophyll maxima with higher concentrations on the downcurrent side of Guanaja Island suggest that its interaction with current results in upwelling and higher productivity, a result supported by higher phytoplankton abundance (Sarah Richer).

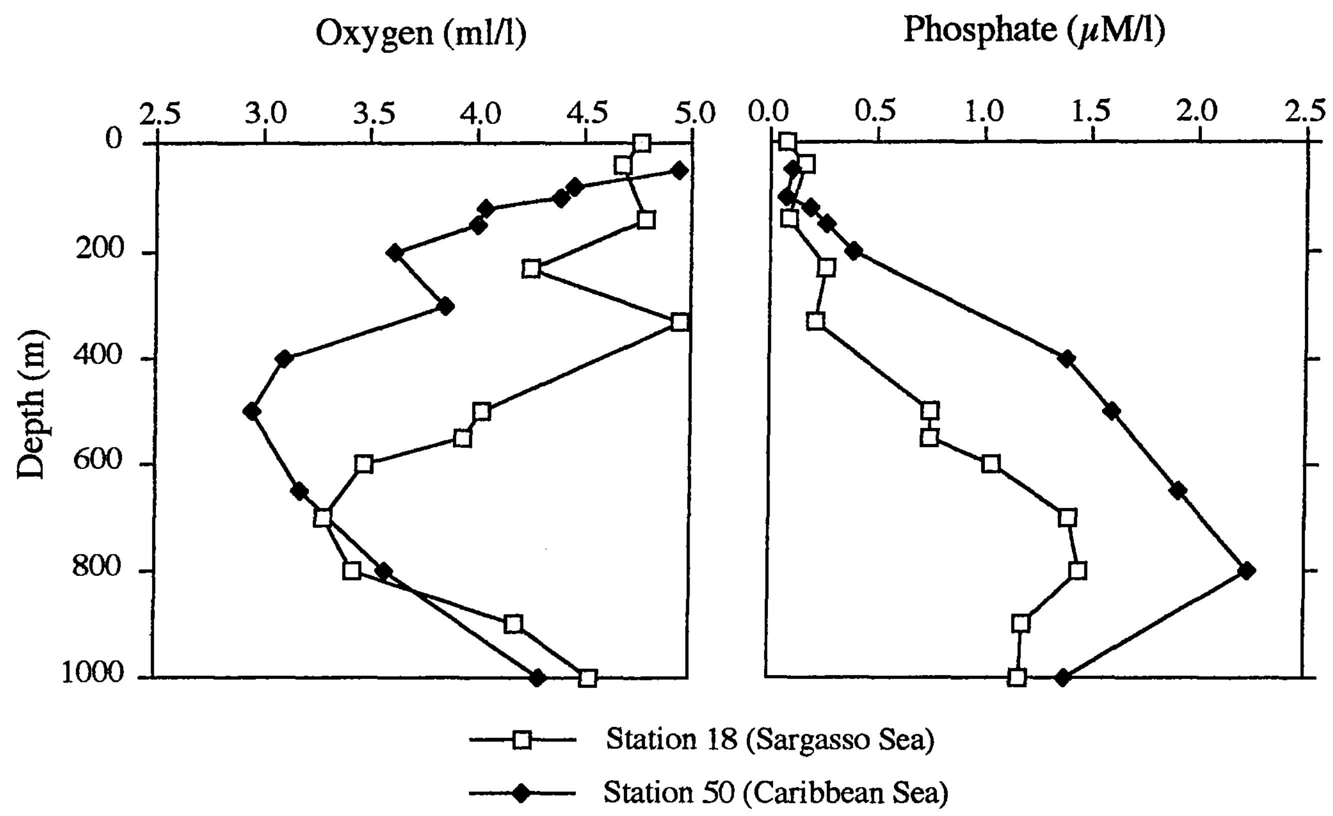
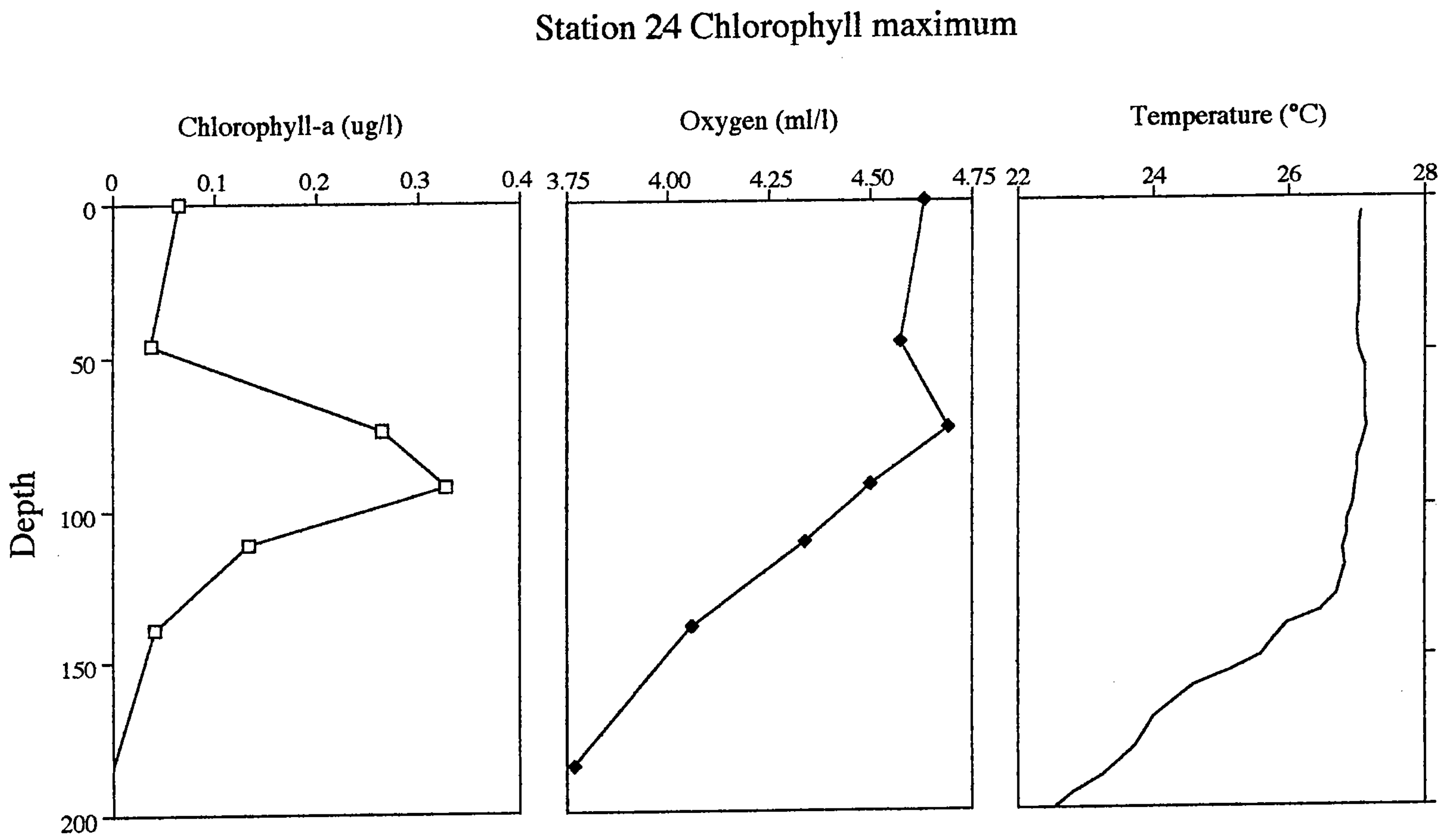


Figure 5. Phosphate and dissolved oxygen concentrations at Stations 18 (Sargasso Sea) and 50 (western Caribbean Sea). The higher phosphate concentrations at Station 50 at about 800 meters reflect, in part, greater proportions of Antarctic Intermediate Water in the Caribbean than North Atlantic.



