

PALMER STATION MONTHLY SCIENCE REPORT

MARCH 2017



***Rigil*, the first of two Rigid Hull Inflatable Boats (RHIB) out on Hero Inlet. A scientific platform for the next generation of Palmer research. Image Credit: Randy Jones**

NEWS FROM THE LAB

Randy Jones, Summer Laboratory Supervisor

The arrival of the ARSV *Laurence M. Gould* signals the conclusion of another successful summer research season here at Palmer Station. A great deal of scientific activity both in the field and in the laboratories has been completed or is ongoing. Overall this summer season, we supported eight grantee groups on station and 14 grantee groups based from the Terra Lab.

The start of the month saw the initial launching of the Rigid Hull Inflatable Boat (RHIB), *Rigil*. Many years of planning and work have gone into making this dream a reality. RHIB *Rigil* will extend the range of current scientific boating operations and will be joined by an identical RHIB, *Hadar*, in the near future. Further testing and short voyages saw RHIB *Rigil* out on the water throughout the month. Testing of her capabilities will proceed through the end of boating operations this winter and continue again the following summer.

Warm weather throughout the month allowed a number of groups to take full advantage of the ideal conditions to make field trips out to the surrounding islands and waters. Calving off the glacier face proceeded at an extremely high rate for many days in March, which added a large quantity of brash ice and bergy bits to Arthur Harbor and the region around Palmer Station. Towards the end of the month, oceanographic and meteorological conditions shifted towards winter ranges with dropping ocean and air temperatures gifting us with the first few snow falls of the winter season. Finally, farewell to departing and a welcome to incoming ASC staff and grantees!

MARCH 2017 WEATHER

Liz Widen, Research Associate

Palmer Monthly Met summary for March, 2017

Temperature
Average: 2 °C / 35.5 °F
Maximum: 9.3 °C / 48.74 °F on 20 Mar 17:35
Minimum: -2.1 °C / 28.22 °F on 1 Mar 06:23
Air Pressure
Average: 997.6 mb
Maximum: 1012.2 mb on 5 Mar 18:22
Minimum: 978 mb on 22 Mar 04:24
Wind
Average: 8.8 knots / 10.2 mph
Peak (5 Sec Gust): 61 knots / 70 mph on 27 Mar 13:49 from NNE (23 deg)
Prevailing Direction for Month: NNE
Surface
Total Rainfall: 134.9 mm / 5.31 in
Total Snowfall: 0 cm / 0 in
Greatest Depth at Snow Stake: 0 cm / 0 in
WMO Sea Ice Observation: No Sea Ice in sight, only ice of land origin, 1-5 bergs, with growlers and bergy bits.
Average Sea Surface Temperature: 1.14 °C / 34.1 °F

The following two plots (Fig. 1 and 2) show the month's average temperature and wind speed plotted against the historical average (where the historical average goes back to November 30, 2001). Overall, temperatures were above average for the month of March, with a few record highs. Wind speeds were mostly consistent with historical averages. Arthur Harbor and Hero Inlet have been clear of sea ice, but have been occasionally filled with growlers and bergy bits from local glacier calving.

