

# NBP 21-13: 15 Nov. 2021 – 22 Dec. 2021, PAL LTER Cruise #29

## Weekly Science Report II (Nov. 22<sup>nd</sup> to Nov 28<sup>th</sup>)

LTERR: Ecological Response and Resilience to “Press-Pulse” Disturbances and a Recent Decadal Reversal in Sea Ice Trends Along the West Antarctic Peninsula.

### Overview (Carlos Moffat, Chief Scientist)

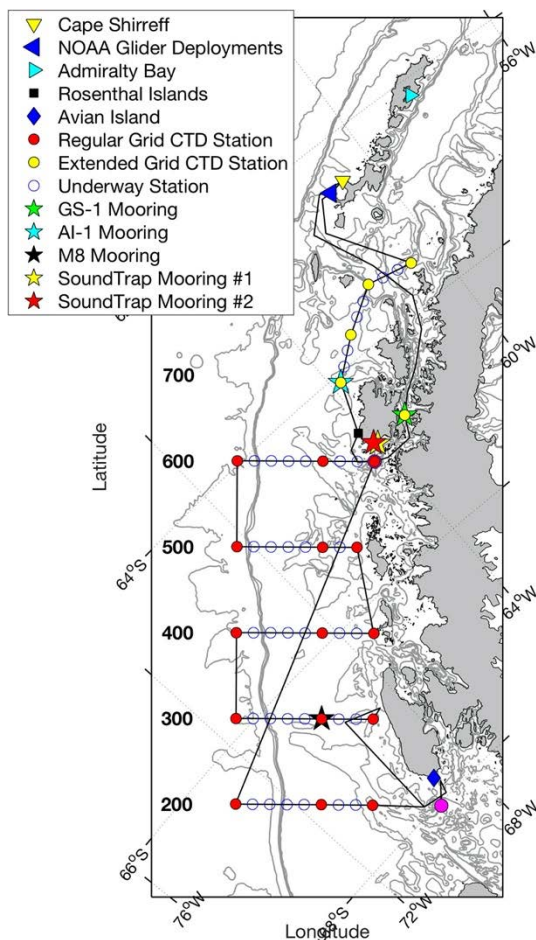


Figure 1: Cruise Plan. This week, we completed the first 4 stations (out of 5) of the extended grid, and the regular grid down to most of the 300 line.

The first week of LTER science after leaving Cape Shirreff was full of activity and significant progress. We arrived at the first *extended grid* station (831.-002) on November 22<sup>nd</sup> and we finish the first four stations by mid-afternoon on November 23<sup>rd</sup>. The last station (692.080) is the site for the planned AI-1 mooring. We conducted a detailed bathymetric survey of the area in preparation for that deployment, which we expect will occur in an upcoming *L.M. Gould* cruise.

The next stop was the Rosenthal Islands, where Megan Cimino’s group (C-013) conducted a successful survey of the penguin colonies on Nov 24<sup>th</sup> (see their report below). Penguin colonies are typically associated with deep canyon near that provide a pathway for the onshore transport of nutrient-rich oceanic waters. While the penguin census was being conducted, the *N.B. Palmer* conducted a bathymetric and plankton acoustic survey of the nearby waters. Preliminary analysis of the bathymetric survey suggests much deeper waters than those available in a handful of soundings for that region.

We arrived at our first regular grid station (at Palmer Deep) shortly after midnight on November 25<sup>th</sup>. At about 8am that morning, we arrived at Palmer Station to drop off a member of the science party that required medical treatment that while not life-

threatening, could not be provided on the ship. That person will be picked up by us when we make our way back to Palmer Station by mid-December.

As I reported last week, we were able to deploy one of the two NOAA gliders off Cape Shirreff, but conditions did not allow us to deploy the second one. At the same time, we had some concerns about the readiness of a Rutgers glider that we expected to use to sample the extended grid region, and we decided not to deploy it. Thanks to the generosity of our NOAA colleagues Christian Reiss and George Watters, we were able to quickly set up a collaboration to use the NOAA glider on the extended grid. On our way to the 600.100 grid station, we made a stop to successfully deploy it. More details on the mission below.