Station 24 Chlorophyll maximum

Figure 6. Deep chlorophyll maximum (DCM) at Station 24 (north of Jamaica). The DCM occurs just above the base of the mixed layer (sharp decrease in temperature at about 130 meters). The slight oxygen maximum in the DCM suggests that the chlorophyll may be produced by an actively photosynthesizing pytoplankton population.

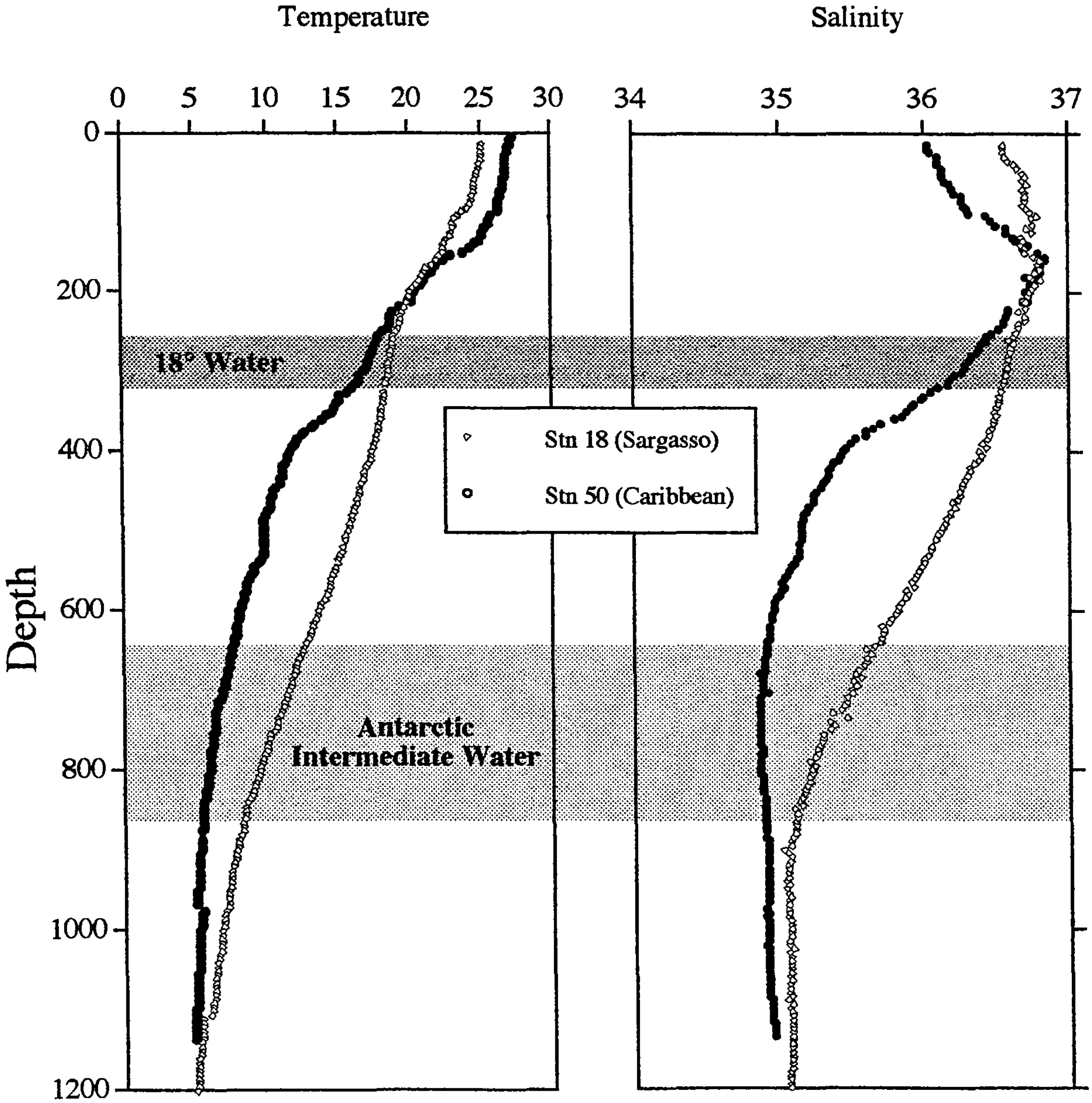


Figure 7. Temperature and salinity profiles in the Sargasso and Caribbean, showing 18° Water in the Sargasso Sea (thermostad, or layer of little temperature change with depth), and Antarctic Intermediate Water in the Caribbean (salinity minimum between about 650 and 850 meters).