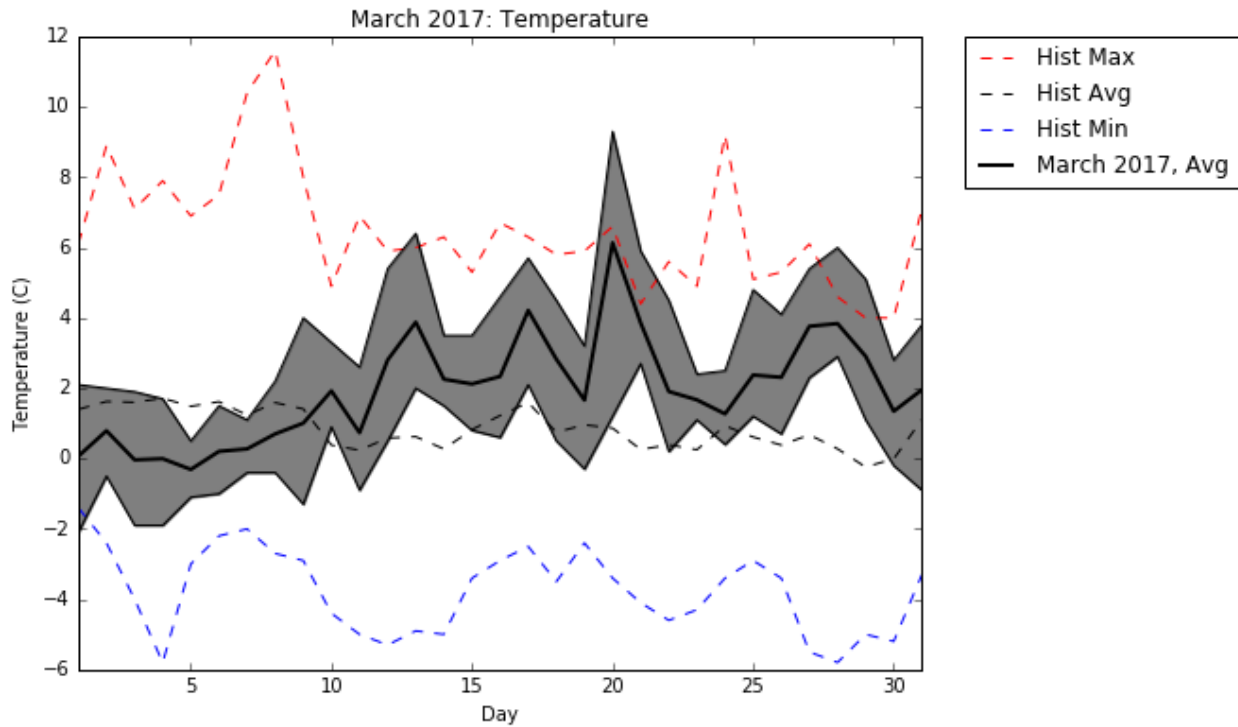


Fig. 1 – Plot of daily temperature in March 2017. Shown in black/shaded gray are the daily average, the minimum, and the maximum for this year. The dotted lines on the graph indicate average, minimum, and maximum values for “historical values” for 2002 to 2016. (We thank Liz Widen for providing this data and the figure.)

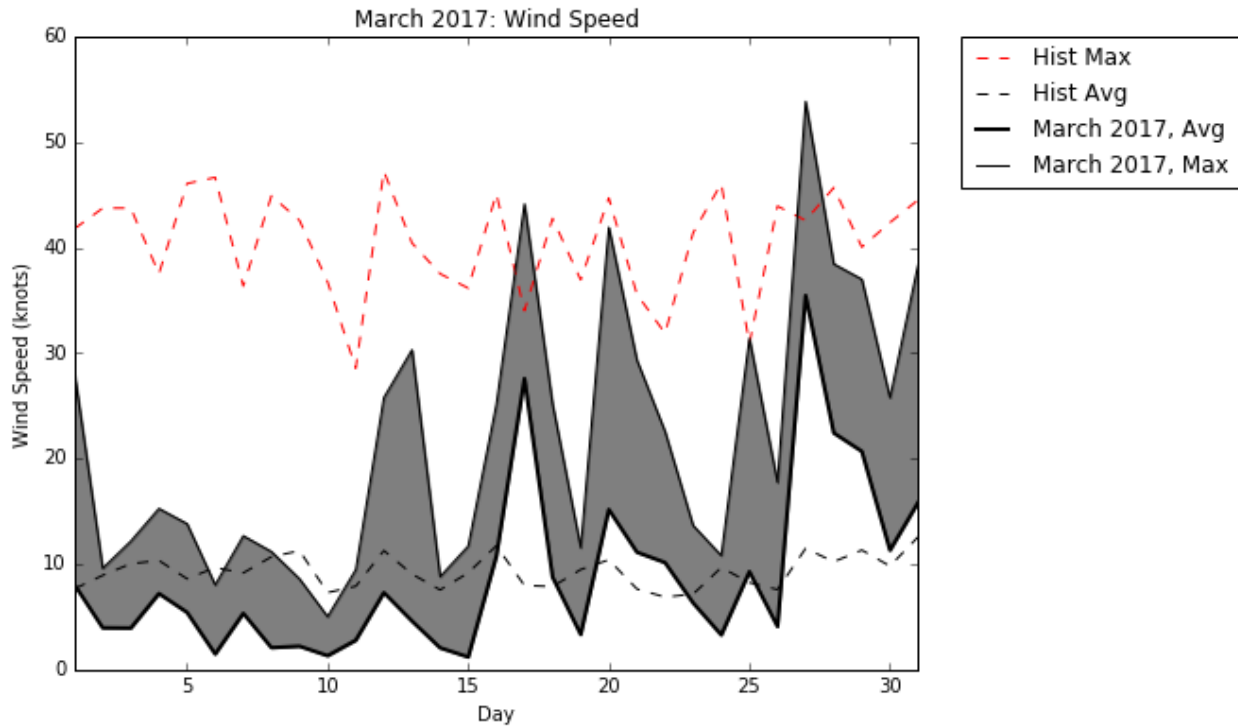


Fig. 2 – Plot of daily wind speed in March 2017. The daily averages are shown in black with grey shading indicating gusts. The dotted lines on the graph indicate average and maximum values for “historical values” for 2002 to 2016. (We thank Liz Widen for providing this data and the figure.)

B-022-P: THE CHEMICAL ECOLOGY OF SHALLOW-WATER MARINE MACROALGAE AND INVERTEBRATES ON THE ANTARCTIC PENINSULA

Dr. Charles Amsler and Dr. James McClintock, Principal Investigators, University of Alabama at Birmingham; Dr. Bill Baker, Principal Investigator, University of South Florida

Personnel on station: Charles Amsler, Margaret Amsler, Bill Baker, Sabrina Heiser, James McClintock, Leucas Miller, Andrew Shilling, Santana Thomas

Personnel movements this month: James McClintock departed with LMG17-02NB on 15 March and Bill Baker arrived with LMG17-03SB on 29 March.

