R/V Atlantic Explorer 1918
Cruise Report
July 25th, 2019

Report prepared by Leocadio Blanco Bercial

Report available at:

Biological and Chemical Oceanography Data Management Office
Woods Hole Oceanographic Institution
Woods Hole, MA 02543
http://bcodmo.org/

NSF project #OCE-1829318 (PIs: Maas, Blanco Bercial) and #OCE-1829378 (Tarrant)

"Collaborative Research: Diel physiological and vertical migratory rhythms in a tropical oceanic copepod"

Cruise report AE1918 (July 25th, 2019) – science party only. Leocadio Blanco-Bercial (chief scientist).

This cruise was dedicated to the NSF ship inspection for the RV Atlantic Explorer (NSF OCE). Sea time was provided as an opportunity for science to occur during the cruise, giving the observers a better sense of the interaction between the personnel of the RVAE and the science party. The National Science Foundation's 2019 ship inspection of R/V Atlantic Explorer was funded through a combination of the NSF's contract with Jamestown Marine Services, Ship Operations R/V Atlantic Explorer Cooperative Agreement (#OCE-1822492) and Oceanographic Technical Services, Bermuda Institute of Ocean Sciences grant (OCE#-1823636).

As such, we took the opportunity to carry out two oceanographic sampling activities (a CTD cast and a MOCNESS net tow) that provided new data for the NSF grant *Diel physiological rhythms in a tropical oceanic copepod* NSF BIO-OCE #1829318. A significant part of this grant is carried out using plankton samples taken from 100 m depth, at a station placed in relatively deep water (>1000 m) in the vicinity of Bermuda (Station Leo: 32.3330 N, 64.5532 W). To date, however, we lacked any hydrographic data or vertical distribution of the zooplankton from this site. With the sampling provided, we have information about both the hydrography and the daytime vertical distribution of the zooplankton at station Leo.

This opportunity was also used as a learning experience for the students from the BIOS Marine Plankton Ecology course 2019, as well as a Woods Hole Oceanographic Institution intern from the Woods Hole Partnership Education Program (PEP). The TA for the course had recently finished his Master at the Skidaway Institute of Oceanography (University of Georgia) and gained new sampling experience during the cruise. In total, this sea-going time provided a unique experience for 11 oceanography-oriented students from seven countries (Table 1), during which they observed how science is done at sea on an oceanographic vessel – experience that only two of them have had before.

Table 1. Science party during the RVAE1918.

Last Name	First Name	Citizenship	Affiliation
Blanco Bercial	Leocadio	Spain	BIOS - Chief Scientist
Antonaki	Danai	Greece	University of London - Student
Busby	Emma	UK	University of St Andrews - Student
Carbone	Dylan	UK	Swansea University - Student
Fletcher	Leigh	USA	John Hopkins University - Student
Godfrey	Jessica	Bermuda	Newcastle University - Student
Gu	Baoxuan	China	University of Southampton - Student
Smith	Maisie	UK	University of Exeter - Student
Villiot	Naomi	France	Heriot-Watt University - Student
Fernandez Zapata	Braulio	Chile	University of Concepcion - Student
Duffy	Patrick	USA	BIOS - TA
Milton	Isaiah	USA	Hampton University - WHOI intern

The RVAE departed St Georges at 8:30 for station Leo. After arrival, some tests were carried out as part of the NSF inspection. After the tests, a CTD cast was launched at 10:01 (local time). The CTD was taken to 700 m. This cast was also used for the NSF inspection to test the emergency stop for the winch. The CTD profile (Figure 1) showed a very shallow mixed layer (less than 40 m), and a DCM at about 100 m

(extending from 75 to about 150 m). Some bottles were closed at 50 m to ensure the carrousel worked (not for science). The CTD cast finished at 10:51 local time.

After the CTD, a MOCNESS deployment was done around 11:30. The deployment ran very smoothly, but at approximately 40 m depth, the deck box lost contact with the Seabird 9. The MOCNESS was brought back to deck (with the nets trailing after the boat). After turning back on the deck box, the fuse blew up. Switching to the new deck box and changing how the termination was set in the net solved the problems, and the net was redeployed in the water (11:50 local time). The net was taken to 600 m depth with no problem.