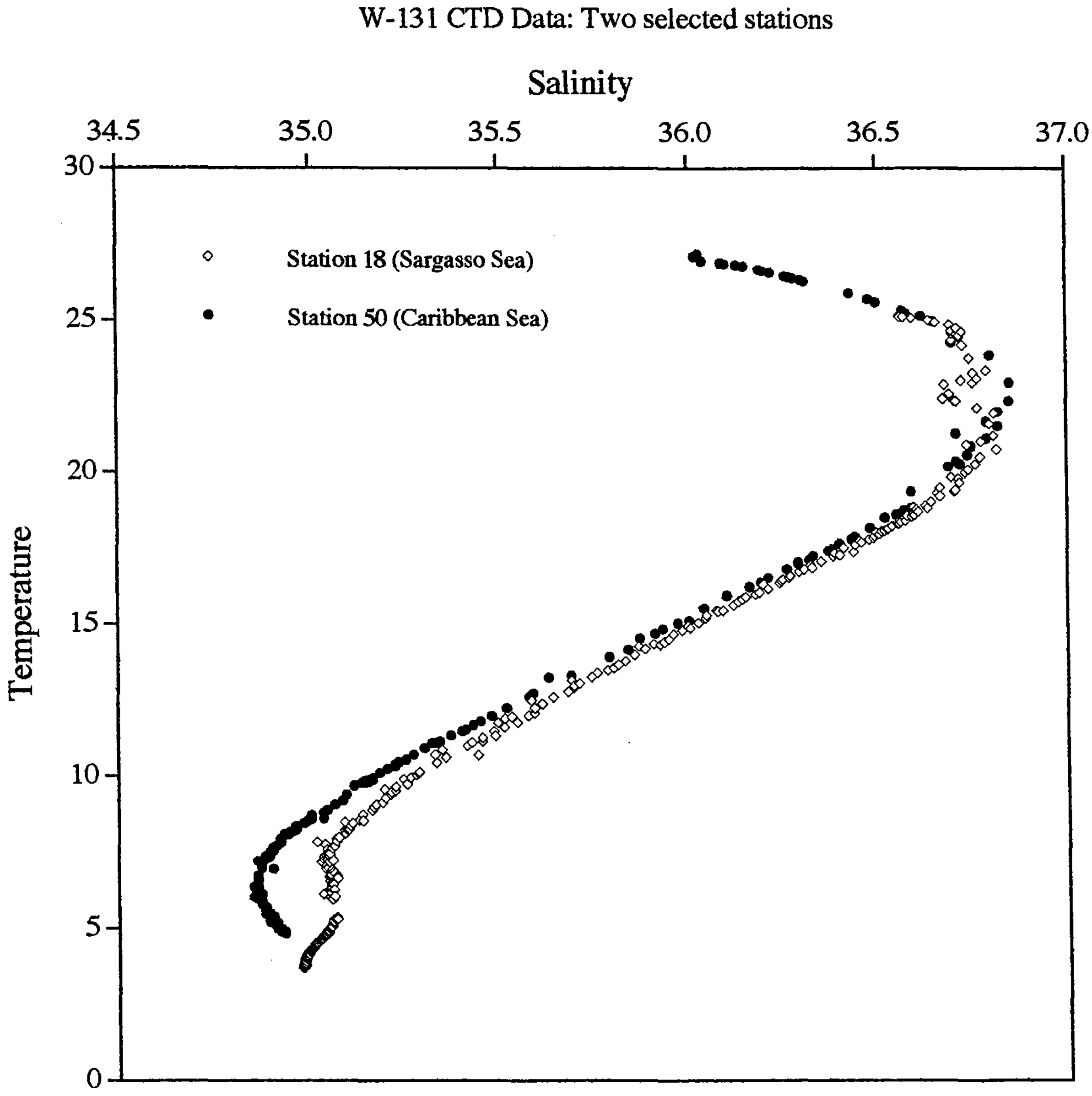


Figure 8. Temperature-salinity diagram for Sargasso and Caribbean Sea stations. Salinity minimum in the Caribbean indicates presence of Antarctic Intermediate Water.

In physical oceanography, Katie Church tracked 18° Water from the Sargasso Sea into the Caribbean Sea by its temperature, salinity, and oxygen characteristics, and found its distinct signature disappearing between Jamaica and Roatan (Figure 7). We may have found little 18° Water because we were sampling this "mode water" at its oldest and weakest during the yearly cycle, or because little was produced during the mild winter of 1992-1993. A study of CTD (conductivity-temperature-depth) data by Chris Wang found Antarctic Intermediate Water (recognized as a salinity minimum) in the southernmost Sargasso and Caribbean Sea, a finding confirmed by phosphate and AOU data (Figure 8). The relative geostrophic velocities of the Cayman Current between Jamaica and Explorer Seamount ranged from 0.16 to 0.37 meters/second to the northwest at the surface (Figure 9), with an intriguing southeasterly countercurrent near Jamaica (John McCabe).

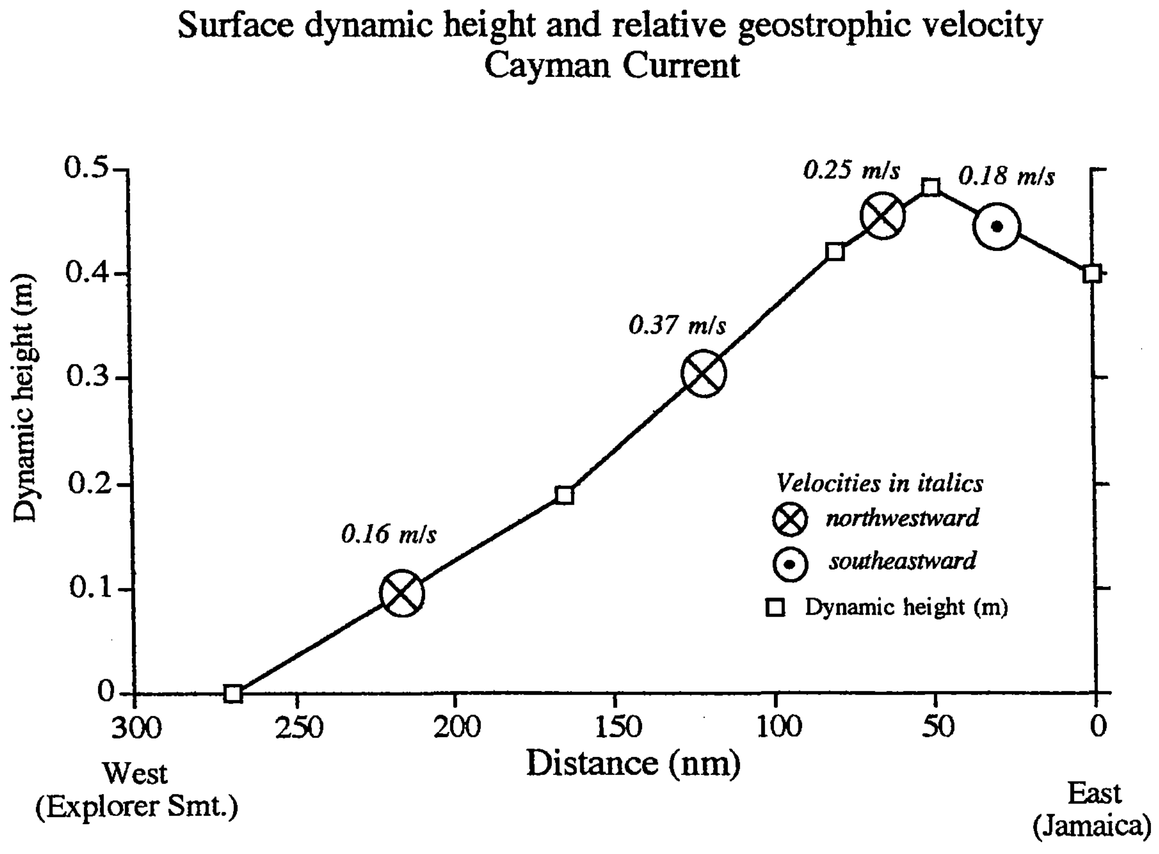

Surface dynamic height and relative geostrophic velocity
Cayman Current

Figure 9. Dynamic topography and surface velocities of the Cayman Current between Jamaica and Explorer Seamount.

A study which integrated surface temperature observations with bathythermograph (BT) and CTD profiles to study the thermal structure of the near-surface waters found warmest surface temperature (SST) associated with deep mixed layers (Syd Evans). In addition, a comparison between bucket SSTs and those measured by a hull-mounted sensor on the hull suggest a slightly lower bucket SST. This small offset may be a reflection of a lower "skin" temperature at the air-sea interface. A study of the effects of Guanaja Island on water-column structure showed slightly shallower near-surface isotherms on the down-current side of the island which, in conjunction with the chlorophyll profiles, suggest some island-induced upwelling (Rich Flynn).