March came in like a lamb (penguin chick?) and stayed that way most days for over three weeks, allowing us to make 37 dives between the 1st and 26th. Unfortunately, March went out like a lion (leopard seal?) with high winds and/or heavy seas preventing diving in the five March days thereafter. The favorable conditions throughout most of the month allowed numerous collections of our focus organisms for this season's work: the red alga *Plocamium cartilagineum*, the amphipod *Paradexamine fissicauda* which commonly associates with *P. cartilagineum*, and the huge brown alga *Himantothallus grandifolius* with its associated gastropod fauna.



Leucas Miller working in the B-022-P (Amsler/Baker/McClintock) sorting table in the Aquarium.
Image Credit: Randy Jones

The station gas chromatograph was in constant use throughout the month enabling us to determine which of 12 or more chemical groups (chemogroups) *P. cartilagineum* individuals

belong to. With that knowledge, we were able to establish a season-long experiment looking at the growth of *P. fissicauda* on the different chemogroups as well to begin a series of shorter-term bioassays measuring feeding rates of *P. fissicauda* on the different chemogroups. Analysis of chemogroup distribution between sites has also allowed us to select likely study sites for an analysis of short-range pattern variation in *P. cartilagineum* chemogroups which will begin as soon as weather conditions allow diving. The chemogroup determinations are also allowing us to identify sites for a common-garden *P. cartilagineum* transplant experiment that will be set up in April and run until our 2018 field season.

Analysis of *H. grandifolius*-associated gastropods (primarily snails) revealed that gastropod densities are relatively uniform across individuals and locations, particularly at shallower depths. However, some individuals from greater depths at one site had much greater densities ranging to over 6000 individual gastropods per alga. These data will enable us to move on to manipulative experiments in outdoor mesocosm tanks looking at the degree to which the algae provide the gastropods with a refuge from fish and sea star predation. Additional collections of algal-associated gastropods will continue but most will be preserved and shipped to our home institution for analysis. These data also set the stage for longer-term mesocosm tank experiments to be initiated early in our 2018 field season.

We are grateful for the generous and professional assistance of numerous ASC staff in assisting with our activities. Randy Jones, Carly Quisenberry, Nikki Chatelain, Rosemary McGuire, and Michael Tepper-Rasmussen deserve special thanks for facilitating our laboratory and field efforts.

B-256-P: COLLABORATIVE RESEARCH: WINTER SURVIVAL MECHANISMS AND ADAPTIVE GENETIC VARIATION IN AN ANTARCTIC INSECT

Dr. Richard E. Lee, Jr. and Dr. David L. Denlinger, Principal Investigators, Miami University, Oxford, Ohio and Ohio State University, Columbus, Ohio.

Personnel on Station: J.D. Gantz and Drew Spacht

During March, Drew Spacht and J.D. Gantz made numerous collecting trips for larvae to continue a seasonal profile of larval metabolism and stress tolerance. We also completed a comparative study of genetic and physiological variation among different microhabitats used by the larvae. Larvae are found in diverse terrestrial microhabitats ranging from moss beds to grass to mats of terrestrial algae (*Prasiola crispa*) to guano-rich sites adjacent to penguin rookeries. Additionally, we retrieved all remaining temperature loggers deployed at the start of last season that will help us to parse out environmental variables that contribute to genetic and physiological differences between microhabitats. We have wrapped up all our projects and are beginning to process some of our data. Preliminary results suggest that larvae collected from different habitats have different stress tolerances. Further, these differences do not disappear quickly when larvae are maintained in the same conditions and on the same food, suggesting that the observed differences are controlled by genetics or epigenetics, rather than by acclimation or diet.

Our outreach efforts seek to connect the science activities of our team and other research projects on station with teachers and their students. Spearheaded by Natalie Ylizarde, A Fly on the Pole (<http://aflionthepole.com/>) is the official outreach program for the 2017 Antarctic research

expedition. Prior to leaving at the beginning of February, Natalie connected PreK-16 schools, informal educators, and the general public with Palmer Station by using video and teleconferencing, blogging, and various social media outlets. As part of the NSF-MADE-CLEAR grant (NSF DUE 1043262) she led an exploratory study using real-time polar research at Palmer Station as a vehicle to teach climate change in classrooms, grades 4-12. A second website (<http://www.units.miamioh.edu/cryolab/>) at Miami University provides K-12 classroom activities based on national and state standards.

We are grateful to station personnel for their support and helpfulness during our second field season on this project. Randy Jones and Carly Quisenberry helped with our efforts to complete our experiments and move out of the lab spaces in anticipation of leaving Palmer Station for the season. Rosemary McGuire and Nikki Chatelain were especially helpful supporting our boating needs. We also thank our volunteers in the field who helped with our major collecting days.

C-013-P PALMER LONG TERM ECOLOGICAL RESEARCH (LTER): LOOKING BACK IN TIME THROUGH MARINE ECOSYSTEM SPACE, APEX PREDATOR COMPONENT

Dr. William R. Fraser, Principal Investigator, Polar Oceans Research Group, Sheridan, MT

Personnel on station: Shawn Farry, Ben Cook, Carrie McAtee, Donna Patterson-Fraser

Adélie penguin work concluded this month with the fledgling of all chicks ending our presence/absence radio transmitter study on Humble Island. Gentoo Penguin breeding was slightly behind Adélie penguins this year with work during March focused on obtaining adult diet samples and chick fledging weights on Biscoe Island and in the Joubin Islands.