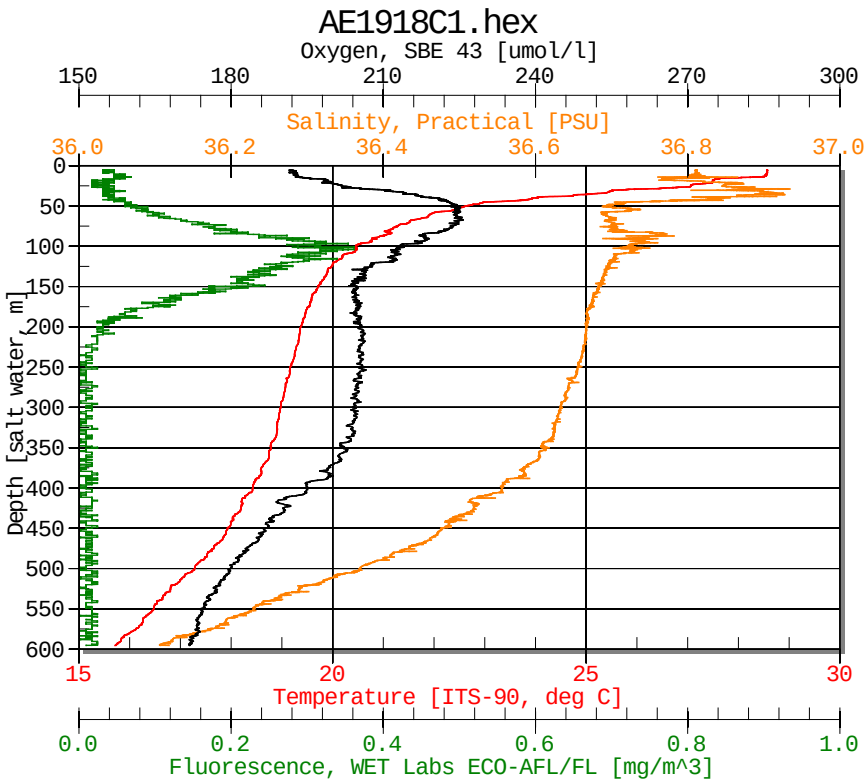

Figure 1. CTD profile at Station Leo. The DCM was located at ~ 100 m depth. The MLD was ~ 13 m, meanwhile a slightly higher salinity layer was found from surface to ~ 40 m.

It was noticed that there were very high speeds recorded for the net (horizontal velocity) despite an apparent low speed on the boat (almost 0 ground speed due to the current). A new recalibration of the flow meter might be needed, since the flow meter, after frequent use, might now be experiencing less friction. We cannot then trust the volume filtered, and a new estimate should be done before analyzing the data. (Processed files at BCO-DMO have been corrected for the new calibration).

We solved this problem by ignoring horizontal speed reads (that were likely around double of what they should read), and maintaining vertical speeds between 7 and 12. Ship speed was kept between 0.8 and 1.5 kn, and winch speed was about 5 m/min for the deeper layers, increasing gradually to ~15 m/min near the surface. All nets closed properly, and no problems were observed at any time (Figure 2). The nets were closed at 600-500-400-300-200-150-75-40-0 m (Figure 2). Recovery was very smooth (13:45

local time – 2 hours wire time), the cod ends were washed with the sea water hose and taken to the Aft Lab using buckets.

Once in the lab, all samples were split once with half of the sample preserved in ethanol 95% and the other half preserved in 4 % buffered formalin in sea water. The students collaborated in this activity, helping with the splitting. Not much biomass was observed at any depth, except for in the surface (0-40 m, net 8) were there were abundant salps (unknown species). Two relatively intact siphonophores were also found in two of the intermediate depths. After splitting, formalin and borax were added to all samples and the ethanol samples were moved to the freezer. The nets and electronics were taken out of the MOCNESS at the end of the day, then washed and taken to dry.

Figure 2. Nets depths, angle, flow counts and volume for the MOCNESS tow. Volumes seemed too high for the towing conditions. Corrections were made for the processed data files.