Two surface sediment transects were completed using a Shipek grab sampler (and some Fisher scoops at banktops) on the northwestern flanks of Pedro and Rosalind Banks (a winch breakdown forced us to abort a similar transect on the northern flank of Little Bahama Bank). A joint study (by Lynette deVries and Happy Hazelton) of sedimentary components in size fractions greater than 350 microns found sediments at 300 to 900 meters on Pedro and Rosalind Banks to be dominated by algal fragments, foraminifera (benthic and planktonic), and pteropods. The same study found larger grain sizes at Pedro Bank at about 300 meters, with the Rosalind Bank sediments dominated by grains less than 63 microns at these water depths. At greater depths Pedro Bank sediments were more skewed toward smaller grains, whereas Rosalind Bank appeared to have more even sorting. The difference between the banks may be due to proximity to different terrigenous sources (such as Jamaica) or redistribution by currents (such as the countercurrent found by John McCabe). Jenny Fick's research on the carbonate content of these sediments revealed a minimum in bulk percent carbonate at both Pedro and Rosalind Banks at 500 meters water depth. It is not clear how the balance of carbonate supply, dissolution by water-column and pore-water chemistry, and dilution by terrigenous sediments all interact to produce this feature. Bill Glennon's study of the distribution of living and dead benthic foraminifera showed a maximum in the ratio of living to dead forams at about 500 meters at Rosalind Bank and about 750 meters at Pedro Bank. The maxima were associated with dissolved oxygen minima in the nearby water column - an intriguing and unexpected result. Matt Holstein's project on the echo character of the seabed (though a dead line scan recorder left us echo-less between Little Bahama Bank and Jamaica) revealed a variety of seabed features including: a wedge of post-glacial Holocene sediment (probably deposited after the post-glacial rise of sea level) on the flank of Little Bahama Bank, possible submarine canyons on the Florida shelf, and hyperbolic echoes indicating rough topography off the north coast of Jamaica, near the tectonically active Cayman Trough. Indistinct echoes with sub-bottom reflectors on Pedro Bank were consistent with the large-grain, high-carbonate sediments found in Shipek grabs.

Appendix A. W-131 Station Summary

STATION	DATE	TIME	LOG	LATITUDE	LONGITUDE	LOCALE	EQUIPMENT DEPLOYED
1a	09-Feb-94	0012	62.3	27.30	78.53	NW LITTLE BAHAMA BANK	Neuston
1b	09-Feb-94	0053	62.3	27.30	78.53	NW LITTLE BAHAMA BANK	Neuston
2	09-Feb-94	0950	81.4	27.25	78.23	N. OF LITTLE BAHAMA BANK	Shipek Grab
3	09-Feb-94	1318	89.2	27.19	78.25	N. OF LITTLE BAHAMA BANK	Fisher Scoop
4	09-Feb-94	1327	89.5	27.19	78.26	N. OF LITTLE BAHAMA BANK	Fisher Scoop
5	09-Feb-94	1332	89.6	27.18	78.26	N. OF LITTLE BAHAMA BANK	Fisher Scoop
6	09-Feb-94	1335	89.7	27.18	78.26	N. OF LITTLE BAHAMA BANK	Fisher Scoop
7	09-Feb-94	1558	96.5	27.21	78.18	N. OF LITTLE BAHAMA BANK	Neuston
8	10-Feb-94	0015	122.8	27.15	77.39	N. OF LITTLE BAHAMA BANK	Neuston
9	10-Feb-94	0933	154.0	27.17	77.06	N. OF LITTLE BAHAMA BANK	CTD
9	10-Feb-94	1036	154.0	27.18	77.07	N. OF LITTLE BAHAMA BANK	Phytoplankton Net
9	10-Feb-94	1036	154.0	27.18	77.70	N. OF LITTLE BAHAMA BANK	Hydrocast
10	10-Feb-94	2246	195.8	27.30	76.19	SARGASSO SEA	CTD
11	12-Feb-94	0014	299.3	27.42	74.29	SARGASSO SEA	Meter Net
12	12-Feb-94	1145	329.3	27.36	73.49	SARGASSO SEA	CTD
12	12-Feb-94	1145	329.5	27.36	73.49	SARGASSO SEA	Hydrocast
13	13-Feb-94	0014	371.0	27.27	72.54	SARGASSO SEA	Neuston
14	14-Feb-94	0030	458.0	26.57	71.09	SARGASSO SEA	Meter Net
15a	14-Feb-94	1021	495.6	26.25	70.42	SARGASSO SEA	CTD
15a	14-Feb-94	1021	495.6	26.25	70.42	SARGASSO SEA	Hydrocast
15a	14-Feb-94	1050	495.6	27.36	70.42	SARGASSO SEA	Phytoplankton Net
15b	14-Feb-94	1218	495.6	26.25	70.42	SARGASSO SEA	CTD
15b	14-Feb-94	1305	495.6	26.25	70.42	SARGASSO SEA	Hydrocast
16	14-Feb-94	1218	495.7	26.25	73.49	SARGASSO SEA	Phytoplankton Net
17	16-Feb-94	0410	649.1	23.35	70.48	SARGASSO SEA	Meter Net
18a	16-Feb-94	0752	650.3	23.32	70.48	SARGASSO SEA	CTD
18a	16-Feb-94	0838	650.3	23.31	70.48	SARGASSO SEA	Hydrocast
18b	16-Feb-94	0953	650.3	23.31	70.48	SARGASSO SEA	CTD
18b	16-Feb-94	1030	650.3	23.31	70.48	SARGASSO SEA	Phytoplankton Net
18b	16-Feb-94	1020	650.3	23.30	70.48	SARGASSO SEA	Hydrocast
19	16-Feb-94	2232	700.9	22.50	71.31	S.SARGASSO SEA	Meter Net
20	17-Feb-94	0045	706.1	22.51	71.35	CAICOS PASSAGE	Neuston
21	17-Feb-94	0800	738.0	22.29	72.00	CAICOS PASSAGE	CTD
22	18-Feb-94	0040	814.6	21.27	72.37	CAICOS PASSAGE	Neuston