Brown skua work also concluded this month with nest monitoring and growth measurements ending with the fledgling of our last study chick. Our south polar skua study on Shortcut Island continued through March with intensive chick monitoring, growth measurements, banding, and sample collections.

Giant petrel chick banding on all local islands was completed in March while our intensive chick growth measurement study on Humble Island will continue through April. We also experimented this month with the deployment of high resolution data logging GPS tags on adult giant petrels on Humble Island.

Marine mammal monitoring continued with observations of large numbers of fur seals, rapidly declining elephant seal numbers, sporadic leopard seal and crab-eater seal sightings, and a return of a few Weddell seals to the area. Whale observations in the Palmer area decreased during March with sporadic sightings of humpback and minke whales. A highlight of the season occurred this month with the rare observation of a southern Atlantic right whale.



Giant petrel chick weighting on Humble Island. *Image Credit: Fraser Group*

Sediment trap contents were collected from Adélie colonies on Torgersen, Gentoo colonies on Biscoe Island, and chinstrap colonies on Dream Island. These Palmer area sediment trap samples as well as Avian Island samples were all processed for otoliths. Limpet trap contents were also collected from kelp gull colonies on four local islands.

ASC continued to provide great support this month and we'd like to thank everyone on station for their efforts throughout the entire summer. We would like to specifically thank Station Manager Bob Farrell for his support of our numerous Joubin Island trips this month as well as Resident Marine Technicians Rosemary McGuire and Nikki Chatelain for the endless boating assistance.

C-019-P: PALMER, ANTARCTICA LONG TERM ECOLOGICAL RESEARCH (LTER): LAND-SHELF-OCEAN CONNECTIVITY, ECOSYSTEM RESILIENCE, AND TRANSFORMATION IN A SEA-ICE INFLUENCES PELAGIC ECOSYSTEM, PHYTOPLANKTON COMPONENT

Dr. Oscar Schofield, Principal Investigator, Rutgers University, Institute for Earth, Ocean, and Atmospheric Sciences, Department of Marine and Coastal Sciences

Personnel on station: Mike Brown, Colette Feehan, and Schuyler Nardelli

The Schofield group was able to sample twice in March, thus concluding another successful season of work. Figures 3 and 4 display chlorophyll and primary productivity data across the duration of the season at Stations B and E. At Station B, there was a significant peak in both variables at the beginning of February, and otherwise values stayed relatively low and consistent. At Station E, chlorophyll peaked in early December, while primary productivity peaked in early February. Station E peak values were about three times less than the peak values seen at Station B.

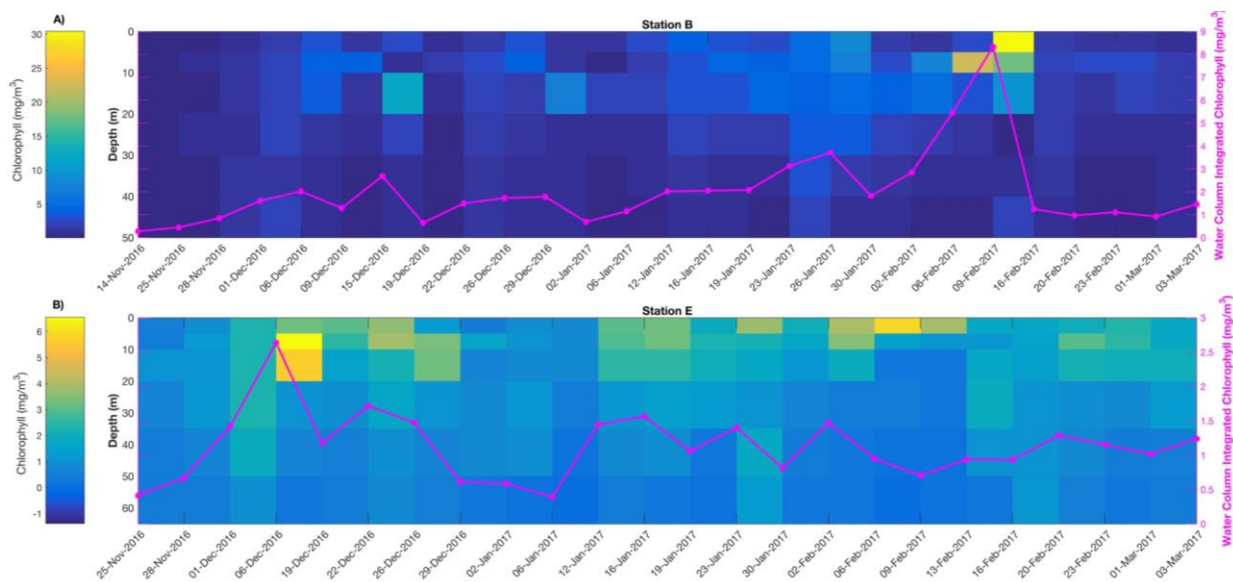


Fig. 3 – Chlorophyll (mg Chl m^{-3}) at Station B (a) and Station E (b) throughout the water column throughout the season from Nov 14, 2016 through Mar 3, 2017 are shown using a color bar (note color bar scales are different). Water-column integrated chlorophyll concentrations (mg Chl m^{-2}) are shown as a pink line (note y-axis scales are different).

