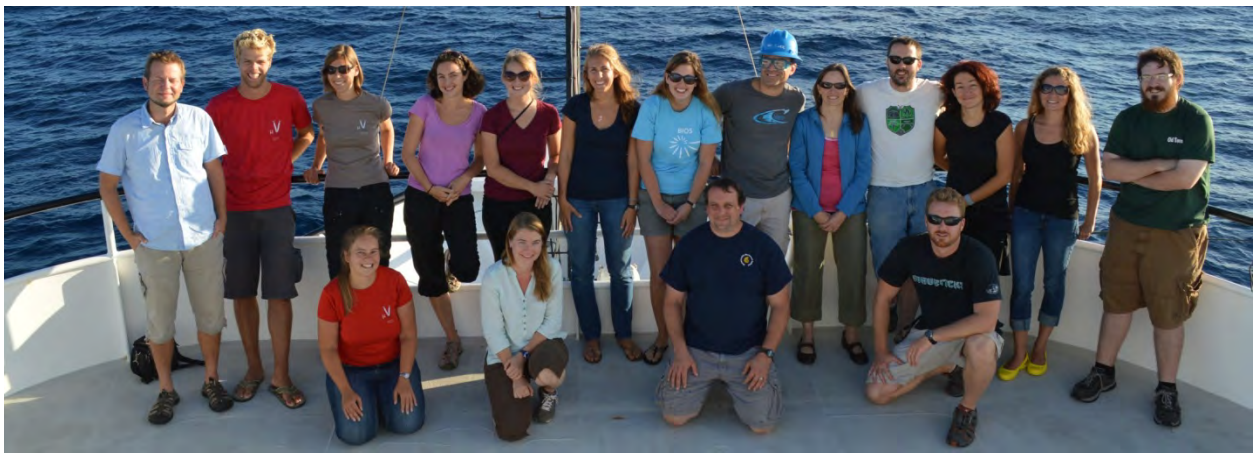
Post-Cruise Report for RV Atlantic Explorer Cruise AE1319

August 15 – 19th (Leg 1) and August 20th – September 11th (Leg 2)

Chief Scientist: Michael Lomas



(**back row L to R**: Adam Martiny, Jeppe Pedersen, Ina Severin, Celine Mouginot, Jessica Oquist, Bridget Bachman, Kristina Terpis, Nathan Garcia, Nicole Poulton, Wayne Slade, Ivona Cetinic, LeAnn Whitney, Ben Segee; **front row L to R**: Claudia Dziallas, Winn Johnson, Mike Lomas, Andrew Woogan)

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Section 1. Cruise Details

1.1 Description of Primary Project and Cruise Rationale.

The primary project supporting this cruise is part of a 5 year Dimensions in Biodiversity grant. The overarching objective of this grant is to understand how diversity, genetic, physiological and taxonomic, in marine planktonic organisms regulates the elemental composition of the oceans, specifically, we have proposed that rich diversity of marine microbes controls ocean C:N:P ratios. The following conceptual model guides our research (Figure 1):

1. The C:N:P ratio of a cell is constrained by the broad *taxonomic* group to which it belongs, which affects whether it has an outer shell, its size, functional metabolism, membrane lipid composition, etc.

2. Within a taxon, there is a high *genetic* diversity. Some of this genetic diversity is potentially laterally transferred or can be lost within taxa and confers various functional abilities (organic phosphate assimilation, nitrate assimilation, photoheterotrophy, etc.). This *functional* diversity provides further flexibility to a cell to respond to varying nutrient supply rates/ratios and affects a cell's C:N:P ratio, within the constraints of #1 above.

3. Given these taxonomic and genetic constraints, a cell is physiologically plastic and tries to optimize allocation of cellular resources in response to nutrient supply rates and ratios in the environment.

4. The microbial diversity (taxonomic, genetic, and functional) of the surface ocean varies over time and space, driven by many factors in addition to nutrients. The sum of this mixture composes the ecosystem C:N:P, the ratio that Redfield describes.

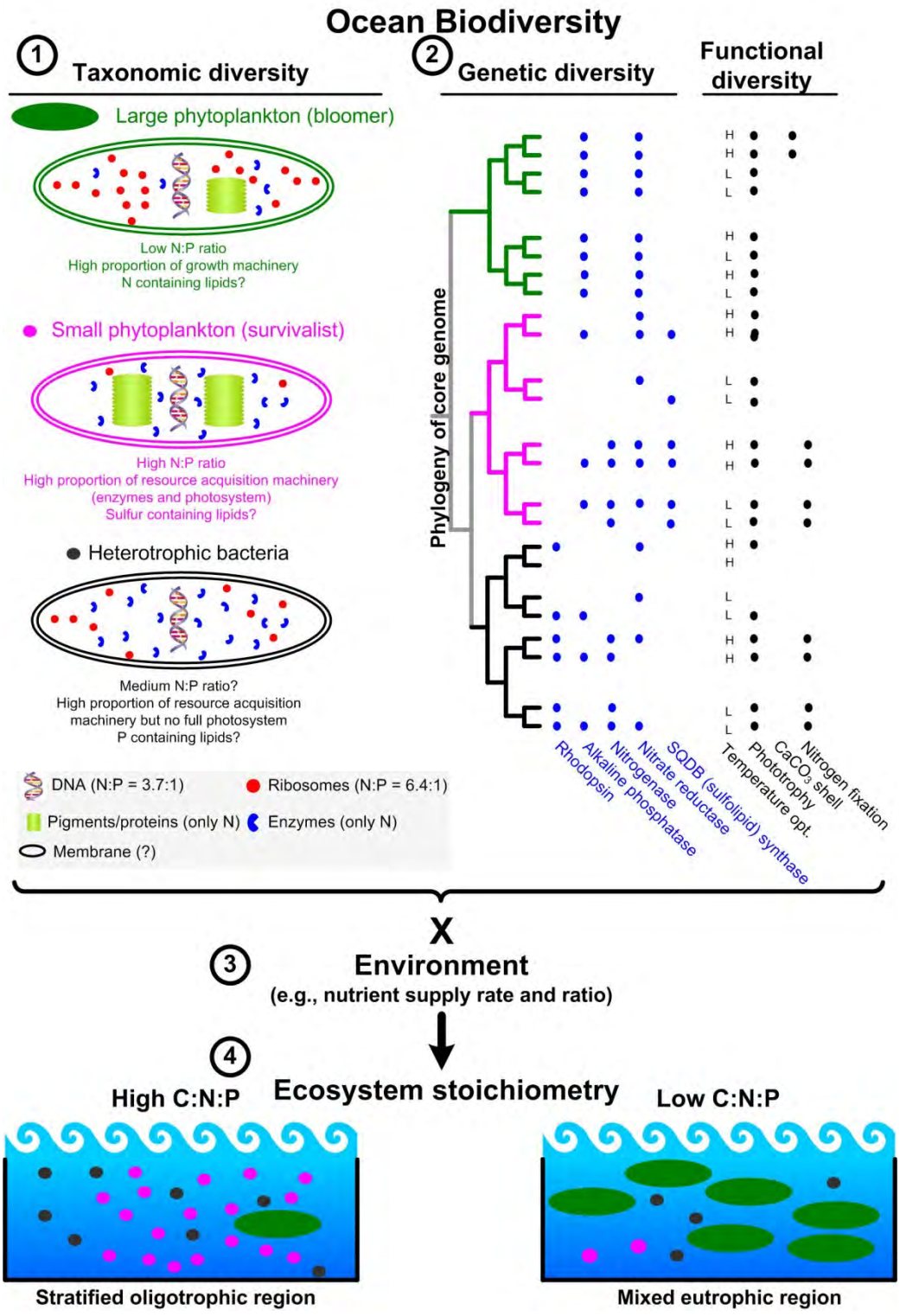

Figure 1. Predicted integrated role of ocean taxonomic (here defined as broad phylogenetic groups), genetic, and functional biodiversity on ocean C:N:P ratios. Number refers to our four questions and associated objectives. Part of the figure is inspired by Arrigo (2005).

We have participated in BATS validation cruises over the past two years which have allowed collection of the type of data to be collected on this cruise from Bermuda south to PR. This cruise will allow the extension of that transect to the north into the Labrador Sea; across a gradient with increasing nutrient concentrations and decreasing ratio of nitrate to phosphate. This condition is very different from that seen from Bermuda to Puerto Rico and therefore the combination of the two cruise transects will allow an investigation of changes in both nutrient concentrations and ratios of macronutrients.

This cruise consisted primarily of CTD casts with some targeted incubations conducted along the cruise track to explore the mechanistic relationships between diversity and nutrient ratios in the dissolved and particulate pools. On the cruise we will collect samples for particulate material, both bulk and flow cytometrically sorted by taxa, to determine elemental carbon, nitrogen and phosphorus concentrations and how this varies with taxonomic grouping, ratio of ambient nitrogen:phosphorus concentrations, and ratio of nitrogen:phosphorus inputs (more details in Group project reports below).

Cruise Dates: The cruise number is AE1319, and consists of 2 legs; Leg 1 sampling from Bermuda to Boothbay Harbor Maine and Leg 2 transiting from Boothbay Harbor to the Labrador Sea and sampling along a transect back to Bermuda. The timing of the cruise is as follows. August 13-14th are mobilization days, however August 14th, RV Atlantic Explorer (RVAE) will relocate BIOS to Penno's wharf in the afternoon. August 15th, 0800, the cruise will begin Leg 1. The first station will be BATS, and then 2 other stations between BATS and Portland Maine where we will clear US Customs/Immigration. We will then transit to Boothbay Harbor and dock at Wotton's ~1500 on the 19th of August and be there for until the following morning. During this time all personnel/gear must be sorted out and ready to depart at 0800 on the 20th August.

Cruise Track: The preliminary cruise track is below with Leg 1 stations in red and Leg 2 stations in blue. The stations are ~2o latitude apart to allow coverage of a large spatial gradient that balances the overall workload. Several days at the end of the cruise will be spent around the Bermuda Atlantic Time-series Study (BATS) site to continue incubations and use BATS as a reference point for our work in the North Atlantic. If additional time avails itself additional stations will be sampled and *ad hoc* basis.

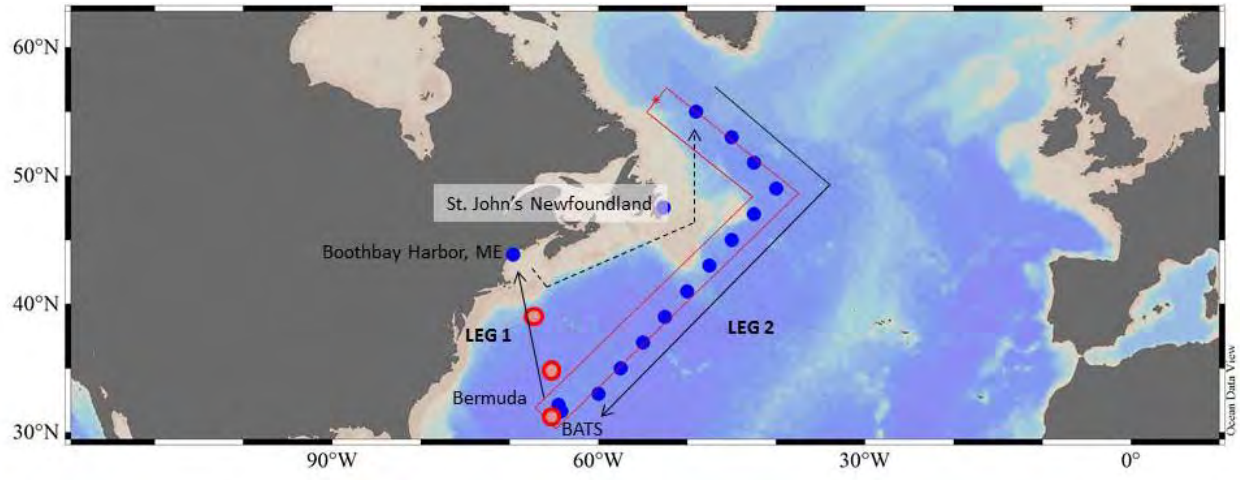

Figure 2. Cruise track for AE1319. Stations on Leg 1 are in red and stations on Leg 2 in blue.

Ancillary projects. In addition to the primary project activities there are several ancillary research groups that are making important contributions to the broader science question. Briefly, Winn Johnson, representing the Kujawinksi research group, is measurement metabolites over the water column and along the transect to better understand the composition and cycling of the dissolved organic matter pool. As well, she and Jeremy Tagliaferre sampled for intact polar lipids and polyphosphate in marine particles along the transect. Claudia Dziallas and Ina Severin are conducting experiments to quantify the rates of microbial nitrogen fixation. Ivona Cetinic, Wayne Slade, Nicole Poulton and Ben Segee are making measurements of the near surface optical characteristics of marine waters and particles, validated with discrete measurements. Jeff Krause, Jackie Collier and Eric Lachenmyer sampled for rates of silicic acid uptake and dissolution, as well as tested recent observations about the presence of silica in marine *Synechococcus.* Bridget Bachman, representing the Richardson research group, is making measurements of size fractionated primary production along the transect and at select stations quantifying taxon-specific rates of primary production using flow cytometric sorting.

In addition to these ancillary projects, we collected ancillary samples for total DIC analysis for Dr. Nick Bates and samples for del15N in nitrate and suspended particulate matter for Dr. Sarah Fawcett.

Section 2. Completed Cruise Activities

Section 2.1. Overview

A total of 54 CTD casts were conducted at 16 total stations between Leg 1 and Leg 2 (Figure 2). The transect covered a significant gradient in chlorophyll a concentrations and depths where the maximum occurred (Figure 3).

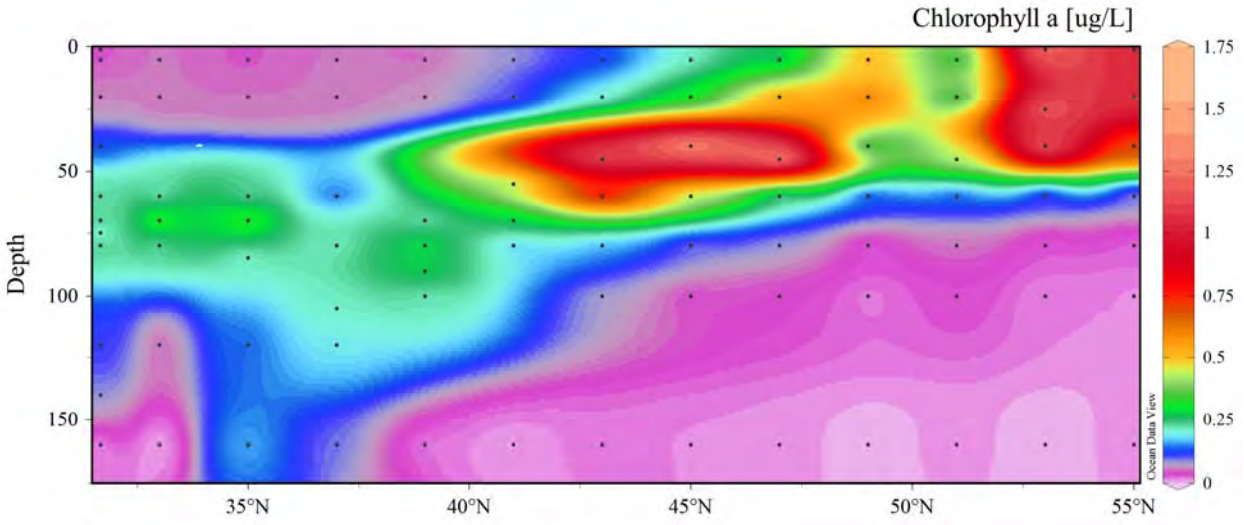

Figure 3. Latitudinal section of chlorophyll *a* showing the decrease in chlorophyll concentrations from north to south as well as a deepening of the sub-surface maximum.

Section 2.2. Lomas Research Group

(Lomas, Pritchard Whitney, Terpis)

Ocean Biogeochemistry:

One of our foci was on biogeochemical characterization of the dissolved and particulate environment along the transect. To this end, we collected samples for dissolved nutrient concentrations over the water column at each station so that ultimately we can estimate nutrient supply rates and ratios. We collected samples for bulk particulate matter elemental composition, as well as taxon-specific elemental composition in the cyanobacteria and small eukaryotes. For the larger eukaryotes we used a size-fractionated approach and will measurement elemental composition on the >25um size fraction. We collected samples for several of the ancillary research groups as well.

Table 1. Summary of sample types and numbers that were collected by the Lomas group.

Parameter	**No. Depths per Station**	**No. Stations**	**Total Samples**
Dissolved nutrients	7 + 2 on deep casts	16	128
Hi-Sensitivity SRP	7	9	63
Total Dissolved P	7	16	112
Bulk Particle C/N	7 + 2 on deep casts	16	128
Bulk Particle P	7	16	116
Total Chlorophyll	7	16	116
FCM	7	16	116
Taxon- POC/N/P in pico and nanoplankton	3	16	48
Taxon – POC/N/P in microplankton	2	16	32
Dissolved Inorganic Carbon (Bates)	7	16	112
Del15N-nitrate (Fawcett)	11	8	88
Del15N-particles (Fawcett)	4	8	32

Phytoplankton P physiology:

Phosphorus (P) is an essential nutrient for phytoplankton growth and as such can restrict primary production in ocean systems with low P concentrations like the subtropical North Atlantic. So, in addition to the biogeochemical characterization of the plankton community, we measured whole community and taxon-specific P uptake kinetics rates and ambient uptake rates at several stations along the transect to compliment prior research we'd done on this topic. We observed that generally both the whole community and cyanobacterial taxa became less efficient, ie., increasing Ks values, at more northerly stations where presumably both the concentration and supply rates of phosphorus were higher (Figure 4). Eukaryote populations showed a less conclusive trend but that is like due to the fact they are an operationally defined group of plankton and thus confounded by biodiversity. In addition there is the suggestion that nutrient saturated P uptake rates, Vmax, also decrease to the north, in support of the idea that Vmax values much greater than instantaneous need for P (i.e., product of growth rate and cellular P quota) at southern stations is part of a P-stress response exhibited by these communities.

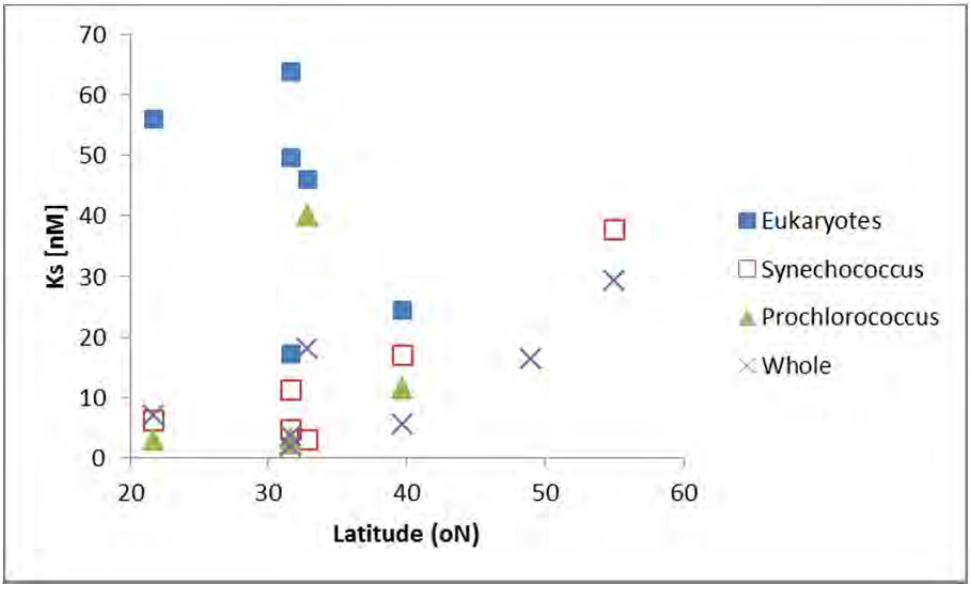

Figure 4. Estimates of half saturation concentrations for phosphate uptake in whole community and specific flow cytometrically sorted populations at stations along a latitudinal gradient.

Picoeukaryotes are a group of globally distributed phytoplankton that contribute significantly to oceanic primary production and global carbon cycling. Despite their importance, very little is known regarding their physiological and molecular responses to P availability; this is the project that LeAnn Whitney is studying. The strong gradient in P concentrations traversed as part of this cruise offered the potential to study P metabolism in natural picoeukaryote assemblages. To that end, samples were collected for molecular analyses; DNA samples will be used to identify the picoeukaryotes present and RNA will be used to characterize the expression of genes involved in P metabolism. The community composition and gene expression from samples collected in the northern P-rich waters will be compared to the P-deplete subtropical waters to identify how picoeukaryotes respond to variations in environmental P availability. In addition, the picoeukaryotic molecular response to a pulse in P availability will also be investigated in an incubation experiment where low nutrient whole-water samples received nutrient additions.

Section 2.3. Martiny Research Group

(Martiny, Mouginot, Garcia, Oquist)

The main objective for us was to address Question 2 in the original Dimension of Biodiversity - Biological controls of the ocean C:N:P ratios proposal:

What is the range of gene content diversity within taxa and how does this diversity impact C:N:P ratios?

To address this question, we performed a series of tasks:

1. **Community Composition**
   To examine the overall community composition, we collected samples for bulk DNA from 5, 25, 40, 60, 80, 100, 120, and 160m at all stations. Secondly, we concentrated samples from three depths (5, 80, and 160m) from which we plan to cytometrically sort *Prochlorococcus* and *Synechococcus* cells and make metagenomic libraries from the sorted cells.

2. **Nutrient addition experiment**
   We also did nine nutrient addition experiments (Sta. # 5, 8, 10, 11, 13, 14, and BATS), to examine how an increase in dissolved inorganic N, P, or a combined N+P would influence the stoichiometry of the plankton community. This was done in triplicate and incubated at 48h. We monitored the overall cell abundance using flow cytometry, measured the nutrient concentration before and after the incubation, measured changes in particulate C:N:P ratios, and ambient P uptake and $V_{max,P}$.

3. **Reciprocal transplant experiment**
   We also wanted to disentangle the relative effect of environmental and community variance on the nutrient uptake. To do this, we designed a reciprocal transplant experiment whereby we factorially mixed water and cells from different stations (Sta. # 4, 7, 9, 12, 14, and BATS) and measured the P uptake rates in the whole community as well as for *Prochlorococcus*, *Synechococcus*, and small Eukaryotes after 24h of incubation. Additionally, we monitored changes in cell abundance with flow cytometry and measured the nutrient concentrations after incubation.

In addition to these core tasks, we also took DNA samples at sta. #4 and BATS to create functional metagenomics libraries to look at antibiotic resistance and P uptake genes.

Section 2.4. van Mooy / Kujawinkski Research Groups

(Tagliaferre, Johnson)

Our objective was to characterize low molecular weight organic matter across a latitudinal gradient as well as a vertical gradient. Samples were collected at stations 4, 5, 7, 9, 11, 13, 15, and 16. Analysis will include measurement of total organic carbon (TOC) and high-resolution mass spectrometry. The mass spectrometry samples were collected from the surface, deep chlorophyll maximum, 1500 m, and 3000 m at all of the stations listed above. At some of the lower latitude stations water was also collected from the oxygen minimum and Eighteen Degree Mode Water. TOC was collected at additional depths to create a complete profile of bulk organic carbon concentrations. Samples were filtered through a GF/F filter and a 0.2 um filter. DOM was collected by extraction with a solid phase PPL cartridge and eluted with methanol. Both the filters and the extract will be analyzed using high-resolution mass spectrometry.

Samples were also collected on behalf of Ben Van Mooy. These samples will be used to measure intact polar lipids and polyphosphate. They were collected at every station on Durapore filters at the surface, 20 m, deep chlorophyll maximum, 60 m, 100 m, and 160 m. At every other station they were collected on GF/F filters as well.

Section 2.5 Dziallas/Severin Research Group

(Dziallas, Severin, Pedersen)

Nitrogen is an essential element for all living biomass in the world but not available for most organisms in its most abundant form (gaseous N2). However, some prokaryotes can fix N2 and convert it to bioavailable ammonium - these organisms are called nitrogen fixers or diazotrophs. In the global oceans, approximately 1% of all prokaryotic cells are capable of nitrogen fixation. Their activity is controlled by a variety of abiotic factors, among which the amount of ambient organic nitrogen compounds is important but not yet fully understood. Therefore, we study the distribution and composition of the present and active diazotrophic community along a nutrient gradient from the Labrador Sea to the Sargasso Sea by sampling for DNA and RNA. Since light may serve as an additional energy source, the vertical structure of the diazotrophic community is also explored along depth profiles within the photic zone. In addition, we measure the nitrogen fixation rates of the surface community along the transect using the stable isotope 15N2 which is incorporated into the biomass of active diazotrophs. Diazotrophic community compositions as well as nitrogen fixation rates are assessed for different size fractions in order to compare free-living and particle- or organisms-associated

nitrogen fixers. To gain further insight into organisms-associated diazotrophs we also sample ciliates to study their diazotrophic symbionts along the transect.

Section 2.6. Cetinic Research Group

(Cetinić, Slade, Poulton, Segee)

Our participation on this cruise is part of the NASA funded project titled "Multi-Sensor, Ecosystem-Based Approaches For Estimation Of Particulate Organic Carbon" in which we strive to evaluate natural variability and ecosystem (biome) specificity in particulate organic carbon (POC) – phytoplankton/particles – optical properties relationship, and use the undelaying relationships to build a new, multivariate, remote sensing algorithm for surface POC.

During this cruise we have collected measurements from several platforms; the primary platform for collection of optical and biogeochemical data was an underway flow-through system. Intake from this system was in the ship's moon pool, adjacent to the aft lab of the ship. Using a teflon diaphragm pump, water was continuously supplied to the aft lab and measured using a suite of optical instruments, examining optical properties in high resolution (see Table 1). Every half an hour (in higher chlorophyll waters) or full hour (low chlorophyll waters), seawater was diverted through a 0.2-µm cartridge filter, providing an instrument baseline and allowing us to derive particulate optical properties (calculated by difference from temporally adjacent measurements). Seawater from the flow-through system was collected 2-3 times a day for POC, suspended particulate matter, fluorometric chlorophyll and pheopigments, HPLC pigments and plankton composition by flow cytometry and FlowCAM. The flow-through system was operational from August 21th – September 9th. In order to evaluate the performance of our system, we have conducted several comparisons between particle loads in water collected from ship's and our flow-through system, as well as surface rosette samples. These comparisons have demonstrated significant differences of 20% less chlorophyll in samples collected from ship's flow through system (preliminary data).

The second platform on which we collected data was the ship's CTD rosette. We have deployed two instruments on the rosette: a beam transmissometer (C-Star, WET Labs) and a chlorophyll fluorometer/backscattering meter (FLNTU, WET Labs). We have collected water for analysis of above mentioned variables on every station, from surface and the subsurface chlorophyll maximum. Additionally, several samples for POC analysis were collected on deep casts (>2500 m).

The third platform in our measurement set was a hyperspectral radiometer (HyperPro, Satlantic, aka the "flotilla"). The HyperPro is was configured with a float collar for surface measurement, and equipped with two hyperspectral radiometers and auxiliary sensors (e.g.,

temperature, salinity, instrument tilt). One of the radiometers measured above-water downwelling irradiance and the second below-surface upwelling radiance. These deployments were conducted every day at noon – near in time to the MODIS overpass.

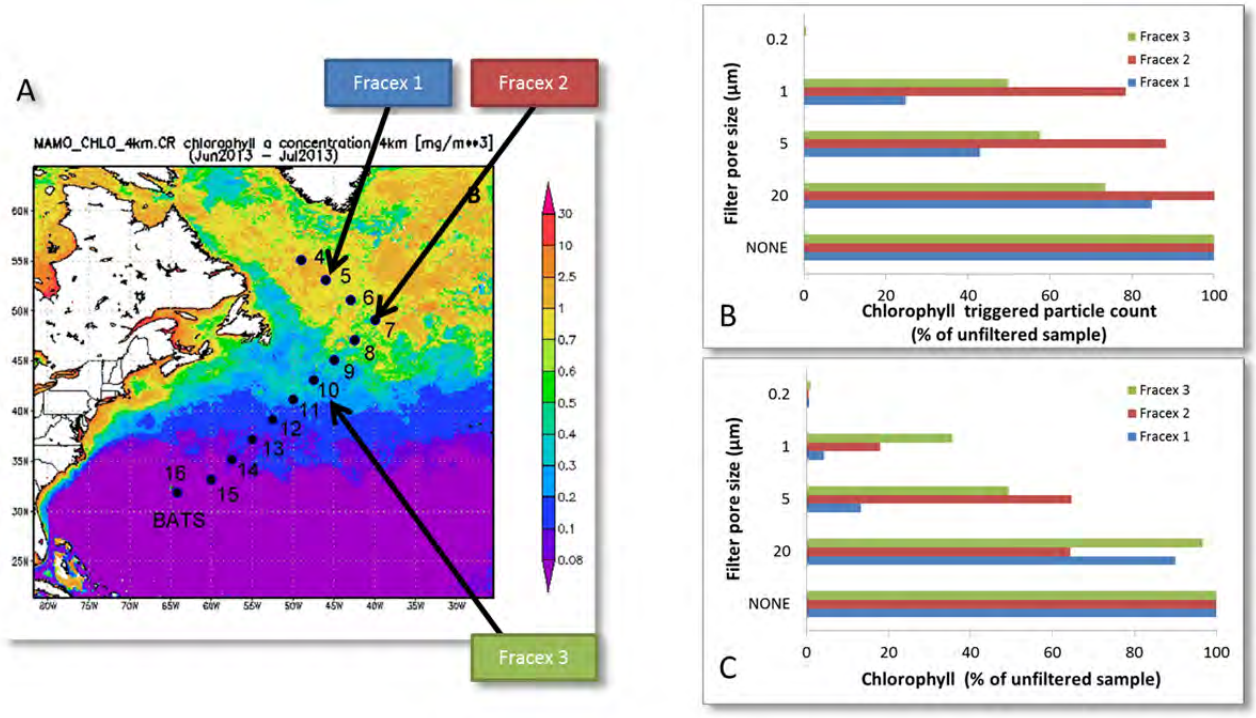

Figure 5. Size fractionation experiments during AE 1319 – preliminary data. Timepoints when experiments were performed were selected to capture the transition between several oceanic "ecosystems" (surface chlorophyll concentration for the month of July, 2013 - panel A). Transition from the lager phytoplankton dominated size fraction in Labrador sea to smaller phytoplankton dominated community in Gulf Stream is visible from size fractionated flow-cytometer based phytoplankton abundance (panel B) and chlorophyll concentration (panel C).

As a side project on this cruise, we have set up a series of size fractionation measurements in hope to offer an answer to the question – which size fraction contributes the most to the oceanic backscattering signal. Overall, we have performed five size fractionation experiments along the ecosystem gradient, collecting a large suite of optical measurements and discrete biogeochemical measurements including phytoplankton composition. Preliminary particle/pigment data are showing significant trend in decrease in phytoplankton size fraction/chlorophyll fraction as a function of the north/south gradient (Figure 1). In order to evaluate potential effects of diel variability on the optical signal, we also conducted a24-hour experiment while on station at BATS, in which we combined flow-through mode (discrete water samples collected every 2 hours) with CTD profiles (every 6 hours), as well as a HyperPro deployment.

All data that we have collected during this cruise together with the associated methods and descriptions of the deployments will be deposited on SeaBASS within a year of collection.

Table 2. List of measured variables during AE 1319 cruise.

Variable	Symbol	***Cruise AE 1319***	Variable	Symbol	***Cruise AE 1319***
Total absorption coefficient	a (vis - λ)	X	Particulate organic carbon	POC	X
Particulate absorption coefficient	a_p(vis - λ)	X	Suspended particulate matter	SPM	X
Dissolved absorption coefficient	a_{diss}(vis -λ)	X	Fluorometric chlorophyll and pheopigments	*Chl* and *Pheo*	X
Total attenuation coefficient	c(vis - λ)	X	HPLC pigment analysis	HPLC	X
Particulate attenuation coefficient	c_p(λ, 0.93°) c_p (~660 nm, 1.22°) c_p (~670nm, (b))	X	Plankton composition/ plankton carbon	*N/A* C_{phyt}	X
Particulate backscattering	b_{bp}(700 nm, 140°) b_{bp}(440, 532; 660 nm, 117°)	X	Phytoplankton size and type	*Derived from flow-cytometry and FlowCam*	X
Polarized angular scattering	*betap(532 nm)=S11, 0.08-150°* *DoP = -S12/S11and S22 (15-150°)*	*Instrument failure*	Radiometry	*Ed, Lu, derived Rrs*	X
Chlorophyll fluorescence	*Chl F*(ex.470/ em.700 m)	X	Satellite data available	*MODIS Rrs*	X

Section 2.7. Richardson Research Group

(Bachman)

I. Objectives

1. To quantify how size-fractionated rates of primary productivity and phytoplankton biomass (as chl *a*) vary along a north-south transect from the Labrador Sea to BATS.

2. To quantify cell-specific rates of primary productivity to determine group-specific differences between the picophytoplankton (*Prochlorococcus*, *Synechococcus* and picoeukaryotes) which are often the dominant producers in oligotrophic regions.

II. Brief methods

Experiments to determine size-fractionated rates of primary production were performed at approximately every other station along the transect from the Labrador Sea south to BATS (Table 1). Samples were taken from deep casts to 3000 meters and three depths in the euphotic zone were sampled: surface (between 1 and 5 meters), mid-depth (30 to 40 meters) and the DCM (55 to 100 meters). The samples were inoculated with ^{14}C-sodium bicarbonate (final activity 0.04 – 0.08 μCi ml^{-1}) and incubated in 250 ml polycarbonate Nalgene bottles. Bottles were pre-screened to the appropriate PAR levels from each sample depth and incubated for 24 hours under simulated *in situ* conditions in on-deck incubators cooled with surface seawater. At three stations experiments were also performed to quantify the cell-specific and group-specific rates of primary productivity of the three dominant groups of picophytoplankton. For these experiments 10 ml of sample were incubated for 24 hours in glass scintillation vials with ^{14}C-sodium bicarbonate (final activity 10 μCi ml^{-1}).

Table 3. Cruise AE1319 station information.

Date	**Station no.**	**Cast no.**	**Latitude/Longitude**	**Experiment performed**
8/17/2013	2	5	37° 44.01’ N 66° 39.25’ W	Size-frac PP
8/26/2013	4	7	55° 0.092’ N 48° 59.84’ W	Size-frac PP
8/29/2013	7	17	48° 59.63’ N 39° 59.84’ W	Size-frac PP
8/31/2013	9	23	45° 0.25’ N 45° 0.09’ W	Size-frac PP/ Pico group-specific PP
9/3/2013	11	31	41° 0.063’ N 49° 59.997’ W	Size-frac PP/ Pico group-specific PP
9/5/2013	13	37	37° 0.183’ N 55° 0.14’ W	Size-frac PP
9/7/2013	15	43	32° 59.98’ N 60° 0.033’ W	Size-frac PP
9/8/2013	16		BATS (31 N/ W)	Size-frac PP/ Pico group-specific PP

III. Initial results: *Size-fractionated rates of primary productivity*

Primary production was most often dominated by the picophytoplankton and integrated production peaked at 45° N and decreased dramatically in the Sargasso Sea region. Productivity by both size classes was greatest in surface 1 to 5 meters before decreasing by ~ 90% (Fig. 2).