Figure 2: Left: Megan Cimino, Darren Roberts, Megan Roberts (All C-013), Ben Urmston, XX, XX (all ASC) depart the NBP for the Rosenthal Islands (background). Right: Megan and Darren Roberts survey the penguin colonies on the islands.

Completing the LTER grid, both on underway and full CTD stations has progressed at a good pace, and we have completed 14 of 20 planned grid stations. The transit through the grid has also allowed for extensive seabird and whale surveys conducted by the Cimino (C-013) and Friedlaender (C-024) groups. On November 26<sup>th</sup>, while on transit from the 600.200 to the 500.200 offshore grid stations, we spotted a group of more than 12 humpback whales. Ross Nichols and Darren Roberts, with ASC support, successfully took samples for biopsies from two individuals.



Figure 3: NOAA Glider AMLR05 is deployed from the N.B. Palmer on November 25th, 2021.

As we made our way through the grid, we suffered the loss of the Compact Optical Profiling System (C-OPS) during a deployment with rough seas that resulted in the cable to get severed while profiling at the 300.200 station on Nov. 28<sup>th</sup>.

Next, we are preparing to recover the M7 mooring currently deployed at 300.100. We will then move on to a high-resolution survey off the northern coast of Adelaide Island, and a 3-day census of the seabird populations on Avian Island, paired with a process station at 200.-040. If opportunity arises, we will also be tagging and/or biopsying whales at that site.

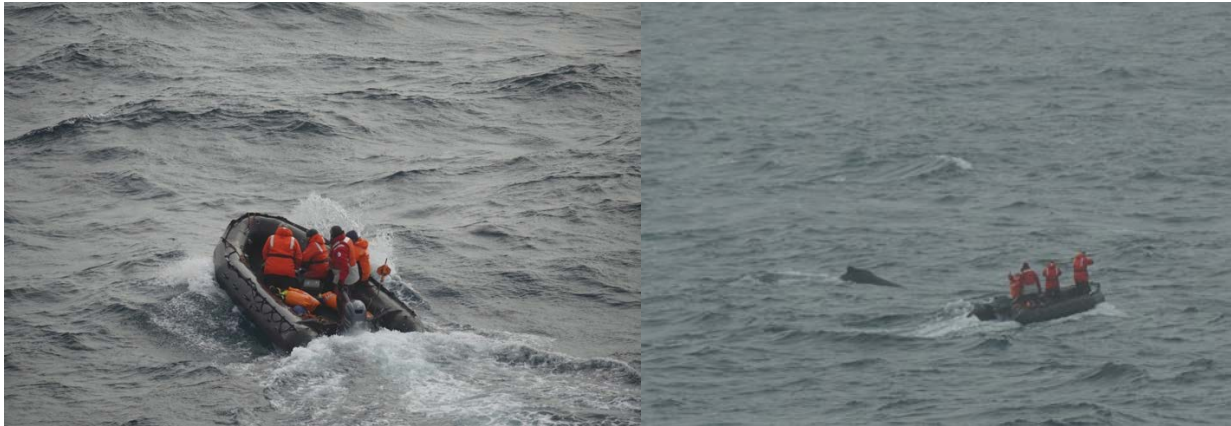


Figure 4: Ross Nichols (UCSC, C-024), Darren Roberts (UCSC, C-013), Anna McBee (ASC), and Mike Burns (ASC) collect a biopsy sample from a humpback whale on Nov 26th, 2021.

## Group Reports

### C-013 Seabirds (Megan Cimino, LTER PI, UCSC)

The Birders censused the penguin breeding colonies in the Rosenthal Islands, located on the western coast of Anvers Island, which is an Antarctic Specially Protected Area partly due to the diversity of breeding seabirds. The survey included counting all penguin nests across six islands over a ~12-hour period. The *Pygoscelis* (Adélie, gentoo, chinstrap) penguin population increased 14% since the last census in 2016 totaling nearly 10,000 nests. The team noted significant expansion of gentoo penguin colonies, following trends in the region. These surveys would not have been possible without boating support from ASC/ECO.