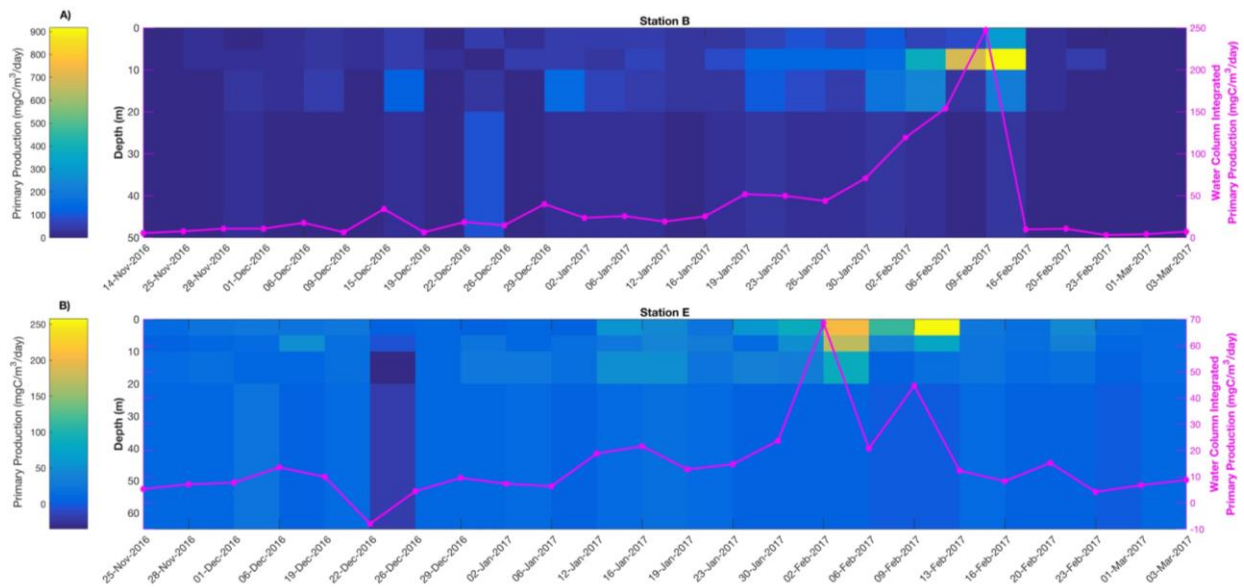


Fig. 4 – Primary Production ($\text{mg C m}^{-3} \text{ day}^{-1}$) at Station B (a) and Station E (b) throughout the water column throughout the season from Nov 14, 2016 through Mar 3, 2017 are shown using a color bar (note color bar scales are different). Water-column integrated primary production values ($\text{mg C m}^{-2} \text{ day}^{-1}$) are shown as a pink line (note y-axis scales are different).

A huge thank you to ASC for all their help and support throughout the course of the season, and also to the Ducklow lab for being amazing sampling partners!

C-024-P: PALMER, ANTARCTICA LONG-TERM ECOLOGICAL RESEARCH (LTER): CLIMATE MIGRATION, ECOSYSTEM RESPONSE AND TELECONNECTIONS IN AN ICE-DOMINATED ENVIRONMENT, WHALE COMPONENT

Dr. Ari Friedlaender, Principal Investigator, Oregon State University, Newport, OR

Personnel on Station: Logan Pallin and James Fahlbusch

For the month of March, the ‘Whale Researchers’ (James Fahlbusch and Logan Pallin) stationed at Palmer as part of the LTER project have continued our two primary projects that involve humpback whale photo id/biopsy sampling and acoustic-based prey mapping. This month we have spent a total of ~150 hours on the water surveying and to date, a little less than last month due to the increased frequency of bad weather days. James and Logan have collected 92 skin blubber biopsy samples, of which 86 are humpback and 6 are minke whales. We continued to encounter minke whales early in the month of March, allowing for further sampling and photo identification (Fig. 5). These samples will be used for genetic and hormone analyses to assess changes in baleen whale population demography. In addition to whale surveys, we completed another 17 active acoustic surveys this month to understand krill variability over time in the Palmer area. We concluded our acoustic surveys by conducting our end of the year calibration which will be used to standardize the data against varying environmental conditions.



Fig. 5 – An Antarctic minke whale surfaces for a quick breath near Cormorant Island, right before heading back under the brash ice.

Again, this month the number of whales encountered slowed a bit, likely due to the absence of krill locally. However, in the last two weeks we have had the pleasure of encountering some awesome sights. Several times in the last few weeks, we have encountered what we would consider to be very friendly and curious whales. They have displayed some amazing surface behaviors, as well as showing an unprecedented curiosity in our presence. These encounters have truly been amazing (Figs. 6 and 7). Additionally, we encountered a single southern right whale



Fig. 6 – Two humpbacks socializing on the surface near the zodiac.