Appendix A. W-131 Station Summary

STATION	DATE	TIME	LOG	LATITUDE	LONGITUDE	LOCALE	EQUIPMENT DEPLOYED
23	18-Feb-94	2105	858.5	20.38	73.01	CAICOS PASSAGE	Phytoplankton Net
23	18-Feb-94	1955	859.0	20.38	73.01	CAICOS PASSAGE	CTD
23	18-Feb-94	1955	859.0	20.38	73.01	CAICOS PASSAGE	Hydrocast
24a	21-Feb-94	0737	1055.5	18.38	75.54	N OF FORMIGAS BANK	CTD
24a	21-Feb-94	0850	1055.5	18.37	75.54	N OF FORMIGAS BANK	Hydrocast
24a	21-Feb-94	0726	1055.5	18.39	75.54	N. OF FORMIGAS BANK	Phytoplankton Net
24b	21-Feb-94	1030	1055.5	18.36	75.57	N. OF FORMIGAS BANK	Phytoplankton Net
25	22-Feb-94	0002	1089.0	18.42	76.39	N. OF JAMAICA	Neuston
26	22-Feb-94	0900	1120.5	18.51	77.53	N. OF JAMAICA	CTD
26	22-Feb-94	0940	1120.5	18.51	77.53	N. OF JAMAICA	Phytoplankton Net
26	22-Feb-94	0900	1120.5	18.51	77.53	N. OF JAMAICA	Hydrocast
27	22-Feb-94	1547	1140.3	18.43	77.27	N. OF JAMAICA	Neuston
28	22-Feb-94	2234	1127.9	18.44	77.44	N. OF JAMAICA	Meter Net
29	23-Feb-94	0000	1169.2	18.42	77.45	N. OF JAMAICA	Meter Net
31	27-Feb-94	0200	1273.0	17.43	78.49	PEDRO BANK	Meter Net
32	27-Feb-94	0230	0.0	17.35	78.54	PEDRO BANK	Shipek Grab
33	27-Feb-94	0310	1282.3	17.35	78.54	PEDRO BANK	Shipek Grab
34	27-Feb-94	0510	1285.6	17.35	79.00	PEDRO BANK	Shipek Grab
35	27-Feb-94	0640	1290.8	17.38	79.03	PEDRO BANK	Shipek Grab
39	27-Feb-94	1934	1298.2	17.39	79.22	PEDRO BANK	CTD
39	27-Feb-94	2000	1298.2	17.38	79.23	PEDRO BANK	Phytoplankton Net
39	27-Feb-94	1934	1298.2	17.39	79.22	PEDRO BANK	Hydrocast
40	28-Feb-94	0007	1299.0	17.35	79.27	W. OF PEDRO BANK	Neuston
42	28-Feb-94	2100	1376.7	16.47	80.38	ROSALIND BANK	Fisher Scoop
43	28-Feb-94	2230	1378.5	16.46	80.40	ROSALIND BANK	Fisher Scoop
44	28-Feb-94	2310	1380.3	16.54	80.42	ROSALIND BANK	Fisher Scoop
45	01-Mar-94	0445	1396.3	16.54	80.56	ROSALIND BANK	Shipek Grab
46	01-Mar-94	0517	1396.3	16.54	80.56	ROSALIND BANK	Shipek Grab
47	01-Mar-94	0751	1402.2	16.59	81.01	ROSALIND BANK	Shipek Grab
48	01-Mar-94	0947	1406.5	17.02	81.05	ROSALIND BANK	Shipek Grab
49	01-Mar-94	1156	1411.7	17.07	81.10	ROSALIND BANK	Shipek Grab
50	01-Mar-94	1600	1421.1	17.18	81.20	W OF ROSALIND BANK	CTD
50	01-Mar-94	1600	1421.1	17.18	81.20	W OF ROSALIND BANK	Hydrocast
51	02-Mar-94	1235	1448.2	17.13	81.50	W OF ROSALIND BANK	Neuston

Appendix A. W-131 Station Summary

STATION	DATE	TIME	LOG	LATITUDE	LONGITUDE	LOCALE	EQUIPMENT DEPLOYED
52	02-Mar-94	1800	1524.7	16.43	83.02	EXPLORER SEA MT ST.1	CTD
52	02-Mar-94	1800	1524.7	16.44	83.02	EXPLORER SEA MT ST.1	Hydrocast
53	02-Mar-94	2235	1527.2	15.27	83.06	EXPLORER SEA MT ST.1	CTD
53	02-Mar-94	2235	1527.2	16.47	83.06	EXPLORER SEA MT ST.2	Hydrocast
54	05-Mar-94	0036	1641.2	16.24	85.06	W. CARIBBEAN SEA	Neuston
54	05-Mar-94	0036	1648.2	16.24	85.06	W. CARIBBEAN SEA	Neuston
55	05-Mar-94	1844	1681.8	16.26	85.41	GUANAJA BANK	Phytoplankton Net
56	05-Mar-94	1925	1682.0	16.24	85.41	GUANAJA BANK	CTD
56	05-Mar-94	1925	1682.0	16.24	85.41	GUANAJA BANK	Hydrocast
57	05-Mar-94	2250	1690.5	16.30	85.44	GUANAJA BANK	CTD
57	05-Mar-94	2345	1690.5	16.30	85.45	GUANAJA BANK	Phytoplankton Net
57	05-Mar-94	2250	1690.5	16.30	85.44	GUANAJA BANK	Hydrocast
58	06-Mar-94	0228	1697.5	16.35	85.50	GUANAJA BANK	CTD
58	06-Mar-94	0230	1697.5	18.55	85.45	GUANAJA BANK	Phytoplankton Net
58	06-Mar-94	0220	1697.5	16.35	85.50	GUANAJA BANK	Hydrocast
59a	06-Mar-94	0510	1700.0	16.36	85.52	GUANAJA BANK	CTD
59a	06-Mar-94	1700	1700.0	16.36	85.53	GUANAJA BANK	Hydrocast
59a	06-Mar-94	0420	1700.0	16.37	85.52	GUANAJA BANK	Phytoplankton Net
59b	06-Mar-94	0510	1700.0	16.37	85.52	GUANAJA BANK	Phytoplankton Net
60	16-Mar-94	0550	2344.0	23.04	81.35	SE KEY WEST	CTD
60	16-Mar-94	0550	2344.0	23.04	81.35	SE KEY WEST	Phytoplankton Net
60	16-Mar-94	0615	2344.0	23.03	81.35	SE KEY WEST	Hydrocast
61	16-Mar-94	0713	2344.3	24.04	81.31	SE KEY WEST	Meter Net

Appendix B. W-131 Bathythermograph Stations

Station	Date	Time	Log	Latitude	Longitude	Surface Temp.
BT-001	08-Feb-94	1510	13.3	26.59	79.47	25.7
BT-002	08-Feb-94	1635	22.3	27.08	79.37	25.6
BT-003	08-Feb-94	1845	33.0	27.18	79.26	25.2
BT-004	08-Feb-94	2045	43.0	27.25	79.14	25.3
BT-005	08-Feb-94	2235	54.0	27.30	79.02	24.2
BT-006	09-Feb-94	0230	67.3	27.29	78.44	24.6
BT-007	10-Feb-94	0428	136.6	27.15	77.24	22.9
BT-008	11-Feb-94	0350	207.8	27.35	76.11	23.4
BT-009	11-Feb-94	1732	267.0	27.43	75.04	24.1
BT-010	12-Feb-94	0950	329.0	27.36	73.49	22.3
BT-011	13-Feb-94	0515	393.7	27.22	72.26	22.8
BT-012	13-Feb-94	1745	444.5	27.06	71.33	23.5
BT-013	16-Feb-94	1745	681.0	23.09	71.13	25.5
BT-014	17-Feb-94	1236	755.6	22.11	72.08	26.3
BT-015	18-Feb-94	0337	825.8	21.17	72.40	25.8
BT-016	18-Feb-94	1329	853.8	20.49	72.54	26.5
BT-017	21-Feb-94	0537	1049.1	18.44	75.49	26.8
BT-018	22-Feb-94	0645	1113.6	18.49	77.06	26.7
BT-019	26-Feb-94	1054	1227.1	18.18	78.29	27.0
BT-020	28-Feb-94	0404	1308.0	17.30	79.41	26.9
BT-021	28-Feb-94	2044	1371.5	16.52	80.37	26.8
BT-022	01-Mar-94	2045	1431.0	17.19	81.34	27.1
BT-023	02-Mar-94	1030	1495.5	16.48	82.34	27.1
BT-024	02-Mar-94	1710	1523.3	16.44	83.00	27.4
BT-025	04-Mar-94	1053	1611.2	16.17	84.32	26.9
BT-026	04-Mar-94	1500	1622.8	16.20	84.47	26.8
BT-027	04-Mar-94	1648	1627.9	16.20	84.53	26.4
BT-028	05-Mar-94	1614	1681.3	16.26	85.41	26.6
BT-029	06-Mar-94	0130	1693.3	16.33	85.47	26.4
BT-030	06-Mar-94	0915	1718.8	16.21	86.08	26.8
BT-031	07-Mar-94	2200	1751.0	16.10	86.31	26.8
BT-032	09-Mar-94	1955	1797.2	16.12	86.33	26.5
BT-033	10-Mar-94	0115	1831.5	16.39	86.36	26.7
BT-034	15-Mar-94	1300	2304.5	23.54	83.00	25.5
BT-035	15-Mar-94	1810	2322.6	24.01	82.29	25.6
BT-036	16-Mar-94	0425	2342.3	24.05	81.38	25.8
BT-037	16-Mar-94	0945	2448.5	24.05	81.18	26.0