### C-024 Whales (Ross Nichols, Friedlaender Group, UCSC)

The Whalers have, as of 11.28.2021, collected 2 skin and blubber biopsy samples from two individual adult humpback whales along the LTER grid. Additionally, bridge surveys of cetaceans and pinnipeds have continued with a combined total of two Antarctic Minke whales (Bb), thirty-one Humpback whales (Mn) and sixteen individuals of unknown cetacean species (Figure 5). Humpbacks sighted have been found in an equal ratio of solo and groups of two individuals performing both travelling and foraging behaviors. Thus far, no surface feeding or bubble netting has been observed. However, surfacing breaching has been sighted on two occasions. Photo identification data using flue imagery has been collected on three humpback whales. The whalers have deployed using small boat operations multiple times thanks to the continued support of the ASC/ECO staff and crew, of which much of this work was made possible.

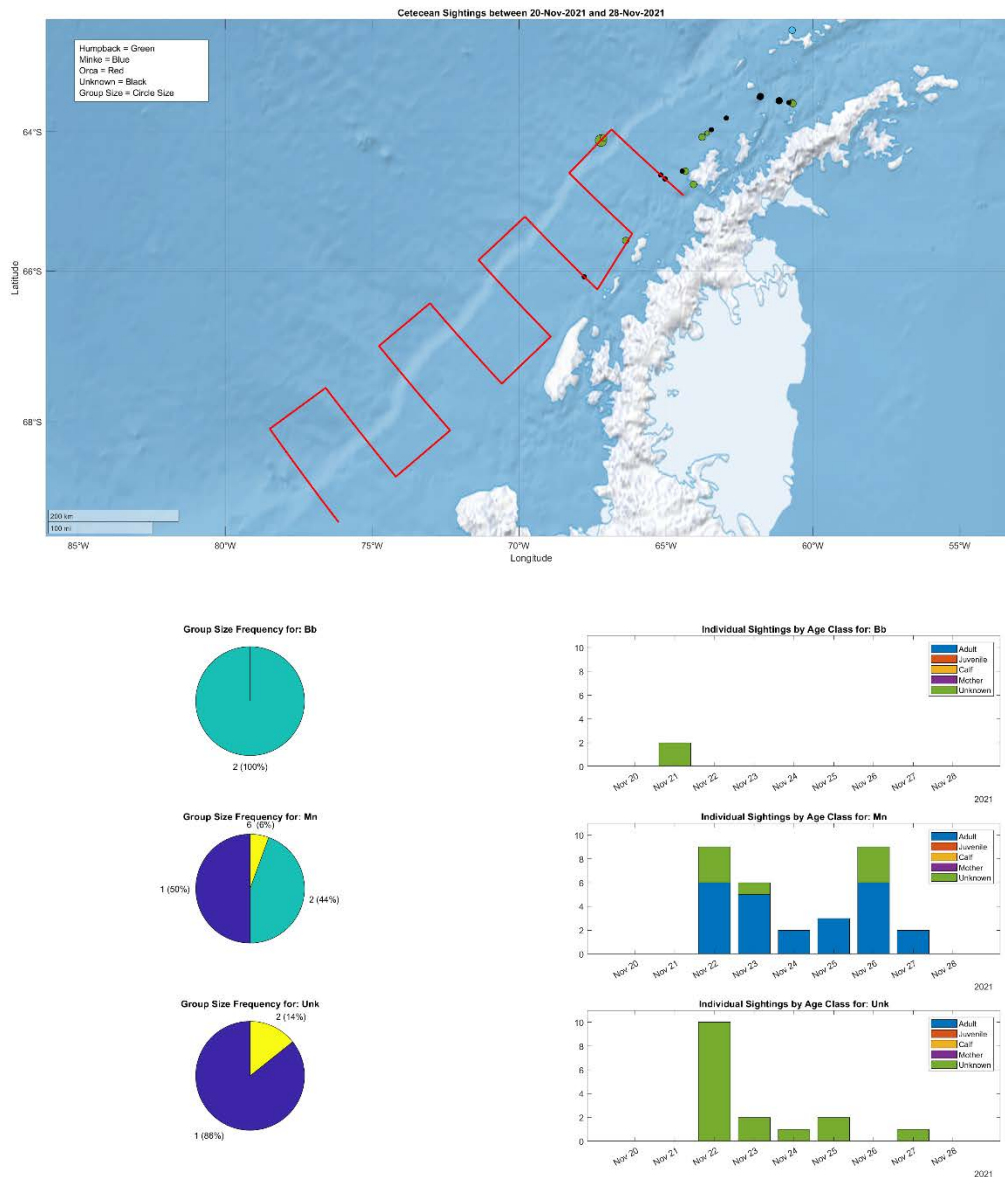


Figure 5: A map of cetacean sightings (top) using bridge and small boat surveys in reference to the LTER grid. A sightings summary (bottom) of group size and species demographics, separated by species.