Fig. 7 – Logan is surprised by a curious humpback as he records underwater go pro footage.

(*Eubalaena australis*) near station the final week in March (Figs. 8 and 9). This was truly a treat. To our knowledge the last southern right whale encountered near Palmer Station was in the 1992/93 summer season. Like humpbacks, these animals are baleen whales, but utilize a ram filter feeding technique, rather than active pursuit lunge filter feeding, swimming slowly with



Fig. 8 – Photograph of the head of a southern right whale encountered near Palmer Station. Notice the white/grey callosities scattered along the head of the whale.

their mouth open. Like their northern hemisphere counterpart, the southern right whale is quite distinguishable from other cetaceans by the callosities on its head, the absence of a dorsal fin, and its unparalleled turgid appearance. These callosities (Fig. 8), like the fluke of a humpback

whale, form a unique pattern to each individual and if fully imaged, can be used for identification purposes. Interestingly enough, a group of scientists have been able to use high resolution satellite imagery to identify these whales using their callosities from space. The paper can be found here: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0088655>. These callosities occur from calcified skin patches on the head of these species. To our knowledge, the purpose of these callosities is still unknown.



Fig. 9 – Fluke of southern right whale encountered near Palmer Station.

The largest extent of our field season is starting to come to a close here at Palmer Station. Logan will be heading north on the LMG17-03NB cruise to get ready to defend his master's degree and to start processing the samples that he and James collected this year. James will be on and off station until the end of May, working with a colleague from Australia, where their primary objective will be to deploy satellite tracking tags on humpbacks from the ARSV *Laurence M. Gould*. Finally, we both contributed to and benefitted from collaborative assistance with other LTER projects operating at Palmer; the collaboration between and among the projects was evident and helpful and we would like to thank all those who have helped guide us to whales in the area.

C-045-P: PALMER, ANTARCTICA LONG-TERM ECOLOGICAL RESEARCH (LTER): CLIMATE MIGRATION, ECOSYSTEM RESPONSE AND TELECONNECTIONS IN AN ICE-DOMINATED ENVIRONMENT, MICROBIAL / BIOGEOCHEMICAL COMPONENT

Dr. Hugh Ducklow, Principal Investigator, Columbia University, Lamont Doherty Earth Observatory

Personnel on Station: Adrian Jaycox and Leigh West

The Ducklow group had a productive and enjoyable end-of-season. It started with a bit of a roadblock, with one of our sampling boat's engines failing. The Palmer MTs worked very hard to get us back out on the water, however, and we were able to sample on two days in March using

one out of two engines on the landing craft and zodiac support. We sampled at Stations B and E on both days and were able to complete two days of primary production work before our rad lab closeout deadline on March 9th. Our last day of sampling was hectic and memorable, as we participated in a Video Teleconference Call (VTC) with elementary, middle, and high school students midway through the day. During a break in our post-sampling processing, we video chatted with schools via the LTER Outreach program at Rutgers University. We had a wonderful time answering the students' great questions and sharing our experiences in Antarctica with them. Jeff Otten from the Palmer IT department and Janice McDonnell from Rutgers did an amazing job of facilitating this call—many thanks to them both!



Adrian Jaycox reprogramming the soil temperature loggers in the backyard, while trying to keep his laptop dry. *Image Credit: Ducklow Group*

After the end of sampling for the season, we focused on packing and tying up loose ends. On our last day on station, we made one final trek into the backyard to reprogram our temperature loggers. Heading towards the mist-covered glacier, scrambling over rocky substrate while listening to a chorus of birds and seals, we were reminded how lucky we are to have been Hugh Ducklow's field team members this season. It's been six months chock-full of exciting science and unforgettable experiences, and we are so grateful to everyone who has contributed to our time on station. Thanks so much to Palmer's ASC contractors, in particular Palmer's stellar MTs, Lab Supervisor, and Instrument Technician, as well as the C-019-P group, with whom we worked so closely over the course of the season.

PALMER STATION
RESEARCH ASSOCIATE MONTHLY REPORT
March 2017
Liz Widen

G-090-P: GLOBAL SEISMOGRAPH NETWORK (GSN) SITE AT PALMER STATION
Kent Anderson, Principal Investigator, Incorporated Research Institutions for Seismology (IRIS)

Station PMSA is one of more than 150+ sites in the GSN, monitoring seismic waves produced by events worldwide. Real-time telemetry data is sent to the U.S. Geological Survey (USGS). The Research Associate operates and maintains on-site equipment for the project.

The system operated normally throughout the month.

A-109-P: ANTARCTIC EXTREMELY LOW FREQUENCY/VERY LOW FREQUENCY (ELF/VLF) OBSERVATIONS OF LIGHTNING AND LIGHTNING-INDUCED ELECTRON PRECIPITATION (LEP)

Robert Moore, Principal Investigator, University of Florida

ELF/VLF radio wave observations at Palmer Station are used to provide a deeper understanding of lightning and its effects on the Earth's inner radiation belt. The Research Associate operates and maintains on-site equipment for the project.

The VLF/ELF system has operated well throughout the month.