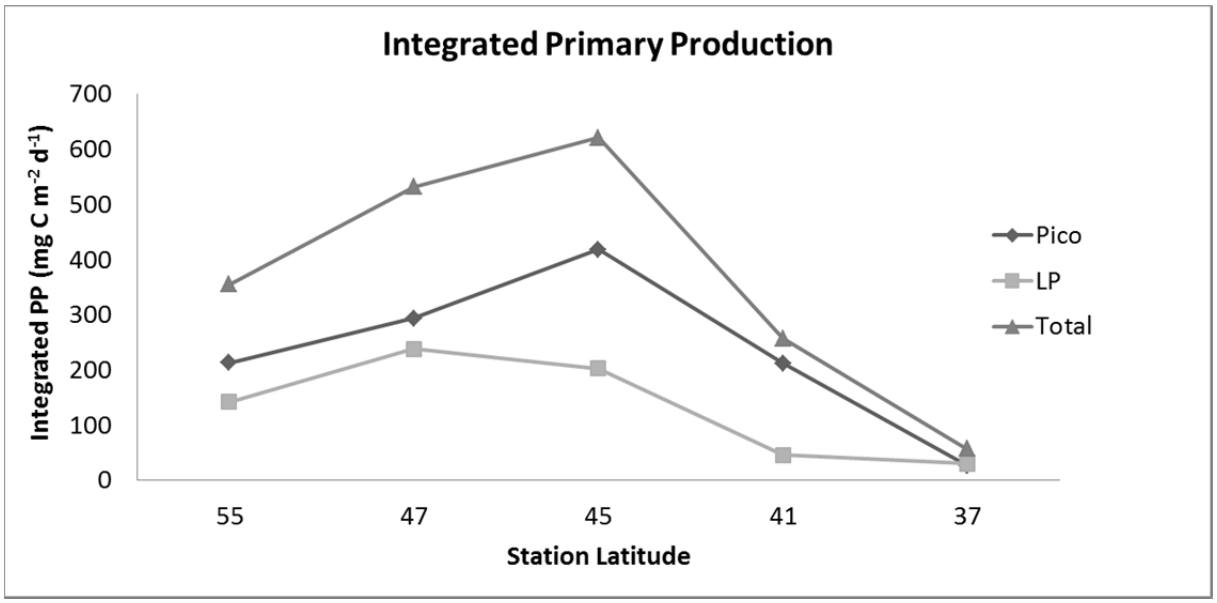

Figure 6. Latitudinal variation of integrated rates of primary productivity where Pico = 0.7-2 μm and LP (large phytoplankton) = 2-200 μm.

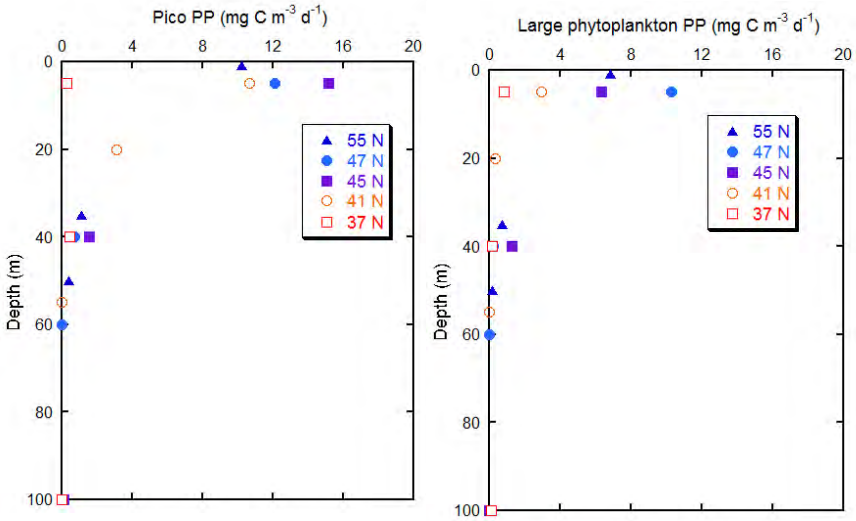

Figure 7. Depth-specific rates of primary productivity (PP) for the picophytoplankton and large phytoplankton.

III. Initial Results: *Cell-specific* ^{14}*C-uptake*

Uptake of 14C was determined for the three populations of picophytoplankton and uptake (measured by dpm) had a consistently linear relationship with cell number, as expected (Fig. 3). The picoeukaryotes had the greatest cell-specific uptake, with a ratio of 5.5-15:1 vs. *Syn* and 20:1 vs. *Pro* (Fig. 4). At Station 11 *Syn* had an uptake 30% greater than *Pro* while the *Pro*

population at Stn. 9 was not large enough to be sorted and likely contributed little to production.

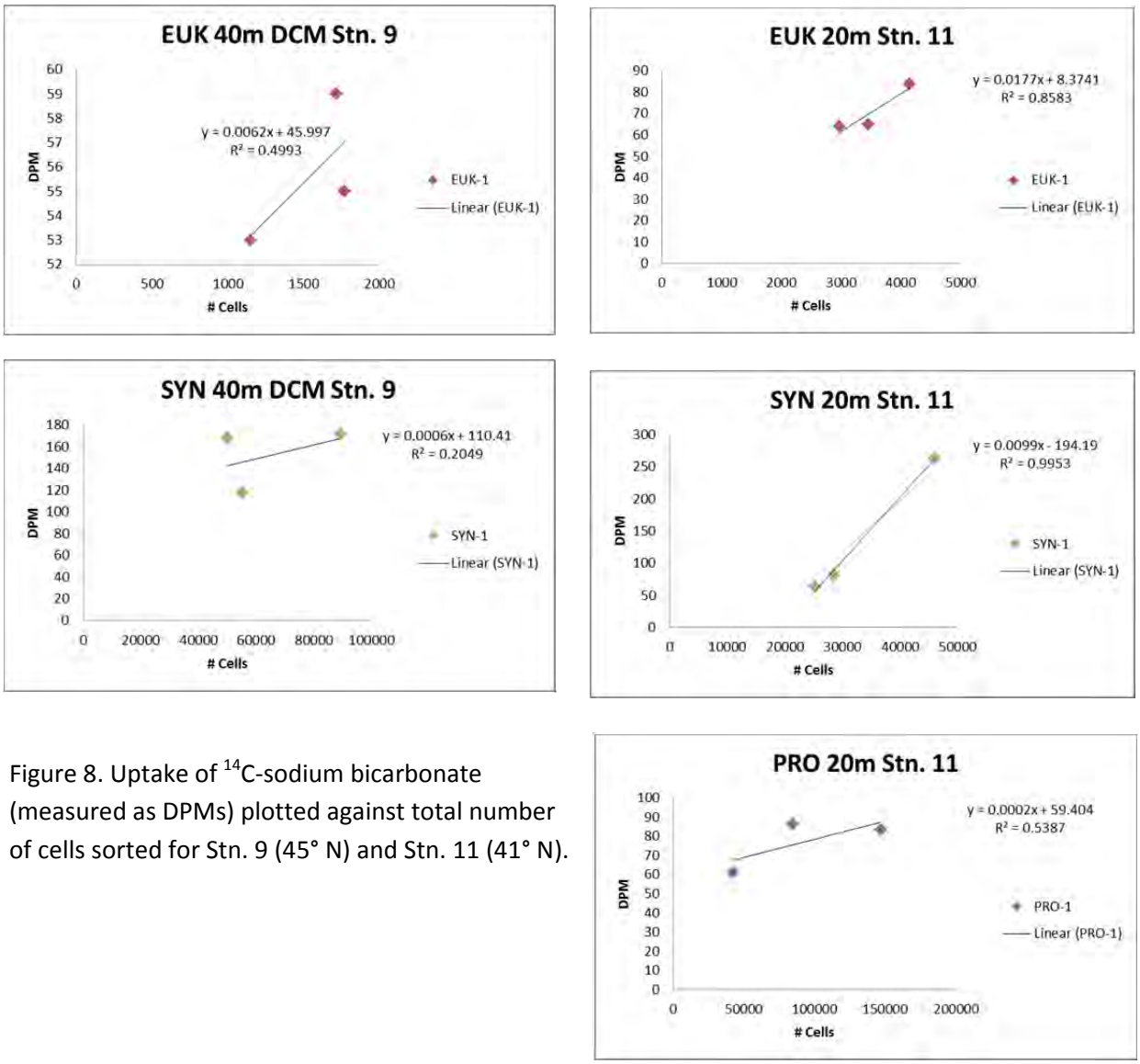

Figure 8. Uptake of ^{14}C-sodium bicarbonate (measured as DPMs) plotted against total number of cells sorted for Stn. 9 (45° N) and Stn. 11 (41° N).

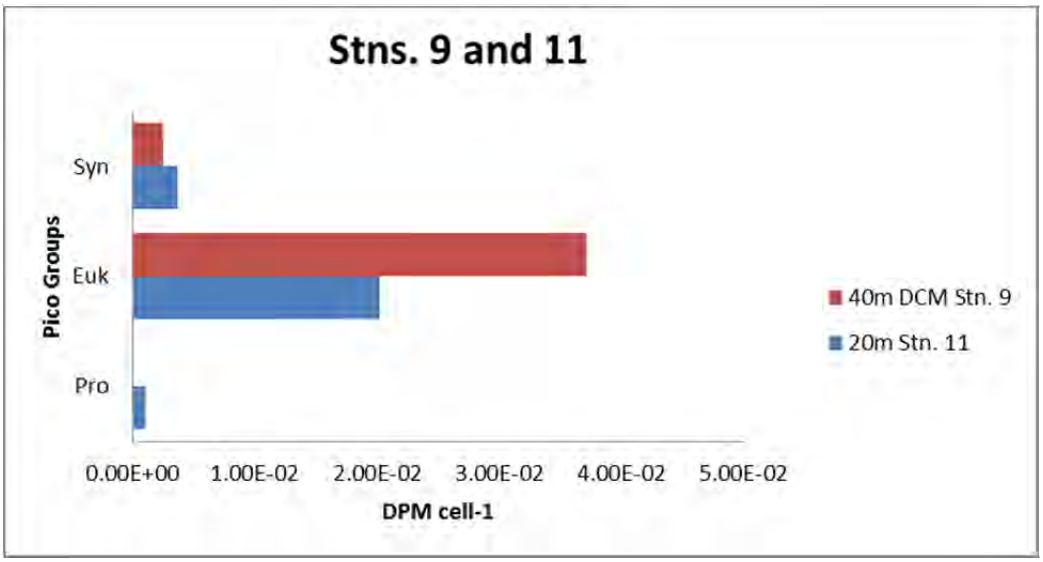

Figure 9. Cell-specific uptake rates (DPM cell^{-1}).

Section 2.8. Krause/Collier Research Groups

(Krause, Collier, Lachenmyer)

The Dauphin Island Sea Lab (DISL) and Stony Brook University (SBU) groups represented a larger collaborative project, funded by the National Science Foundation Biological Oceanography (OCE 1335012, 1131139, 1131046), to examine the role of picocyanobacteria in the marine Si cycle. On Leg 1, profile stations were conducted at BATS, in the Gulf Stream and in the mid-Atlantic coast. The DISL and SBU groups obtained samples for size-fractioned biogenic silica (>3.0 µm, and >0.4 µm) standing stock and production (using ^{32}Si tracer), silicic acid concentration, size-fractioned DNA (>3.0 µm, and >0.4 µm), flow cytometry, net growth rates for *Synechococcus*, and diatom abundance/diversity at seven profile depths. Samples targeting *Synechococcus* and diatoms for single-cell elemental composition (using single-cell X-ray fluorescence), were done at these same stations but only at the surface and deep-chlorophyll-maximum depths. With the assistance of Dr. Michael Lomas, the DISL/SBU group used the Cytopia (now BD) Influx sorting flow cytometer to sort out populations of *Synechococcus* for analysis of Si using bulk sample methods (e.g. biogenic silica standing stock). If successful, this will allow for the first bulk-measurement of *Synechococcus* Si/cell in the field and would be an independent confirmation of Si/cell observations in the field using single cell methods.

Section 3. Appendices

Appendix 3.1. Alphabetical List of cruise participants and contact information.

Name	Role	Affiliation	Email	Leg 1	Leg 2
Michael Lomas	C. Scientist	Bigelow Laboratory	mlomas@bigelow.org	x	x
Bridget Bachman	graduate student	U. South Carolina	b.cotti19@gmail.com	x	x
Ivona Cetinic	Scientist	U. Maine/Darling Marine Center	icetinic@gmail.com		x
Jackie Collier	Scientist	Stony Brook University	jackie.collier@stonybrook.edu	x	
Claudia Dziallas	Scientist	University of Copenhagen	cdziallas@bio.ku.dk		x
Nathan Garcia	Scientist	UC-Irvine	n8garcia@gmail.com		x
Winn Johnson	graduate student	WHOI	wjohnson@whoi.edu		x
Jeff Krause	Scientist	USA/Dauphin Island Sea Lab	jkrause@disl.org	x	
Eric Lachenmyer	Technician	USA/Dauphin Island Sea Lab	e.lachenmy@gmail.com	x	
Adam Martiny	co C. Scientist	UC-Irvine	amartiny@uci.edu		x
Celine Mouginot	Technician	UC-Irvine	cmougino@uci.edu		x
Jessica Oquist	undergraduate student	UC-Irvine			x
Jeppe Pedersen	graduate student	University of Copenhagen			x
Nicole Poulton	Scientist	Bigelow Laboratory	npoulton@bigelow.org		x
Benjamin Segee	Undergraduate student	Umaine-Orono	Benjamin_Segee@umit.maine.edu		x
Ina Severin	Scientist	University of Copenhagen	ina.severin@bio.ku.dk		x
Wayne Homer Slade	Scientist	Sequoia Scientific Inc.	wayne.slade@gmail.com		x
Jeremy Tagliaferre	Technician	WHOI	jeremy.tagliaferre@gmail.com	x	
Kristina Terpis	Technician	Bigelow Laboratory	kterpis@bigelow.org		x
LeAnn Pritchard Whitney	Scientist	Bigelow Laboratory	lwhitney@bigelow.org		x
James Caison	Ship MT	BIOS	James.caison@bios.edu	X	
Sheldon Blackmon	Ship MT			X	X
Andrew Woogan	Ship MT				X

Appendix 3.2. Scanned copy of Bridge Science Log.

[begins on following page]

R/V ATLANTIC EXPLORER SCIENCE LOG

PAGE# 1 OF

SAILING DATE: 15 AUGUST 2013 THURSDAY CRUISE: LOMAS (AE1319A) AE CRUISE# - AE1319A

ZONE TIME	ZD v3	DESCRIPTION	LEAD SCIENTIST	WINCH	DEPTH (METERS)	WIRE OUT MAX	MAX. TENSION	LATITUDE (NORTH)	LONGITUDE (WEST)
1218		CTD DEPLOYED	LOMAS	DS	SURFACE			31°40.015'N	064°10.063'W
1234		CTD RECOVERED	LOMAS	DS		0.0	2805.2	31°40.073'N	064°10.111'W
1301		CTD DEPLOYED	LOMAS	DS	SURFACE			31°40.138'N	064°10.208'W
1313		CTD RECOVERED	LOMAS	DS		0.0	2712.7	31°40.157'N	064°10.195'W
1333		CTD DEPLOYED	LOMAS	DS	SURFACE			31°40.172'N	064°10.229'W
1349		CTD RECOVERED	LOMAS	DS		0.0	2976.9	31°40.138'N	064°10.181'W
1410		CTD DEPLOYED	LOMAS	DS	500			31°40.218'N	064°10.306'W
1514		CTD RECOVERED	LOMAS	DS		510.5	2795.7	31°40.305'N	064°10.397'W
		17 AUGUST 2013 SATURDAY							
0435		DEPLOYED CTD	LOMAS	DS	500			37° 44. 043'	066° 39. 078'
0540		RECOVERED CTD	LOMAS	DS		510.5	2149.7	37° 44. 309'	066° 40. 429'
		18 AUGUST 2013 SUNDAY							
1247		CTD DEPLOYED	LOMAS	DS				42°01.561'N	069°12.388'W
1529		CTD RECOVERED	LOMAS	DS		480.8	3215.0	42°01.512'N	069°12.980'W
		26 AUGUST 2013 MONDAY							
0231		CTD DEPLOYED	LOMAS	DS	~~2500~~ 2000			53°00.068'N	048°59.935'W
0504		CTD RECOVERED	LOMAS	DS		3035.3	2924.7	54° 59.891'	048°59.583'
0610		DEPLOYED CTD	LOMAS	DS	500			55° 00.229'	048° 59.835'
0655		RECOVERED CTD	LOMAS	DS		503.0	2157.0	54° 59. 894'	048° 59. 033'
0745		DEPLOYED CTD	LOMAS	DS	500	505,5		55° 00. 094'	048° 59. 956'
0832		RECOVERED CTD	LOMAS	DS	500	505.5	2585.6	54°59.926	048°59.712
1011		DEPLOYED CTD	LOMAS	DS	500	501.3	2175.1	55°00.120	049°00.091
1057		RECOVERED CTD	LOMAS	DS	500	501.3	2175.1	55°00.054	049°00.0[illegible]
1211		FLOTILLA DEPLOYED	SLADE	-	-	-	-	54°55.112'N	048°52.140'W
1223		FLOTILLA RECOVERED	SLADE					54°52.483'N	048°52.313'W
0550	✓	~~DEPLOYED CTD~~	LOMAS	DS				53° 00.003'	~~048° 00.001'~~

WINCH DESCRIPTION: DUSH 4 -- D4 DUSH 5 -- D5 COMM7 -- C7 OVERBOARD SHEAVE -- OB TSE WINCH -- TSE DEME WINCH -- DEME

R/V ATLANTIC EXPLORER SCIENCE LOG

PAGE# 2 OF

SAILING DATE: 26 AUGUST 2013, THURSDAY CRUISE: LOMAS LEG 2 AE CRUISE# - AE1319-B

ZONE TIME	ZD +3	DESCRIPTION	LEAD SCIENTIST	WINCH	DEPTH (METERS)	WIRE OUT MAX	MAX. TENSION	LATITUDE (NORTH)	LONGITUDE (WEST)
		27 AUGUST 2013, TUESDAY							
0556		DEPLOYED CTD	LOMAS	D5	3000	3063.0	3248.9	53° 00.003'	046° 00.001'
0831		RECOVERED CTD	LOMAS	D5	3000	3063.0	3248.9	52°59.919	046°02.167
0924		DEPLOYED CTD	LOMAS	D5	500	504.1	2266.8	52°59.761	045°59.711
1056		RECOVERED CTD	LOMAS	D5	500	504.1	2266.8	52°59.941	045°59.751
1107		DEPLOYED CTD	LOMAS	D5	500	508.0		53.00.131	046°00.011
1144		RECOVERED CTD	LOMAS	D5	500	508.0	2940	53°00.291	045°59.881
1143		FLOTILLA DEPLOYED	SLADE	-	-	-	-	53°00.309'N	045°59.821'W
1200		FLOTILLA RECOVERED	SLADE	-	-	-	-	53°00.191'N	045°59.712'W
		28 AUGUST 2013 WEDNESDAY							
0500		DEPLOYED CTD	LOMAS	D5	500			51° 00.000'	042° 59.896'
0545		RECOVERED CTD	LOMAS	D5		500.5	2568.2	51° 00.119'	042° 59.817'
0737		DEPLOYED CTD	LOMAS	D5	500	506.8	2148.6	50° 59.997'	042° 59.844'
0817		RECOVERED CTD	LOMAS	D5	500	506.8	2148.6	51°00.771	042°59.791
0930		DEPLOYED CTD	LOMAS	D5	500	505.8	2774.1	50°59.991	043°00.031
1016		RECOVERED CTD	LOMAS	D5	500	505.8	2774.1	50°59.971	042°59.891
1205		HYDROPRO DEPLOYED	SLADE	-	-	-	-	50°51.591'N	042°46.563'W
1222		HYDROPRO RECOVERED	SLADE	-	-	-	-	50°52.170'N	042°46.157'W
		29 AUGUST 2013, THURSDAY							
0650		DEPLOYED CTD	LOMAS	D5	3000 2500m			48° 59.713'	040° 59.950'
0936		RECOVERED CTD	LOMAS	D5	3000	3097.5	2788	48°57.421	039°59.998
1041		DEPLOYED CTD	LOMAS	D5	500	505.8	2617.1	49°00.103	040°00.169
1128		RECOVERED CTD	LOMAS	D5	500	505.8	2617.1	48°59.591	040°00.576
1132		HYPERPRO DEPLOYED	SLADE	-	-	-	-	48 57.21'	040°01.51'
1140		HYPERPRO RECOVERED	SLADE	-	-	-	-	48°58.233'N	040°01.160'W
1212		CTD DEPLOYED	LOMAS	D5	500			48°59.858'N	040°00.314

WINCH DESCRIPTION: DUSH 4 -- D4 DUSH 5 -- D5 COMM7 -- C7 OVERBOARD SHEAVE -- OB TSE WINCH -- TSE DEME WINCH -- DEME

R/V ATLANTIC EXPLORER SCIENCE LOG

PAGE# 3 of

SAILING DATE: 13 AUGUST 2013 TUESDAY — CRUISE: LOMAS LEG 2 — AE CRUISE# - AE1313-B

ZONE TIME	ZD	DESCRIPTION	LEAD SCIENTIST	WINCH	DEPTH (METERS)	WIRE OUT MAX	MAX. TENSION	LATITUDE (NORTH)	LONGITUDE (WEST)
		29 AUGUST 2013 THURSDAY CONT'D							
1310		CTD RECOVERED	LOMAS	DS		531.3	2949.5	48° 38.876'N	040°02.810'W
		30 AUGUST 2013, FRIDAY							
0620		DEPLOYED CTD	LOMAS	DS	500			47° 00. 382'	042° 29.422'
0710		RECOVERED CTD	LOMAS	DS		517.5	2949.5	47° 01. 393'	042° 28. 548'
0839		DEPLOYED CTD	LOMAS	DS	500	507.8	2748	47°00,051	042°30.136
0924		RECOVERED CTD	LOMAS	DS	500	507.8	2748	47°00.491	042°30.021
1006		DEPLOYED CTD	LOMAS	DS	500	509	2735	46°59.921	042°29.961
1049		RECOVERED CTD	LOMAS	DS	500	509	2735	47°00.691	042°30.151
1103		DEPLOY HYDROPRO	LOMAS	D				47°00.291	042°30.424
1112		RECOVERED HYDROPRO	LOMAS	—				47°00.121	042°30.510
0849		DEPLOYED CTD	LOMAS	DS	3000	3035	3577	45°00,211	045°00.015
1161		RECOVERED CTD	LOMAS	DS	3000	3035	3577	45°00.011	045°00.021
1253		CTD ~~RECOVERED~~ DEPLOYED	LOMAS	DS	500			44°59.597'N	045°00.146'W
1346		CTD RECOVERED	LOMAS	DS		502.3	2929.5	44°59.510'N	045°00.373'W
1420		CTD DEPLOYED	LOMAS	DS	500			44°59.970'N	044°59.981'W
1518		CTD RECOVERED	LOMAS	DS		502.3	2863.5	44°59.663'N	045°00.392'W
		1 SEPTEMBER 2013 SUNDAY							
1159		HYDROPRO DEPLOYED	SLOCUM	—	—	—	—	43°36.137'N	046°48.058'W
1208		HYDROPRO RECOVERED	SLOCUM	—	—	—	—	43°36.267'N	046°48.371'W
1747		CTD DEPLOYED	LOMAS	DS	500			43°00.131'N	047°30.299'W
1838		RECOVERED CTD	LOMAS	DS		506.8	2554.1	43° 00.511'	047° 30. 298'
2004		DEPLOYED CTD	LOMAS	DS	500	506.8	2969	42°00.101	047°29.912
2046		RECOVERED CTD	LOMAS	DS	500	506.8	2969	42°59.973	047°29.96
2129		DEPLOYED CTD	LOMAS	DS	500			42°59.999	047°29.941
2208		RECOVERED CTD	LOMAS	DS	500			42°59.9[illegible]	047°30.01

WINCH DESCRIPTION: DUSH 4 -- D4 DUSH 5 -- D5 COMM7 -- C7 OVERBOARD SHEAVE -- OB TSE WINCH -- TSE DEME WINCH -- DEME

R/V ATLANTIC EXPLORER SCIENCE LOG

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SAILING DATE: 15 AUGUST 2013 THURSDAY CRUISE: LOMAS LEG 2 AE CRUISE# - AE1319B

ZONE TIME	ZD	DESCRIPTION	LEAD SCIENTIST	WINCH	DEPTH (METERS)	WIRE OUT MAX	MAX. TENSION	LATITUDE (NORTH)	LONGITUDE (WEST)
		2 SEPTEMBER 2013 MONDAY							
1200		HYPERPRO DEPLOYED	SLADE	-	-	-	-	41° 34.111'N	049° 16.321'W
1212		HYPERPRO RECOVERED	SLADE	-	-	-	-	41° 33.970'N	049° 16.236'W
1742		CTD DEPLOYED	LOMAS	D5	500			41° 00.105'N	050° 00.030'W
1833		RECOVERED CTD	LOMAS	D5		506.5	2423.7	40° 59.941'	050° 00.104'
1905		DEPLOYED CTD	LOMAS	D5	500	509	2888	41° 00.133'	049° 59.443'
1959		RECOVERED CTD	LOMAS	D5	500	509	2888	41° 00.032	049° 59.341
2054		DEPLOYED CTD	LOMAS	D5	3000	3038	3364	41° 00.041	050° 00.102
2359		RECOVERED CTD	LOMAS	D5	3000	3038	3364	40° 59.961	050° 00.513
		3 SEPTEMBER 2013 TUESDAY							
1203		HYPER PRO DEPLOYED	SLADE	-	-	-	-	39° 28.731'N	051° 41.672'W
1212		HYPER PRO RECOVERED	SLADE	-	-	-	-	39° 29.939'N	051° 41.854'W
1842		DEPLOYED CTD	LOMAS	D5	500			39° 00.043'	052° 30.033'
1929		RECOVERED CTD	LOMAS	D5		510.3	1948.9	39° 00.133'	052° 29.435'
2005		DEPLOYED CTD	LOMAS	D5	500	510	2692	39° 00.023	052° 29.919
2046		RECOVERED CTD	LOMAS	D5	500	510	2692	38° 59.991	052° 29.481
2204		DEPLOYED CTD	LOMAS	D5	500	510	2692	39° 00.411	052° 29.911
2246		RECOVERED CTD	LOMAS	D5	500	510	2692	39° 00.013	052° 29.411
		4 SEPTEMBER 2013 WEDNESDAY							
1205		HYPER PRO DEPLOYED	SLADE	-	-	-	-	37° 39.203'N	054° 11.691'W
1216		HYPER PRO RECOVERED	SLADE	-	-	-	-	37° 39.403'N	054° 11.714'W
1921		DEPLOYED CTD	LOMAS	D5	500	510.3	2786	37° 00.048'	055° 00.091'
2015		RECOVERED CTD	LOMAS	D5	500	510.3	2786	36° 59.715	055° 00.409
2059		DEPLOYED CTD	LOMAS	D5	500	510.1	2944	37° 00.221	055° 00.110
2149		RECOVERED CTD	LOMAS	D5	500	510.1	2944	37° 00.220	055° 00.122
2226		DEPLOYED CTD	LOMAS	D5	3000			37° 00.191	055° 00.112

WINCH DESCRIPTION: DUSH 4 -- D4 DUSH 5 -- D5 COMM7 -- C7 OVERBOARD SHEAVE -- OB TSE WINCH -- TSE DEME WINCH -- DEME

R/V ATLANTIC EXPLORER SCIENCE LOG

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SAILING DATE: 15 AUGUST 2013 THURSDAY CRUISE: LOMAS LEG 2 AE CRUISE# - AE1313

ZONE TIME	ZD	DESCRIPTION	LEAD SCIENTIST	WINCH	DEPTH (METERS)	WIRE OUT MAX	MAX. TENSION	LATITUDE (NORTH)	LONGITUDE (WEST)
		5 SEPTEMBER 2013 THURSDAY							
0047		CTD RECOVERED	LOMAS	DS		3012.0	3269.0	36° 59.384'N	055°00.889'W
1202		HYPER PRO DEPLOYED	SLADE	-	-	-	-	35°47.711'N	056°36.990'W
1214		HYPER PRO RECOVERED	SLADE	-	-	-	-	35°47.739'N	056°37.231'W
1808		DEPLOYED CTD	LOMAS	DS	500			35° 00. 037'	057° 30.294'
1902		RECOVERED CTD	LOMAS	DS		505.0	2310.7	35° 00. 022'	057° 30. 657'
1937		DEPLOYED CTD	LOMAS	DS	500	508	2948	35° 00.014'	057° 29.867'
2020		RECOVERED CTD	LOMAS	DS	500	508	2948	35°00.071	057° 30.1'W
2145		DEPLOYED CTD	LOMAS	DS	500	508	2948	34°59.891	057 29.8'W
2227		RECOVERED CTD	LOMAS	DS	500	508	2948	34°59.971	057 29.967
		6 SEPTEMBER 2013 FRIDAY							
1204		HYPER PRO DEPLOYED	SLADE	-	-	-	-	33°35.203'N	059°15.303'W
1215		HYPER PRO RECOVERED	SLADE	-	-	-	-	33°35.668'N	059°15.469'W
1739		CTD DEPLOYED	LOMAS	DS	500			33°00.033'N	060°00.006'W
1824		RECOVERED CTD	LOMAS	DS		504.3	2596	32°59.846'	060°00.429'
1854		DEPLOYED CTD	LOMAS	DS	500			33° 00.038'	059°59.787'
1938		RECOVERED CTD	LOMAS	DS	500			32° 59.611	059°59.893'
2039		DEPLOYED CTD	LOMAS	DS	3000	3039	3220	32°59.741	060°00.036
2326		RECOVERED CTD	LOMAS	DS	3000	3039	3220	33°00.000	060°00.014
		7 SEPTEMBER 2013 SATURDAY							
1204		HYPER PRO DEPLOYED	SLADE	-	-	-	-	32°21.636'N	062°01.127'W
1215		HYPER PRO RECOVERED	SLADE	-	-	-	-	32°21.703'N	062°01.300'W
		8 SEPTEMBER 2013 SUNDAY							
0048		CTD DEPLOYED	LOMAS	DS	500			31°40.187'N	064°10.315'W
0129		CTD RECOVERED	LOMAS	DS		502.8	2651.4	31°40.185'N	064°10.505'W
0203		CTD DEPLOYED	LOMAS	DS	500			31°40.113'N	064°10.329'W

WINCH DESCRIPTION: DUSH 4 -- D4 DUSH 5 -- D5 COMM7 -- C7 OVERBOARD SHEAVE -- OB TSE WINCH -- TSE DEME WINCH -- DEME

R/V ATLANTIC EXPLORER SCIENCE LOG

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SAILING DATE: 15 AUGUST 2013 THURSDAY CRUISE: LOMAS LEG 2 AE CRUISE# - i3193

ZONE TIME	ZD #3	DESCRIPTION	LEAD SCIENTIST	WINCH	DEPTH (METERS)	WIRE OUT MAX	MAX. TENSION	LATITUDE (NORTH)	LONGITUDE (WEST)
		8 SEPTEMBER 2013	SUNDAY (LOG D)						
0246		CTD RECOVERED	LOMAS	D5		524.0	2647.4	31°39.998'N	064°10.320'W
0503		DEPLOYED CTD	LOMAS	D5	500			31° 40.268'	064° 10.196'
0548		RECOVERED CTD	LOMAS	D5	500	506.5	1886.4	31° 39.901'	064° 10.329'
0801		DEPLOY CTD	LOMAS	D5	3000	3041	3208	31°40.321	064° 10.195'
1035		RECOVERED (TD)	LOMAS	D5	3000	3041	3208	31°40.221	064° 10.221
1140		Deployed (TD)	LOMAS	D5	500			31°40.17,	064° 10.201
1218		CTD RECOVERED	LOMAS	D5		502.3	2683.7	31°40.212'N	064°10.187'W
1226		HYPER PRO DEPLOYED	SLADE	-	-	-	-	31°40.279'N	064°10.349'W
1238		HYPER-PRO RECOVERED	SLADE	-	-	-	-	31°40.467'N	064°10.585'W
1239		HYPER-PRO DEPLOYED	SLADE	-	-	-	-	31°40.464'N	064°10.590'W
1254		HYPER PRO RECOVERED	SLADE	-	-	-	-	31°40.723'N	064°10.886'W
1536		CTD DEPLOYED	LOMAS	D5	500			31°40.261'N	064°10.252'W
1615		RECOVERED CTD	LOMAS	D5		513.0	2190.2	31° 40. 231'	064°10. 155'
1741		CTD DEPLOYED	LOMAS	D5	500			31°40.144'N	064°10.279'W
1820		RECOVERED CTD	LOMAS	D5		507.0	2041.4	31° 39.765'	064° 10.535'
		9 SEPTEMBER 2013 MONDAY							
0031		CTD DEPLOYED	SEVERIN	D5	500			31°40.347'N	064°10.704'W
0111		CTD RECOVERED	SEVERIN	D5		502.3	2687.1	31°40.221'N	064°10.560'W
0529		DEPLOYED CTD	SEVERIN	D5				31° 40.241'	064° 09.992'
0606		RECOVERED CTD	SEVERIN	D5		508.0		31° 40. 135'	064° 10.064'
1443		CTD DEPLOYED	LOMAS	D5	500			31°40.082'N	064°10.292'W
1535		CTD RECOVERED	LOMAS	D5		505.5	2842.5	31°40.188'N	064°10.523'W
2057		DEPLOYED (TD)	LOMAS	D5	500			31°40.58)	064° 10. 165
2148		RECOVERED CTD	LOMAS	D5	500			31°40.411	064° 10 B01

WINCH DESCRIPTION: DUSH 4 -- D4 DUSH 5 -- D5 COMM7 -- C7 OVERBOARD SHEAVE -- OB TSE WINCH -- TSE DEME WINCH -- DEME

Appendix 3.3. Scanned copies of CTD cast sheets for all cruise casts.