### C-019 Phytoplankton (Jessie Taylor, Schofield Group, UCONN/Rutgers)

As of November 28, 2021, the phytoplankton team has sampled 14 grid stations and 27 underway stations. Since the start of sampling, we have seen a transition between the Bransfield strait extended grid area and the main LTER grid region south of Palmer station in terms of water reflectance, phytoplankton biomass, and phytoplankton species present. Bransfield strait waters had overall higher reflectance in the blue wavelengths (Figure 6) and lower chlorophyll concentrations. Northwest of Anvers Island in the southern Bransfield Strait, the ship passed through a diluted bloom of *Corethron* diatoms (Figure 7), accompanied by various other large

and small diatoms, small ciliates, cryptophytes, and dinoflagellates. In contrast, the historical LTER-grid waters south of the 600 line had overall lower reflectance in the blue and higher chlorophyll concentrations. At deep-water slope stations on lines 600, 400, and 300, blooms of *Phaeocystis* haptophytes (see IFCB Images) were accompanied by large, mostly unidentified diatoms that include pennate, centric, and chain-forming lineages (Figure 8). The *Corethron* sp. and *Phaeocystis* sp. had average vs. decreased photosynthetic efficiency, respectively, showing a difference in overall photophysiology.

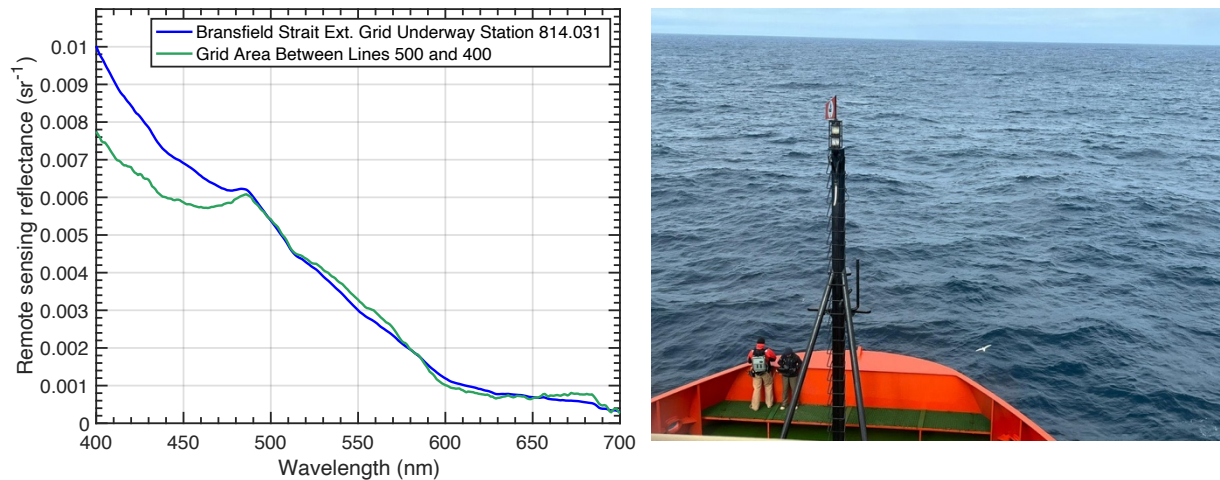


Figure 6. Surface water reflectance measurements with the ASD handheld radiometer in Bransfield Strait (blue line) and the LTER grid area (green line).