Appendix C. W-131 Hydrocast Data Summary

Station	Bottle #	Target Depth (m)	Temp. (°C)	Salinity (o/oo)	Phosphate (μM/kg)	Chl-a (μg/kg)	Oxygen (ml/l)
9	1	500	15.9	36.2	0.722		4.36
9	2	450	17.0	36.4	0.297		4.48
9	3	400	17.8	36.5	0.398		4.78
9	4	350	18.0	36.5	0.238		4.82
9	5	300	18.3	36.1	0.215	0.003	4.92
9	6	250	18.5	36.6	0.135	0.004	4.96
9	7	200	18.8	36.6	0.220	0.005	4.76
9	8	150	20.2	36.7	0.126	0.052	4.69
9	9	100	21.8	36.7	0.032	0.095	4.81
9	10	50	22.7	36.6	0.139	0.277	4.99
9	11	0	23.3	36.5	0.163	0.093	4.91
12	1	1000	6.7	35.1	1.346		4.41
12	2	500	17.2	36.4	0.389		4.36
12	3	400	18.1	36.5	0.334		4.98
12	4	350	18.4	36.6	0.235		5.03
12	5	300	18.5	36.6	0.191		4.86
12	6	200	18.8	36.6	0.121	0.004	5.01
12	7	150	19.2	36.6	0.107	0.023	4.75
12	8	120	19.8	36.7	0.169	0.140	4.75
12	9	100	20.5	36.7	0.121	0.109	4.69
12	10	80	21.1	36.7	0.315	0.207	5.09
12	11	50	21.6	36.6	0.196	0.050	5.03
12	12	0			0.027	0.038	5.03
015A	1	1200	4.9	35.0	1.229		5.66
015A	2	1000	5.6	35.1	1.115		4.78
015A	3	900	6.4	35.1	1.389		4.30
015A	4	800	7.3	35.1	1.317		3.86
015A	5	700	9.1	35.2	1.181		3.80
015A	6	650	10.2	35.3	0.869		3.63
015A	7	600	11.4	35.0	1.164		3.63
015A	8	550	12.4	35.6	1.088		3.77
015A	9	500	13.2	35.7	0.524		3.83
015A	10	450	13.9	35.0	0.759		4.25
015A	11	400	14.9	36.0	7.999		3.96
015A	12	350	15.8	36.1	0.484		3.97
015B	1	400	15.2	36.0	0.572		4.24
015B	2	350	16.1	36.2	0.487		4.04
015B	3	320	16.7	36.3	0.421		4.37
015B	4	300	17.4	36.4	0.224		4.53
015B	5	280	18.3	36.6	0.182		4.33
015B	6	250	19.1	36.6	0.144	0.002	4.51
015B	7	220	19.5	36.7	0.083	0.032	4.53
015B	8	200	19.8	36.7	0.183	0.009	4.19
015B	9	150	20.6	36.7	0.121	0.061	4.36
015B	10	100	21.8	36.6	0.169	0.154	5.03
015B	11	50	22.9	36.7	0.125	0.044	5.09
015B	12	0	24.2	36.8	1.802	0.027	4.90

Appendix C. W-131 Hydrocast Data Summary

Station	Bottle #	Target Depth (m)	Temp. (°C)	Salinity (o/oo)	Phosphate (μM/kg)	Chl-a (μg/kg)	Oxygen (ml/l)
018A	1	550	14.2	35.9	0.750		3.93
018A	2	330	18.0	36.5	0.205		4.95
018A	3	230	19.2	36.7	0.262	0.005	4.25
018A	4	140	22.4	36.7	0.077	0.060	4.78
018A	5	40	25.0	36.6	0.154	0.036	4.67
018A	6	0	25.1	36.6	0.069	0.032	4.76
018B	7	1000	5.3	35.1	1.167		4.53
018B	8	900	6.7	35.1	1.181		4.18
018B	9	800	7.9	35.1	1.442		3.42
018B	10	700	9.7	35.2	1.390		3.28
018B	11	600	11.9	35.5	1.027		3.47
018B	12	500	14.4	35.9	0.748		4.02
23	1	1000	7.0	35.1	1.412		3.50
23	2	800	8.8	35.1	1.390		3.28
23	3	600	12.5	35.6	1.669		3.44
23	4	500	13.9	35.9	0.933		3.67
23	5	400	16.0	36.2	0.957		3.85
23	6	300	18.0	36.5	0.308	0.001	3.91
23	7	200	21.7	36.9		0.006	4.69
23	8	150	23.4	36.8		0.070	4.79
23	9	100	26.0	36.5	0.110	0.108	5.15
23	10	80	26.3	36.4	0.143	0.091	4.92
23	11	60	26.5	36.3	0.183	0.066	4.84
23	12	0	27.1	36.1	0.036	0.035	4.84
24	1	1000	5.8	34.9	1.482		3.57
24	2	800	7.8	35.0	1.486		3.17
24	3	500	13.6	35.8	0.880		3.30
24	4	400	16.2	36.2	0.694		3.99
24	5	300	19.1	36.6			
24	6	200	23.5	36.8	0.205	0.000	3.77
24	7	150	26.8	36.3	0.147	0.042	4.06
24	8	120	26.8	36.2	0.041	0.134	4.34
24	9	100	27.0	36.2		0.326	4.50
24	10	80	27.0	36.0	0.158	0.264	4.69
24	11	50	27.0	35.8	0.158	0.039	4.57
24	12	0	27.0	36.8	0.000	0.065	4.63
26	1	1000	5.0	35.0	1.445		4.74
26	2	800	5.9	34.9			3.73
26	3	700	6.2	34.9			3.39
26	4	500	6.4	34.8	1.196		3.32
26	5	300	6.5	34.8	0.717		3.46
26	6	250	6.7	34.9	0.572	0.000	3.99
26	7	200	7.3	34.9	0.378	0.000	3.80
26	8	150	8.3	35.1	0.464	0.000	4.07
26	9	120	9.4	35.2	0.257	0.000	3.94
26	10	100	13.5	35.8	0.083	0.000	4.16
26	11	80	18.6	36.6	0.209	0.003	4.03