[begins on following page]

Lipid Alg P. 5xRBF Bsi 32Si DNA synSeT

Cruise: AE1319-A	Leg: 1	Cast: ~~#88~~ 1319C_1	Type: hydrocast – surface water only
Date: 8/15/2013 Time: 1521 GMT	Lat: 31 40.031	Long: 64 10.092	Samplers:
Date: 8/15/2013 Time: 1525 GMT	Lat:	Long:	

Niskin #	Depth	Niskin temp	Oxygens	DIC Bates	DIC Keeling	TOC/N	Sugars	Salts	Nuts	TDP / SRP / APA	Bact.	Virus/ Probes	POC/N vol =	Psi vol =	POP vol =	HPLC/FCM vol =	ChlA
1	1m																
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	
21																	
22																	
23																	
24	1m																

No Samples taken

Cruise: AE1319-A	Leg: 1	Cast: 1319C-2	Type: hydrocast Surface only
Date: 8/15/2013 Time: ~~1600~~ 1609 GMT	Lat: 31 40.151	Long: 64 10.210	Samplers:
Date: 8/15/2013 Time:	Lat:	Long:	

Niskin #	Depth	Niskin temp	Oxygens	DIC Bates	DIC Keeling	TOC/N	Sugars	Salts	Nuts	TDP / SRP / APA	Bact.	Virus/ Probes	POC/N vol =	Psi vol =	POP vol =	HPLC/FCM vol =	ChlA
1	1m																
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	
21																	
22																	
23																	
24	1m																

No Samples taken

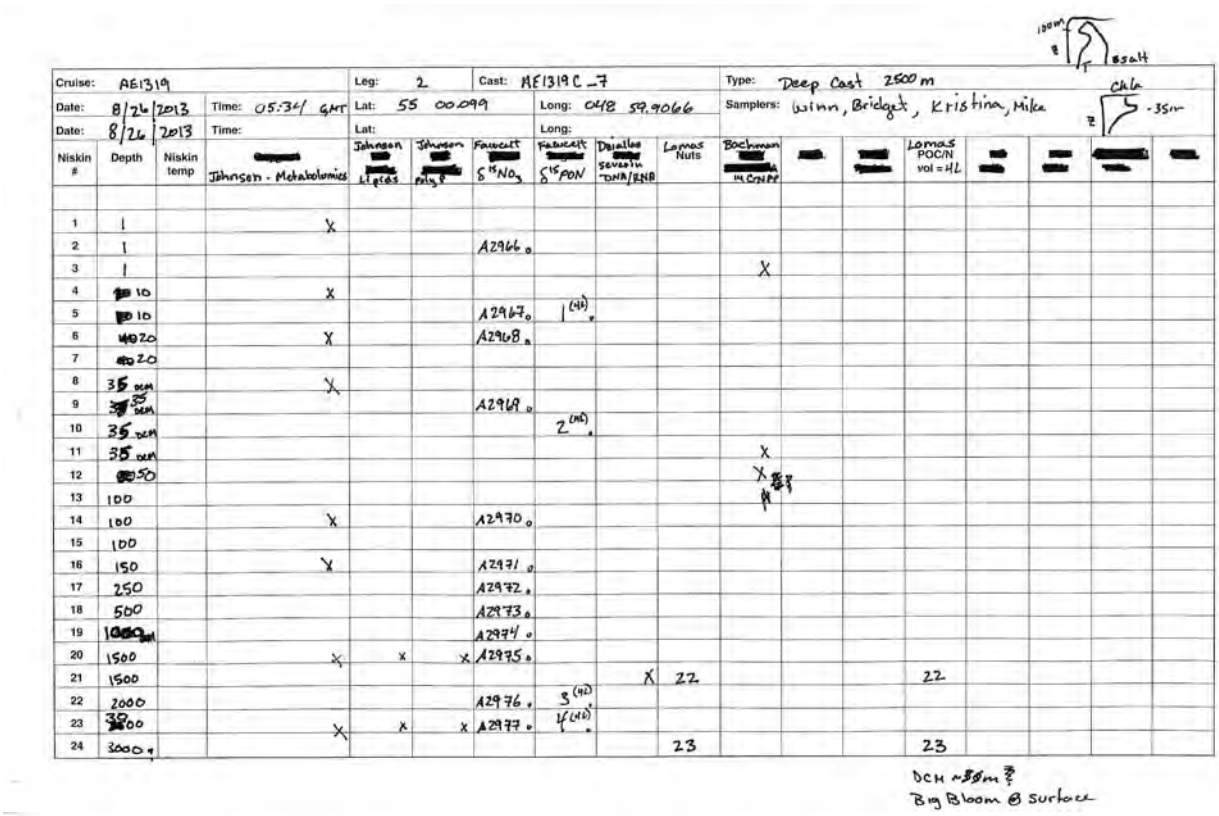
Cruise: AE1319-A				Leg: 1		Cast: 1319C-3				Type: Hydrocast - surface only							
Date: 8/15/2013			Time: 1650 GMT	Lat: 31 40.210			Long: 64 10.331			Samplers:							
Date:			Time:	Lat:			Long:										
Niskin #	Depth	Niskin temp	Oxygens	DIC Bates	DIC Keeling	TOC/N	Sugars	Salts	Nuts	TDP / SRP / APA	Bact.	Virus/ Probes	POC/N vol =	Psi vol =	POP vol =	HPLC/FCM vol =	ChlA
1	1m																
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	
21																	
22																	
23	6																
24	1m																

undersampled - taken

Cruise: AE1319-A				Leg: 1		Cast: 1319E-4				Type: hydrocast							
Date: 8/15/2013			Time: 1717 GMT	Lat: 31 40.2175			Long: 64 10.3761			Samplers:							
Date: 8/15/2013			Time:	Lat:			Long:										
Niskin #	Depth	Niskin temp	[redacted] Vamsay Lipids	Vamsay [redacted] Pay P	Krause [redacted] Sugars	Krause [redacted] DNA	Krause [redacted] 32Si	K.rause [redacted] SXRF	Lomas Nuts	Lomas TDP / SRP / [redacted]	[redacted]	[redacted]	Lomas POC/N vol = 1	K.rause Bsi vol =	Lomas POP vol = 3	FCM [redacted] vol =	ChlA 0.5L
1	1		x	x													
2	1				x												
3	1					x	x	x						x			
4	1								1	1/1			1		1	1	1
5	13																
6	20		x	x													
7	20								2	2/2			2		2	2	2
8	31																
9	40		x	x													
10	40								3	3/3			3		3	3	3
11	50																
12	60		x	x													
13	60								4	4/4			4		4	4	4
14	73																
15	80		x	x													
16	80								5	5/5			5		5	5	5
17	111																
18	120		x	x													
19	120																
20	120								6	6/6			6		6	6	6
21	120																
22	120																
23	140								7	7/7			7		7	7	7
24	140																

Cruise: AE1319-1				Leg: 1		Cast: AE1319 C-5				Type: Hydrocast. / Sta 2. 'Gulf Stream Sta"							
Date: 8/17			Time: 07:43 GMT	Lat: 37 19.0125			Long: 66 39.1860			Samplers: MLD ~50m. O2 min night below DCM.							
Date: 8/17			Time:	Lat:			Long:										
Niskin #	Depth	Niskin temp	[redacted] VanMooy Lipids	[redacted] VMooy Poly P	Krause [redacted] Synthet	Krause [redacted] DNA	Krause [redacted] 32 ft'	Krause [redacted] SXRF	Lomas Nuts	Lomas TDP / SRP / [redacted]	Sachman [redacted] HC NAP	[redacted]	Lomas POC/N vol = 1	Krause Bsi vol =	Lomas POP vol = 3	Lomas [redacted]/FCM vol =	Lomas ChlA vol = 0.5L
1	1		x	x													
2	1				x												
3	1					x	x	x						x			
4	1								8	8/8			8	8	8	8	8
5	1										x						
6	[redacted]145					x	x	x						x			
7	20		x	x													
8	20								9	9/9			9		9	9	9
9	31					x	x	x						x			
10	[redacted]31										x						
11	40		x	x													
12	40								10	10/10			10		10	10	10
13	50					x	x	x						x			
14	60		x	x													
15	[redacted]60								11	11			11		11	11	11
16	[redacted]73					x	x	x						x			
DCM 17	80		x	x													
18	[redacted]80								12	12			12		12	12	12
19	[redacted]111					x	x	x						x			
20	[redacted]111										x						
21	120		x	x													
22	120								13	13			13		13	13	13a/b
23	140					x	x	x						x			
24	140								14	14			14		14	14	14

Cruise: AE1319 - A				Leg: 1		Cast: 1319 C - 6				Type: Hydrocast (shelf station)							
Date: 8/18/2013			Time: 15[redacted] GMT	Lat: 42° 01.[redacted]'N			Long: 69° 12.[redacted]'W			Samplers:							
Date: 8/18/2013			Time:	Lat:			Long:										
Niskin #	Depth	Niskin temp	[redacted] VanMooy Lipids	Van Mooy [redacted] Poly P	Krause [redacted] syn dna	Krause [redacted] DNA	Krause [redacted] SXRF	[redacted]	Lomas Nuts	Lomas TDP / SRP / [redacted]	[redacted]	[redacted]	Lomas POC/N vol = 1	Krause Bsi vol =	Lomas POP vol = [redacted]	[redacted]/FCM	ChlA vol=0.5L
1	1		x	x													
2	1				x												
3	1					x	x							x			
4	1								x 15	x 15/15			x 15		x 15 (32)	x 15	x 15
5	1																
6	10		x	x													
7	10					x								x			
8	10								x 16	x 16/16			x 16		x 16	x 16	x 16
9	25		x	x													
10	25					x								x			
11	25								x 17	x 17/17			x 17		x 17	x 17	x 17
12	35		x	x													
13	35				x												
14	35					x	x							x			
15	35								x 18	x 18/18			x 18		x [redacted] 18	x [redacted] 18	x 18/18a
16	50		x	x													
17	50					x								x			
18	50								x 19	x 19/19			x 19		x 19	x 19	x 19
19	70		x	x													
20	70					x								x			
21	70								x 20	x 20/20			x 20		x 20	x 20	x 20
22	100																
23	100					x								x			
24	100								x 21	x 21/21			x 21		x 21	x 21	x 21



Cruise: AE1319				Leg: 2		Cast: AE1319C_7				Type: Deep Cast 2500 m							
Date: 8/26/2013			Time: 05:34 GMT	Lat: 55 00.099			Long: 048 59.9066			Samplers: Winn, Bridget, Kristina, Mike							
Date: 8/26/2013			Time:	Lat:			Long:										
Niskin #	Depth	Niskin temp	Johnson - Metabolomics	Johnson Lipids	Johnson poly P	Fawcett $\delta^{15}NO_3$	Fawcett $\delta^{15}PON$	Detailed seventh DNA/RNA	Lomas Nuts	Bochman 4 Combo			Lomas POC/N vol = 4L				
1	1		X														
2	1					A2966											
3	1									X							
4	10		X														
5	10					A2967	1 (4L)										
6	20		X			A2968											
7	20																
8	35 DCM		X														
9	35 DCM					A2969											
10	35 DCM						2 (4L)										
11	35 DCM									X							
12	50									X							
13	100																
14	100		X			A2970											
15	100																
16	150		X			A2971											
17	250					A2972											
18	500					A2973											
19	1000					A2974											
20	1500		X	X	X	A2975											
21	1500							X	22				22				
22	2000					A2976	3 (4L)										
23	2000		X	X	X	A2977	1 (4L)										
24	3000								23				23				

DCM ~35m?
Big Bloom @ surface

Cruise: AE1319				Leg: 2		Cast: AE1319C-8				Type: Martiny Incubation							
Date: 8/26/2013			Time: 09:14	Lat: 55 00.146			Long: 048 59.5607			Samplers: Adam, Celine, Nathan, Jessica							~1% PAR ~35-40m.
Date: 8/26/2013			Time:	Lat:			Long:										
Niskin #	Depth	Niskin temp	Martiny UGA/DNA	Martiny EYE													
1	1		X														
2	1		X														
3	1			X	water												
4	1			X													
5	1			X													
6	1			X	cells x2												
7	1			X													
8	1			X													
9	1			X													
10	1			X													
11	25		X														
12	25		X														
13	40		X														
14	40		X														
15	60		X														
16	60		X														
17	80		X														
18	80		X														
19	100		X														
20	100		X														
21	120		X														
22	120		X														
23	160		X														
24	160		X														

Cruise: AE1319				Leg: 2		Cast: AE1319-9				Type: Lomas shallow							
Date: 8/26/2013		Time: 1050 GMT		Lat: 55 00.004			Long: 048 59.9499			Samplers:							
Date: 8/26/2013		Time:		Lat:			Long:										
Niskin #	Depth	Niskin temp	~~Oxygens~~	DIC Bates	Lomas ~~DIC~~ ~~Keeling~~ nuts/TDP	Lomas POC/N 2L	Lomas ~~Sugars~~ POP 2L	Lomas ~~Salts~~ Chl-a asl	Lomas ~~Nuts~~ FCM	Lomas ~~TOF/~~ Tin POC/N PP+NP + 4L	Lomas ~~Bact.~~ Tin-POP PP+NP ?	Lomas DNA/RNA big PCM	Lomas Tin POC/P mP	Lomas AMB UPT KINETICS	Johnson Lipids	Johnson POLYP	Cetinic optics
1	1		~~1~~	1	~~2~~4/22	24	22	22	22					kinetics X			
2	1																X
3	1									1	1	1		AMB.UPT.			
4	1												poc/n-1 poc/n-2		X	X	
5	1																
6	1												pop-1				
7	1												pop-2				
8	20 DCM		~~2~~	2	25/23	25	23	23/23a	23					AMB.UPT.			
9	20									2	2	2					
10	20														X	X	
11	20																X
12	20												poc/n-3				
13	20												poc/n-4				
14	20												pop-3				
15	20												pop-4				
16	40		~~3~~	~~3~~4	26/24	26	24	24	24			3					
17	40														X	X	
18	60		~~4~~	~~4~~5	27/25	27	25	25	25								
19	60									3	3	4					
20	60														X	X	
21	80		~~5~~	~~5~~6	28/26	28	26	26	26			5					
22	100		~~6~~	~~6~~7	29/27	29	27	27	27			6		AMB.UPT.	X	X	
23	160		~~7~~	~~7~~8	30/28	30	28	28	28								
24	160														X	X	

Cruise: AE1319				Leg: 2		Cast: AE1319 C-10				Type: Deiallas / Severin							
Date: 8/26/2013		Time: ~~1050~~ am 13:15		Lat: 55° 00.103			Long: 49° 01.049			Samplers:							
Date: 8/26/2013		Time:		Lat:			Long:										
Niskin #	Depth	Niskin temp	Deiallas/Severin N2 Fix	D/S [redacted] Other	whitney [redacted] DNA/RNA	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
1	1		X														
2	1		X														
3	1		X														
4	1		X														
5	1		X														
6	1		X														
7	1		X														
8	1		X														
9	1		X														
10	1		X														
11	1		~~X~~	X													
12	1				X												
13	~~100~~ 10			(X)													
14	~~120~~ 10				X												
15	~~140~~ DCM 25			X													
16	~~140~~ DCM 25				X												
17	~~DCM~~ 45			X													
18	~~DCM~~ 45				X												
19	~~80~~ 60			X													
20	~~80~~ 60				X												
21	~~100~~ 60			X													
22	~~100~~ 95				X												
23	100			X													
24	100																

DCM = 25 m

Cruise: AE1319				Leg: 2		Cast: AE1319C-11				Type: Deep hydrocast								
Date: 8/27/2013			Time: 09:02 GMT	Lat: 52 59.863			Long: 045 54.997			Samplers: Kristina, Mike, Winn, LeAnn.								
Date: 8/27/2013			Time:	Lat:			Long:											
Niskin #	Depth	Niskin temp	Johnson [redacted] Metabolomics/TOC	Johnson [redacted] Lipids	Johnson [redacted] Poly P	Fawcett $\delta^{15}NO_3$	Fawcett $\delta^{15}PON$	Dziallas Severin DNA/RNA	Whitney DNA/RNA	Lomas [redacted] NUTS	Lomas POC	Celinie						
1	1		X															
2	1					A2978 X												
3	1								X									
4	10		X															
5	10					A2979	5 (42)											
6	20 DCM		X															
7	20 DCM					A2980	6 (42)											
8	20 DCM								X									
9	40 [redacted]		X			A2981												
10	[redacted] 40								X									
11	[redacted] 75		[redacted]			A2982			X									
12	100		X			A2983												
13	150		X			A2984												
14	250					A2985												
15	500					A2986												
16	[redacted] 00	O2 MAX				A2987												
17	1500		X	X	X													
18	1500					A2988	7 (42)			[redacted]	[redacted]							
19	1500							X										
20	1500									31	31							
21	2000					A2989												
22	3000					A2990	8 (42)											
23	5000		X	X	X					32	32							
24	3000											X						

2000 Bomb

no evidence for LSW (homogeneous T/S).

Cruise: AE1319				Leg: 2		Cast: AE1319C-12				Type: Martiny Cast.								
Date: 8/27/2013			Time: 9:45am	Lat: 52° 59.957			Long: 045° 59.832			Samplers:								
Date: 8/27/2013			Time:	Lat:			Long:											
Niskin #	Depth	Niskin temp	Martiny [redacted] WSA/DNA	[redacted] Nutrient addition	[redacted]													
1	1		X															
2	1		X															
3	1			X														
4	1			X														
5	1			X														
6	1			X														
7	1			X														
8	1			X														
9	25 DCM	1	X															
10	25 DCM	1	X															
11	40	25	X															
12	40	25	X															
13	60	40	X															
14	60	40	X															
15	80	60	X															
16	80	60	X															
17	100	80	X															
18	100	80	X															
19	120	100	X															
20	120	100	X															
21	160	120	X															
22	160	120	X															
23		160	X															
24		160	X															

Cruise: AE1319 | Leg: 2 | Cast: AE1319C_13 | Type: Lomas Shallow

Date: 8/27/2013 | Time: ~~[illegible]~~ 14:03 | Lat: 53 00.12 | Long: 046 00.185 | Samplers:

Date: 8/27/2013 | Time: | Lat: | Long:

Niskin #	Depth	Niskin temp	[redacted]	DIC Bates	Lomas [redacted] Nuts/TDP	Lomas [redacted] POC/N (2L)	Lomas [redacted] POP (2L)	Lomas [redacted] Chla (.5L)	Lomas [redacted] FCM	Lomas [redacted] Tan POC/N pP+nP	Lomas [redacted] Tan POP pP+nP	Lomas [redacted] DNA/RNA By FCM	Lomas [redacted] Tan POC/N mP	Johnson [redacted] Lipids	Johnson [redacted] polyP	Cetinic [redacted] Optics	[redacted]
1	1			9	33/29	35	29	29	29								
2	1															x	
3	1									4	4	7					
4	1												70ml Bch	x	x		
5	1												POC/N-3				
6	1												POP-3				
7	1																
8	25 DCM			10	34/30	34	30	30	30								
9	25 DCM									5	5	8					
10	25 DCM													x	x		
11	25 DCM															x	
12	25 DCM												60ml Bch				
13	25 DCM												POC/N-4				
14	25 DCM												POP-4				
15	~~25~~ 40m																
16	40			11	35/31	35	31	31	31			9		40m X	40m X		
17	60													60m X	60m X		
18	60			12	36/32	36	32	32	32								
19	60									6	6	10					
20	80																
21	100 (fired in error)			13	37/33	37	33	33	33			11		X	X		
22	100			14	38/34	38	34	34(a)	34			12					
23	160			15	39/35	39	35	35	35								
24	160													x	x		

Cruise: AE1319 | Leg: 2 | Cast: AE1319C_14 | Type: Lomasshallow. | DCM 45m

Date: 8/28/2013 | Time: 08:00 | Lat: 50 59.98 | Long: 042 59.92 | Samplers:

Date: 8/28/2013 | Time: | Lat: | Long:

Niskin #	Depth	Lomas [redacted] Nuts/DP	Lomas POC/N (2L)	Lomas [redacted] DOP (2L)	DIC Bates	Lomas [redacted] Chla (0.5L)	Lomas [redacted] FCM	Lomas [redacted] Tan POC/N pP+nP	Lomas [redacted] Tan POP pP+nP	Lomas [redacted] DNA/RNA by FCM	Lomas [redacted] Tan POC/N/P mP	Johnson [redacted] Lipids	Johnson [redacted]	Cetinic [redacted] Optics	Lomas [redacted] DNA/RNA filter	Krause [redacted] SynSi sort.	Lomas [redacted] Live CMP sort	[redacted]
1	5	40/36	40	36	16	36	36											
2	5													X				
3	5							7	7	13								
4	5											x	x					
5	5										POC/N-5							
6	5										POP-5							
7	5																	
8	20											x	x					
9	20							8	8	15								
10	20	41/37	41	37	17	37	37											
11	20										[illegible]				DNA/RNA-1 X	x	10 X	
12	45										POC/N-6							
13	45										POP-6							
14	45	42/38	42	38	18	38	38											
15	45							9	9	14								
16	45													x				
17	45											x	x					
18	60	43/39	43	39	19	39(a)	39			16								
19	60											x	x					
20	80	44/40	44	40	20	40	40			17								
21	100											x	x					
22	100	45/41	45	41	21	41	41			18								
23	160	46/42	46	42	22	42	42											
24	160											x	x					

Lomas Shallow
[illegible]
Martiny

Note: Cast 14 labeled as Station 5.

Cruise: AE1319 | Leg: 2 | Cast: AE1319C-15 | Type: Dunlap/Sedwick/Whitney cast. // Station 6

Date: 8/28/2013 | Time: 10:40 | Lat: 50 59.98 | Long: 042 59.84 | Samplers:

Date: 8/28/2013 | Time: | Lat: | Long:

Niskin #	Depth	Niskin temp	Dialkis/Sweon N_2fix [redacted]	T/S other [redacted]	Whitney [redacted] DNA/RNA	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
1	5		x														
2	5		x														
3	5		x														
4	5		x														
5	5		x														
6	5		x														
7	5		x														
8	5		x														
9	5		x														
10	5		x														
11	5		x														
12	5				X												
13	~~45~~ 20			X													
14	~~45~~ 20				X												
15	45 DCM			X													
16	45 DCM				X												
17	60			X													
18	60				X												
19	80			X													
20	80				X												
21	100			X													
22	100				X												
23	100																
24	100																

Cruise: AE1319 | Leg: 2 | Cast: AE1319C-16 | Type: Martiny Cast

Date: 8/28/2013 | Time: | Lat: | Long: | Samplers:

Date: 8/28/2013 | Time: | Lat: | Long:

Niskin #	Depth	Niskin temp	Martiny [redacted] WGA/DNA.	Garcia [redacted] VTC	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
1	5		x														
2	5		x														
3	5			x													
4	5			x													
5	5			x													
6	5			x													
7	25 DCM		x														
8	25 DCM		x														
9	40		x														
10	40		x														
11	60		x														
12	60		x														
13	80		x														
14	80		x														
15	100		x														
16	100		x														
17	100			x													
18	100			x													
19	100			x													
20	100			x													
21	120		x														
22	160		x														
23	160		x														
24	160		x														

Cruise:	AE1319			Leg:	2	Cast:	AE1319C-18			Type:	Martin Cast							
Date:	8/29/2013		Time:	Lat:			Long:			Samplers:								
Date:			Time:	Lat:			Long:											
Niskin #	Depth	Niskin temp	Martin [redacted] WGA/DNA	Martin [redacted] RTE	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
1	5		x	NOT FIRED														
2	5		x															
3	5		x	x														
4	5			x														
5	5			x														
6	5			x														
7	5			x														
8	5			x														
9	5			x														
10	5			x														
11	25		x															
12	25		x															
13	40		x															
14	40		x															
15	60		x															
16	60		x															
17	80		x															
18	80		x															
19	100		x															
20	100		x															
21	120		x															
22	120		x															
23	160		x															
24	160		x															

Cruise:	AE1319			Leg:	2	Cast:	AE1319C-19			Type:	Lomao Shallow	Sta 7						
Date:	8/29/2013		Time: 15:14 GMT	Lat:	48 59.82		Long:	040 00.42		Samplers:								
Date:	8/29/2013		Time:	Lat:			Long:											
Niskin #	Depth	Niskin temp	Lomao [redacted] NUTS / TDP	DIC Bates	Lomao [redacted] POC/N (2D)	Lomao [redacted] POP (32)	Lomao [redacted] chla	Lomao [redacted] FCM	Lomao [redacted] Trm POC/N POP & nP	Lomao [redacted] Trm POP & nP	Lomao [redacted] DNA/RNA ByFCM	Lomao [redacted] Trm POC/N nP	Johnson [redacted] Lipids	Johnson [redacted] Poly-D	Cetinic [redacted] Optics	Lomao [redacted] Kinetics	Lomao [redacted] AMB,UPT
1	5		49 / 43	23	49	43	43	43										
2	5								10	10	19							
3	5											POP N/P & POP-F				x	x	
4	5																	
5	5																	
6	5												x	x				
7	5														x			
8	20												x	x				
9	20								11	11	20						x	
10	20		50 / 44	24	50	44	44	44										
11	~~40~~ 40	dcm										POC-F & POP-F					x	
12	40	dcm																
13	40	dcm																
14	40	dcm	51 / 45	25	51	45	45/45	45										
15	40	dcm							12	12	21							
16	40	dcm													x			
17	40	dcm											x	x				
18	60	dcm	52 / 46	26	52	46	46	46			22							
19	60												x	x				
20	80		53 / 47	27	53	47	47	47			23		x	x				
21	100																	
22	100		54 / 48	28	54	48	48	48			24							
23	160																	
24	160		55 / 49	29	55	49	49	49					x	x				

Cruise: AE1319				Leg: 2	Cast: AE1319 C-20				Type: Lomas Shallow		Station 8				DCM @ Low Surf.		
Date: 8/30/2013			Time: 09:22	Lat: 47 06.492			Long: 042 29.3879		Samplers:								
Date: 8/30/2013			Time:	Lat:			Long:										
Niskin #	Depth	Niskin temp	Lomas NUTS/TDP	DIC Bates	Lomas POC/N (2L)	Lomas POP (2L)	Lomas Chl a (0.5L)	Lomas FCM	Lomas TKN POCP pP+dP	Lomas TKN POP pP+dP	Lomas DNA/RNA By FCM	Lomas POC/N+POP mP	Johnson Lipids	Johnson Poly P	Cetinic Optics		
1	5		56/50	30	56	50	50	50									
2	5								13	13	25						
3	5												x	x			
4	5														x		
5	5											} POC/N-9					
6	5																
7	5											} POP-9					
8	20								14	14							
9	20												x	x			
10	20		57/51	31	57	51	51	51			26						
11	45								15	15	27						
12	45 DCM		58/52	32	58	52	52/STP	52									
13	45 DCM														x		
14	45 DCM												x	x			
15	45 DCM											} POC/N-10					
16	45 DCM																
17	45 DCM											} POP-10					
18	60												x	x			
19	60		59/53	33	59	53	53	53			28						
20	80		60/54	34	60	54	54	54			29						
21	100												x	x			
22	100		61/55	35	61	55	55	55			30						
23	160												x	x			
24	160		62/56	36	62	56	56	56									

*** SST ~18-19°C - Prochlorococcus is coming!

** 20m low salinity/high temp water @ surface. DCM right below it - high diffusive flux.

* very sharp DCM 0.2 → 2.2 units over a 20m span. HUGE O2 signal 220 → 320 µmol/kg assoc. w/ DCM

Cruise: AE1319				Leg: 2	Cast: AE1319 C-21				Type: Martiny Cast								
Date: 8/30/2013			Time:	Lat:			Long:		Samplers:								
Date: 8/30/2013			Time:	Lat:			Long:										
Niskin #	Depth	Niskin temp	Martiny USA/DNA	Garcia NAE	Martiny Test filter	TOC/N	Sugars	Salts	Nuts	TDP / SRP / APA	Bact.	Virus/ Probes	POC/N vol =	Psi vol =	POP vol =	HPLC/FCM vol =	ChlA
1	5		x														
2	5		x														
3	5				x												
4	5				x												
5	5			x													
6	5			x													
7	5			x													
8	5			x													
9	25		x														
10	25		x														
11	40		x														
12	40		x														
13	60		x														
14	60		x														
15	80		x														
16	80		x														
17	100		x														
18	100		x														
19	100			x	x												
20	100			x	x												
21	120		x														
22	120		x														
23	160		x														
24	160		x														

Cruise: AE1319				Leg: 2		Cast: AE1319C – [redacted] 22				Type: Deiallas/Severin/Whitney							
Date: 8/30 2013			Time: 13:10	Lat: 46° 59.8909			Long: 43° 29.9555			Samplers:							
Date: 8/30/2013			Time:	Lat:			Long:										
Niskin #	Depth	Niskin temp	Deiallas/Severin [redacted] N2 Fix	D/S [redacted] other	Whitney [redacted] DNA/RNA	TOC/N	Sugars	Salts	Nuts	TDP / SRP / APA	Bact.	Virus/ Probes	POC/N vol =	Psi vol =	POP vol =	HPLC/FCM vol =	ChlA
1	5		x														
2	5		x														
3	5		x														
4	5		x														
5	5		x														
6	5		x														
7	5		x														
8	5		x														
9	5		x														
10	5		x														
11	5		x														
12	5			[redacted]	x												
13	5			[redacted]	x												
14	[redacted] 5			[redacted]	X												
15	[redacted] 20 [redacted]			X	[redacted]												
16	40 DCM			X	[redacted]												
17	40 DCM			[redacted]	X												
18	[redacted] 40 DCM			[redacted]	X												
19	[redacted] 40 DCM			[redacted]	X												
20	[redacted] 60			[redacted] X													
21	80			X													
22	100			X													
23	100																
24	100																

temperature gradient 20→12 °C in 60m

still large DCM ~2 μg/L
Salinity 33→34 and huge O_2 signal

Cruise: AE1319				Leg: 2		Cast: AE1319C – 23				Type: Deep CTD							
Date: 8/31/2013			Time: 11:49	Lat: 45 00.[redacted]39			Long: 045 00.079			Samplers:							
Date: 8/31/2013			Time:	Lat:			Long:										
Niskin #	Depth	[redacted]	Johnson [redacted] Metabolomics	Johnson [redacted] Lipids	Johnson [redacted] Poly P	Fawcett [redacted] $\delta^{15}NO_3$	Fawcett [redacted] $\delta^{15}PON$	Bachman [redacted] NPP	Deiallas [redacted] severin	Whitney [redacted] DNA/RNA	Cetinic [redacted] Particles	Lomas [redacted] NUCS	Lomas [redacted] POC/N	[redacted]	[redacted]	[redacted]	[redacted]
1	5		X			A3003 X											
2	5							X									
3	5									X							
4	5									X							
5	20		X														
6	20					A3004 X	-13 +/-17 [redacted]										
7	40 DCM		X														
8	40 DCM					A3005 X	-14 [redacted]										
9	40 DCM							X									
10	40 DCM									X							
11	40 DCM									X							
12	1[redacted]0		X			A3006											
13	100							X									
14	150		X			A3007											
15	250					A3008											
16	500					A3009											
17	1000 O2 max		X	X	X	A3010											
18	1500		X	X	X							-[redacted]	[redacted]				
19	1500					A3011	-15+18					63	63				
20	1500								X								
21	2000					A3012	-16+19										
22	[redacted] 3000		X	X	X												
23	3000 [redacted]					A3013						64	64				
24	[redacted] 3000										X						

NOTE: 17-19 collected by cell trap!

shdw 63

Cruise: AE1319				Leg: 2		Cast: AE1319C_24				Type: Martiny Incubation							
Date: 8/31/2013			Time: 13 20	Lat: 44 59.624 N			Long: 45 00.306 W			Samplers:							
Date: 8/31/2013			Time:	Lat:			Long:										
Niskin #	Depth	[redacted]	Martiny [redacted] WSA / DNA	Martiny [redacted] RTB	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
1	5		X														
2	5		X														
3	5			X													
4	5			X													
5	5			X													
6	5			X													
7	5			X													
8	5			X													
9	~~6~~	25	X	~~X~~													
10	~~5~~	25	X	X													
11	~~25~~	40	X														
12	25	40	X														
13	~~40~~	60	X														
14	40	60	X														
15	60	80	X														
16	60	80	X														
17	80	100	X														
18	80	100	X														
19	100	120	X														
20	100	120	X														
21	120	160	X														
22	120	160	X														
23	160	500	~~X~~														
24	160	500	X														

Cruise: AE1319				Leg: 2		Cast: AE1319C-25				Type: Lomas Shallow Cast							
Date: 8/31/2013			Time: 17:22	Lat: 44 59.9557			Long: 45 00.0029			Samplers:							
Date: 8/31/2013			Time:	Lat:			Long:										
Niskin #	Depth	Lomas [redacted] NUT/POP	Lomas [redacted] POC/N (2L)	DIC Bates	Lomas [redacted] POP (2L)	Lomas [redacted] Chla (2L)	Lomas [redacted] FCM	Lomas [redacted] TKN-Pos/N pP-toP	Lomas [redacted] TKN-Pos pP-toP	Lomas [redacted] DNA/RNA by FCM	Lomas [redacted] TKN Poly/P tnP	Lomas [redacted] kinetics	Johnson [redacted] Lipids	Johnson [redacted] poly P	Cetinic [redacted] optics	[redacted]	[redacted]
1	5	65/57	65	37	~~55~~57	57	57										
2	5							16	16	31							
3	5										POC-11						
4	5										POP-11						
5	5											X					
6	5												X	X			
7	5														X		
8	20	66/58	66	38	58	58	58			32							
9	20							17	17								
10	20												X	X			
11	40 DCM	67/59	67	39	~~55~~9	59	59(a)			33							
12	40 DCM							18	18								
13	40 DCM												X	X			
14	40 DCM														X		
15	40 DCM										POC-12						
16	40 DCM										POP-12						
17	40 DCM																
18	60												X	X			
19	60	69/60	69	40	60	60	60			34							
20	80	70/61	70	47	61	61	61			35							
21	100												X	X			
22	100	71/62	71	43	62	62	62			36							
23	160												X	X			
24	160	72/63	72	49	63	63	63										

Cruise: AE1319			Leg: 2		Cast: AE1319C-26				Type: Lomas Shallow Cast								
Date: 9.1.13		Time: 2052	Lat: 48° 00.159		Long: 47° 30.341				Samplers:								
Date:		Time:	Lat:		Long:												
Niskin #	Depth	[redacted]	Lomas [redacted] NUTS/TDP	DIC Bates	Lomas [redacted] POC/PON (24)	Lomas [redacted] POP (24)	Lomas [redacted] cuda	Lomas [redacted] FCM	Lomas [redacted] TRN POC/PON	Lomas [redacted] TRN POP PP nP	Lomas [redacted] TRN/RNA by FCM PP nP	Lomas [redacted] TRN POC mP	Jobinson [redacted] Lipids	Johnson [redacted] PolyP	Celtric [redacted] Optics	[redacted]	[redacted]
1	5		73/64	44	73	64	64	64									
2	5								19	19	57						
3	5											POC-13					
4	5											POP-13					
5	5																
6	5												X	X			
7	5														X		
8	20		74/65	45	74	65	65	65			38						
9	20								20	20							
10	20												X	X			
11	40 45 DCM		75/66	46	75	66	66 60	66									
12	40 45 DCM								28	28	39						
13	40 45 DCM											POC-14					
14	40 45 DCM											POP-14					
15	40 45 DCM																
16	40 45 DCM												X	X			
17	40 45 DCM														X		
18	60		76/67	47	76	69	67	67			40						
19	60												X	X			
20	80		77/68	48	77	68	68	68			41						
21	100		78/69	49	78	69	69	69			42						
22	100												X	X			
23	160		79/70	50	79	70	70	70									
24	160												X	X			

Cruise: AE1319			Leg: 2		Cast: AE1319C-27				Type: Martiny Cast								
Date:		Time:	Lat:		Long:				Samplers:								
Date:		Time:	Lat: ,		Long:												
Niskin #	[redacted] Depth	[redacted]	Martiny [redacted] UGM/DNA	Garcia [redacted] Nitrate	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
1	5		x														
2	5		x														
3	5			x													
4	5			x													
5	5			x													
6	5			x													
7	5			x													
8	5			x													
9	5			x													
10	5			x													
11	25		x	[redacted]													
12	25		x														
13	40		x														
14	40		x														
15	60		x														
16	60		x														
17	80		x														
18	80		x														
19	100		x														
20	100		x														
21	120		x														
22	120		x														
23	160		x														
24	160		x														

Cruise: AE1319 | Leg: 2 | Cast: AE1319C-28 | Type: DSW Cast
Date: 9.1.13 | Time: 0030 | Lat: [redacted] 00.002 | Long: 47° 29.[redacted]892 | Samplers:
Date: | Time: | Lat: | Long:

Niskin #	[redacted] Depth	[redacted]	Dziallas/Severin [redacted]	WHITNEY [redacted] DNA/RNA	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
1	5		X														
2	5		x														
3	5		x														
4	5		x														
5	5		x														
6	5		x														
7	5		x														
8	5		x														
9	5		x														
10	5		x														
11	5		x														
12	5			x													
13	5			X													
14	5			x													
15	5		x	X													
16	20		x														
17	50		X														
18	50 DCM			X													
19	50 DCM			x													
20	50 DCM			x													
21	50 DCM			X													
22	50 DCM		x														
23	80		x														
24	100		X														

Cruise: AE1319 | Leg: 2 | Cast: AE1319 C-29 | Type: Martiny Cast
Date: 9/2/2013 | Time: 18:00 | Lat: 41 N | Long: 50 W | Samplers:
Date: 9/2/2013 | Time: | Lat: | Long:

Niskin #	Depth	[redacted]	Martiny [redacted] WGA/DNA	Garcia [redacted] Nut Add.	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
1	5	5	x														
2	5	5	x														
3	5	5		x													
4	5	5		x													
5	5	5		x													
6	5	5		x													
7	25	5	x	x													
8	25	5	x	x													
9	40	5	x	x													
10	40	5	x	x													
11	60	25	x														
12	60	25	x														
13	80	40	x														
14	80	40	x														
15	100	60	x														
16	100	60	x														
17	100	80	x	x													
18	100	80	x	x													
19	100	100	x	x													
20	100	100	x	x													
21	120		x														
22	120		x														
23	160		x														
24	160		x														