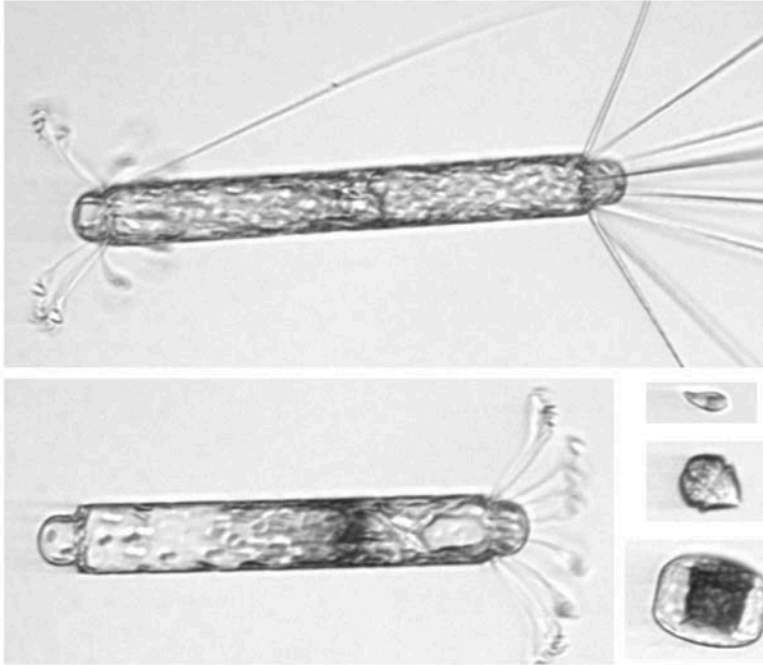


Figure 7. Imaging Flow CytoBot (IFCB) images of *Corethron* sp. and associated phytoplankton found in Bransfield Strait.

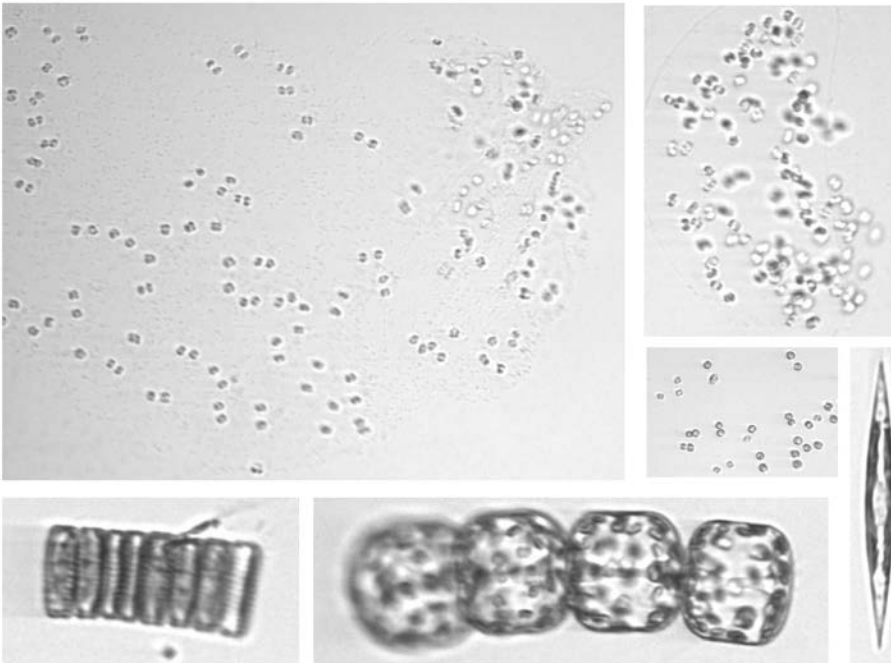


Figure 8. IFCB images of *Phaeocystis* sp. and associated phytoplankton found on slope stations of the LTER grid lines 600 through 300.