A-119-P: DEVELOPMENT OF ANTARCTIC GRAVITY WAVE IMAGER

Michael Taylor, Principal Investigator, Utah State University

The Gravity Wave Imager takes images of the night sky in the near infrared, observing the dynamics of the upper atmosphere. The camera takes one 20-s exposure image every 30s of a very faint emission originating from a layer located at ~55 miles of altitude.

The IR camera has operated well throughout the month. Some adjustments to the lens were made to improve focus and image quality.

A-357-P: EXTENDING THE SOUTH AMERICAN MERIDIONAL B-FIELD ARRAY (SAMBA) TO AURORAL LATITUDES IN ANTARCTICA

Eftyhia Zesta, Principal Investigator, University of California Los Angeles

The three-axis fluxgate magnetometer is one in a chain of longitudinal, ground-based magnetometers extending down through South America and into Antarctica. The primary scientific goals are the study of ULF (Ultra Low Frequency) waves and the remote sensing of mass density in the inner magnetosphere during geomagnetically active periods. The Research Associate maintains the on-site system.

The magnetometer was operational all month.

A-373-P: TROPOSPHERE-IONOSPHERE COUPLING VIA ATMOSPHERIC GRAVITY WAVES

Vadym Paznukhov, Principal Investigator, Boston College

The goal of this project is to enhance the comprehensive research understanding of troposphere-ionosphere coupling via Atmospheric Gravity Waves (AGWs) in the Antarctic region. Both experimental and modeling efforts will be used on the Antarctic Peninsula to investigate the efficiency and main characteristics of such coupling and will address several questions remaining in the current understanding of this coupling process.

The system operated well throughout the month.



An Antarctic fur seal (*Arctocephalus gazella*) pulled out on Gamage Point. Image Credit: Randy Jones

O-202-P: ANTARCTIC METEOROLOGICAL RESEARCH CENTER (AMRC) SATELLITE DATA INGESTOR

Mathew Lazzara, Principal Investigator, University of Wisconsin

The AMRC computer processes satellite telemetry received by the Palmer Station TeraScan system, extracting Automated Weather Station information and low-resolution infrared imagery and sending the results to AMRC headquarters in Madison, WI. The Research Associate operates and maintains on-site equipment for the project.

The data ingestor computer system has been operating normally all month.

O-264-P: A STUDY OF ATMOSPHERIC OXYGEN VARIABILITY IN RELATION TO ANNUAL DECADAL VARIATIONS IN TERRESTRIAL AND MARINE ECOSYSTEMS

Ralph Keeling, Principal Investigator, Scripps Institution of Oceanography

The goal of this project is to resolve seasonal and interannual variations in atmospheric O₂ (detected through changes in O₂/N₂ ratio), which can help to determine rates of marine biological productivity and ocean mixing as well as terrestrial and oceanic distribution of the global anthropogenic CO₂ sink. The program involves air sampling at a network of sites in both the Northern and Southern Hemispheres. The Research Associate collects samples fortnightly from Terra Lab.

Air samples were taken twice this month.

O-264-P: COLLECTION OF ATMOSPHERIC AIR FOR THE NOAA/GMD WORLDWIDE FLASK SAMPLING NETWORK

Don Neff and Steve Montzka, Principal Investigators, National Oceanic and Atmospheric Administration / Global Monitoring Division, Boulder, CO

The NOAA ESRL Carbon Cycle Greenhouse Gases (CCGG) group makes ongoing discrete measurements to document the spatial and temporal distributions of carbon-cycle gases and provide essential constraints to our understanding of the global carbon cycle. The Halocarbons and other Atmospheric Trace Species (HATS) group quantifies the distributions and magnitudes of the sources and sinks for atmospheric nitrous oxide (N₂O) and halogen containing compounds. The Research Associate collects weekly air samples for the CCGG group and fortnightly samples for the HATS group.

CCGG samples were taken regularly and HATS air samples were taken twice this month.

O-264-P: ULTRAVIOLET (UV) SPECTRAL IRRADIANCE MONITORING NETWORK

James Butler, Principal Investigator, National Oceanic and Atmospheric Administration / Global Monitoring Division, Boulder, CO

A Biospherical Instruments (BSI) SUV-100 UV spectroradiometer produces full sky irradiance spectra ranging from the atmospheric UV cutoff near 290 nm up to 605 nm, four times per hour. A BSI GUV-511 filter radiometer, an Eppley PSP Pyranometer, and an Eppley TUVB radiometer also continuously measure hemispheric solar flux within various spectral ranges. The Research Associate operates and maintains on-site equipment for the project.

The system operated normally throughout the month. The group is being assisted with their on-site visit to do bi-yearly inspection, calibrations, and upgrades.

O-283-P: ANTARCTIC AUTOMATIC WEATHER STATIONS (AWS)

Mathew Lazzara, Principal Investigator, University of Wisconsin

AWS transmissions from Bonaparte Point are monitored using the TeraScan system and the University of Wisconsin's Data Ingestor system. Data collected from this station is freely available from the University of Wisconsin's Antarctic Meteorological Research Center (AMRC) website. The Research Associate monitors data transmissions for the project and performs quarterly maintenance on the station at Bonaparte Point.