Cruise: AE1319				Leg: 2		Cast: AE1319C-30					Type: Lomas Shallow						
Date: 9/2/2013			Time: 22:08 GMT	Lat: 41 00.146			Long: 4959.409				Samplers:						
Date: 9/2/2013			Time:	Lat:			Long:										
Niskin #	Depth	[redacted]	Lomas [redacted] Nuts / TDP / SRP	DIC Bates	Lomas [redacted] POC/N (24)	Lomas [redacted] POP (20)	Lomas [redacted] Chla	Lomas [redacted] FCM	Lomas [redacted] TEN POC/N pP+nP	Lomas [redacted] Exn-POP pP+nP	Lomas [redacted] DNA/RNA by FCM	Lomas [redacted] Taxon POC/N mP	Johnson [redacted] Lipids	Johnson [redacted] Poly P	Cetinic [redacted] Optics	Johnson [redacted] Metabolomics	[redacted]
1	5		82/71/22a,b	51	82	871	71	71									
2	5								22	22	43						
3	5											} POC/N-15					
4	5											} POP-15					
5	5																
6	5												x	x		[illegible]	
7	5														x		
8	20		83/72/23a,b	52	83	72	72	72			43						
9	20								23	23	[illegible]						
10	20												x	x		[illegible]	
11	55 DCM		84/73/24a,b	53	84	73	73(10)	73			44						
12	55 DCM								24	24							
13	55 DCM											} POC/N-16					
14	55 DCM											} POP-16					
15	55 DCM																
16	55 DCM												x	x		[illegible]	
17	55 DCM														x		
18	70		85/74/25a,b	54	85	74	74	74			45						
19	70												x	x			
20	80		86/75/26a,b	55	86	75	75	75			46						
21	100												x	x			
22	100		87/76/27a,b	56	87	76	[illegible]	76			47		[illegible]	[illegible]			
23	160												x	x			
24	160		88/77/28a,b	57	88	77	77	77					[illegible]	[illegible]			

Cruise: AE1319				Leg: 2		Cast: AE1319C-31					Type: Lomas Deep Cast						
Date: 9/2/2013			Time: 23:53	Lat: 41 00.0656			Long: 49 59.9935				Samplers:						
Date: 9/2/2013			Time:	Lat:			Long:										
Niskin #	Depth	[redacted]	Johnson [redacted] metabolomics	Johnson [redacted] Lipids	Johnson [redacted] Poly P	Fawcett [redacted] $\delta^{15}NO_3$	Fawcett [redacted] $\delta^{15}PON$	Dejallos [redacted] Sewin DNA	Whitney [redacted] DNA/RNA	Cetinic [redacted] Particles	Lomas [redacted] Nuts	Lomas [redacted] POC/N	Bachman [redacted] NPP	[redacted]	[redacted]	[redacted]	[redacted]
1	5		x			A3014											
2	5												X				
3	5								x								
4	5								X								
5	20		[illegible]										X				
6	20		x			A3015	-20										
7	55 DCM		x														
8	55 DCM					A3016	-21										
9	55 DCM												X				
10	55 DCM								X								
11	55 DCM								X								
12	100		x			A3017											
13	100																
14	150		x			A3018											
15	250		x			A3019											
16	350		x			A3020											
17	1000		x			A3021											
18	1500		x	x	x						80	80					
19	1500					A3022	-22										
20	1500							X									
21	2000		X			A3023	-23										
22	3000		x	x	x						81	81					
23	3000					A3024											
24	3000		X	x	x					x	[illegible]						

Cruise: AE1319				Leg: 2		Cast: AE1319C-32				Type: Mooring- Incubation Cast							
Date: 9/3/2013			Time: 19:00	Lat: 39 N			Long: 052:30 W			Samplers:							
Date:			Time:	Lat:			Long:										
Niskin #	Depth	[redacted]	Mooring [redacted] UGA /BNA	Garcia [redacted] MAE KT	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
1	5	5	X														
2	5	5	X														
3	5	5		X													
4	5	5		X													
5	5	5		X													
6	5	5		X													
7	25	5	X														
8	25	5	X														
9	40	5	X														
10	40	5	X														
11	60	25	X														
12	60	25	X														
13	80	40	X														
14	80	40	X														
15	100	60	X														
16	100	60	X														
17	120	80	X														
18	120	80	X														
19	160	100	X														
20	160	100	X														
21		120	X														
22		120	X														
23		160	X														
24		160	X														

Cruise: AE1319				Leg: 2		Cast: AE1319C-33				Type: Lomas Shallow							
Date: 9.3.13			Time: 22:06	Lat: 39° 00.015			Long: 52° 29.996			Samplers:							
Date:			Time:	Lat:			Long:										
Niskin #	Depth	Niskin temp	Lomas ~~Oxygens~~ Nuts/TDP/SRP	DIC Bates	Lomas DIC Keeling POC/N (2-3)	Lomas DOC/N POP(2-4)	Lomas Sugars chl a	Lomas Salts FCM	Lomas Nuts POC/N Tm PP + NP	Lomas TDP + SRP + APA POP Tm PP + NP	Lomas Bact. DOM/PROM by FCM	Lomas Virus + Bacs POC/N/P NP	Johnson POC/N vol = Lipids	Johnson Pol- vol = Polys	Cetinic POP vol = Optics	Lomas HPLC/FCM vol = Kimmics	Lomas GMA Photo Cupt
1	5		89/78/29a,b	58	89	78	78	78								X	X
2	5								25/28	25	48						
3	5											POCIN 17					
4	5																
5	5											POP 19					
6	5												X	X			
7	5														X		
8	20		90/79/30a,b	59	90	79	79	79									X
9	20								26/29	26	49						
10	20												X	X			
11	70		91/80/31a,b	60	91	80	80	80									
12	70												X	X			
13	80		92/81/32a,b	61	92	81	81	81									
14	DCM 90		93/82/33a,b	62	93	82	82	82/82									X
15	DCM 90								27/30	27	50						
16	DCM 90											POCIN 18					
17	DCM 90																
18	DCM 90											POP 18					
19	DCM 90												X	X			
20	DCM 90														X		
21	100		94/83/34a,b	63	94	83	83	83			51						
22	100												X	X			
23	160		95/84/35a,b	64	95	84	84	84									
24	160												X	X			

#22-30 are concentrated by cell trap

Cruise: AE1319			Leg: 2	Cast: AE1319C_34		Type: Dinallas/Severin/Whitney
Date: 9/4/2013	Time: 01:03		Lat: 39 00.0149	Long: 052 30.0146		Samplers:
Date:	Time:		Lat:	Long:		

Niskin #	Depth	[redacted]	Dinallas/Severin [redacted] N2 Fix	D/S [redacted] Other	Whitney [redacted] DNA/RNA	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
1	5		x														
2	5		x														
3	5		x														
4	5		x														
5	5		x														
6	5		x														
7	5		x														
8	5		x														
9	5		x														
10	5		x														
11	5		x														
12	5				x												
13	5				x												
14	5				x												
15	5				x												
16	30		x														
17	60 DCM		x														
18	85 DCM		x														
19	85 DCM				x												
20	85 DCM				x												
21	85 DCM				x												
22	85 DCM				x												
23	100		x														
24	120		x														

Cruise: AE1319			Leg: 2	Cast: AE1319C-35		Type: Lomas Shallow Cast
Date: 9/4/2013	Time: 22:27		Lat: 36°59.993	Long: 55° 00.047		Samplers:
Date:	Time:		Lat:	Long:		

Niskin #	Depth	~~Niskin temp~~	Lomas ~~Oxygens~~ NUTS/TDP/SRP	DIC Bates	Lomas ~~DIC Keeling~~ POC/N (2L)	Lomas ~~TOC/N~~ POP (2L)	Lomas ~~Sugars~~ Chla	Lomas ~~Cells~~ FCM	Lomas ~~Nuts~~ Tan POC/N pP+nP	Lomas ~~TDP/SRP+APA~~ Tan POP pP+nP	Lomas ~~Bact.~~ DNA/RNA PCM	Lomas ~~Virus/Probes~~ POC/N/P MP	Johnson ~~POC/N vol=~~ Lipids	Johnson ~~Pst vol=~~ polyP	Cetinic ~~POP vol=~~ Optics	~~HPLC/FCM vol=~~	~~CHL~~
1	5		96/85/36a,b	65	96	85	85	85									
2	5								31	28	52						
3	5											} POC/N-19					
4	5											} POP-19					
5	5																
6	5												X	X			
7	5														X		
8	20		97/86/37a,b	66	97	86	86	86									
9	20								~~33~~				X	X			
10	60		98/87/38a,b	67	98	87	87	87									
11	60								32	29	53						
12	60												X	X			
13	80		99/88/39a,b	68	99	88	88	88									
14	105 DCM		100/89/40a,b	69	100	89	89	89/89a									
15	105 DCM								33	30	54						
16	105 DCM											} POC/N-20					
17	105 DCM											} POP-20					
18	105 DCM																
19	105 DCM												x	x			
20	105 DCM														X		
21	120		101/90/41a,b	70	101	90	90	90			55						
22	120												x	x			
23	160												x	X			
24	160		102/91/42a,b	71	102	91	91	91									

Cruise: AE1319				Leg: 2		Cast: AE1319C-36				Type: Martiny Incubation							
Date: 9/4/2013			Time: 9:30	Lat: 37 00.322 N			Long: 054 59.971 W			Samplers:							
Date:			Time:	Lat:			Long:										
Niskin #	Depth	Niskin temp	Martiny Oxygens UGM / DNA	Garcia DIC Bates MAB	DIC Keeling	TOC/N	Sugars	Salts	Nuts	TDP / SRP / ARA	Bact	Virus / Probes	POC/N vol=	Pol vol=	POP vol=	HPLC/FCM vol=	CHIA
1	5		X														
2	5		X														
3	5			X													
4	5			X													
5	5			X													
6	5			X													
7	5			X													
8	5			X													
9	5			X													
10	5			(X) 1 copy													
11	25		X														
12	25		X														
13	40		X														
14	40		X														
15	60		X														
16	60		X														
17	80		X														
18	80		X														
19	100		X														
20	100		X														
21	120		X														
22	120		X														
23	160		X														
24	160		X														

Cruise: AE1319				Leg: 2			Cast: AE1319C_37			Type: Lomas Deep Cast.							
Date: 9/6/2013			Time: 0128	Lat: 37° 00.113			Long: 55° 00.459			Samplers:							
Date:			Time:	Lat:			Long:										
Niskin #	Depth	Niskin temp	Oxygens	Johnson DIC Bates Metabolomics	Johnson DIC Keeling Lipids	Johnson TOC/N Poly P	Fawcett Sugars $\delta^{15}NO_3$	Foucault Salts $\delta^{15}PON$	Dagallier Nuts Severin DNA	WHITNEY TDP / SRP / ARA DNA/RNA	Celine Beal Particles	Lomas Virus / Probes Nicks	Lomas POC/N vol= POC/N	Bachman Pol vol= NPP	Selph POP vol=	HPLC/FCM vol=	CHIA
1	5	26.8		X			13025							X			
2	5		301, 302, 304														
3	5		~~301, 302~~, 303														
4	5									X							
5	5									X							
6	40			X			A3026	-24									
7	40			~~X~~			~~A3028~~	~~-25~~						X			
8	100 DCM			X			A3027	-25									
9	100 DCM													X			
10	100 DCM		304							X					~~X~~		
11	100 DCM									X							
12	100 DCM	19.2								X							
13	120			X			A3028										
14	120		~~305~~												~~X~~		
15	150		~~306~~	X			A3029				X				~~X~~		
16	250		~~307~~	X			A3030								~~X~~		
17	~~500~~		~~308~~	X			A3031								~~X~~		
18	~~1000~~		~~309, 310, 311~~	X			A3032								~~X~~		
19	1500			X	X	X											
20	1500		~~312~~				A033	-26				103	103		~~X~~		
21	1500								X								
22	2000		~~313~~	X			A034	-27									
23	3000			X	X	X											
24	3000		~~314~~ Repeat Pipettor Failed				A035					104	104		~~X~~		

Cruise:	AE1319			Leg:	2	Cast:	AE1319C_38			Type:	Martiny Incubation Sta 14.							
Date:	9/5/2013		Time:	Lat:			Long:			Samplers:								
Date:			Time:	Lat:			Long:											
Niskin #	Depth	~~Niskin temp~~	Martiny Oxygens UCA / DNA	~~Garcia DIC Bates~~	~~DIC Keeling~~	~~TOC/N~~ Nicole	~~Sugars~~	~~Salts~~	~~Nuts~~	~~TDR/ SRP+ARA~~	~~Bact~~	~~Virus/ Probes~~	~~POC/N vol=~~	~~Psi vol=~~	~~POP vol=~~	~~HPLC/FCM vol=~~	~~CHLA~~
1	5		X														
2	5		X														
3	5				X												
4	5				X												
5	5				X												
6	5			X													
7	5			X													
8	5			X													
9	5			X													
10	5					X											
11	25		X														
12	25		X														
13	40		X														
14	40		X														
15	60		X														
16	60		X														
17	80		X														
18	80		X														
19	100		X														
20	100		X														
21	120		X														
22	120		X														
23	160		X														
24	160		X														

Cruise:	AE1319			Leg:	2	Cast:	AE1319C_39			Type:	Lomas Shallow.	Sta 14						
Date:	9/5/2013		Time:	Lat:			Long:			Samplers:								
Date:			Time:	Lat:			Long:											
Niskin #	Depth	~~Niskin temp~~	Lomas ~~Oxygens~~ NUTS / TDR / SRP	DIC Bates	~~Lomas DIC Keeling~~ poc (2D)	Lomas ~~TOC/N~~ poc (2D)	Lomas ~~Sugars~~ Chla	Lomas ~~Salts~~ Fcm	Lomas ~~Nuts~~ tdn poc/p pp = pp	Lomas ~~TDR/ SRP+ARA~~ tdn poc/p pp = pp	Lomas ~~Bact~~ DNA/rRNA Bg Fcm	Lomas ~~Virus/ Probes~~ Bag poc/n (mP)	Johnson POC/N Psi = Lipids	Johnson Psi vol= Peg/P	Octave ~~POP~~ Psi Proteins.	~~HPLC/FCM vol=~~	~~CHLA~~
1	5		108 / 92 / 43a,b	72 3	7103	92	92	92									
2	5								54	31	56						
3	5											poc=21					
4	5											pop=37					
5	5																
6	5												X	X			
7	5														X		
8	20		106 / 93 / 44a,b	73 4	104	93	93	93									
9	20								35				X	X			
10	60		105 / 94 / 45a,b	74 5	105	94	94	94									
11	60								x 35	x 32	x 57						
12	60												X	X			
13	70		108 / 95 / 46a,b	75 6	106	95	95	95									
14	85 pcm		109 / 96 / 47a,b	76 7	107	96	96/96a	96									
15	85 pcm								x 36	x 33	x 58						
16	85 pcm											poc= 22					
17	85 pcm											pop=22					
18	85 pcm																
19	85 pcm												X	X			
20	85 pcm														X		
21	120		110 108 / 97 / 48a,b	78	108	97	97 97	97			59						
22	120												X	X			
23	120		111 109 / 98 / 49 A/b	78 9	109	98	98	98									
24	160												X	X			

2nd DCM platform @ 120-19a and O_2 max. mixing recently.

Cruise: AE1319				Leg: 2		Cast: AE1319C_340				Type: Dejallas / Severin / Wintery Cast.							
Date: 9/6/2013			Time: 00 50	Lat: 54 59.900			Long: 57 29.879			Samplers:							
Date:			Time:	Lat:			Long:										
Niskin #	Depth	~~Niskin temp~~	~~Dejallas Severin~~ Oxygens N_2 Fix	~~DIC Rates~~	~~DIC Keeling~~ DNA/RNA	~~TOC/N~~	~~Sugars~~	~~Salts~~	~~Nuts~~	~~TDP/ SRP/APA~~	~~Bacl.~~	~~Virus/ Probes~~	~~POC/N vol =~~	~~Pel. vol =~~	~~POP vol =~~	~~HPLC/FCM vol =~~	~~ChlA~~
1	5		X														
2	5		X														
3	5		X														
4	5		X														
5	5		X														
6	5		X														
7	5		X														
8	5		X														
9	5		X														
10	5		X														
11	5		X														
12	5				X												
13	5				X												
14	5				X												
15	5				X												
16	30		X														
17	60		X														
18	105 pm		X														
19	105 pm				X												
20	105				X												
21	105				X												
22	105				X												
23	120 ~~120~~		X														
24	160		X														

Cruise: AE1319				Leg: 2		Cast: AE1319C_41				Type: Martiny incubation							
Date: 9/6/2013			Time: 6:00 pm	Lat: 32 59.974 N			Long: 60.00 058 W			Samplers:							
Date:			Time:	Lat:			Long:										
Niskin #	Depth	~~Niskin temp~~	~~Martiny Oxygens~~ WGA/DNA	~~Gourcha DIC Rates~~ WAE	~~DIC Keeling~~ Nicole	~~TOC/N~~ Leeann	~~Sugars~~	~~Salts~~	~~Nuts~~	~~TDP/ SRP/APA~~	~~Bacl.~~	~~Virus/ Probes~~	~~POC/N vol =~~	~~Pel. vol =~~	~~POP vol =~~	~~HPLC/FCM vol =~~	~~ChlA~~
1	5	5	X														
2	5	5	X														
3	5	5		X	X												
4	5	5		X		X											
5	5	5		X		X											
6	5	5		X		X											
7	5	25	X	X		X											
8	5	25	X	X		X											
9	5	40	X	X		X											
10	5	40	X	X		X											
11	25	60	X														
12	25	60	X														
13	40	70	X			X											
14	40	70 pm	X			X											
15	60	70	X			X											
16	60	70	X			X											
17	80	80	X														
18	80	80	X														
19	100	100	X														
20	100	100	X														
21	120	120	X														
22	120	120	X														
23	160	160	X														
24	160	160	X														

Cruise: AE1319 | Leg: 2 | Cast: AE1319C_42 | Type: Lomas Shallow Cast Sta. 15.

Date: 9/6/2013 | Time: 21:55 GMT | Lat: 33 00.0157 | Long: 59 59.789 | Samplers:

Niskin #	Depth	Niskin temp	Lomas Oxygens NUTS/TDP/SRP	DIC Bates	Lomas DIC Keeling POCN(%)	Lomas TOCN POC (%)	Lomas Sugars chla	Lomas Salts FCM	Lomas Nuts Tun POC/N pro+P	Cetinic TDP/ SRP+APA Tun POP pro+P	Lomas Bact DAM/NAM by FCM	Lomas Virus/ Probes POC/NP mfp.	Johnson POCN vol= Optics	Johnson Pig vol=p poly-p	Johnson POP vol= Optics Alkpol	Krause HPLC/FCM vol= Synecho	chlA
1	5		112/99/50a,b	80	112	99	99	99									
2	5								37	37	60						
3	5											pocn-23					
4	5											pop-23					
5	5															X	
6	5												X				
7	5													X	X		
8	20		113/100/51a,b	81	113	100	100	100									
9	20													X	X		
10	60		114/101/52a,b	82	114	101	101	101									
11	60								38	38	61						
12	60													X	X		
13	70		115/102/53a,b	83	115	102	102	102									
14	80	DCM	116/103/54a,b	84	116	103	103	103									
15	80	DCM							39	39	62						
16	80	DCM										pocn-24					
17	80	DCM										pop-24					
18	80	DCM															
19	80	DCM											X				
20	80	DCM												X	X		
21	120		117/104/55a,b	85	117	104	104	104			63						
22	120													X	X		
23	160		118/105/56a,b	86	118	105	105	105									
24	160													X	X		

Cruise: AE1319 | Leg: 2 | Cast: AE1319C_43 | Type: Lomas Deep Cast Sta. 15

Date: 9/1/2013 | Time: 23:58 | Lat: 32 59.982 | Long: 60.032 | Samplers:

Niskin #	Depth	Niskin temp	Johnson Oxygens Metabolomics	Johnson DIC Bates Lipids	Johnson DIC Keeling Poly P	Fawcett TOCN δ15N2	Fawcett Sugars δ13 PON	Peralta Salts Secern	Nuts	Cetinic TDP/ SRP+APA Particle	Lomas Bact NUTS	Lomas Virus/ Probes POC/N	Bochman ROCN vol= NPP	Lomas Pig vol= Tun POC/N Lowest	Lomas POP vol= Tun POP Lowest	HPLC/ECM vol=	chlA
1	5		X			13036											
2	5												X				
3	5													X	X		
4	5																
5	5																
6	40		X			13037	- 28										
7	40												X				
8	70	DCM	X			13038	- 29										
9	70	DCM											X				
10	70	DCM												X	X		
11	70	DCM															
12	70	DCM															
13	70	DCM															
14	120		X			13039											
15	150		X			13040											
16	200		X			13041											
17	500		X			13042											
18	800		X			13043											
19	1500		X	X	X												
20	1500					13044	-30				199	119					
21	1500							X									
22	2000		X			13045	-31										
23	3000		X	X	X												
24	3000					13046					120	120					

Cruise: AE1319				Leg: 2		Cast: AE1319C — 44				Type: Marking (RT), leAnn, Bridget Cast							
Date: 9/8/13		Time: 1 a.m.		Lat:			Long:			Samplers:							
Date:		Time:		Lat:			Long:										
Niskin #	Depth	Niskin temp	Oxygens	~~DIC Bates~~ leAnn	~~DIC~~ Keeling Bridget	~~TOC/N~~ Marking RT	Sugars	Salts	Nuts	TDP / SRP / APA	Bact.	Virus/ Probes	POC/N vol =	Psi vol =	POP vol =	HPLC/FCM vol =	ChlA
1	5	5			x												
2	-1r	5			x												
3	-1r	5				x											
4	-11-	5				x											
5	-11-	5				x											
6	-11-	5				x											
7	-11-	~~40~~ 5				x											
8		~~40~~ 5															
9		40			x												
10		40			x												
11		DCM		x													
12				x													
13				x													
14				x													
15				x													
16				x													
17				x													
18				x													
19				x													
20				x													
21				x													
22				x													
23					x												
24	~~5~~	DCM			x												

Cruise: AE1319				Leg: 2		Cast: AE1319C — ~~40~~ 5				Type: incubation cast							
Date: 9/8/2013		Time: 05:06		Lat: 31 40.1186			Long: 64 10.3053			Samplers:							
Date:		Time:		Lat:			Long:										
Niskin #	Depth	Niskin temp	~~Oxygens~~ heat Gold temp	~~Bridget DIC Bates~~ NPP	~~whitney DIC Keeling~~ Biomass	~~TOC/N~~	~~Sugars~~	~~Salts~~	~~Nuts~~	~~TDP / SRP / APA~~	~~Bact.~~	~~Virus/ Probes~~	~~POC/N vol =~~	~~Psi vol =~~	~~POP vol =~~	~~HPLC/FCM vol =~~	~~ChlA~~
1	5		x														
2	5		x														
3	5		x														
4	5		x														
5	5		~~x~~ x	~~x~~													
6	5			x													
7	5			x													
8	40 DCM			x													
9	40			x													
10	70 DCM			x													
11	70			x													
12	70				x												
13	70				x												
14	70				x												
15	70				x												
16	70				x												
17	70				x												
18	70				x												
19	70				x												
20	70				x												
21	70				x												
22	70				x												
23	70				x												
24	70				x												

Cruise: AE1319				Leg: 2		Cast: AE1319 C-46				Type:							
Date: 9/8/2013			Time: 0807 GMT	Lat: 31° 40.27°N			Long: 64° 10.23°W			Samplers:							
Date: 9/8/2013			Time:	Lat:			Long:										
Niskin #	Depth	Niskin temp	Oxygens NUTS/TDP/SRP	DIC Bates	~~DIC Keeling~~ Poc/n ☆	Lomas ~~POC/N~~ POP (2)	Lomas ~~Sugars~~ chl	Lomas ~~Salts~~ Fcm	Lomas ~~Nuts~~ TDN pon/N pP tnP	Lomas ~~TDP/~~ SRP FRPA TDN POP PP TPP	Lomas ~~Bact.~~ DNA/RNA hg Fcm	Lomas ~~Virus/~~ Protos POC/N/P mP	Celtic ~~POC/N~~ not= optics	Johnson ~~Psi~~ vol= polyP	Johnson ~~POP~~ vol= Lipids	Lomas ~~HPLC/FCM~~ vol= kinetic uptake	Krause CHIA Syn Sort
			☆														
1	5		121/106/57a,b	87	121	106	106	106									
2	5							~~40~~	~~40~~ 40	~~40~~ 40	64						
3	5										~~pocN25~~	~~Poc/n25~~					
4	5										~~pop25~~	~~pop25~~					
5	5													X	X		
6	5												XX			X/X	X/X
7	5												X			~~X~~	
8	20		122/107/58 a,b	88	122	107	107	107						~~X~~	~~X~~	X	
9	20													X	X		
10	60		123/108/59 a,b	89	123	108	108	108									
11	60								41	41	65						
12	60													X	X		
13	70		124/109/60 a,b	90	124	109	109/a	109								X	
14	70								42	42	66						
15	70											Poc/N 26					
16	70											Pop 26					
17	70																X
18	70												X				
19	~~70~~													~~X~~ X	~~X~~ X		
20	~~70~~ 65		125/110/61A,B	91	125	110	110	110						~~X~~	~~X~~		
21	120		126/111/62 A,B	92	126	111	111	111			67						
22	120													X	X		
23	160		127/112/63 a,B	93	127	112	112	112									
24	160													X	X		

☆ Computer failure on the way down. Computer was restarted. plot split between 2 different files. ☆
CTD did not have to be restarted.

Cruise: AE1319				Leg: 2		Cast: AE1319C-~~48~~7				Type: Lomas Deep Cast Sta. 16.							
Date: 9/8/2013			Time: 1106 GMT	Lat: 31° 40.314°N			Long: 64° 10.199°W			Samplers:							
Date:			Time:	Lat:			Long:										
Niskin #	Depth	~~Niskin temp~~	Johnson Oxygens Metabolomics	Johnson ~~DIC~~ Lipids	Johnson DIC ~~Keeling~~ PolyP	Fawcett TOC/N $\delta^{15}NO_3$	Fawcett ~~Sugars~~ $\delta^{15}PON$	Douglas ~~Salts~~ Zeaxanthin DNA	Whitney ~~Nuts~~ DNA	cetinic TDP/ SRP FRPA Particles	Lomas ~~Bact.~~ NUTS	Lomas ~~Virus/~~ Protos POC/N	POC/N vol =	Psi vol =	POP vol =	HPLC/FCM vol =	CHIA
1	5		X			A3047											
2	5								X								
3	5								X								
4	5								X								
5	5																
6	40		X			A3048	-32										
7	40					~~A3049~~											
8	60 DCM		X			A3049	-33										
9	60								X								
10	60								X								
11	60								X								
12	60								X								
13	60								X								
14	120		X			A3050											
15	200		X			A3051											
16	450 EDW		X			A3052											
17	500		X			A3053											
18	800 O2min.		X			A3054											
19	1500		X	X	X						128	128					
20	1500					A3055	-34										
21	1500							X									
22	2000		X			A3056	-35										
23	3000		X	X	X												
24	3000					A3057					129	129					

Cruise: AE1319				Leg: 2		Cast: AE1319C-48				Type: Ivona diel 1							
Date: 9/8/2013			Time: 14:38 GMT	Lat: 31°40.232 N			Long: 64°10.187 W			Samplers:							
Date:			Time: 15:12	Lat: 31 40.213 N			Long: 64° 10.202 W										
Niskin #	Depth	Niskin temp	IVONA Oxygens Particles	Jeppe DIC Bates Ciliates	Lomas DIC Keeling PO4	TOC/N	Sugars	Salts	Nuts	TDP/SRP/APA	Bact.	Virus/Probes	POC/N vol=	Psi vol=	POP vol=	HPLC/FCM vol=	ChlA
1	5		X														
2	5		X														
3	5		X														
4	5		X														
5	5			X													
6	5			X													
7	5			X													
8	5			X													
9	5			X													
10	5			X													
11	5				X												
12	5				X												
13	5				X												
14	5				X												
15	5				X												
16	5				X												
17	5				X												
18	5				X												
19	5				X												
20	5				X												
21	60	ocm	X														
22	60		X														
23	60		X														
24	60		X														

(60)

Crazy primary O_2 sensor, not debubbled, 2 Sec O_2 is OK, first 20 m.
maybe lowering CTD first to 10 m then do the real cast.

Cruise: AE1319				Leg: 2		Cast: AE1319C-49				Type: Garcia Incubation							
Date: 9/8/2013			Time:	Lat:			Long:			Samplers:							
Date:			Time:	Lat:			Long:										
Niskin #	Depth	Niskin temp	Garcia Oxygens nut add.	DIC Bates WOA	DIC Keeling	TOC/N	Sugars	Salts	Nuts	TDP/SRP/APA	Bact.	Virus/Probes	POC/N vol=	Psi vol=	POP vol=	HPLC/FCM vol=	ChlA
1	5	5	~~X~~	X													
2	5	5	~~X~~	X													
3	5	5	~~X~~														
4	5	5	~~X~~														
5	5	5	~~X~~														
6	5	5	~~X~~														
7	~~80~~	5	~~X~~														
8	~~80~~	5	~~X~~														
9	~~[illegible]~~	80	~~X~~	X													
10		80	~~X~~	X													
11		160	~~X~~	X													
12		160	~~X~~	X													
13		5	~~X~~ ~~X~~	X													
14	~~160~~	5	~~X~~ X	X													
15	~~160~~	5	~~X~~ X														
16		5	X														
17		5	X														
18		5	X														
19		5	X														
20		5	X														
21		80		X													
22		80		X													
23		160		X													
24		160		X													

any other incubation 1(25)-

Note, CTD didn't start firing from →

Cruise: AE1319				Leg: 2		Cast: AE1319C-50				Type: IUOWA DIEL 2							
Date: 9/8/2013		Time: 20:44		Lat: 31° 40.238'N		Long: 64°10.312W				Samplers:							
Date:		Time:		Lat: [illegible]		Long:											
Niskin #	Depth	Niskin temp	IUOWA ~~Oxygens~~ PARTICLES	GARCIA DIC Bates INCUBATIONS	DIC Keeling	TOC/N	Sugars	Salts	Nuts	TDP / SRP / APA	Bact.	Virus/ Probes	POC/N vol =	Psi vol =	POP vol =	HPLC/FCM vol =	ChlA
12	5		x														
13	5		x														
14	5		x														
15	5		x														
16	70	DCM	x														
17	70	DCM	x														
18	70	DCM	x														
19	70	DCM	x														
20	70	DCM		x													
21	70	DCM		x													
22	70	DCM		x													
23	70	DCM		x													
24	70	DCM		x													

Cruise: AE1319				Leg: 2		Cast: AE1319C-51				Type: Dziallas /Severin Cast.							
Date: 9/9/2013		Time: 00:36		Lat: 31°40.321'N		Long: 64°10.285'W				Samplers:							
Date:		Time: [08:36]		Lat:		Long:											
Niskin #	Depth	~~Niskin temp~~	Dziallas/Severin ~~Oxygens~~ N_2 Fix	D/S ~~DIC Bates~~ DNA	JEPPE DIC Keeling CILIATES	IOWA TOC/N PARTICLES	Sugars	Salts	Nuts	TDP / SRP / APA	Bact.	Virus/ Probes	POC/N vol =	Psi vol =	POP vol =	HPLC/FCM vol =	ChlA
1	5		x														
2	5		x														
3	5		x														
4	5		x														
5	5		x														
6	5		x														
7	5		x														
8	5		x														
9	5		x														
10	5		x														
11	5		x														
12	5					x											
13	5					x											
14	5					x											
15	20		x														
16	40		x														
17	DCM		x														
18	DCM=65				x												
19	DCM				x												
20	DCM					x											
21	DCM					x											
22	DCM					x											
23	90		x														
24	120		x														

Cruise: AR1318 | Leg: 2 | Cast: AR1318-52 | Type: Water Bottle Cast

Date In: 9/9/2013 | Time In: 8:31 | Lat In: 31° 40.268N | Long In: 64° 9.990W

Date Out: | Time Out: | Lat Out: | Long Out: | Samplers:

N #	Depth	Water Part	Miles for Adilia Payton
1	5	X	
8	5	X	
9	5	X	
10	5	X	
11	40		X
12	40		X
13	40		X
14	40		X
15	40		X
16	40		X
17	40		X
18	40		X
19	40		X
20	40		X
21	65 Dcm	X	
22	65 Dcm	X	
23	65 Dcm	X	
24	65 Dcm	X	

* Ship's movement very visible in CTD profile (loopy loops)

Cruise: AT1319 | Leg: 1 | Cast: AT1319-53 | Type: Mooring Surf

Date In: | Time In: 330pm | Lat In: | Long In: | Samplers:

Date Out: | Time Out: | Lat Out: | Long Out:

N #	Depth
1	5
2	5
3	5
4	25
5	25
6	25
7	40
8	40
9	40
10	60
11	60
12	60
13	80
14	80
15	80
16	100
17	100
18	100
19	120
20	120
21	120
22	160
23	160
24	160

Cruise: AE1319	Leg: 2	Cast: AE1319C-54	Type: Last Cast

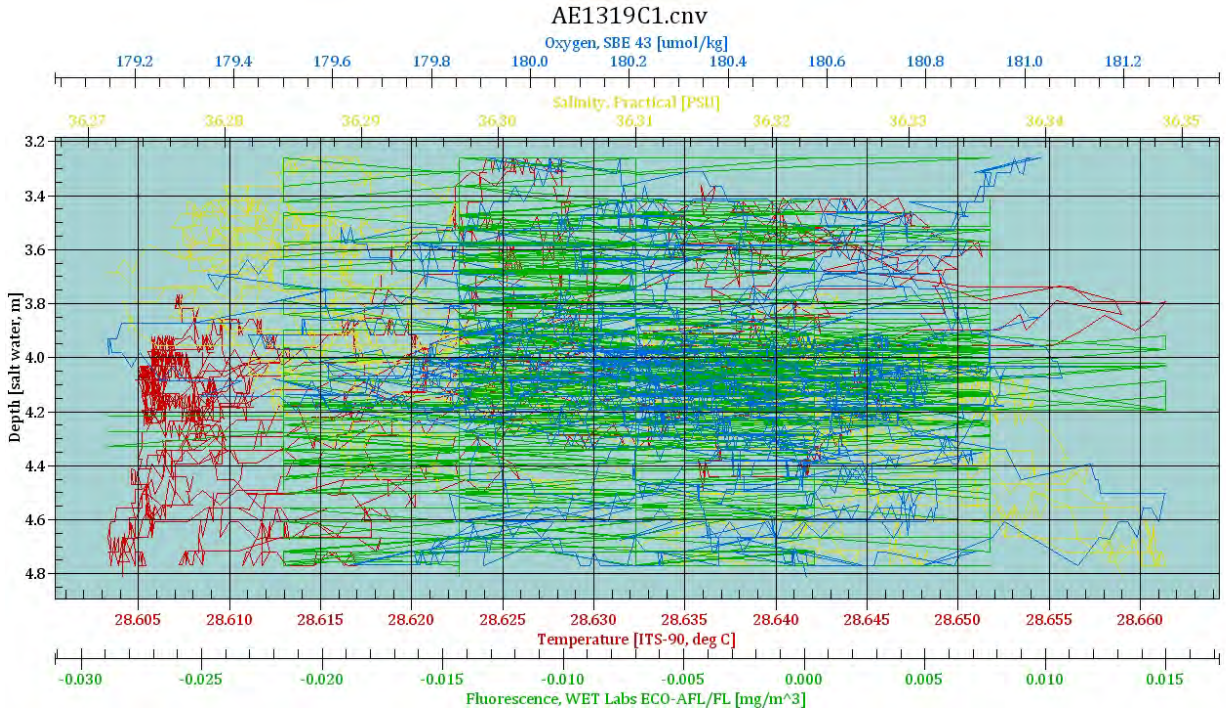
Date In: 9/9/13	Time In:	Lat In:	Long In:	
Date Out:	Time Out:	Lat Out:	Long Out:	Samplers:

N #	Depth		Martiny filter test					Lunnes $\delta^{18}O$											
1	5			x															
2	5			x															
3	5			x															
4	5			x															
5	5			x				x											
6	75cm							x											
7	75							x											
8	75							x											
9	75							x											
10	75							x											
11	75							x											
12	75							x											
13	75							x											
14	75							x											
15	75			x				x											
16	75			x															
17	75			x															
18	75			x															
19	75																		
20	75																		
21	75																		
22	75																		
23	75																		
24	75																		

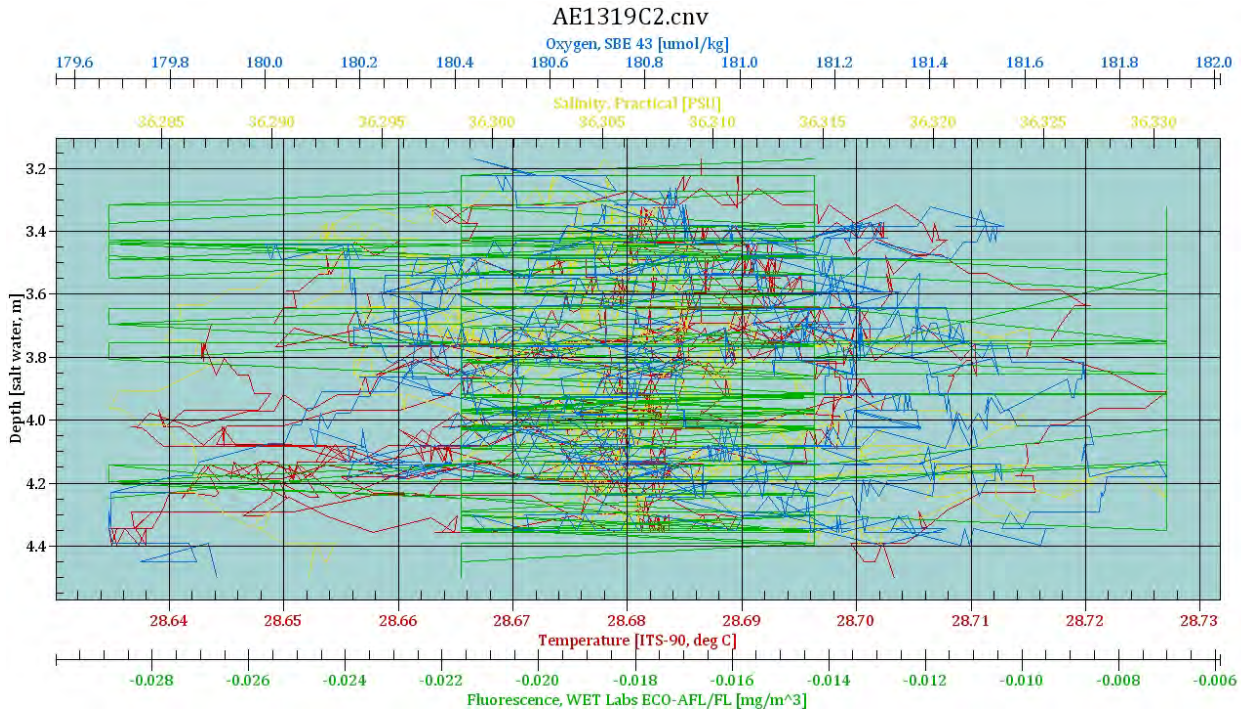
Appendix 3.4. Screen shots of T, S, DO, and fluorescence for each CTD cast.