Appendix C. W-131 Hydrocast Data Summary

Station	Bottle #	Target Depth (m)	Temp. (°C)	Salinity (o/oo)	Phosphate (μM/kg)	Chl-a (μg/kg)	Oxygen (ml/l)
26	12	50	23.0	36.9	0.147	0.002	4.15
39	1	950	5.6	34.9	1.887		3.63
39	2	750	7.8	34.9	1.916		3.06
39	3	650	9.2	35.2	1.639		3.04
39	4	450	14.5	35.9	0.767		3.72
39	5	350	17.3	36.4	0.489		4.06
39	6	250	21.3	36.9	0.203		4.27
39	7	150	26.6	36.2		0.113	4.44
39	8	100	26.8	35.9	0.214	0.260	4.41
39	9	70	27.0	35.9	0.067	0.164	4.61
39	10	50	27.0	35.8	0.102	0.061	4.72
39	11	30	27.0	35.8		0.063	4.63
50	1	1000	5.2	34.9	1.381		4.30
50	2	800	6.1	34.9	2.226		3.57
50	3	650	7.9	34.9	1.901		3.17
50	4	500	9.9	35.2	1.600		2.95
50	5	400	12.0	35.5	1.377		3.10
50	6	300	17.1	36.3	9.999		3.84
50	7	200	20.6	36.7	0.383	0.029	3.61
50	8	150	24.3	36.7	0.261	0.035	4.00
50	9	120	25.6	36.5	0.177	0.168	4.03
50	10	100	26.3	36.3	0.072	0.157	4.38
50	11	80	26.4	36.3		0.375	4.45
50	12	50	26.8	36.1	0.093	0.241	4.93
52	1	1000	5.1	34.7			4.46
52	2	800	5.4	34.9	1.998		3.87
52	3	600	7.4	34.9			2.93
52	4	500	8.7	35.0	1.798		3.05
52	5	300	13.8	35.8	1.707		3.25
52	6	200	16.8	36.3	0.570		3.61
52	7	150	20.1	36.7	0.659		3.69
52	8	100	24.6	36.7	0.140	0.172	3.77
52	9	80	26.1	36.5	0.173	0.535	3.91
52	10	60	27.1	36.0	0.013	0.183	4.38
52	11	40	27.2	36.0	0.072	0.130	4.53
52	12	20	27.4	36.0	0.072	0.089	5.01
53	1	200	17.8	36.4	0.477	0.001	
53	2	150	20.3	36.7	0.203	0.107	
53	3	100	24.6	36.8	0.256	0.236	
53	4	80	27.0	36.0	0.069	0.274	
53	5	60	27.1	36.0	1.066	0.117	
53	6	40	27.2	36.0	0.064	0.080	
53	7	20	27.3	36.0	0.000	0.058	
56	1	200	17.4	36.4	0.589	0.002	
56	2	150	19.4	36.7	0.458	0.025	
56	3	100	23.6	36.8	0.109	0.045	
56	4	80	25.6	36.5	0.074	0.277	

Appendix C. W-131 Hydrocast Data Summary

Station	Bottle #	Target Depth (m)	Temp. (°C)	Salinity (o/oo)	Phosphate (µM/kg)	Chl-a (µg/kg)	Oxygen (ml/l)
56	5	60	26.8	36.0	0.004	0.453	
56	6	40	26.8	36.0	0.078	0.174	
56	7	20	26.8	36.0	0.110	0.109	
57	1	200	17.7	36.4	0.402	0.000	
57	2	150	19.2	36.6	0.355	0.003	
57	3	100	23.3	36.7	0.154	0.145	
57	4	80	25.4	36.6	0.247	0.239	
57	5	60	26.8	36.1	0.004	0.153	
57	6	40	26.8	36.1	0.135	0.140	
57	7	20	26.8	36.1	0.023	0.169	
58	1	200	17.7	36.4	0.513	0.003	
58	2	150	19.9	36.7	0.207	0.011	
58	3	100	22.9	36.8	0.300	0.191	
58	4	80	25.6	36.5	0.042	0.228	
58	5	60	26.8	36.1	0.023	0.082	
58	6	40	26.8	36.1	0.125	0.150	
58	7	20	26.8	36.1	0.008	0.146	
59	1	200	17.7	36.4	0.387	0.000	
59	2	150	20.1	36.7	0.334	0.001	
59	3	100	24.2	36.8	0.125	0.306	
59	4	80	26.2	36.4	0.067	0.255	
59	5	60	26.7	36.1	0.135	0.114	
59	6	40	26.7	36.1	0.028	0.084	
59	7	20	26.7	36.1	0.083	0.114	
60	1	300	15.4	36.0			3.39
60	2	225	18.4	36.5			3.67
60	3	175	19.4	36.7			3.57
60	4	150	21.5	36.8			3.72
60	5	125	23.9	36.8			3.85
60	6	100	25.6	36.4			4.22
60	7	75	26.3	36.1			4.84
60	8	50	26.3	36.1			4.72
60	9	25	26.3	36.1			4.84