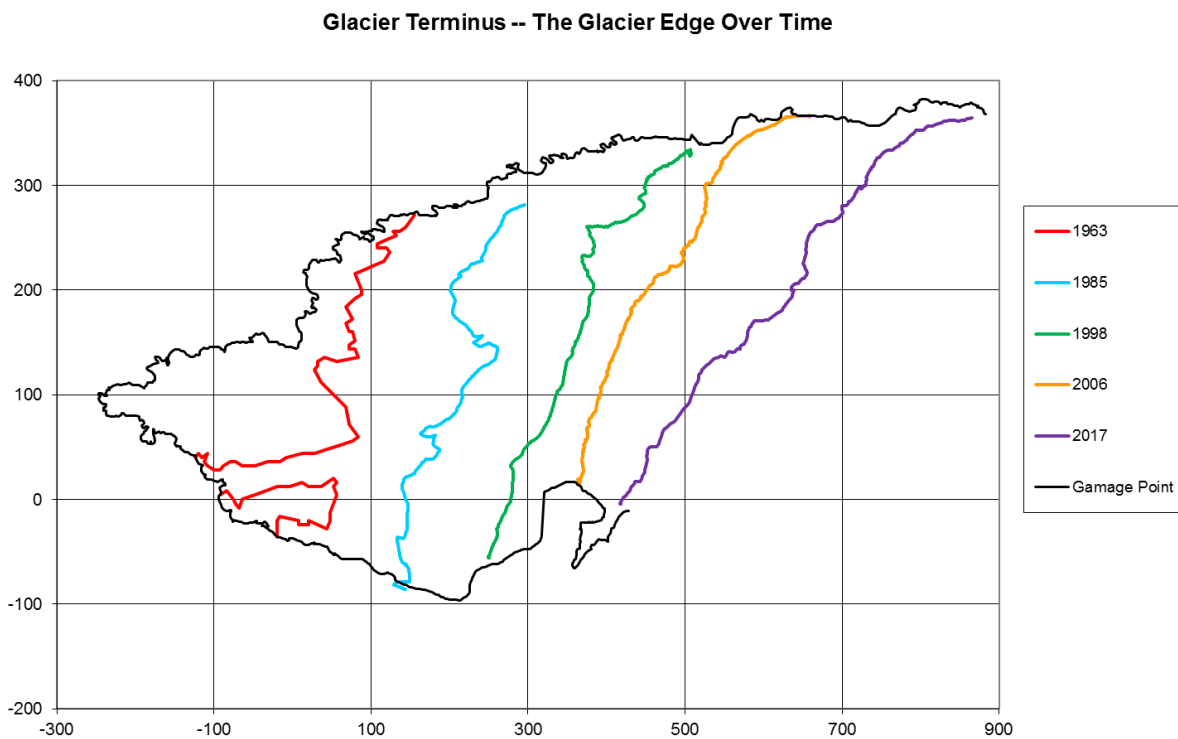
The system operated normally throughout the month.

T-295-P: GPS CONTINUOUSLY OPERATING REFERENCE STATION

Joe Pettit, Principal Investigator, UNAVCO

Continuous 15-second epoch interval GPS data files are collected at station PALM, compressed, and transmitted to the NASA-JPL in Pasadena, CA. The Research Associate operates and maintains on-site equipment for the project.

The system operated well throughout the month. GPS measurements were taken of the glacier termini and faces.



Coastline and glacier outlines from multiple years for the Palmer Station and Backyard. Data courtesy of Liz Widen and UNAVCO. Image Credit: Liz Widen

T-312-P: TERASCAN SATELLITE IMAGING SYSTEM

The TeraScan system collects, processes, and archives DMSP and NOAA satellite telemetry, capturing approximately 25-30 passes per day. The Research Associate operates and maintains

on-site equipment for the project. The TeraScan weather and ice imagery is used for both research and station operations.

The Terascan system worked well throughout the month.

**T-998-P: INTERNATIONAL MONITORING STATION (IMS) FOR THE
COMPREHENSIVE NUCLEAR TEST BAN TREATY ORGANIZATION (CTBTO)**
Managed by General Dynamics

The IMS Radionuclide Aerosol Sampler and Analyzer (RASA) is part of the CTBTO verification regime. The automated RASA continually filters ambient air and tests for particulates with radioisotope signatures indicative of a nuclear weapons test. The Research Associate operates and maintains the instrument.

The system operated normally throughout the month.

OCEANOGRAPHY

Daily observations of sea ice extent and growth stage are also recorded, along with continuous tidal height, ocean temperature, and conductivity at Palmer's pier.

Observations of sea ice around station were made daily and the tide gauge worked well throughout the month. All historical tide data has been transferred to the AMRC.

METEOROLOGY

The Research Associate acts as chief weather observer, and compiles and distributes meteorological data. Weather data collected using the automated electronic system is archived locally and forwarded once per month to the University of Wisconsin for archiving and further distribution. Synoptic reports are automatically generated every three hours by the Palmer Meteorological Observing System (PalMOS) and emailed to the National Weather Service for entry into the Global Telecommunications System.

The local weather station (PAWS) is working well. The Joubin and Wauwermans Island sites have had outages due to their batteries not charging fully.