[begins on following page]

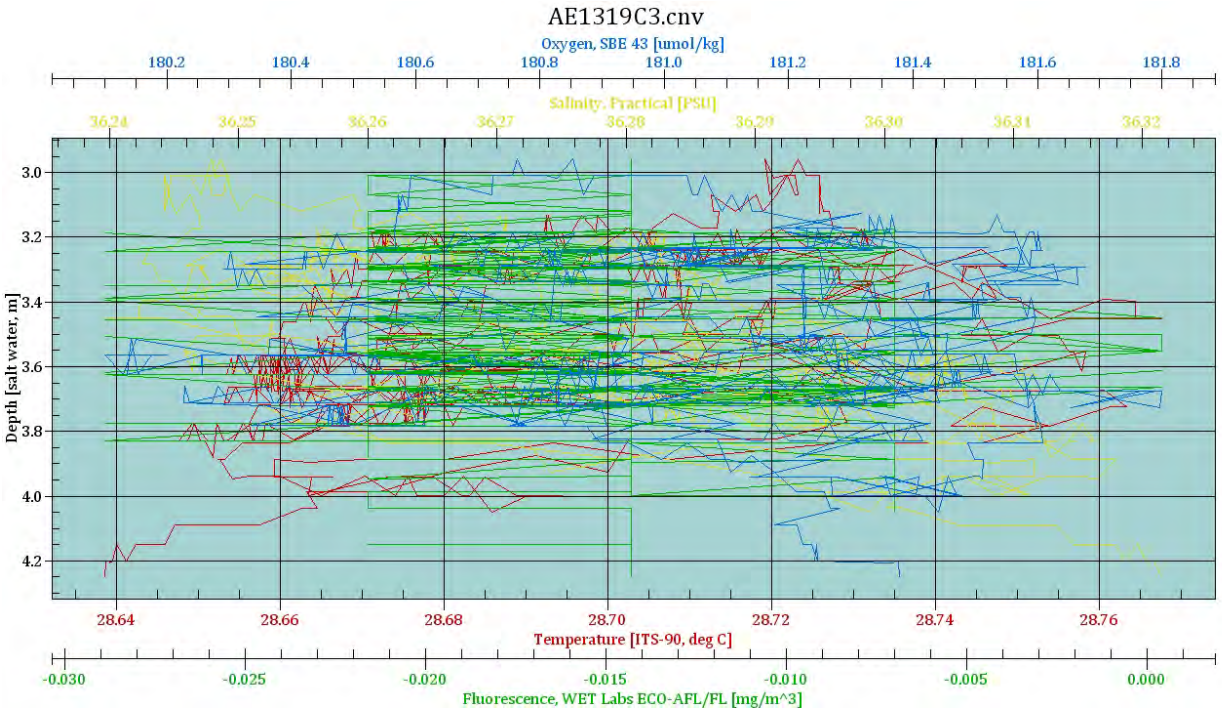
Cast AE1319C_01



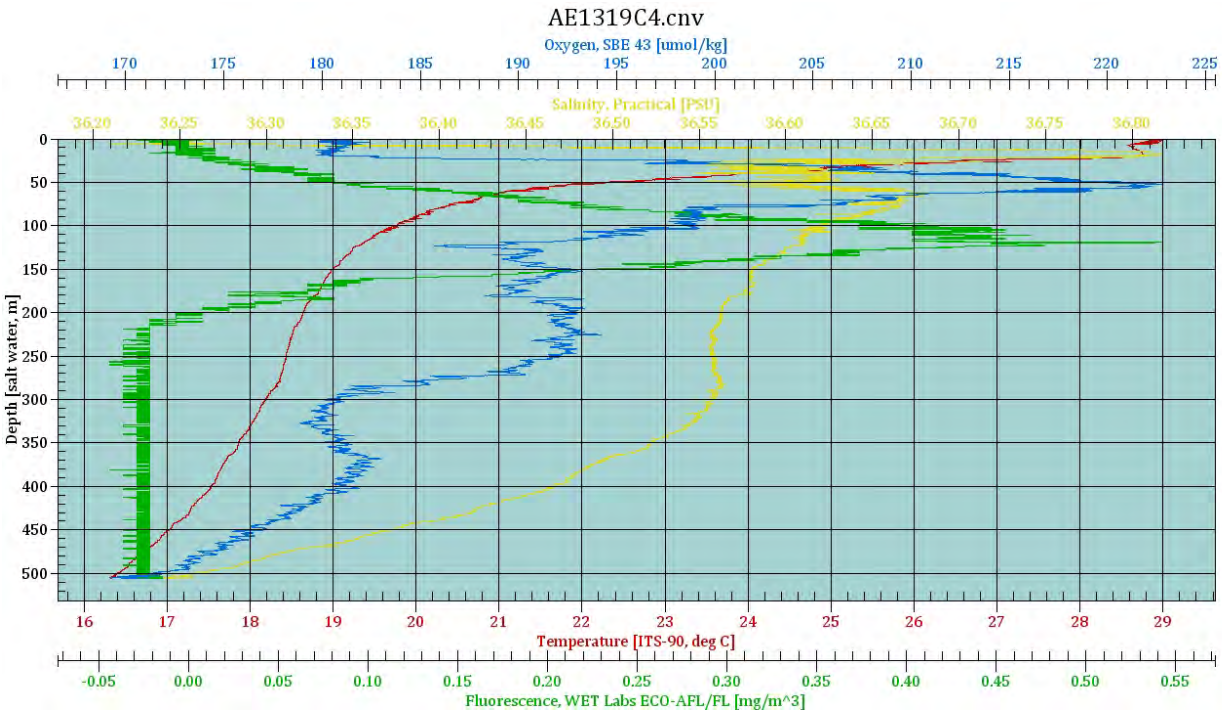
Cast AE1319C_02



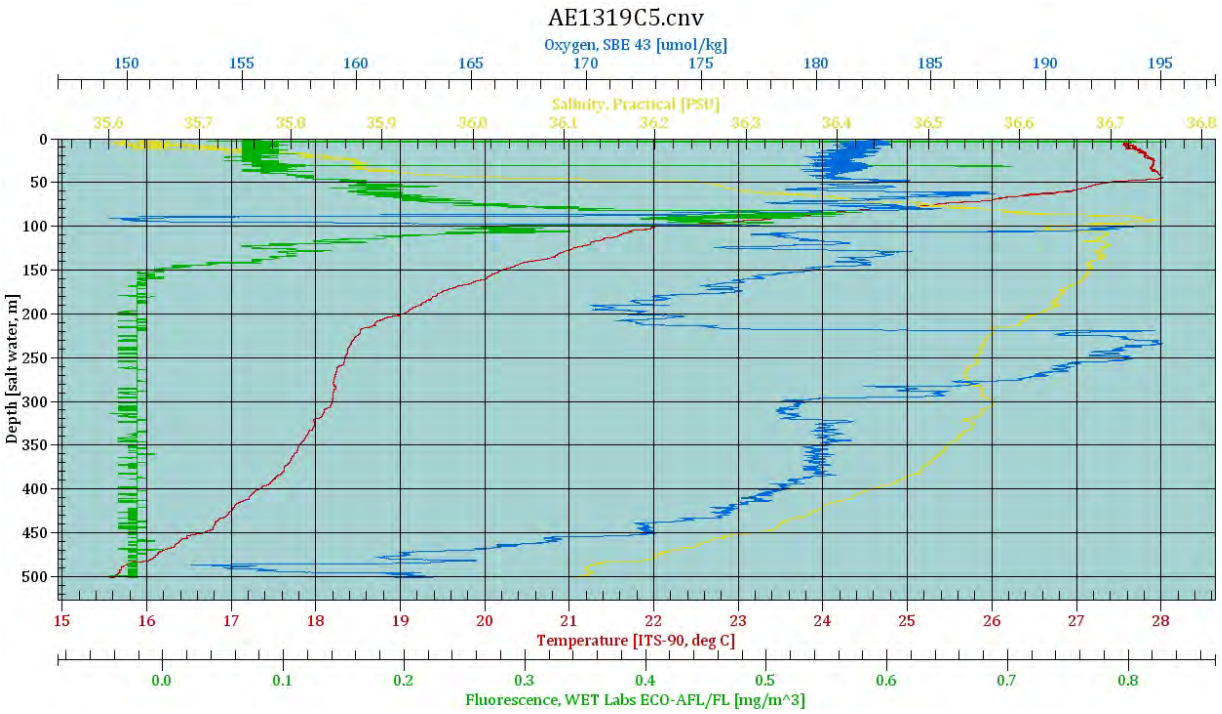
Cast AE1319C_03



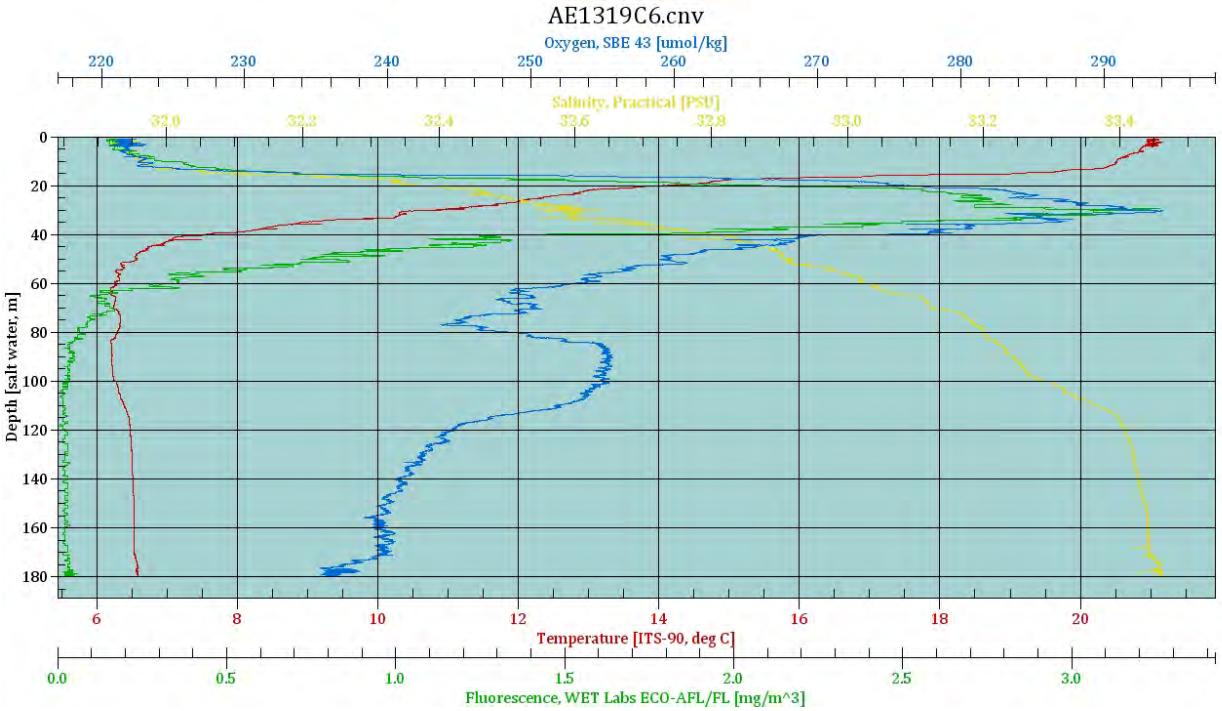
Cast AE1319C_04



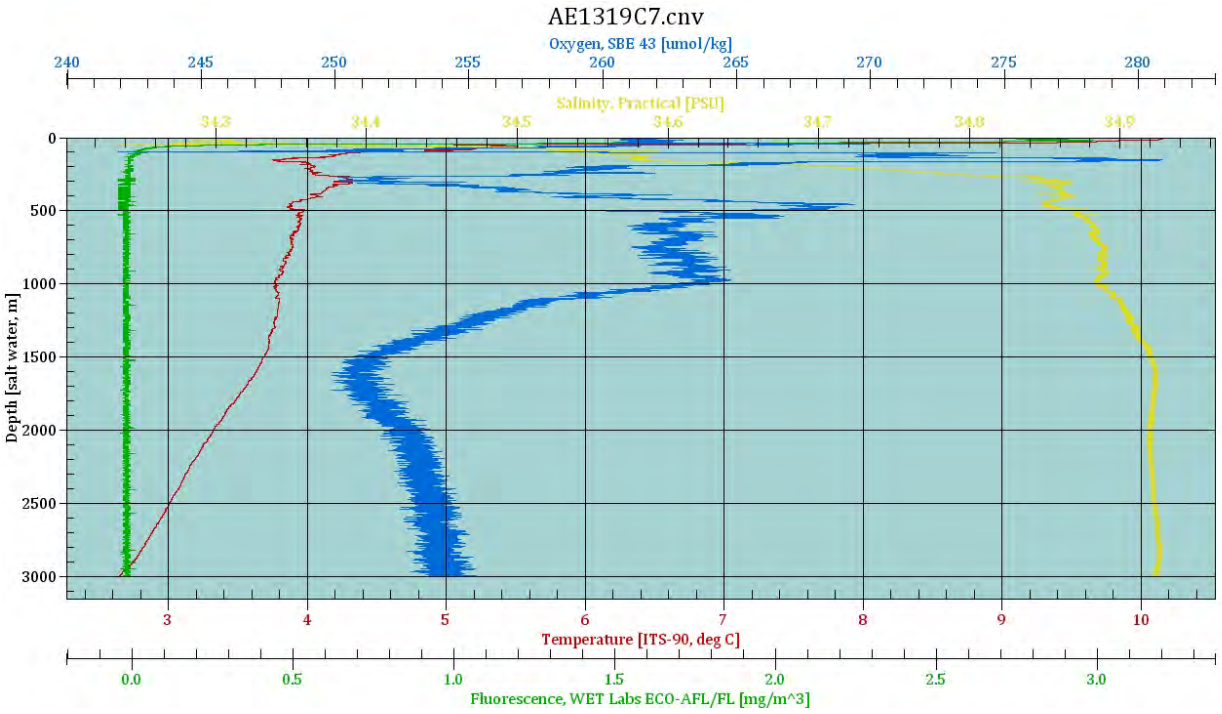
Cast AE1319C_05



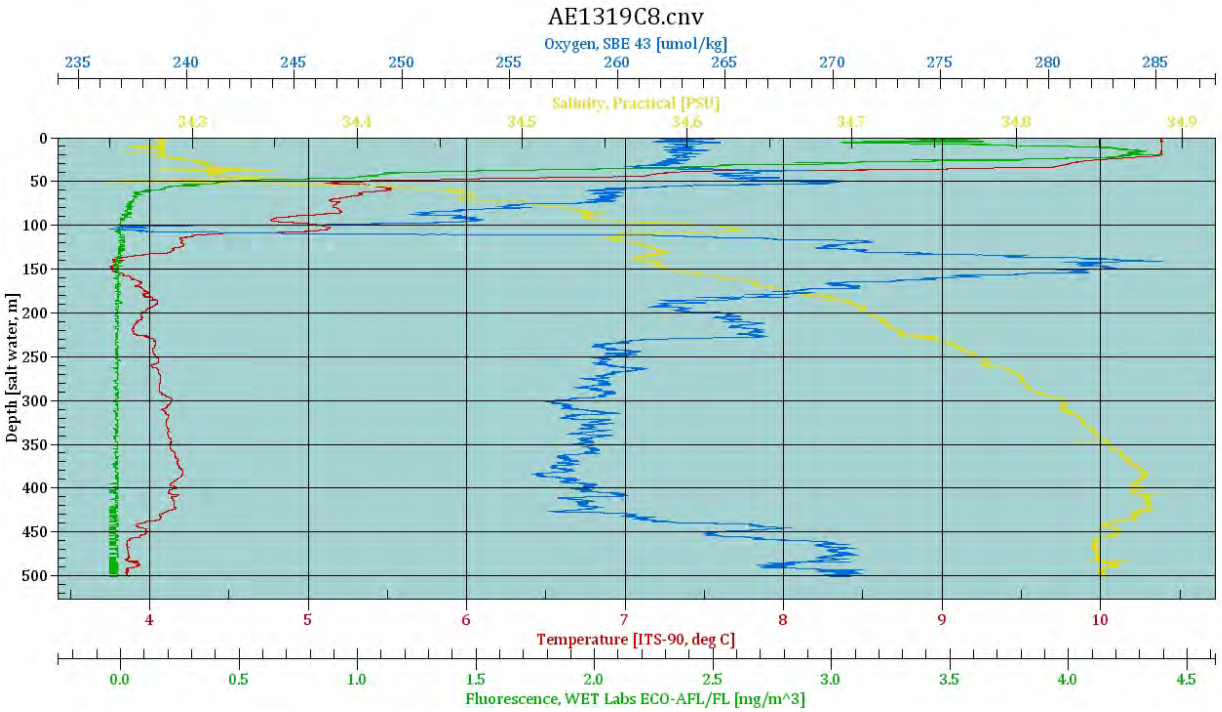
Cast AE1319C_06



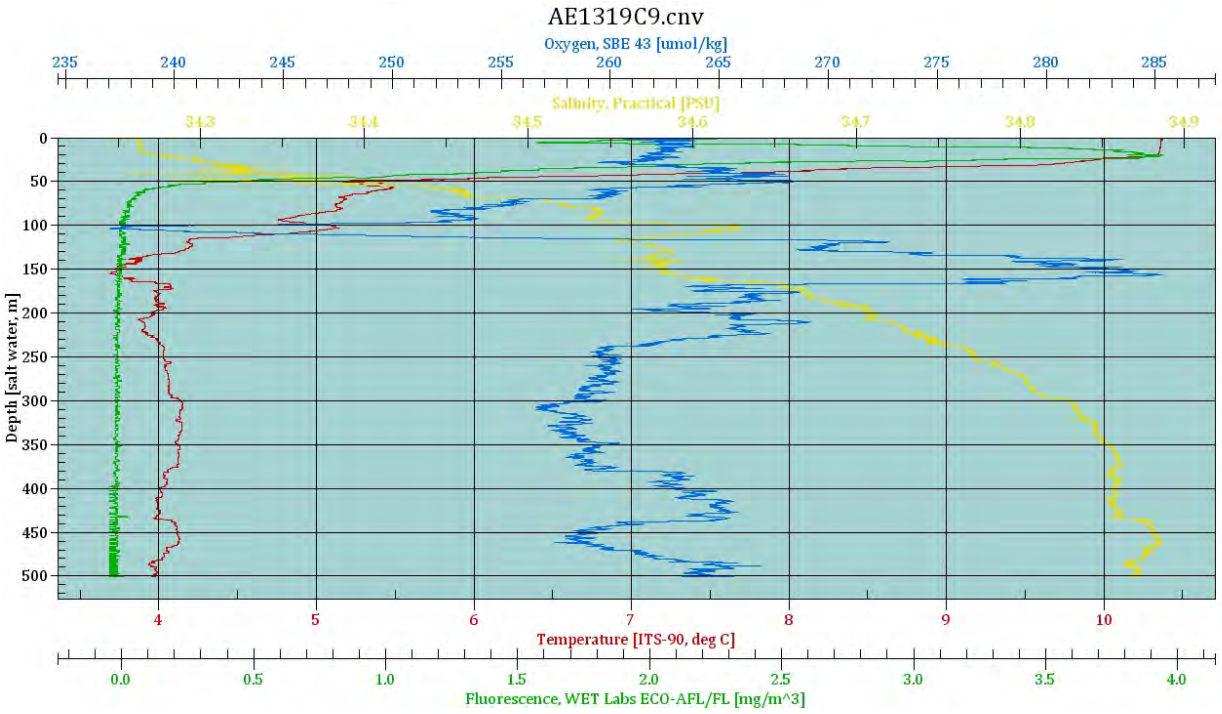
Cast AE1319C_07



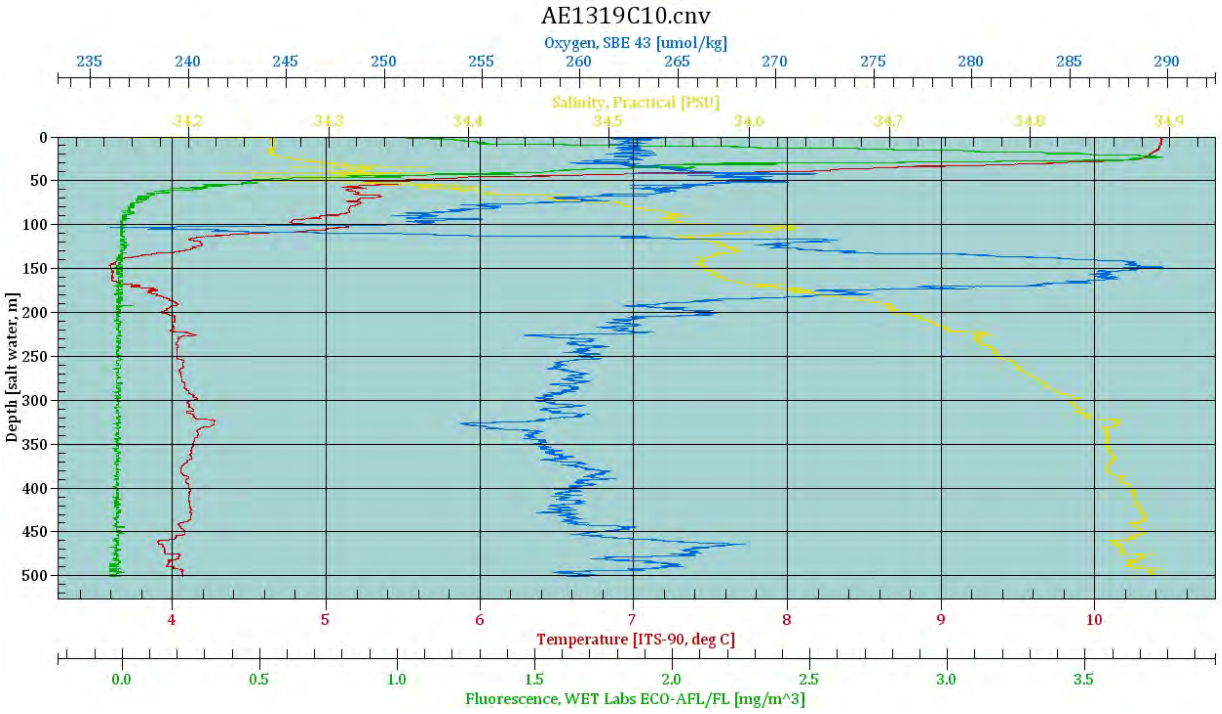
Cast AE1319C_08



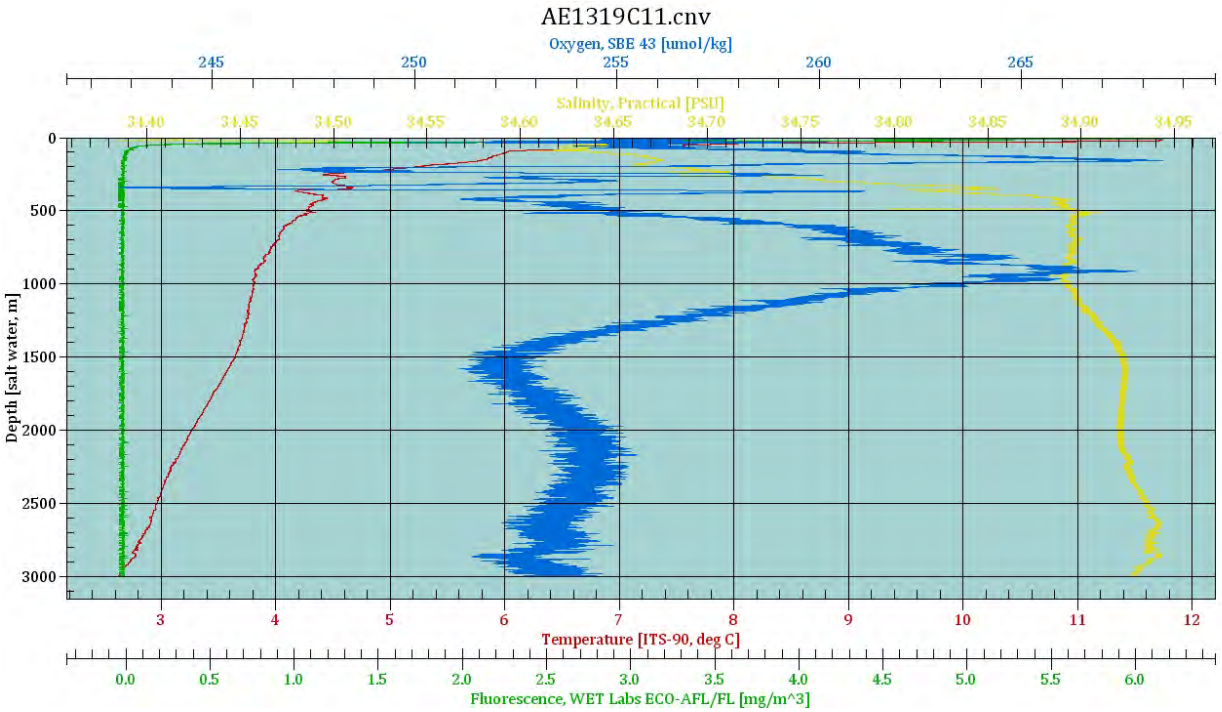
Cast AE1319C_09



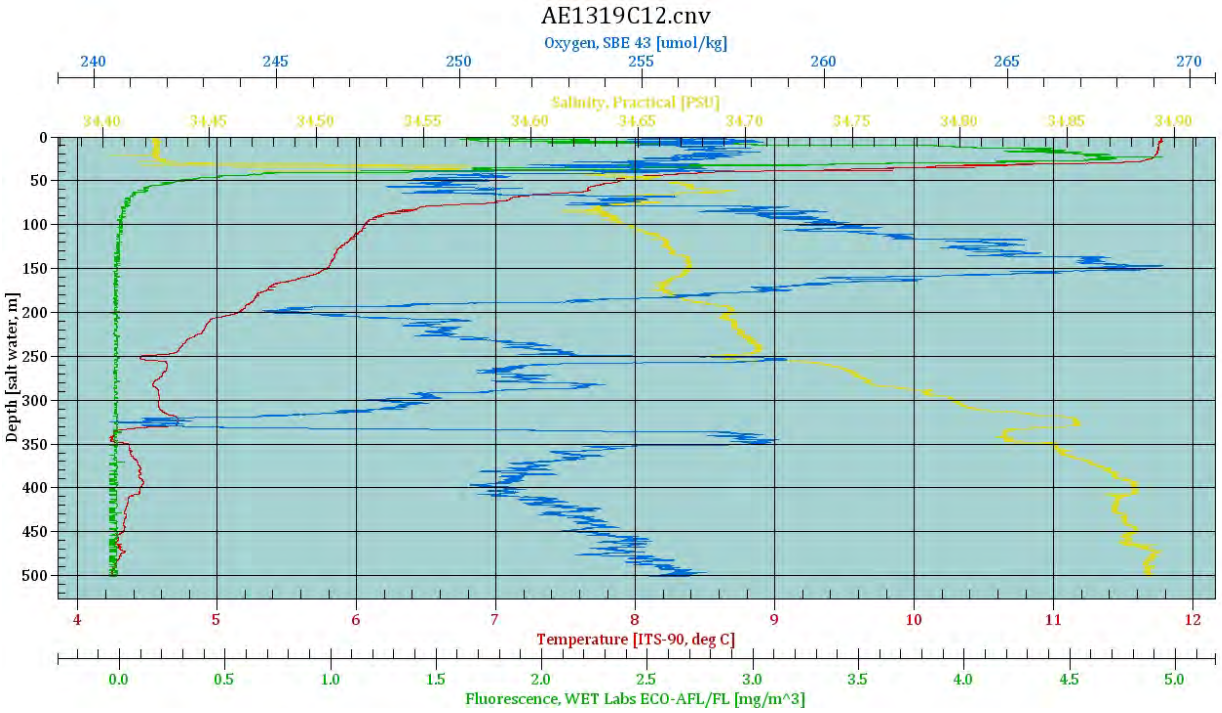
Cast AE1319C_10



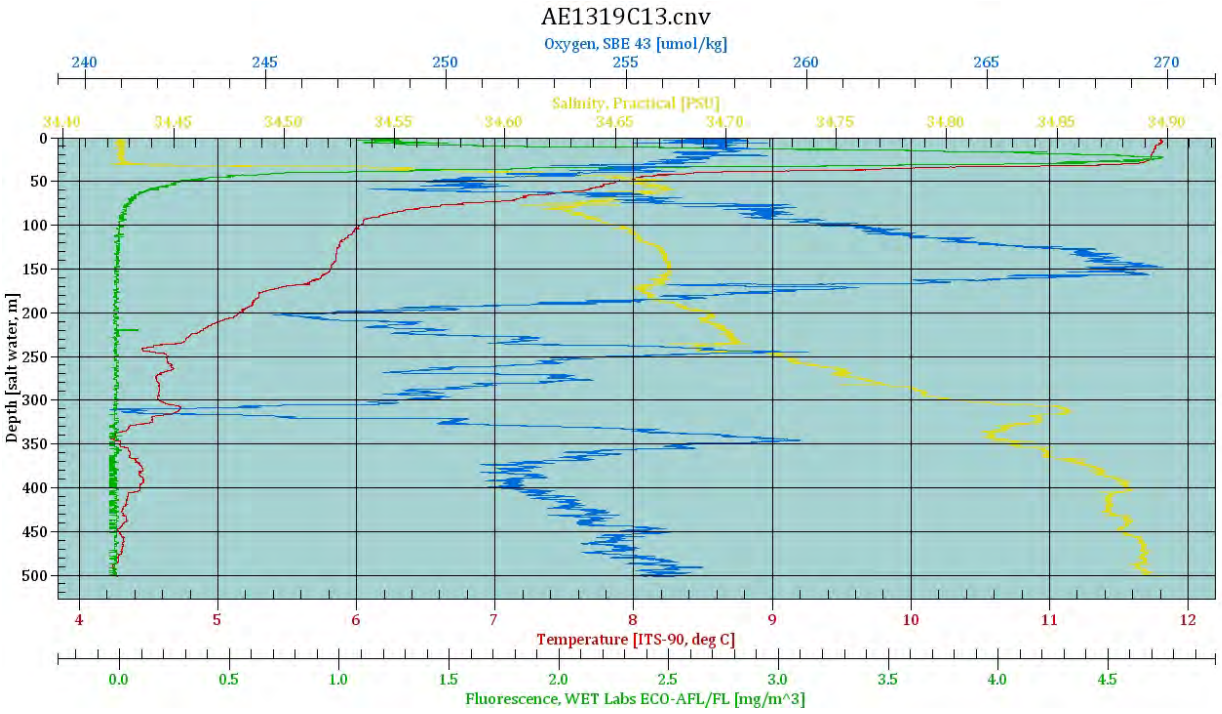
Cast AE1319C_11



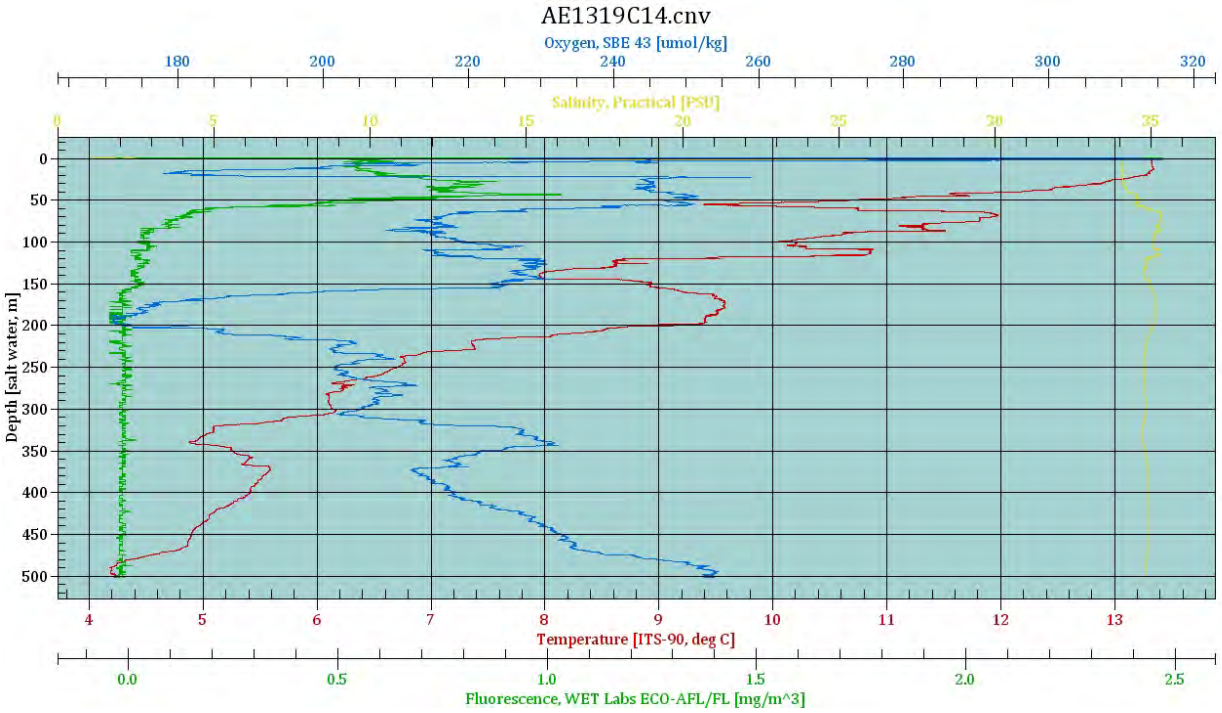
Cast AE1319C_12



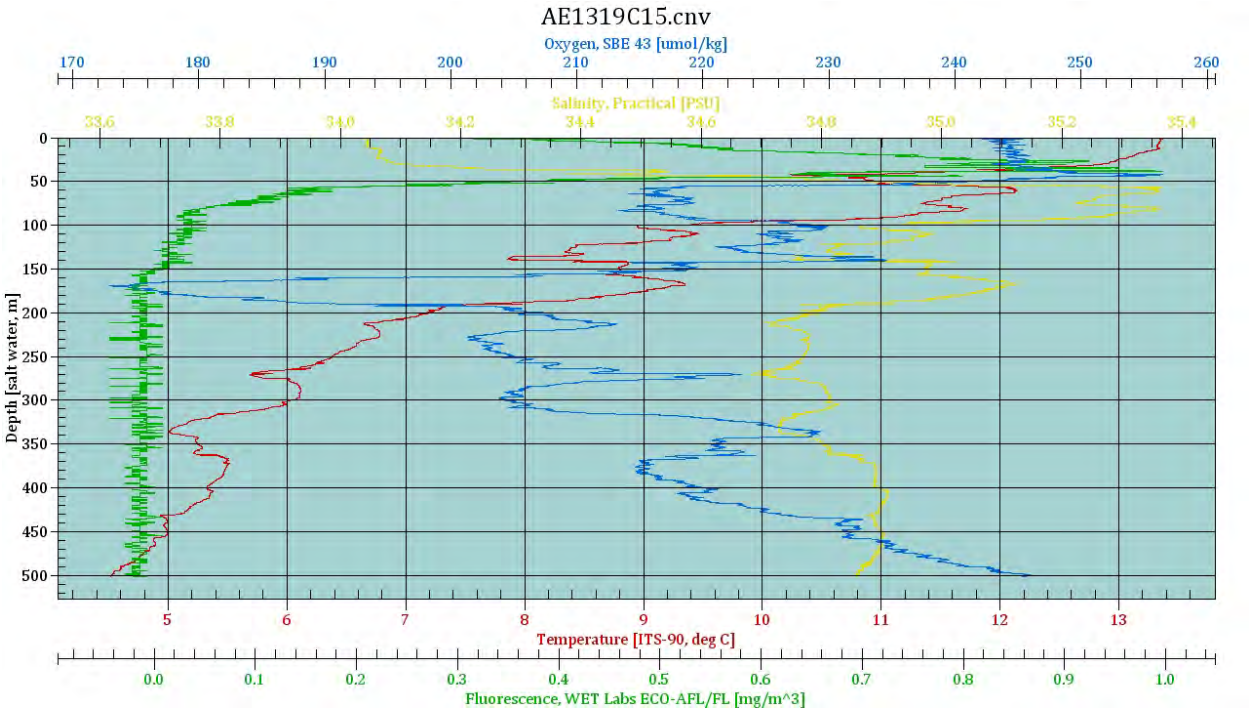