The RVAE docked at BIOS @16:30.

The next two pages are the logs for the CTD deployment and the MOCNESS sampling.

ROSETTE LOG SHEET | **Data Filename:** AE1918C1 .HEX

Cruise Name: NSF	**Type of Cast:**	**Cast Number:** 1
AE Cruise: AE 19	**Station:** LEO	**Depth of Cast:** 700 m

CTD	Time [z]	Date [z]	Latitude	Longitude
Turn on:	1301	2019 Jul 25	32° 20.012 N	64° 33.215 W
Turn off:	1352	2019 Jul 25	32° 20.40 N	64° 33.05 W

Marine Tech(s) on watch: | **BATS Tech(s) on watch:**

Wind Speed [kts]: 17	**Humidity [%]:** 73	**Sea State:** 4
Wind Direction [°]: 185°	**Precipitation [mm]:** 29	**Swell [ft]:** 3-4
Gusts [kts]: 22	**Baro. Pressure [mb]:** 1022	**Wind Waves [ft]:**
SPP [W/m2]: 689.7	**UW SBE-38 Temp [°C]:** 28.023	**Cloud Cover:** 0 / 8
Air Temp [°C]: 29.9°C	**UW Salinity:** 36.843	**Sounder Depth [m]:** —

Niskin # on Rosette	Niskin # on SeaSave	Desired Depth [m]	Actual Depth [m]	Time Fired [z]	Temperature at bottle fire [°C]	Remarks
1	24	50	50.1	134455	23.195	
2	23		50.0	134437	23.237	
3	22		49.9	134421	23.274	
4	21		49.7	134356	23.204	
5	20		49.8	134333	23.216	
6	19		50.0	134302	23.153	
7	18		50.0	134252	23.151	
8	17		50.0	134238	23.127	
9	16		49.9	134221	23.134	
10	15		49.7	134117	23.107	
11	14		50.0	134052	22.987	
12	13		50.0	134039	22.939	
13	12		50.0	133920	22.936	
14	11		50.0	133844	22.907	
15	10		50.0	133816	22.862	
16	9		50.0	133736	22.885	
17	8		50	133717	22.807	
18	7		50.0	133640	22.862	
19	6		50.0	133526	22.864	
20	5		50.0	133423	22.863	
21	4		49.9	133310	22.862	
22	3		49.8	133240	22.881	
23	2		50.0	133220	22.884	
24	1		50.0	133150	22.883	

PAR Sensor: ON / OFF	**MLD [m]:**	**STMW?:**
ADCP [m/s & dir.]:	**DCM [m]:**	**OMZ [m]:**

Comments:

AE1918_M17

MOCNESS DATA SHEET: ~~Zooplankton Diel Rhythms Project~~

AE1918

Cruise ~~AE1910~~ **Location** ~~HYDRO~~ LEO **Tow #** 1

Date (dd/mm/yy) 25/07/19 **Wind (knots)** 10-15 **Direction** _____

Sea State 1.5 m

Location station Leo (vicinity of)

Time 11:50 local **Lat:** 32 19.249N **Long:** 64 33.138

Start: Time out 13:45 **End:**

AE1918C1

Net Size 1 m² **Net Mesh** 150 um **Net Condition** good

400 - 600
500 - 600

Processed filename _____ **Raw filename** _____

NET TOW INFORMATION

Flow count & speed seem too high. Check flow counts
Angle too variable.

	Time open	Depth (m) close	Angle	Flow counts	Volume filtered	MWO net	Comments
Start Net 0 Down		597.8	~30°	Not working- ok 57			
Net 1	600 - 500	449.8	~36				Another control light depth. went below 600
Net 2	500 - 400	400	~36				
Net 3	400 - 300	300.4	~36				
Net 4	300 - 200	198.7	~34				
Net 5	200 - 150	149.8	~36				
Net 6	150 - 75	74.2	~~38~~				
Net 7	75 - 40	38.9					
Net 8	40 - 0	∅					
Closed							

COMMENTS: 1st deployment aborted @ 30 m. out, changed to a different deck box. Apparently it was

Check speed with lat longs.