### C-021 Physical Oceanography (Carlos Moffat, LTER PI, U. Delaware)

On November 25<sup>th</sup>, in collaboration with NOAA and Rutgers (C-019), we deployed a NOAA glider equipped with sensors for pressure, temperature, conductivity, oxygen, chlorophyll and acoustics for plankton measurements. The glider has been returning good data since then, and we expect it to cross the Southern Bransfield Front (SBF) during the first 10 days of December. Figure 9 shows the location of the current track and first surveys captured by the glider.

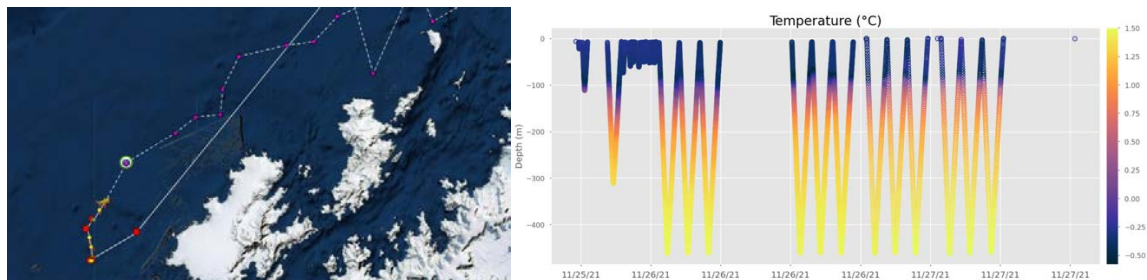


Figure 9: Glider mission and initial track (left) of the NOAA AMLR05 glider and initial temperature profiles (right).

### C-045 Biogeochemistry (Shavonna Bent, Van Mooy Group, MIT/WHOI)

This week the Van Mooy lab has completed sampling of the extended grid, the 600 line of the standard grid, and all associated underway stations. We are looking at lipids and carbohydrates from the surface samples, as well as particulate organic carbon (POC), nutrients (nitrate, phosphate, silicate), and  $\delta^{18}\text{O}$  for the entire depth profile. Flow cytometry samples were collected for autofluorescence from the top seven depths, and for the presence of DNA via SybrGreen staining for the entirety of the water column. RNA samples have been collected at grid stations from the surface and the DCM.

In addition to water column biogeochemistry, we have begun imaging plankton from the surface of grid stations and underway stations. At the beginning of the extended grid, the phytoplankton community appeared to be dominated by a single species (*Corethron criophilum*, image attached). As we began the standard grid in the 600 line, diversity appeared to increase. Notably, there was a *Phaeocystis antarctica* bloom at station 600.200 (off-shore), where Acantharians were also observed. Work to record the swimming and sinking behaviors of these organisms is underway, as are attempts at isolation for cell culturing.

### C-020 Zooplankton (Joe Cope, Steinberg Group, VIMS)

We deployed our 1- and 2-m Metro nets at the extended grid stations and along the standard LTER grid. Animals caught in the nets were identified to the lowest taxonomic rank possible, enumerated, and measured for volume. Several interesting findings were noted with our catch. Juvenile silverfish, *Pleuragramma antarctica*, were only caught at the northernmost extended grid station, where the cold Weddell Sea water influence is the highest. Most of the Antarctic

krill, *Euphausia superba*, that were caught are small juveniles. During past LTER cruises, which took place in January, the krill were typically larger, mature adults.

Graduate student Tor Mowatt-Larssen is looking at the thermal tolerance of Antarctic fishes. Icefishes, family Channichthyidae, may be especially vulnerable to thermal variability due to their physiological adaptations for living in a cold and stable environment. He has conducted thermal incubation experiments on six small icefishes. Graduate student Maya Thomas is interested in fecal pellet production of dominant Antarctic zooplankton. Sinking fecal pellets provide a pathway for carbon transport to the deep ocean, sequestering it from the atmosphere. She has conducted a set of experiments on the Antarctic krill and on salps, *Salpa thompsoni*.