Cast AE1319C_13



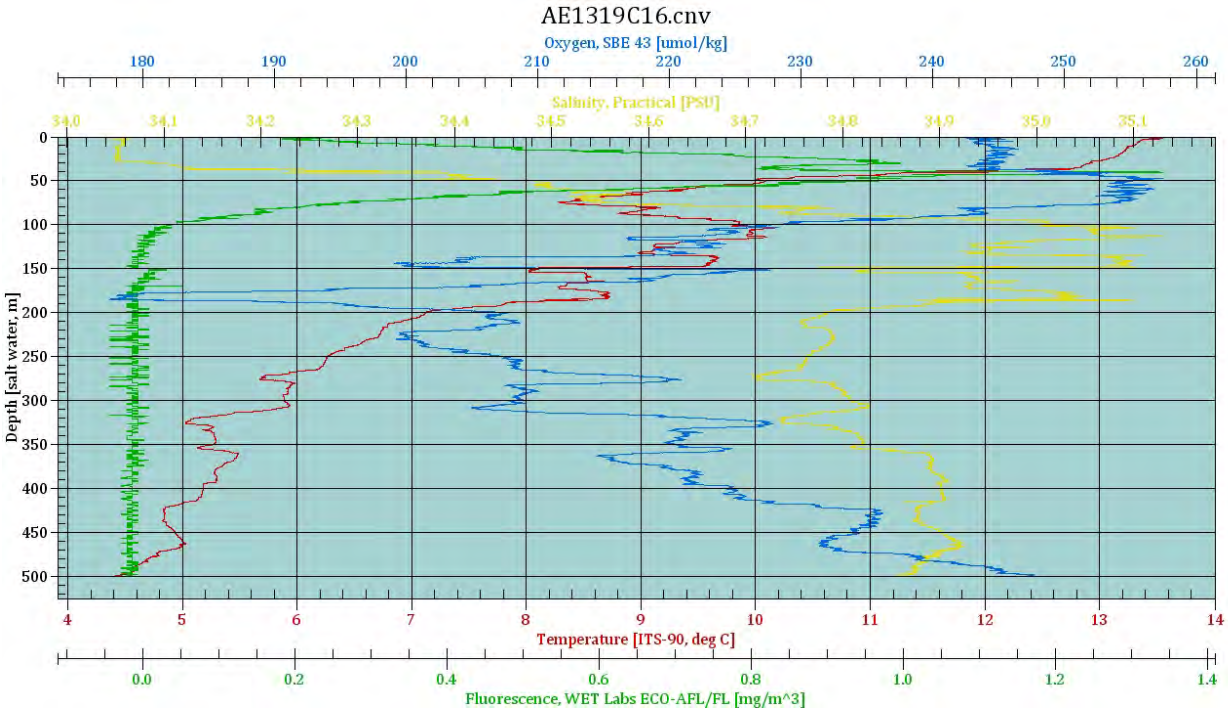
Cast AE1319C_14



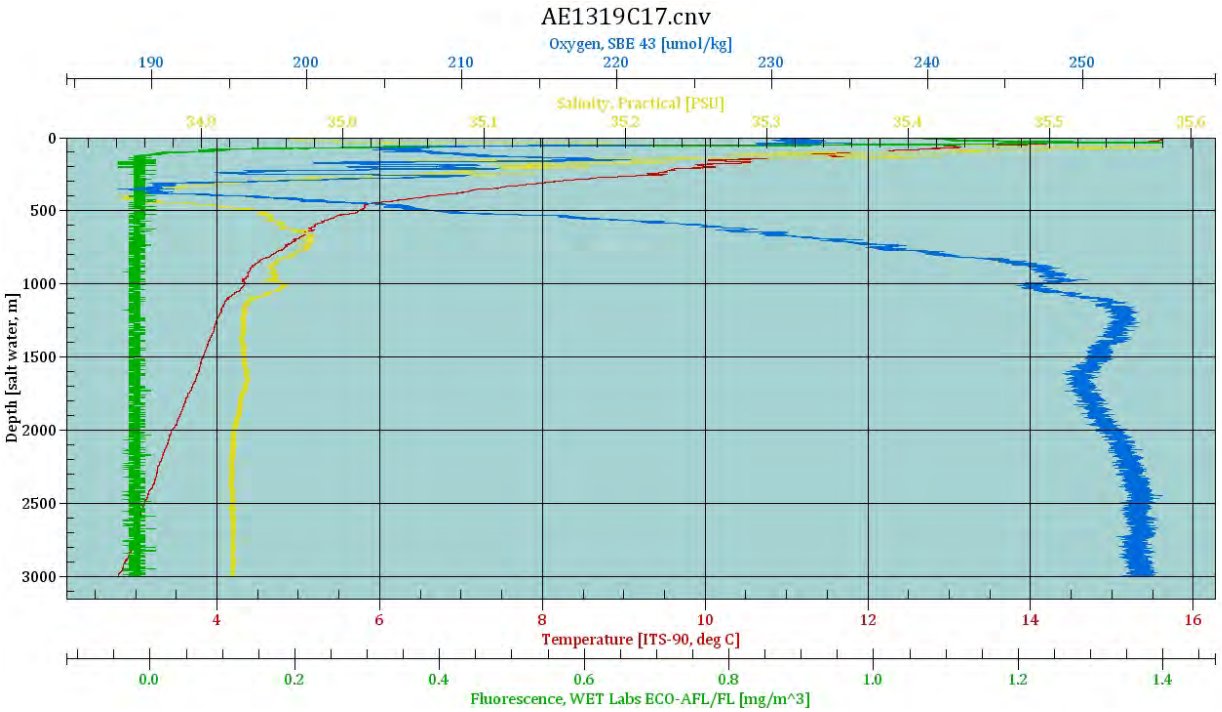
Cast AE1319C_15



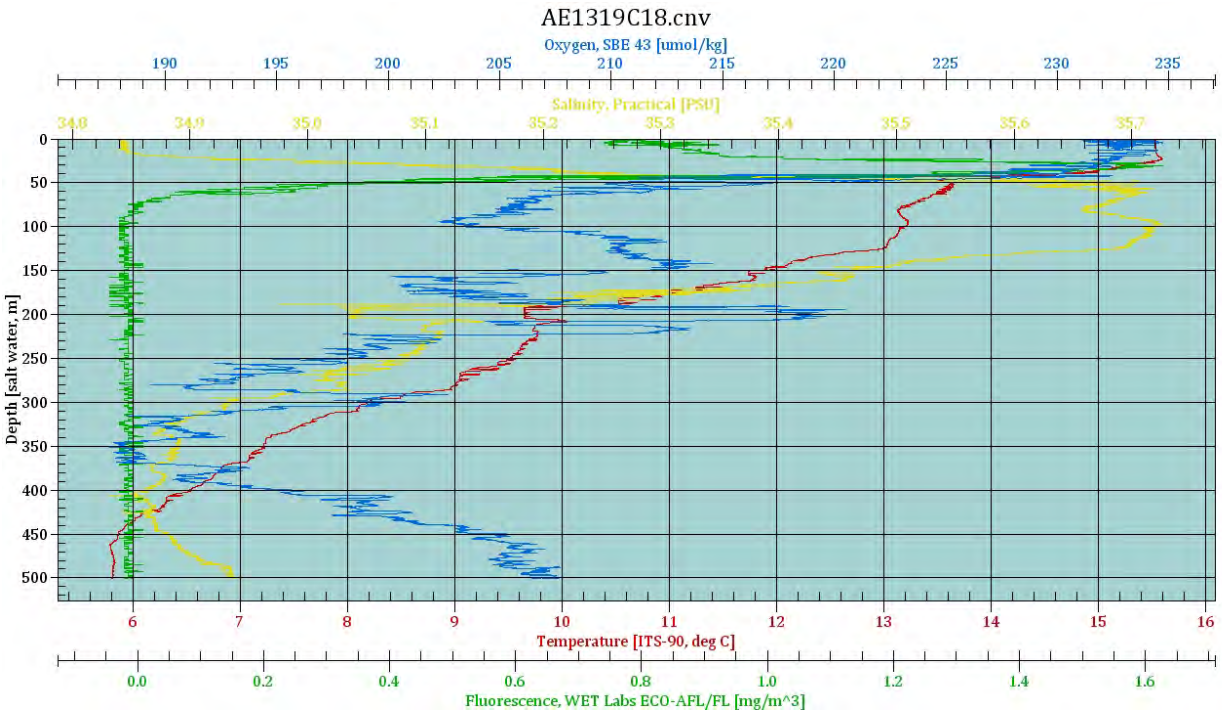
Cast AE1319C_16



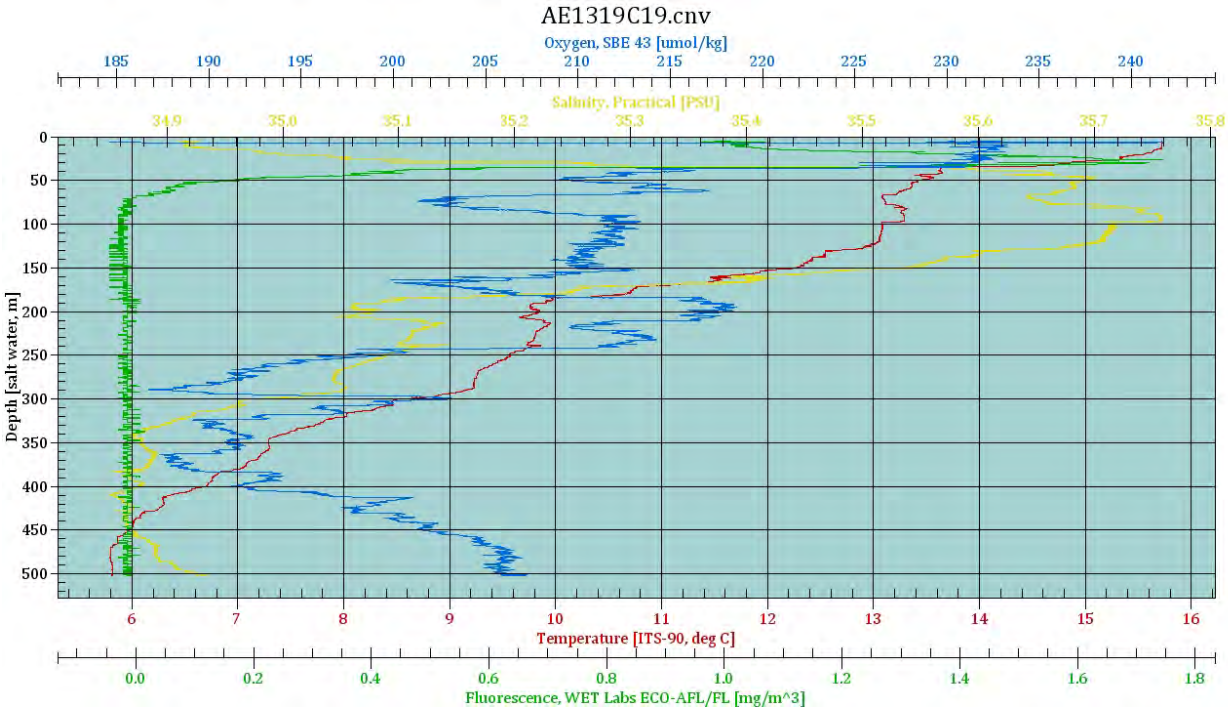
Cast AE1319_17



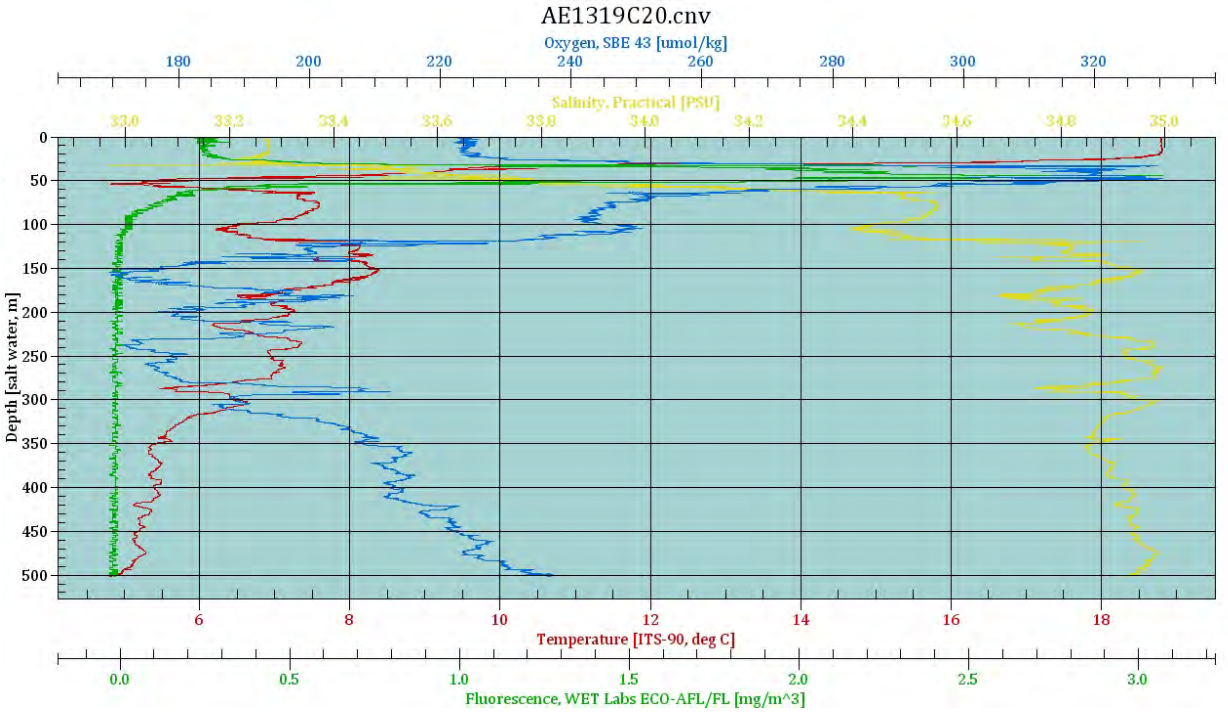
Cast AE1319C_18



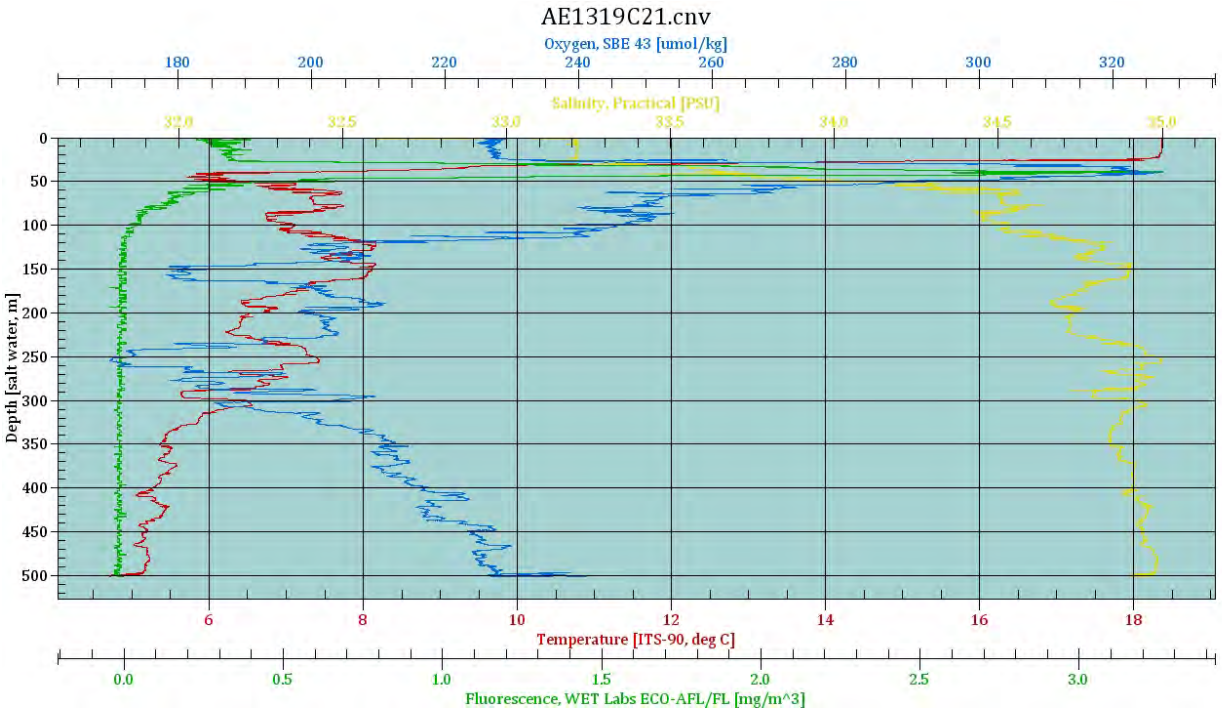
Cast AE1319C_19



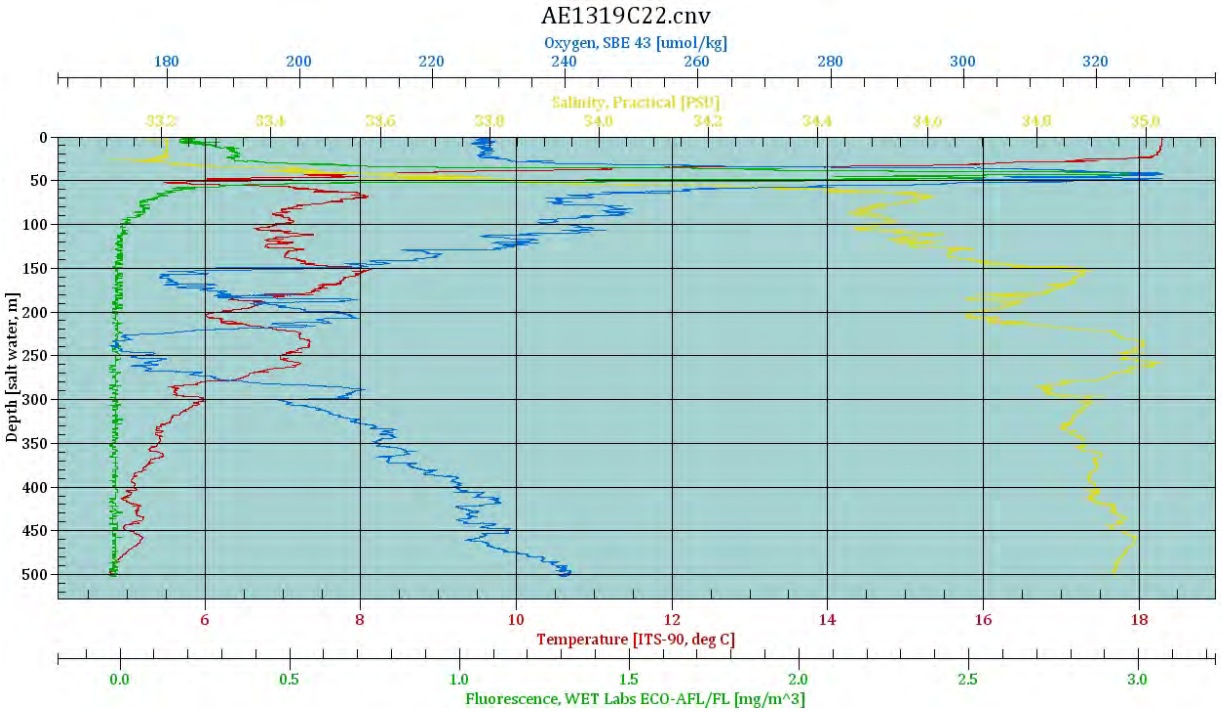
Cast AE1319C_20



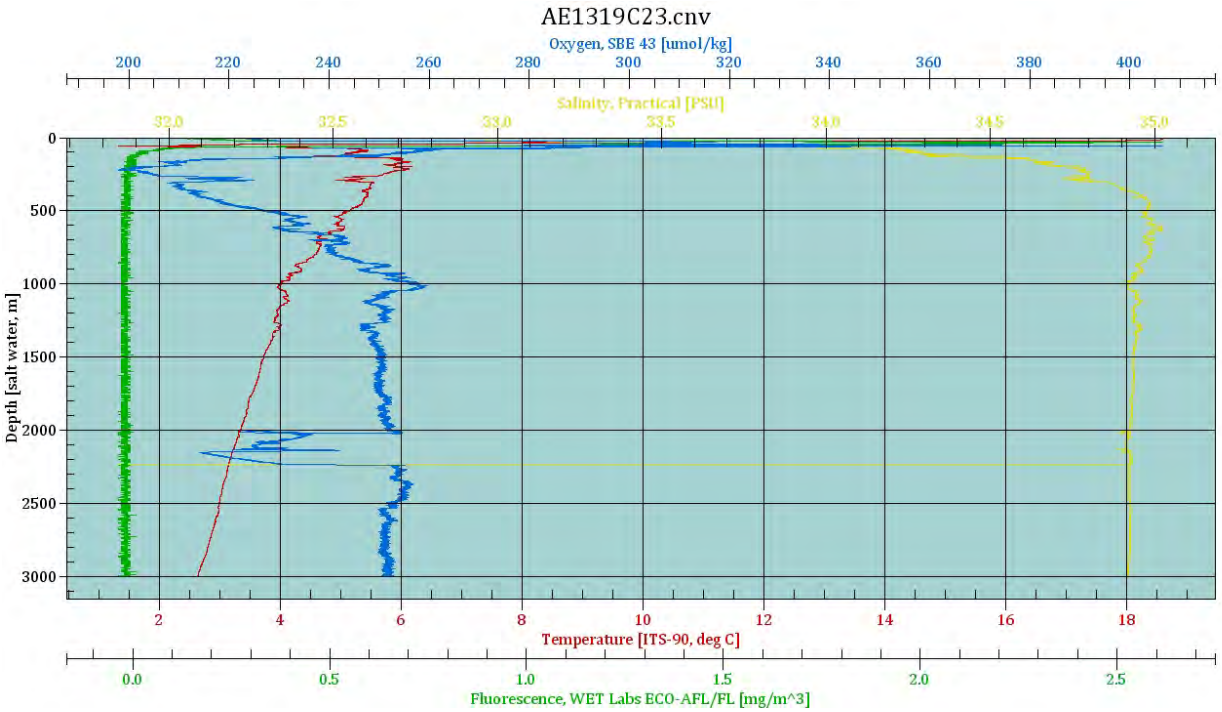
Cast AE1319C_21



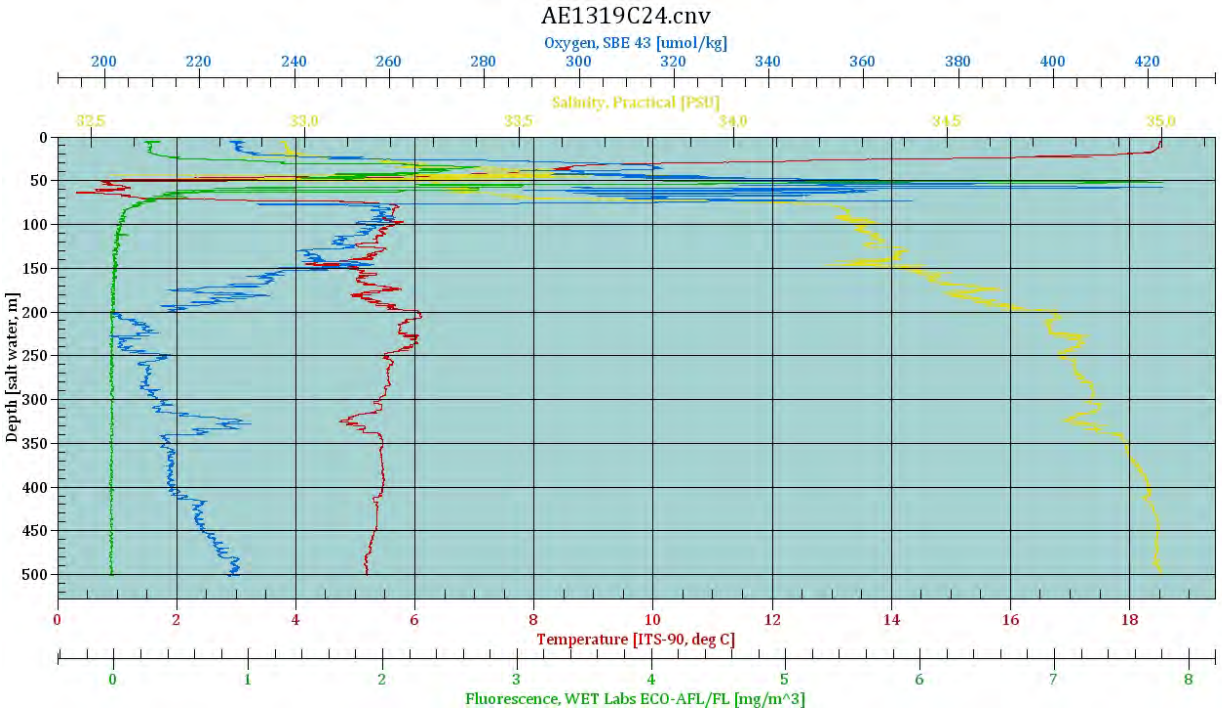
Cast AE1319C_22



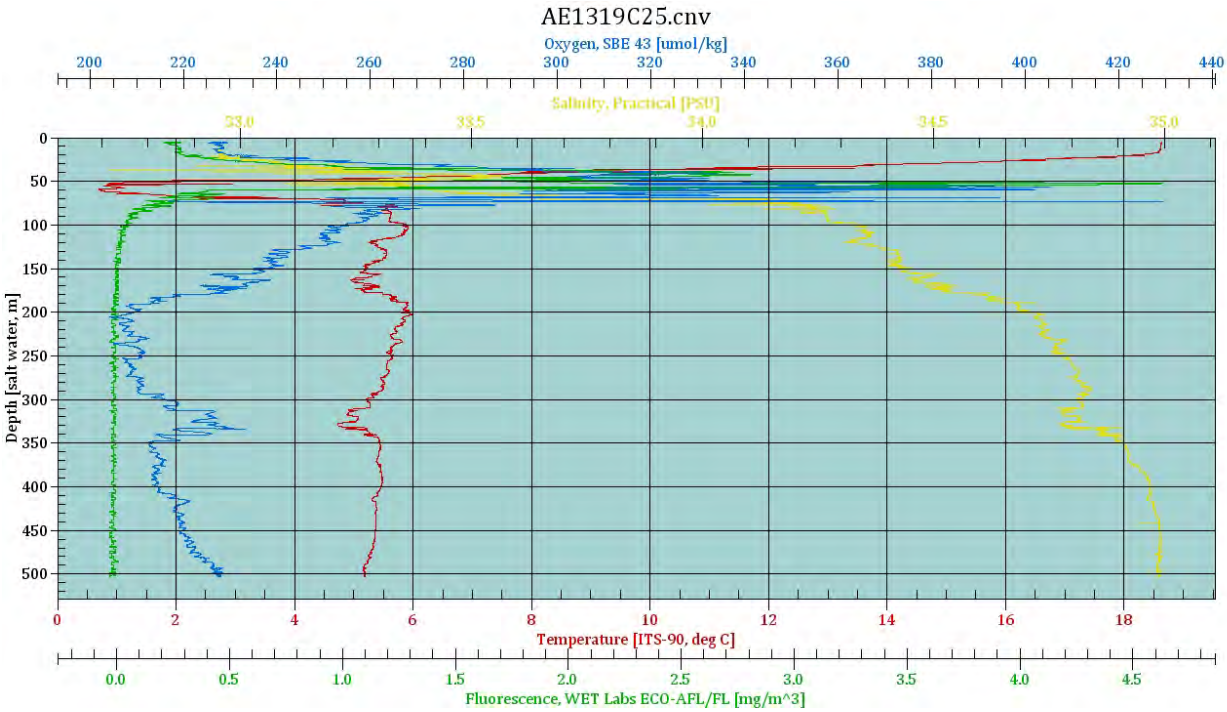
Cast AE1319C_23



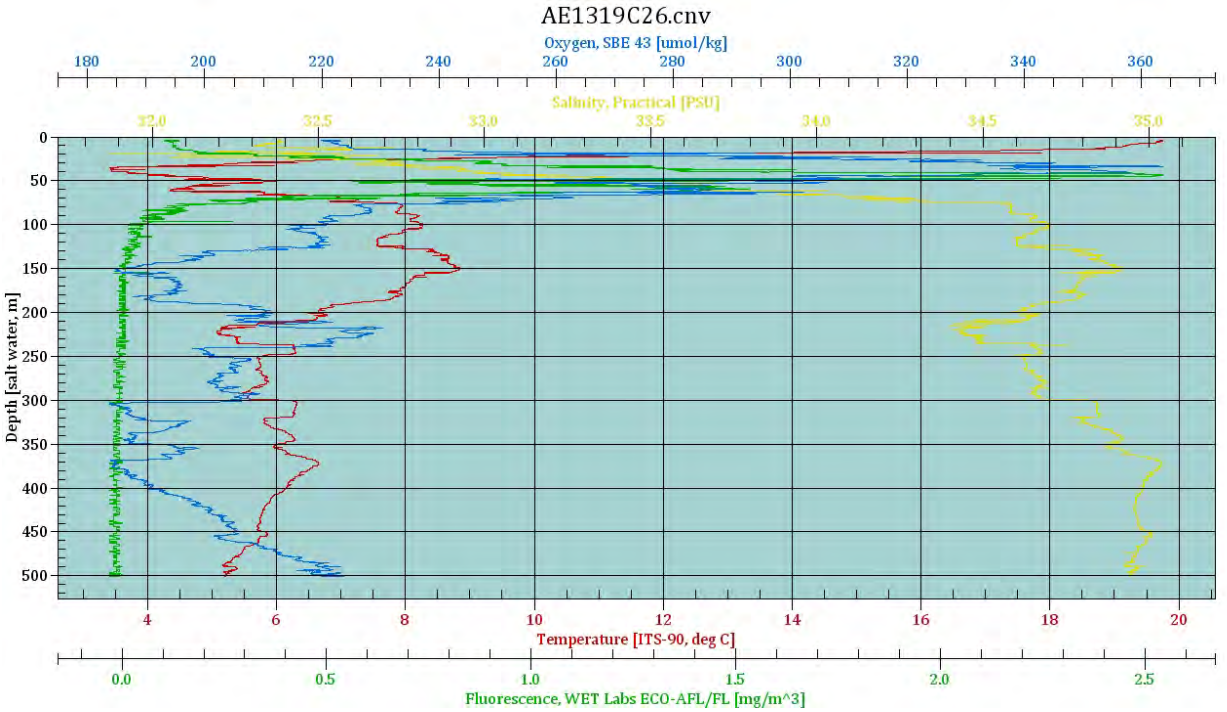
Cast AE1319C_24



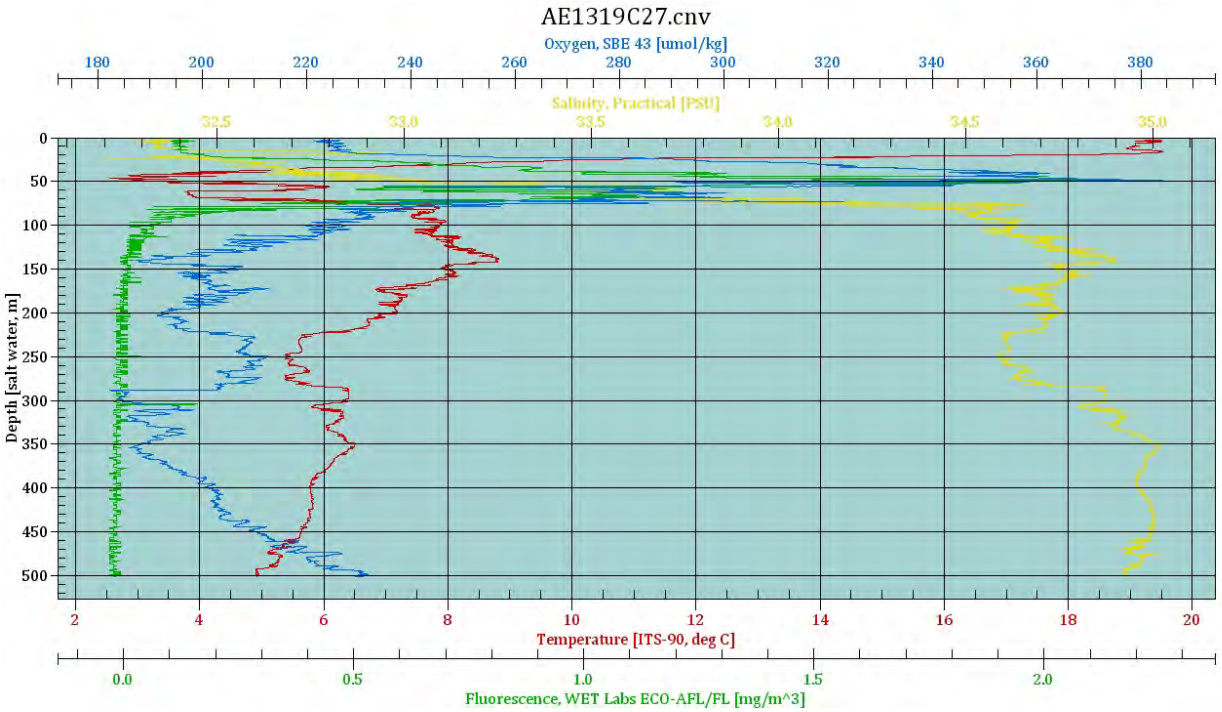
Cast AE1319C_25



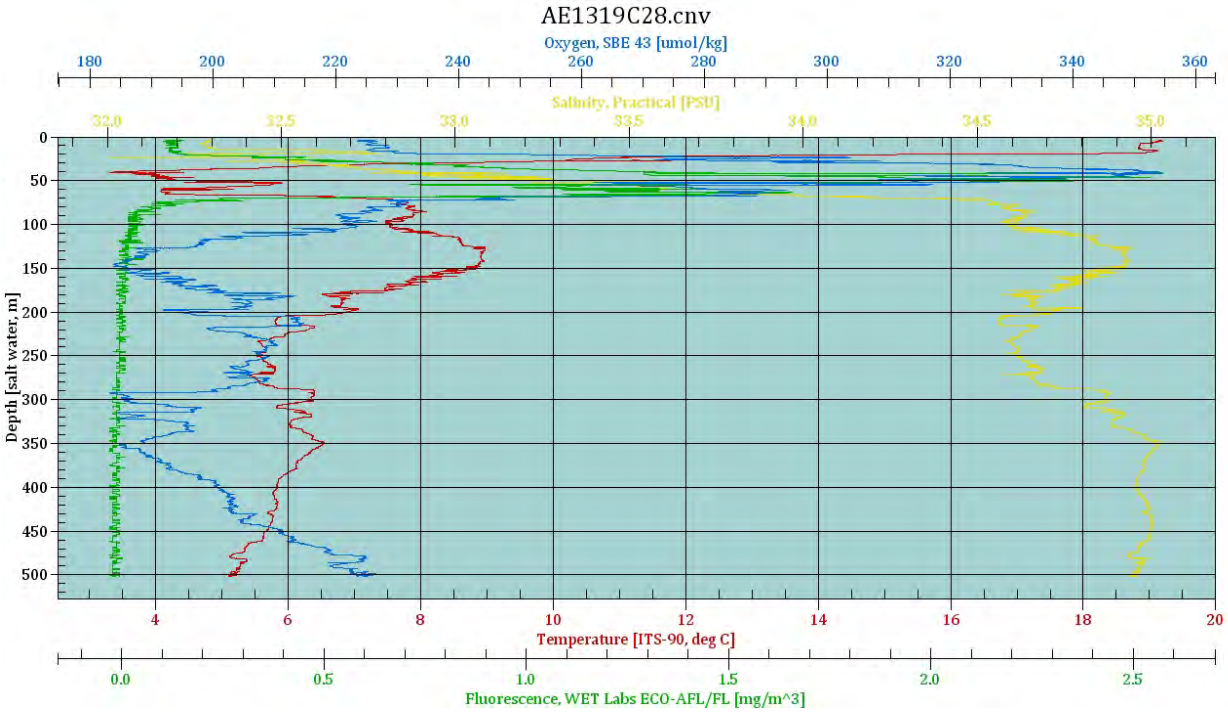