Appendix D. W-131 Surface Station Summary

Station	Date	Time	Log	Latitude	Longitude	SST	Salinity	Phosphate	Chlorophyll
SS-001	08-Feb-94	1800	29.5	27.15	79.30	25.4	36.2	0.09	0.31
SS-002	08-Feb-94	2358	60.5	27.31	78.54	24.4	36.5	0.25	0.04
SS-003	09-Feb-94	1718	100.5	27.22	78.12	24.7	36.4		
SS-004	10-Feb-94	0318	132.9	27.15	77.28	22.6	36.6	0.07	0.03
SS-005	10-Feb-94	1400	161.9	27.20	76.59	23.8	36.7		
SS-006	11-Feb-94	0315	205.8	27.34	76.13	23.4	36.7	0.07	0.07
SS-007	11-Feb-94	0925	231.5	27.46	75.42	24.4	36.8		
SS-008	11-Feb-94	1000	235.0	27.46	75.35	24.5			
SS-009	11-Feb-94	1700	265.3	27.43	75.07	24.1	36.7	0.15	0.03
SS-010	11-Feb-94	2342	293.0	27.42	74.30	23.4	36.7		
SS-011	12-Feb-94	0830	327.0	27.36	73.53	23.1	36.8		
SS-012	12-Feb-94	0900	328.2	27.36	73.51	22.4	36.7	0.02	0.02
SS-013	12-Feb-94	0915	329.0	27.36	73.50	22.4	36.7		
SS-014	12-Feb-94	2000	356.7	27.32	73.20	22.6	36.7		
SS-015	13-Feb-94	0500	393.7	27.23	72.27	22.8	36.7	0.13	0.02
SS-016	13-Feb-94	0825	412.0	27.18	72.06	22.5	36.7		
SS-017	13-Feb-94	1000	420.1	27.14	71.58	23.1	36.7		
SS-018	13-Feb-94	1345	440.5	27.06	71.39	23.8	36.7		
SS-019	13-Feb-94	1500	442.0	27.08	71.37	23.5	36.7	0.08	0.02
SS-020	14-Feb-94	0525	479.0	26.41	70.54	24.0	36.8		
SS-021	14-Feb-94	1800	508.3	26.06	70.35	23.8	36.8	0.11	0.02
SS-022	14-Feb-94	2315	544.0	25.31	70.26	24.0	36.7		
SS-023	15-Feb-94	0900	597.6	24.33	70.22	25.0	36.7	0.15	0.04
SS-024	15-Feb-94	1340	625.5	24.05	70.35	24.4	36.8		
SS-025	16-Feb-94	0200	649.1	23.37	70.48	24.5	36.7		
SS-026	16-Feb-94	1700	677.0	23.17	71.10	25.2	36.5	0.28	0.00
SS-027	17-Feb-94	0500	722.8	22.41	71.50	24.8	36.4		
SS-028	17-Feb-94	1215	752.0	22.16	72.07	26.2	36.4	0.16	0.05
SS-029	17-Feb-94	1730	783.0	21.55	72.27	26.2	36.4		
SS-030	18-Feb-94	0300	822.0	21.20	72.39	26.0	36.3	0.03	0.01
SS-031	18-Feb-94	1200	855.5	20.51	72.53	26.4	36.1		
SS-032	21-Feb-94	0500	1046.6	18.46	75.47	26.8	36.8	0.00	0.00
SS-033	21-Feb-94	1200	1055.5	18.36	75.57	27.1	36.8		
SS-034	21-Feb-94	2100	1081.3	18.33	76.29	27.1	36.8		
SS-035	22-Feb-94	0700	1113.6	18.49	77.06	26.7	36.9	0.25	0.07
SS-036	22-Feb-94	1800	1149.6	18.36	77.34	26.9	36.8		
SS-037	23-Feb-94	0600	1182.8	18.35	77.55	26.4	36.9		0.06
SS-038	24-Feb-94	1600	1186.8	18.31	77.56	27.2		0.22	
SS-039	26-Feb-94	0245	1191.0	18.30	78.01	26.7	36.1		
SS-040	26-Feb-94	0954	1221.0	18.22	78.23	27.4	35.8	0.62	0.05
SS-041	26-Feb-94	1540	1242.0	18.10	78.39	27.3	35.9		
SS-042	28-Feb-94	0200	1302.0	17.32	79.32	27.1		0.04	0.11
SS-043	28-Feb-94	1140	1337.0	17.13	80.10	26.9	35.8		
SS-044	28-Feb-94	1930	1366.8	16.56	80.35	26.9	35.9	0.07	0.05
SS-045	01-Mar-94	2030	1431.0	17.19	81.33	27.1	36.2	0.14	0.00
SS-046	02-Mar-94	0400	1461.9	17.05	82.01	27.0	36.1		
SS-047	02-Mar-94	1030	1495.5	16.48	82.32	27.1	36.1		0.05
SS-048	02-Mar-94	2030	1525.0	16.44	83.01	27.3	36.1		

Appendix D. W-131 Surface Station Summary

Station	Date	Time	Log	Latitude	Longitude	SST	Salinity	Phosphate	Chlorophyll
SS-049	03-Mar-94	1900	1550.0	16.22	83.31	26.5	36.2		0.07
SS-050	04-Mar-94	0330	1579.9	16.13	83.59	26.3	36.2		
SS-051	04-Mar-94	1100	1611.2	16.17	84.32	26.5	36.0	0.06	0.00
SS-052	04-Mar-94	2320	1646.6	16.47	83.06	26.4	36.0		0.00
SS-053	06-Mar-94	0900	1717.8	16.21	86.07	26.8	36.1	0.17	0.00
SS-054	07-Mar-94	2200	1751.0	16.10	86.31	26.8			
SS-055	09-Mar-94	1930	1794.1	16.14	86.30	26.8			
SS-056	10-Mar-94	0620	1865.0	17.13	86.32	26.5			
SS-057	10-Mar-94	1100	1895.5	17.45	86.27	26.9			

Appendix E. W-131 Neuston Data Summary

Station	Surface temp. (°C)	Tow distance (m)	Zooplankton biomass (g)	Macrotar (g)	Plastic (pieces)	Plastic (pellets)	*S. fluitans* (g)	*S. natans* (g)	*Phyllosoma* (no.)	*Linuche* (no.)
1A	24.4	1796	22.0	0.00	0	0	0.0	0.0	0	0.00
1B	24.4	1852	7.0	0.00						
7	24.7	370	2.0	0.00	1	0	0.0	0.0	0	0.00
8	22.7	1852	36.0	0.75	16	0	0.0	0.0	4	0.00
13	22.7	1852	17.0	1.00	17	0	60.0	350.0	7	0.00
20	24.4	1852	5.0	0.00						
22	26.1	1852	3.0	0.00		0	52.0	70.0	1	0.00
25	26.9	1852	35.0	20.95		3	2400.0	0.0	0	
27	27.1	1852	7.0	0.31	2		0.0	0.0	0	0.00
40	27.0	1852	32.0		3	1	0.9	0.9	0	0.00
51	27.1	1852	11.0	0.45	0	0	0.0	0.0	0	0.00
54	26.8	1852	23.0	0.01	0	0	0.0	0.0	2	0.00
54	26.8	1852	23.0	0.10	0	0	0.0	0.0	2	0.00

Appendix F. W-131 Sediment Sampling Summary

STATION	Type	LOCALE	Depth (m)	Qualitative description
2	Shipek grab	N. Little Bahama Bank	600	Foraminiferal/Pteropod Ooze
3	Fisher scoop	N. Little Bahama Bank	33	Fine grained sand/Coral fragments
4	Fisher scoop	N. Little Bahama Bank	23	Fine grained sand/Coral fragments
5	Fisher scoop	N. Little Bahama Bank	15	Fine grained sand/Coral fragments
6	Fisher scoop	N. Little Bahama Bank	13	Fine grained sand/Coral fragments
32	Shipek grab	Pedro Bank	270	Coarse sand/Halimeda
33	Shipek grab	Pedro Bank	530	Foraminiferal/Pteropod Ooze
34	Shipek grab	Pedro Bank	742	Foraminiferal/Pteropod Ooze
35	Shipek grab	Pedro Bank	900	Foraminiferal/Pteropod Ooze
42	Fisher scoop	Rosalind Bank	31	Coarse sand/Halimeda
43	Fisher scoop	Rosalind Bank	28	Coarse sand/Halimeda
44	Fisher scoop	Rosalind Bank	28	Coarse sand/Halimeda
45	Shipek grab	Rosalind Bank	322	Coarse sand/Halimeda
46	Shipek grab	Rosalind Bank	335	Foraminiferal/Pteropod Ooze
47	Shipek grab	Rosalind Bank	506	Foraminiferal/Pteropod Ooze
48	Shipek grab	Rosalind Bank	703	Foraminiferal/Pteropod Ooze
49	Shipek grab	Rosalind Bank	905	Foraminiferal/Pteropod Ooze