Cast AE1319C_26



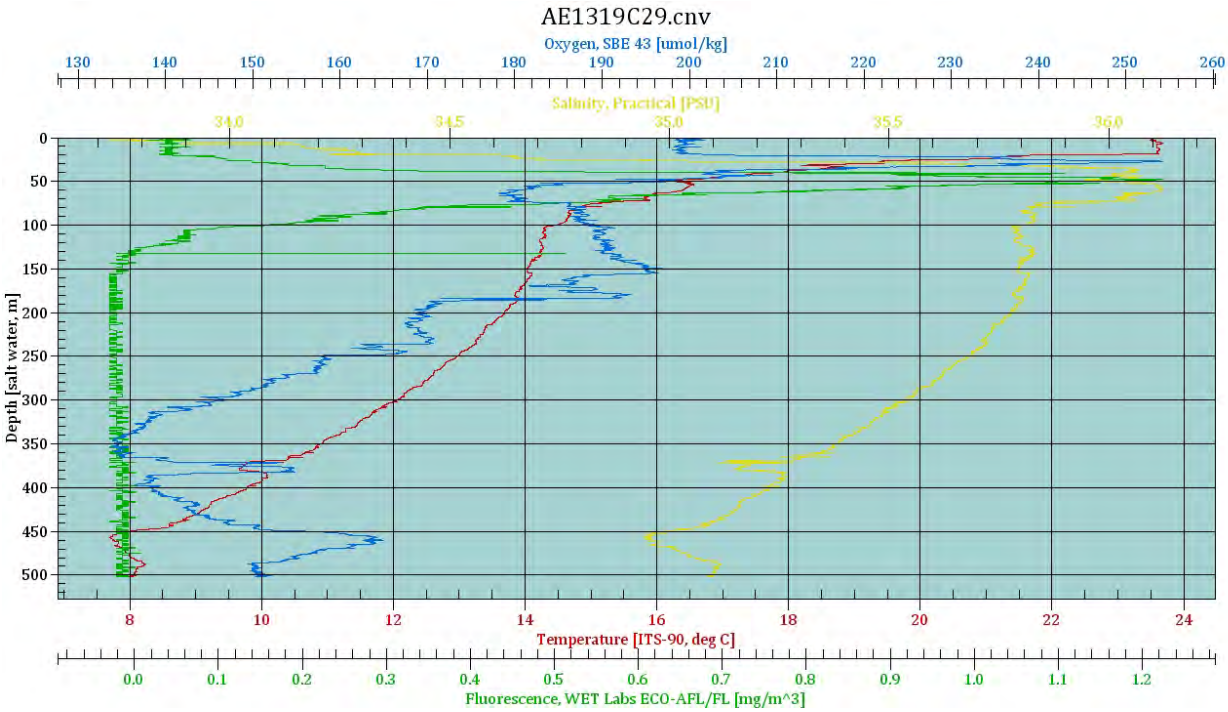
Cast AE1319C_27



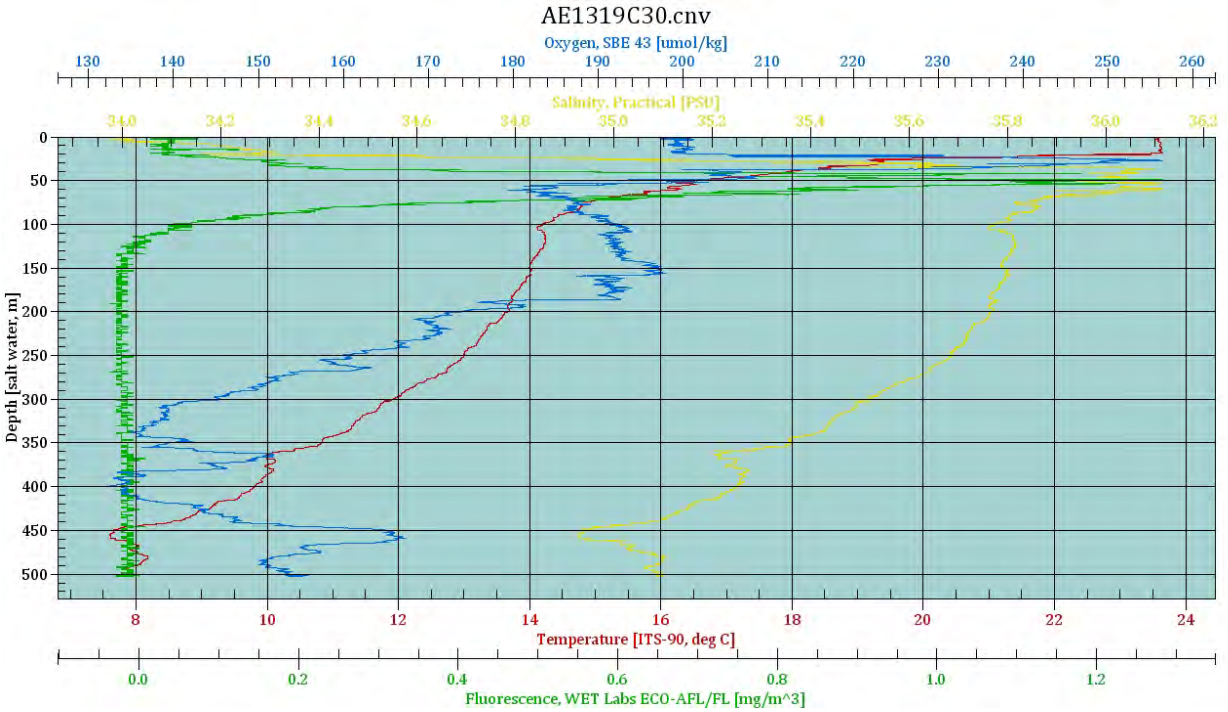
Cast AE1319C_28



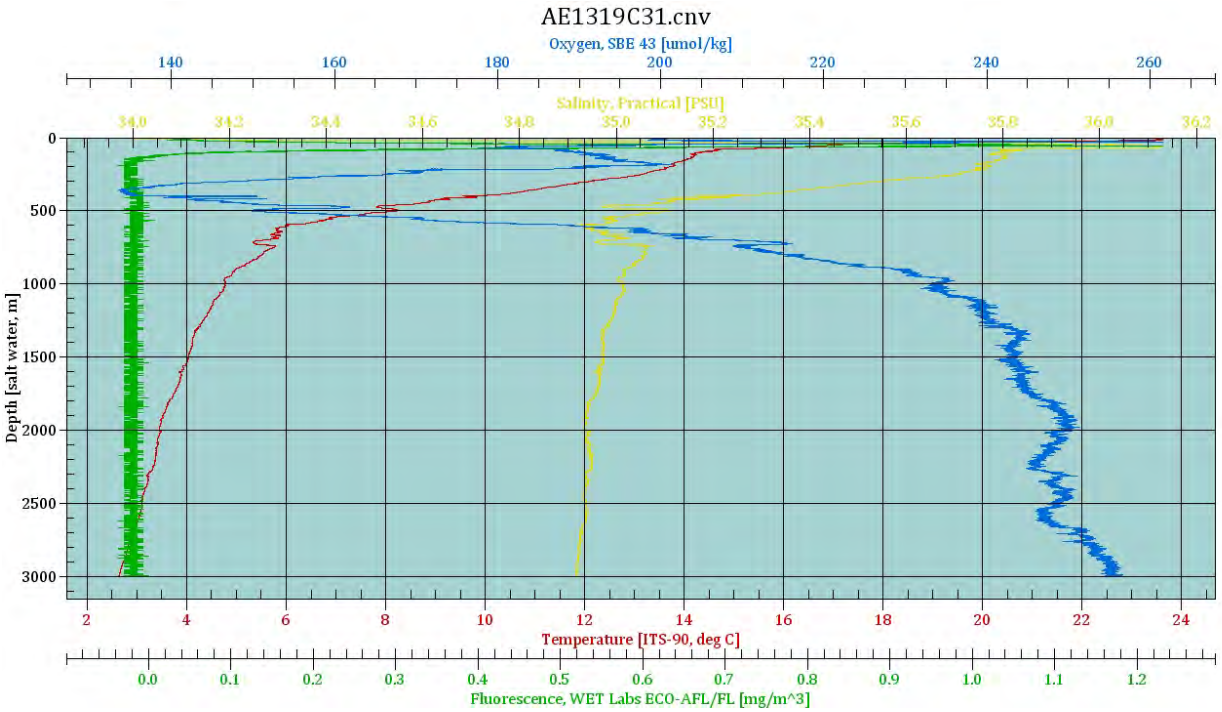
Cast AE1319C_29



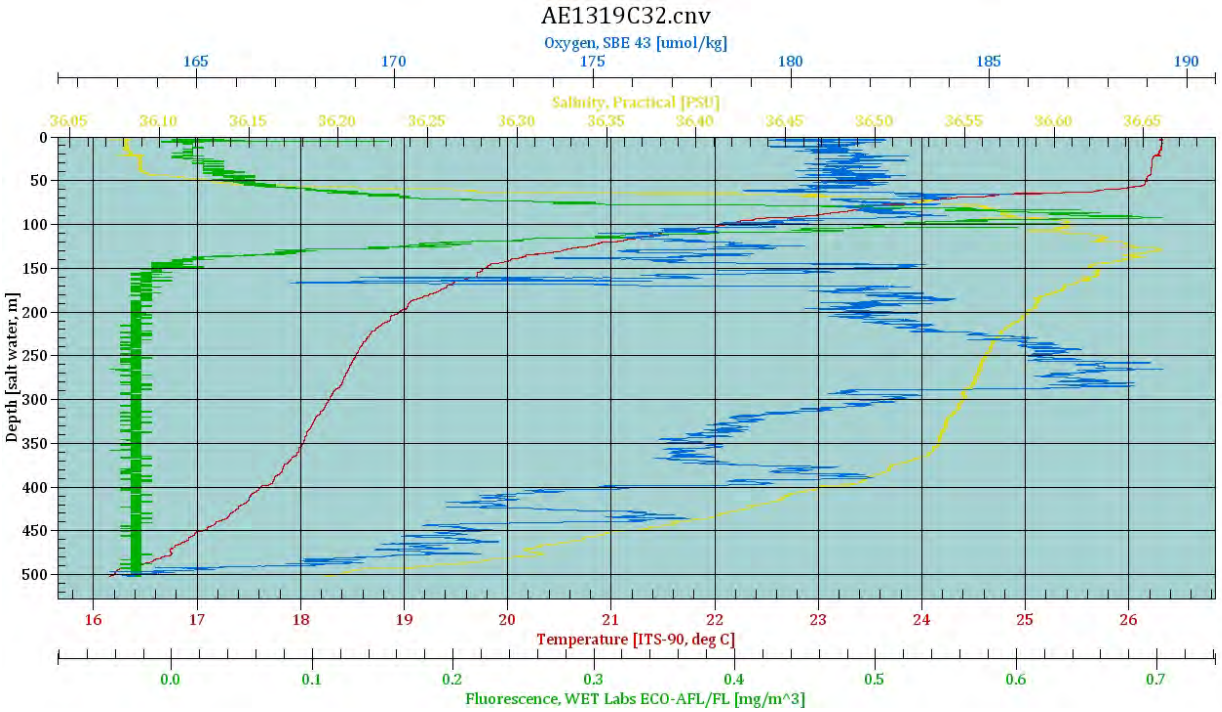
Cast AE1319C_30



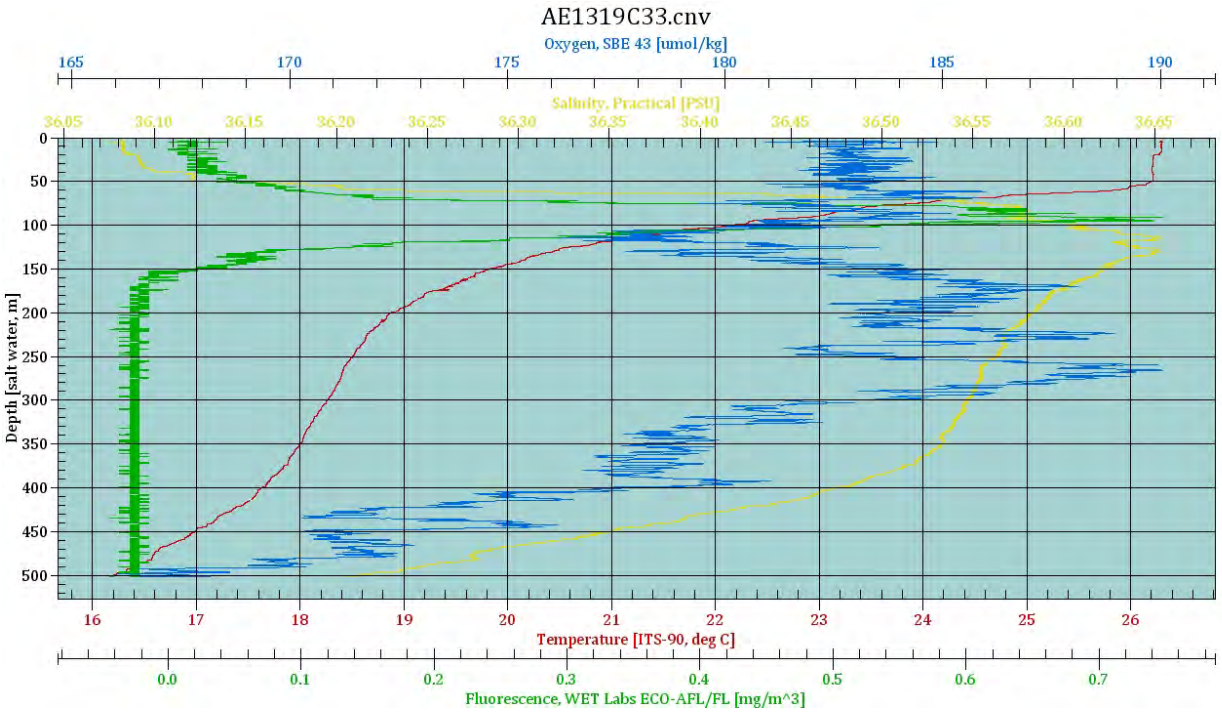
Cast AE1319C_31



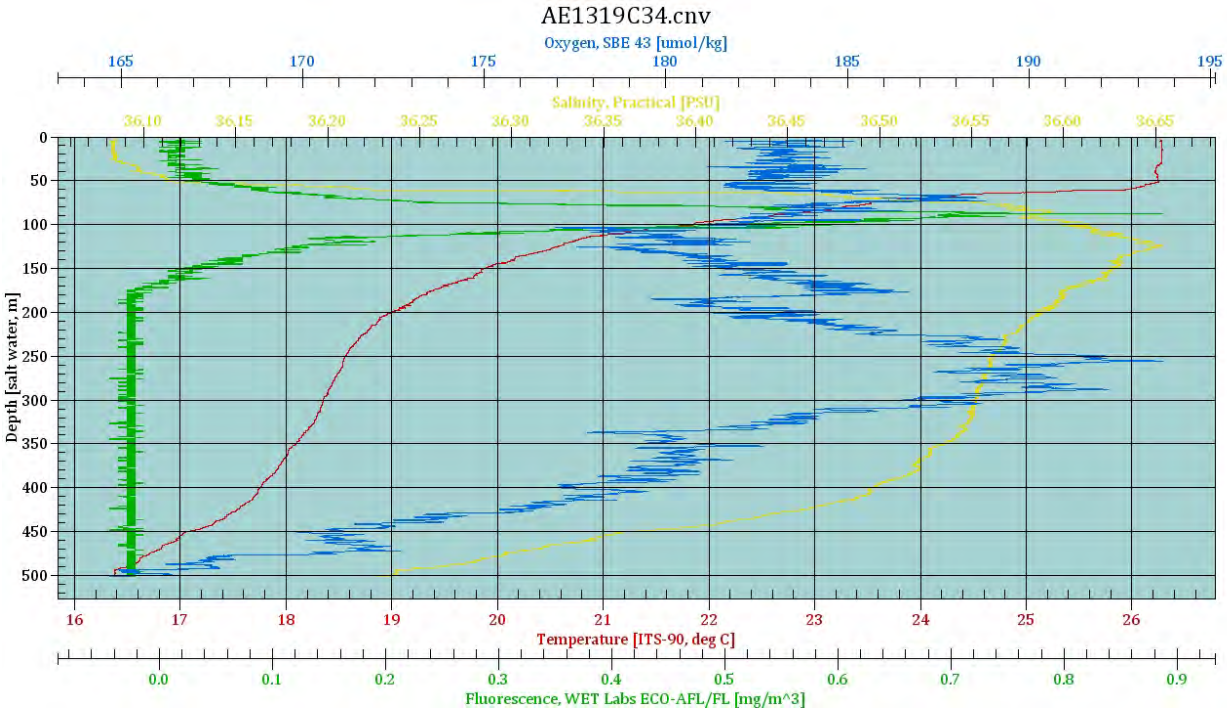
Cast AE1319C_32



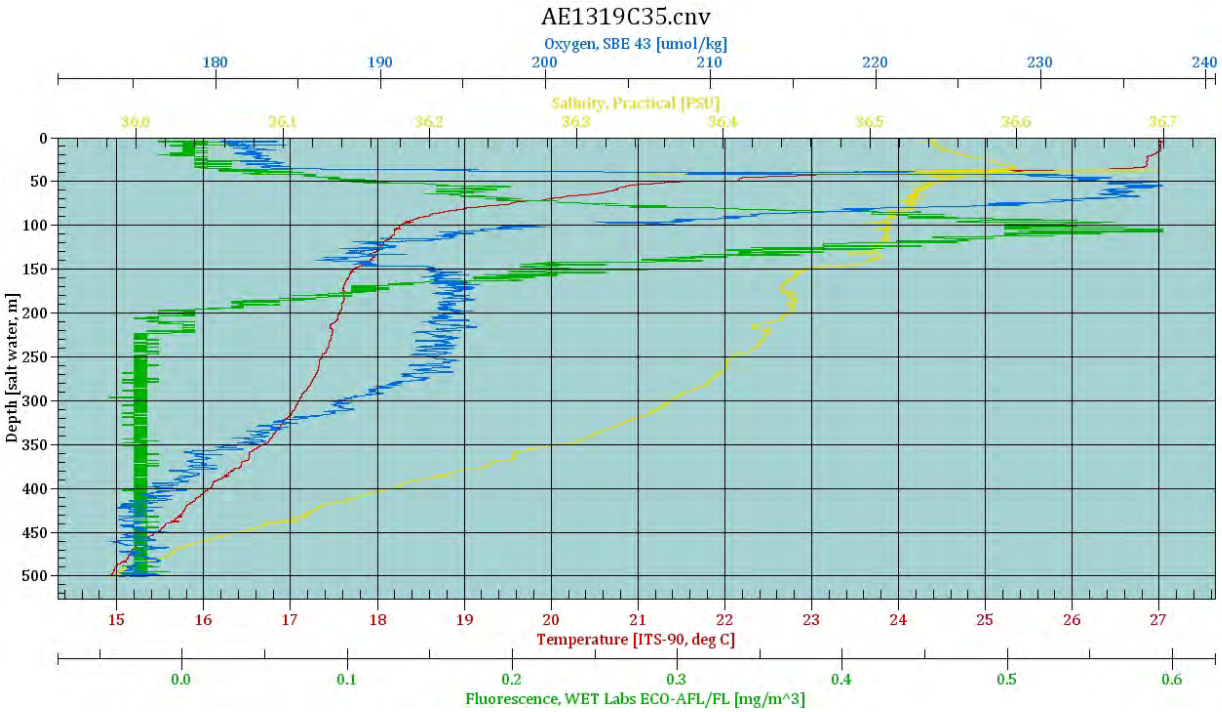
Cast AE1319C_33



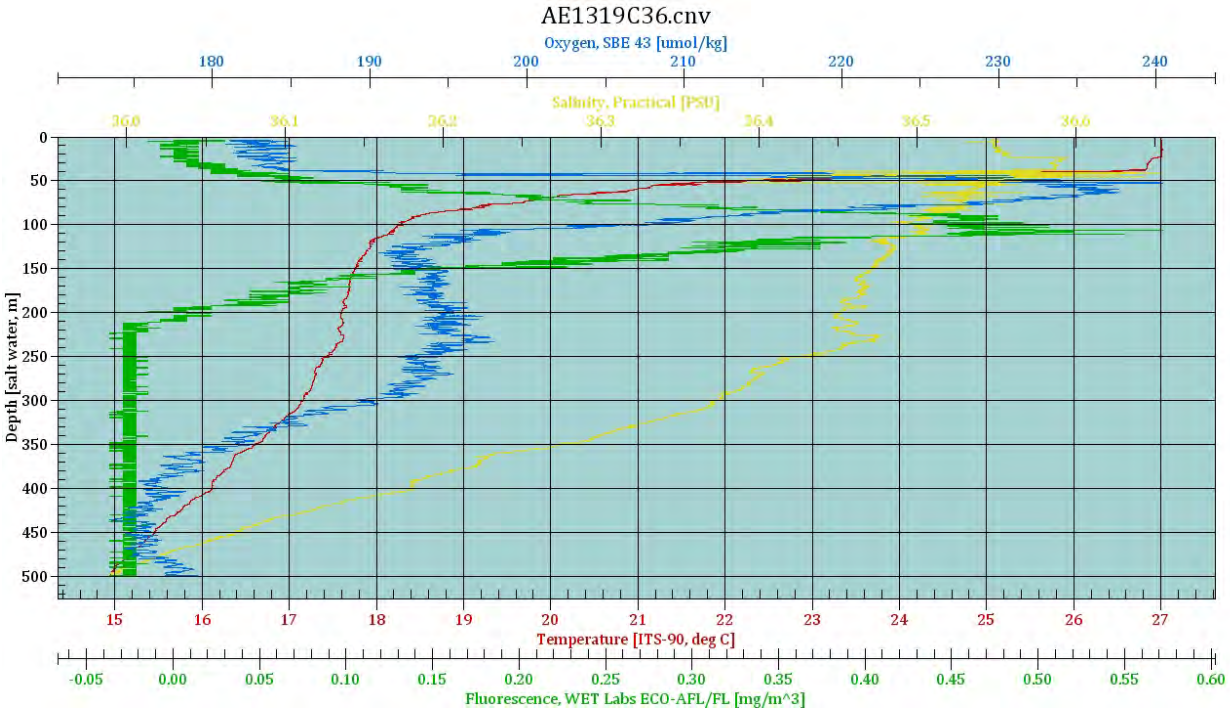
Cast AE1319C_34



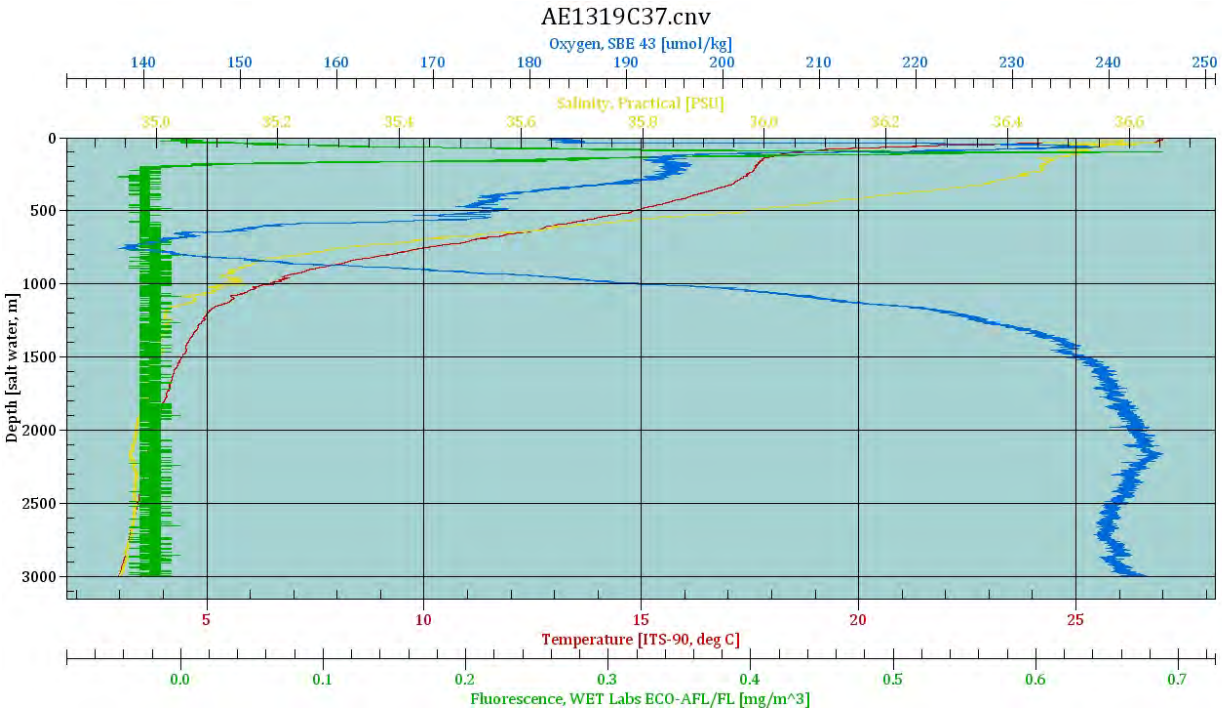
Cast AE1319C_35



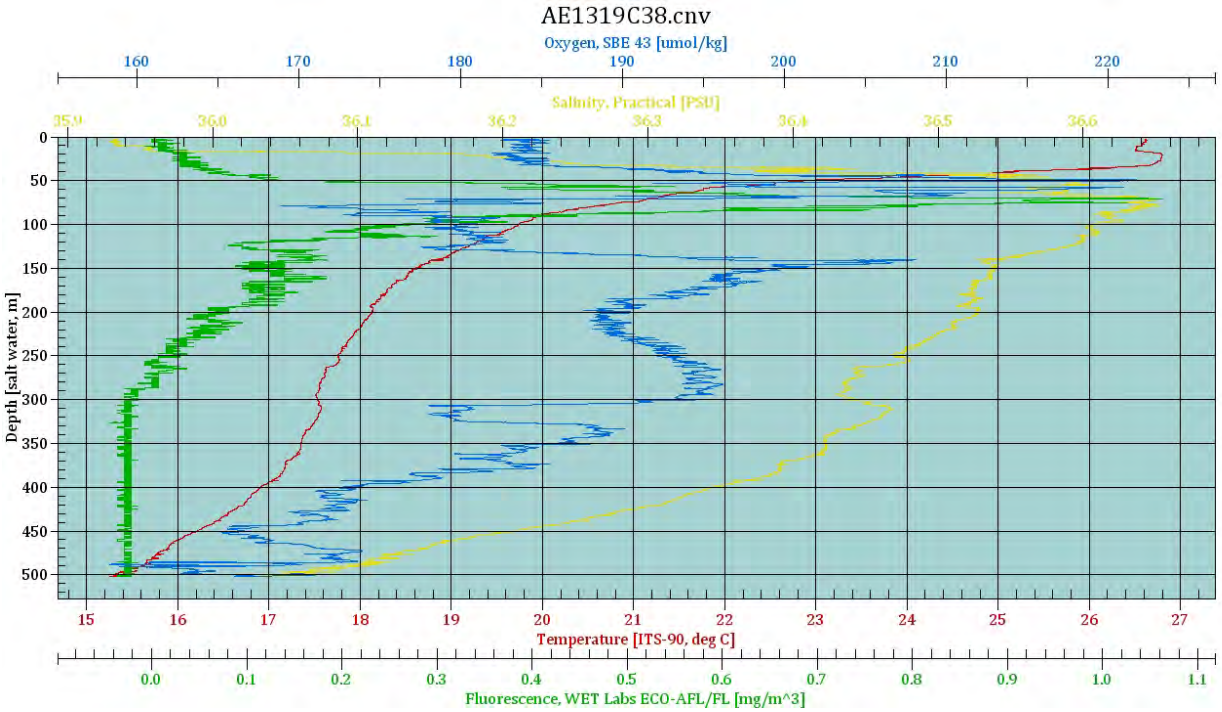
Cast AE1319C_36



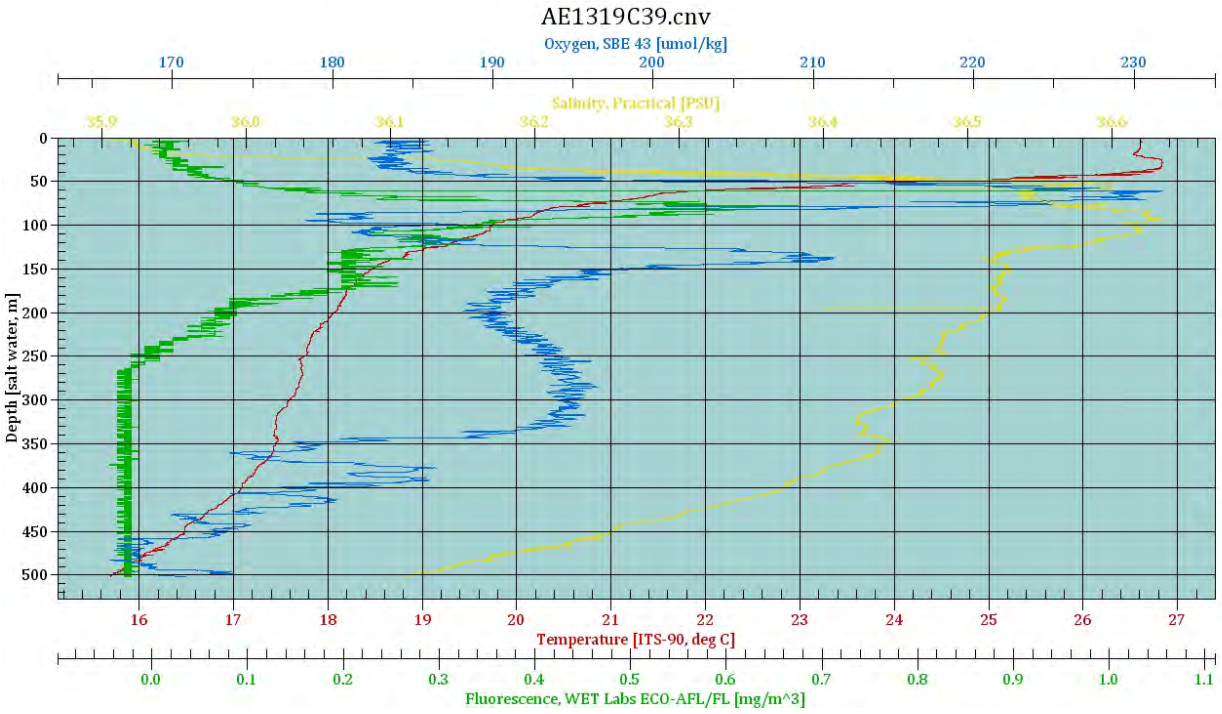
Cast AE1319C_37



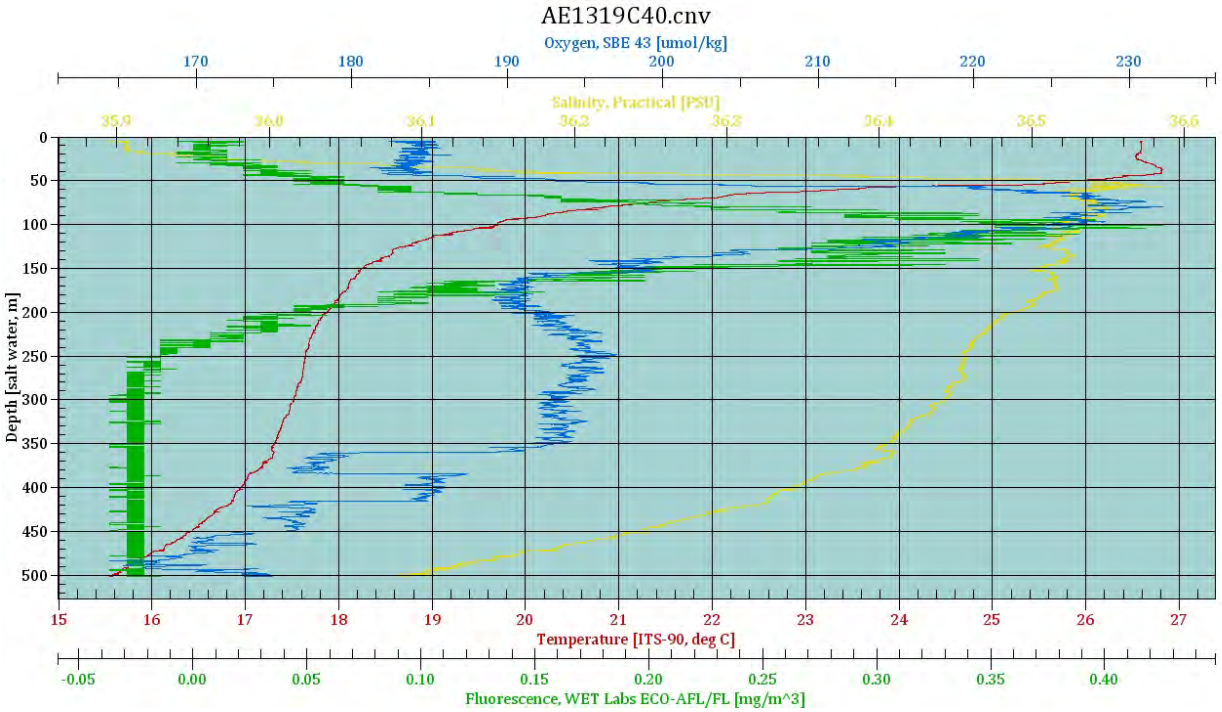
Cast AE1319C_38



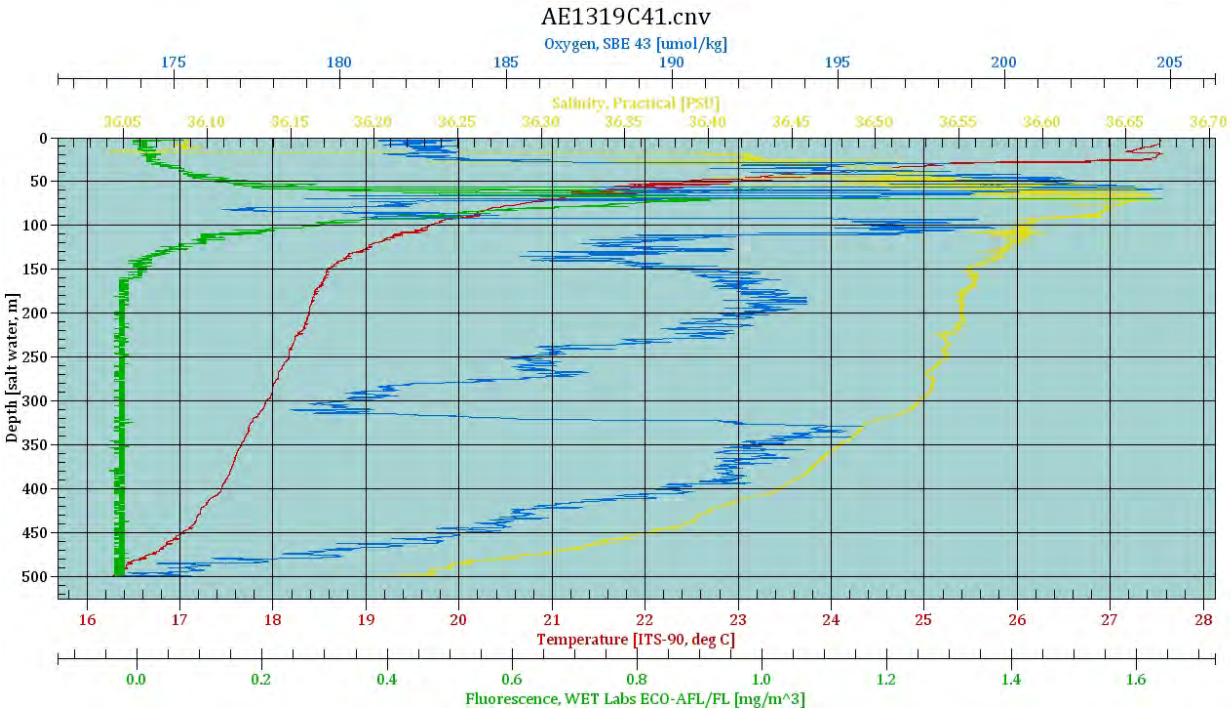
Cast AE1319C_39



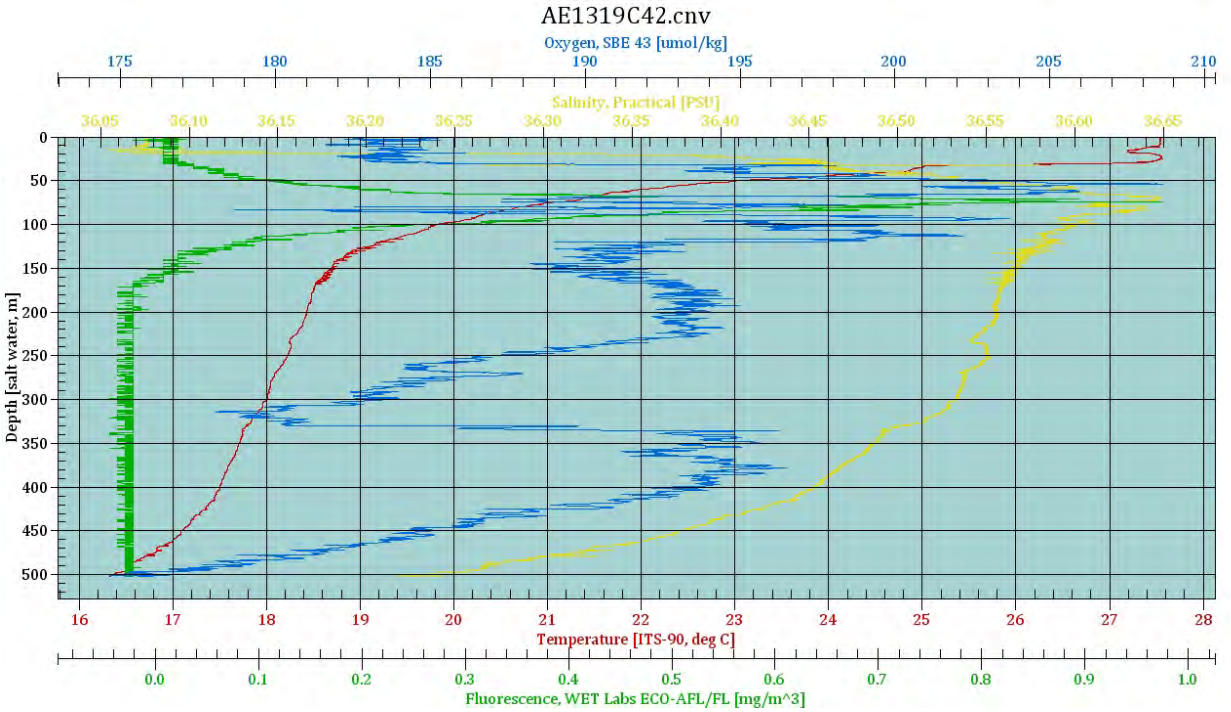
Cast AE1319C_40



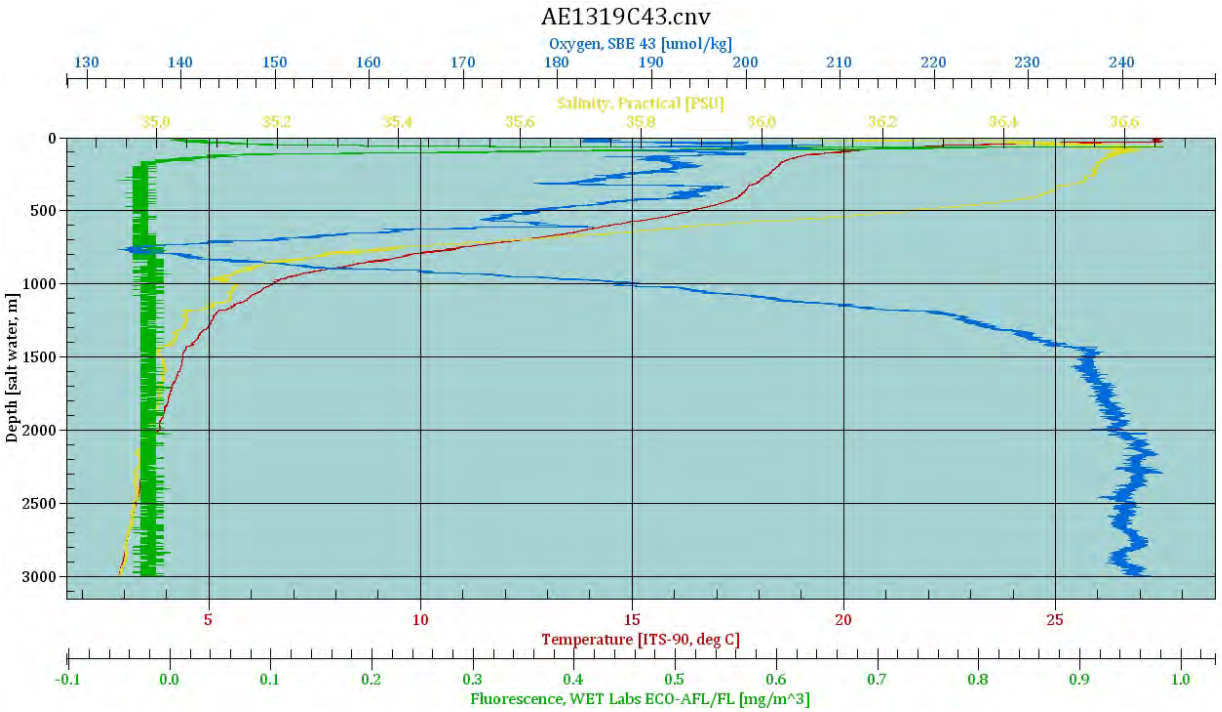
Cast AE1319C_41



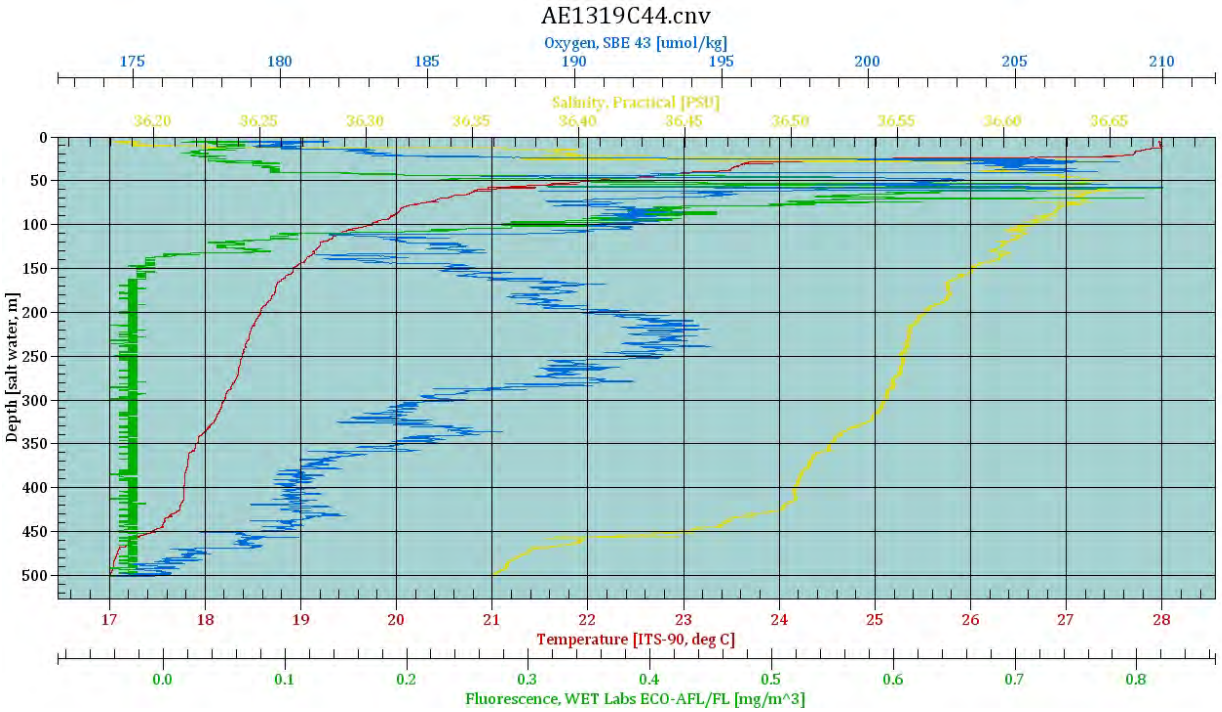
Cast AE1319C_42



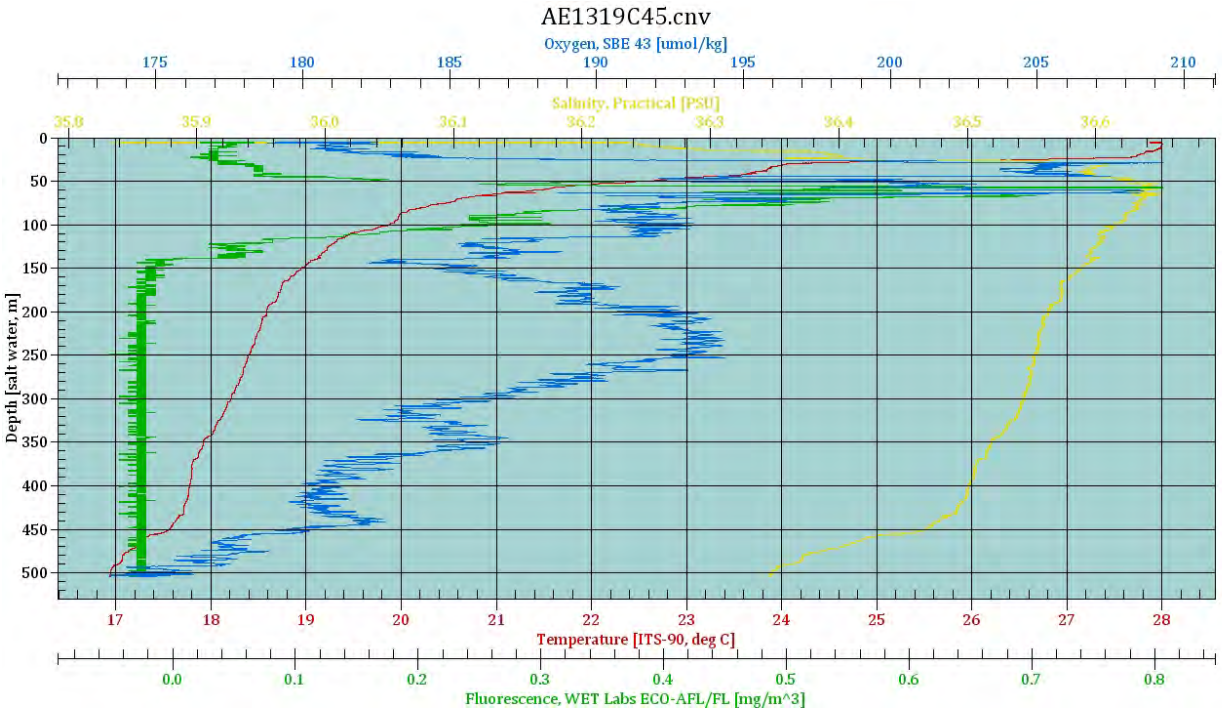
Cast AE1319C_43



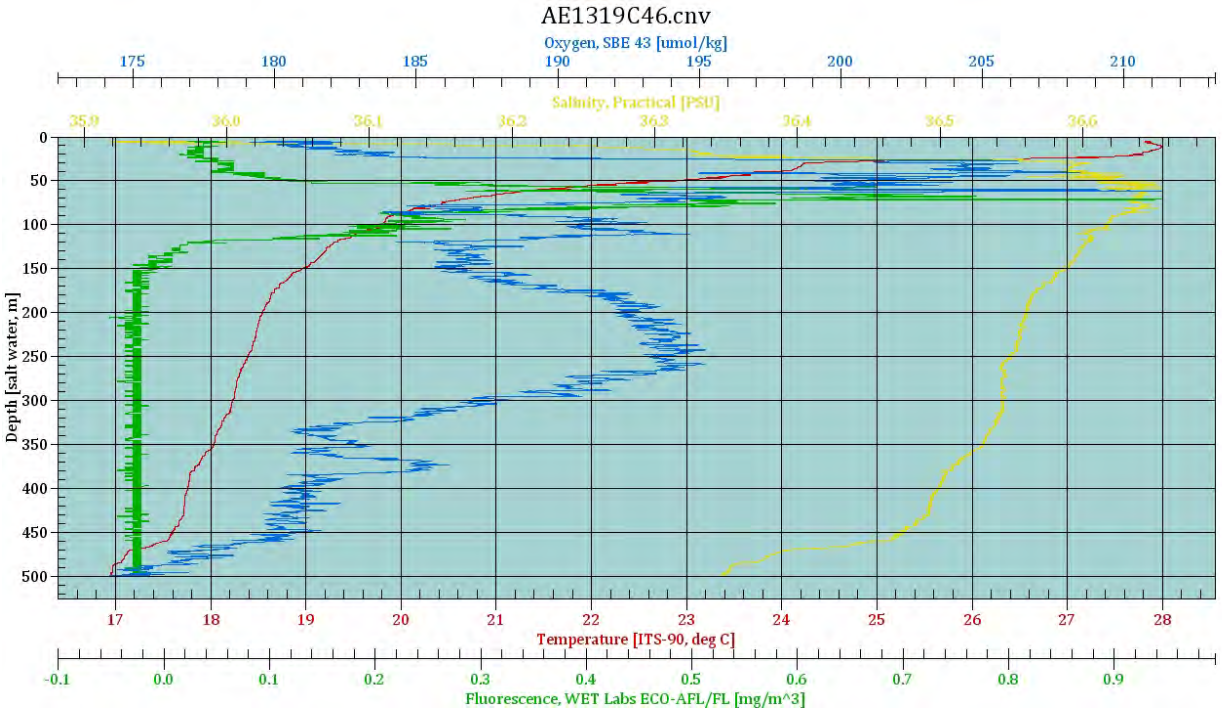
Cast AE1319C_44



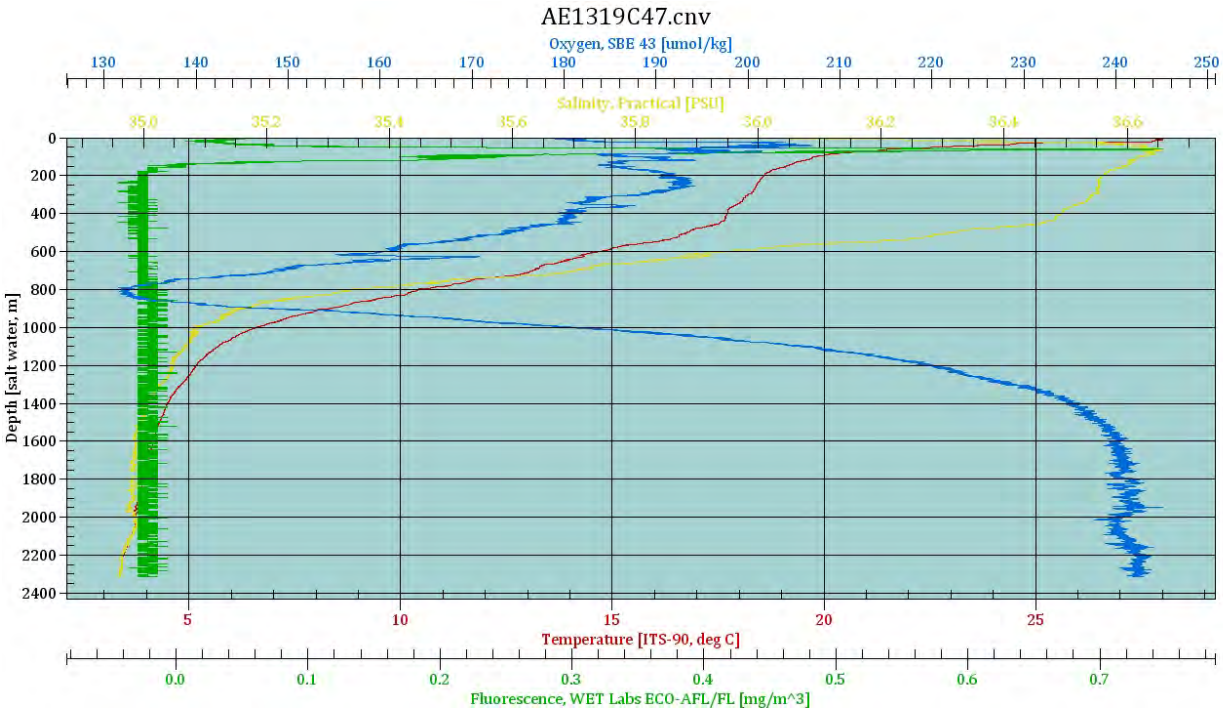
Cast AE1319C_45



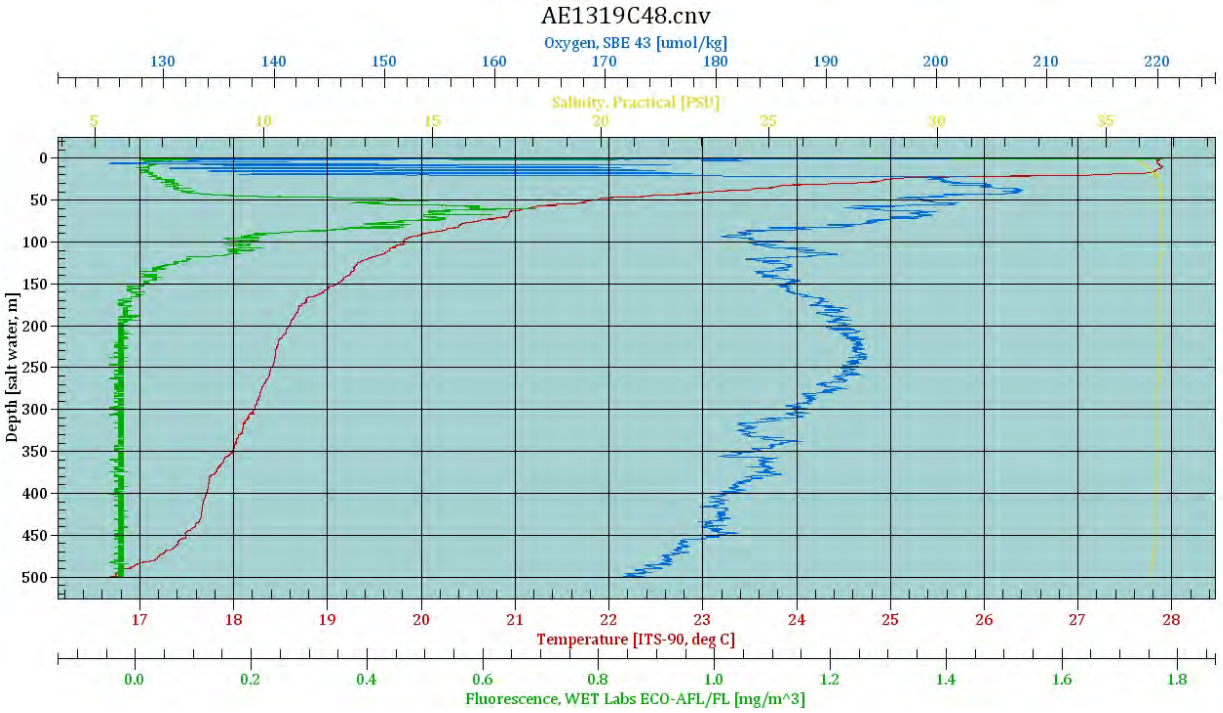
Cast AE1319C_46



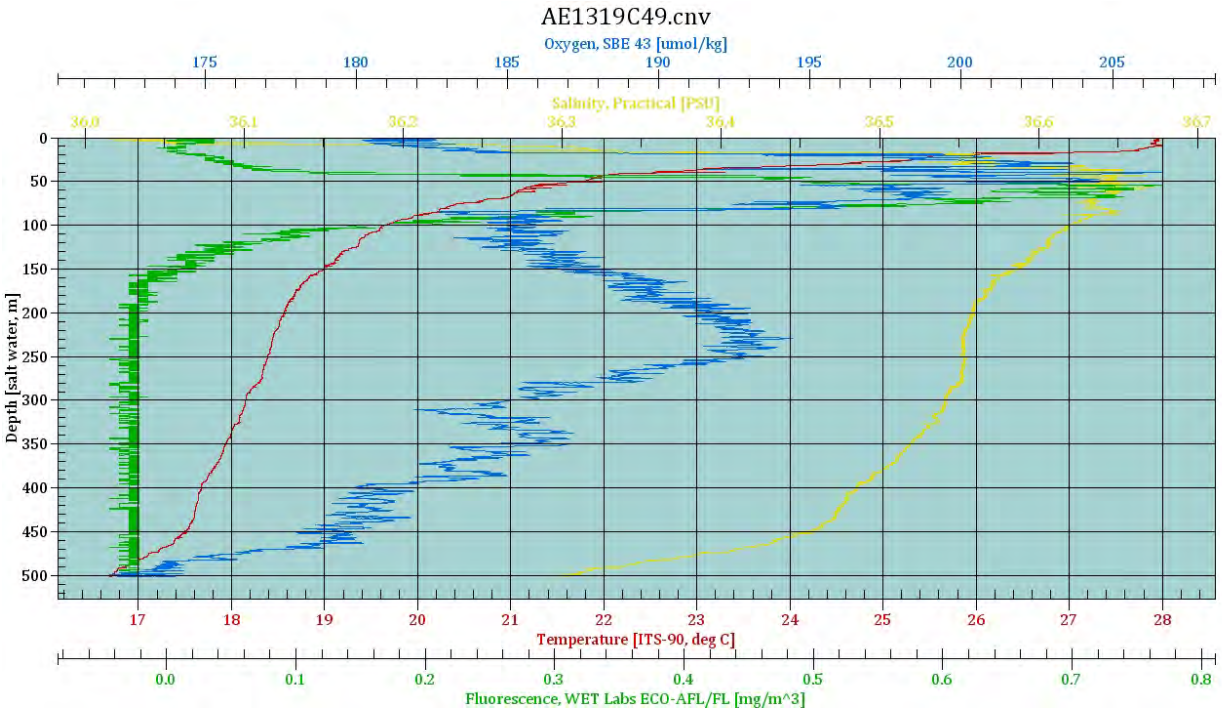
Cast AE1319C_47



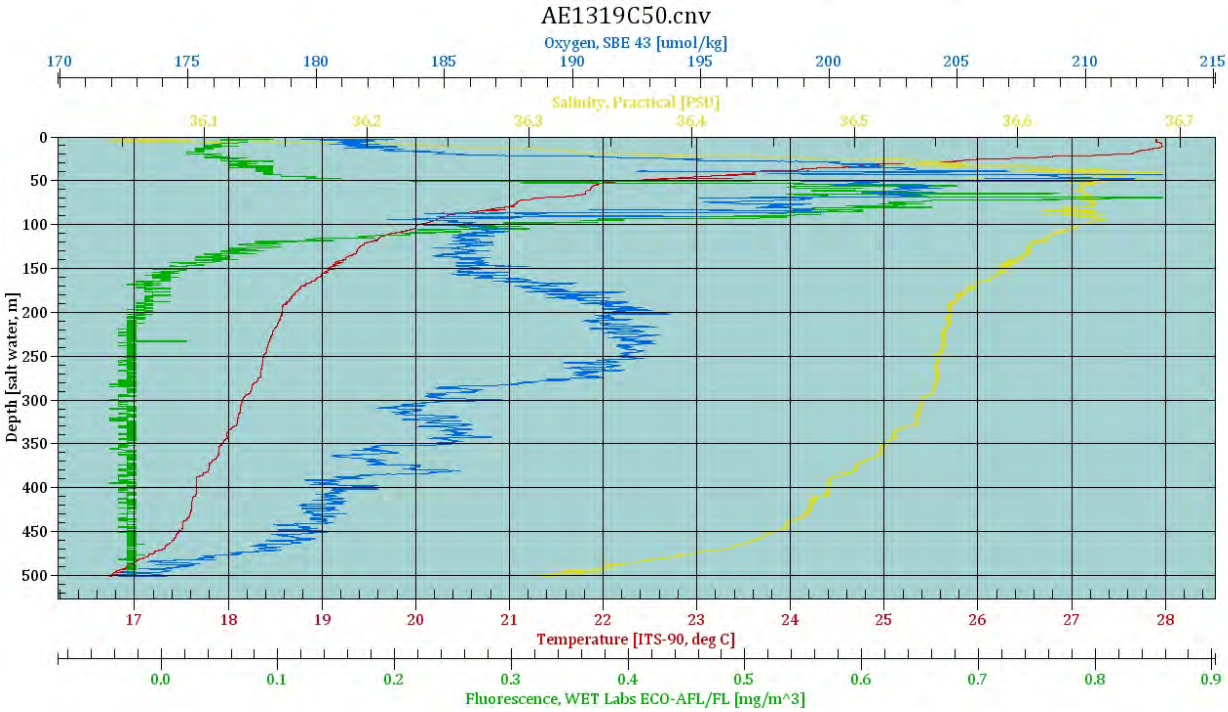
Cast AE1319C_48



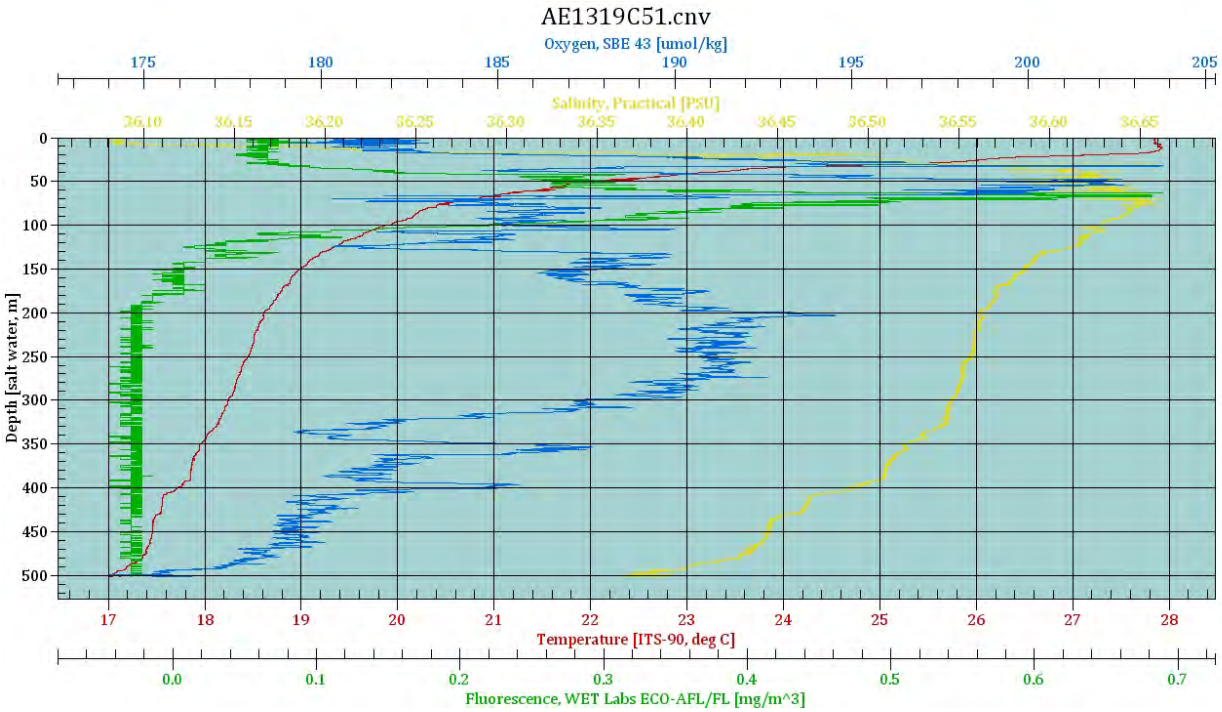
Cast AE1319C_49



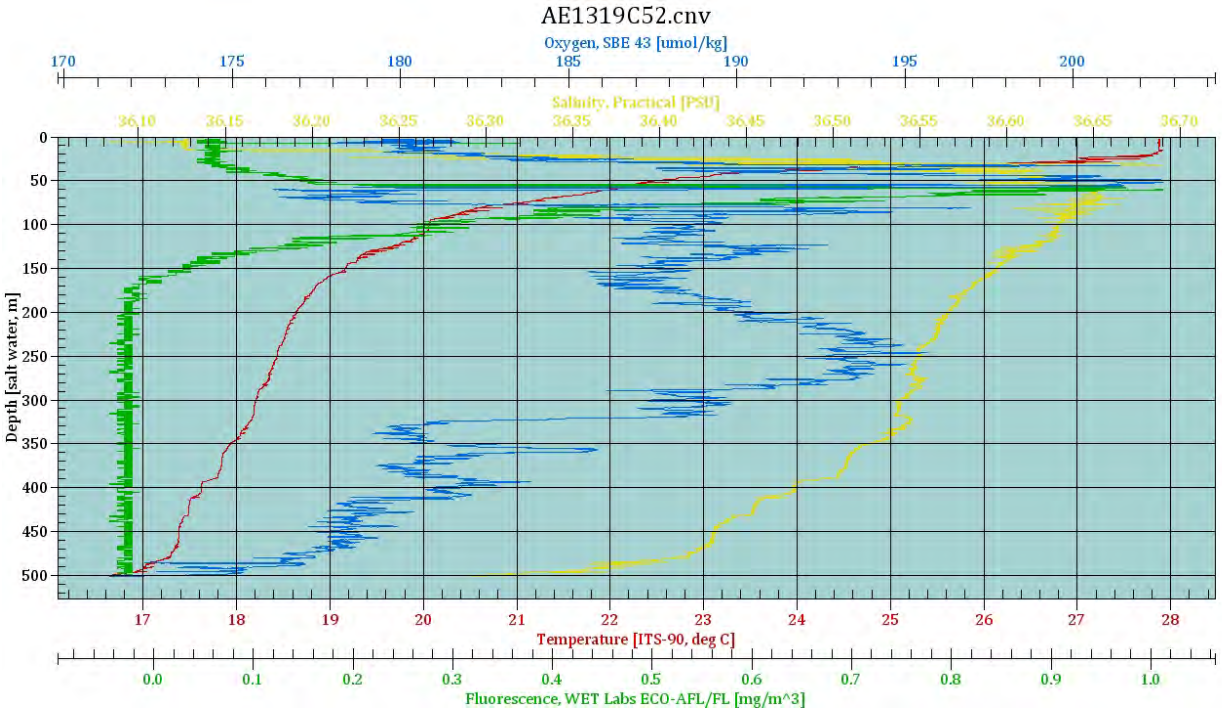
Cast AE1319C_50



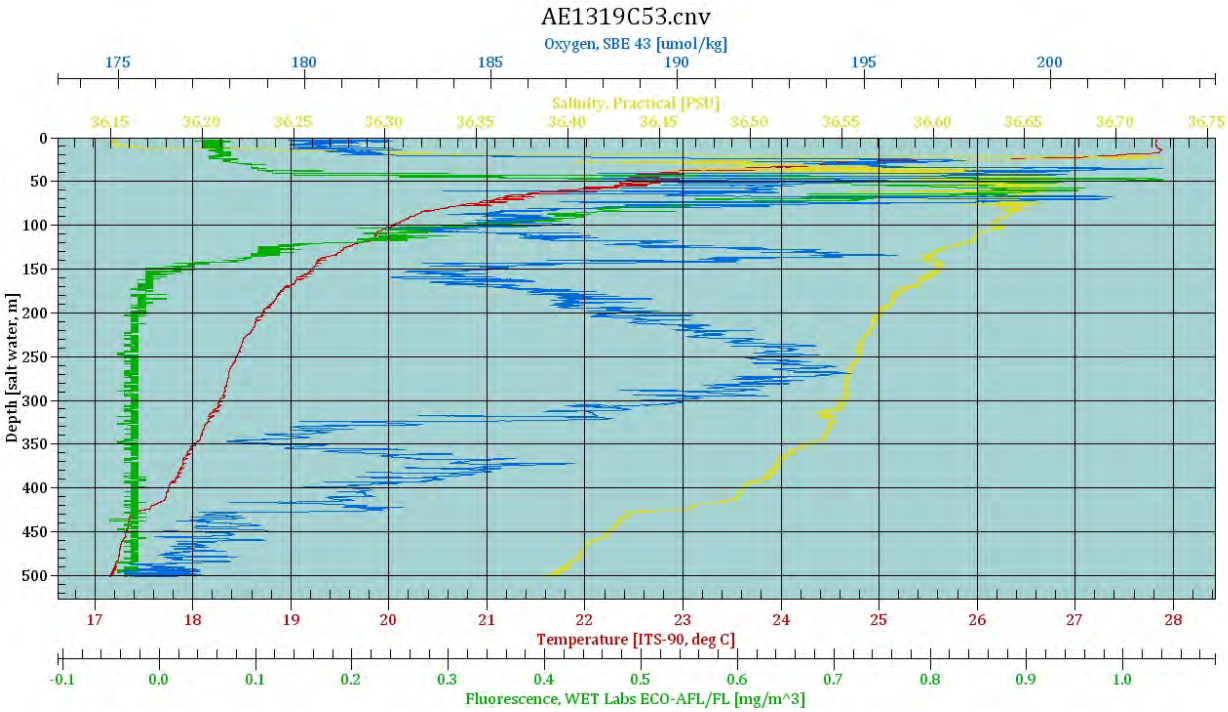
Cast AE1319C_51



Cast AE1319C_52



Cast AE1319C_53



Cast AE1319C_54