

# PALMER STATION MONTHLY SCIENCE REPORT

August 2012



**Corey Allard of B-037-P (Detrich) microinjects embryos of *Notothenia coriiceps* with a fluorescent dye that indicates production of reactive oxygen species.**

*Image Credit: Perri Barbour*

## **NEWS FROM THE LAB**

**By Janice O'Reilly, Winter Assistant Supervisor of Laboratory Operations**

Palmer Station continued to support busy science labs during the month of August. Members from B-037-P (Detrich) and B-038-P (Grim) worked long hours in the labs to determine the effect of temperature on the development of Antarctic fish embryos and to understand the role of oxygen radicals in the bone development in these animals. While grantees focused on their research, winter work tasks continued on the peripheral. The Aquarium Lab remodel project was completed, equipment PMs were conducted, linoleum floors were cleaned and polished, computers were set up, and science supplies were prepared for summer grantees. The labs were full and busy with a wide range of activities.

A variety of weather conditions during August shaped a transitioning landscape, one that changed dynamically from day to day. Beautiful winter scenes were accentuated by direct sunlight and lingering daylight hours. On 11 August the early morning light below the horizon, along with low stratospheric temperatures, created ideal conditions for a large display of iridescent nacreous clouds. The below-freezing seawater and air temperatures allowed for the occasional formation of sea ice, and the strong winds pushed thick pack ice into and out of the local area. Freezing temperatures and increasing sunlight created some interesting changes to the land, seawater, and atmosphere as the transition from winter to summer began.

The quiet and calm frozen seascape was often void of any wildlife; however during periods of open water a few birds and mammals appeared. Early in the month small numbers of Antarctic terns still lingered in the backyard. Snow petrels and giant Antarctic petrels still lingered throughout the month, including a white giant Antarctic petrel seen two times. Toward the end of the month significant increases of blue-eyed shags and snowy sheathbills were documented. Flocks of blue-eyed shags were often seen in numbers up to approximately 50 individuals “flying with purpose,” as one person reported. On 13 August a colony of approximately 300 Adélie penguins was sighted on the south shore of Janus Island preening feathers, waddling up the steep beach, and resting in the snow. Small groups of Adélies were also seen swimming in the nearby water and hopping to the icy shore. No Adélies were seen on Torgersen Island, where they had been observed last month. On the same day, one elephant seal was resting on Elephant Rocks. No other reports or signs of elephant seals were recorded for the month. Crabeater seals were observed resting on sea ice: two on 13 August on Hero Inlet and one on 22 August on Arthur Harbor. On 13 August one crabeater was observed swimming in the water near the south shore of Torgersen Island. On 15 August minke whales surfaced several times through openings in the icy water between Gamage Point and Torgersen Island for approximately 45 minutes. Only one fur seal was seen this month on 24-25 August, wandering on the thick sea ice between Arthur Harbor and Hero Inlet. There were no reports of leopard seals present in the Palmer Station area during the month. Wildlife sightings were usually limited to Palmer Station, the Backyard, and Bonaparte because windy weather and thick sea ice limited boating opportunities.

## **JULY 2012 WEATHER**

**By Neal Scheibe, Research Associate**

The weather in August was typical for late winter in that it featured multiple different weather patterns. Early snows were replaced by high winds, which peaked at 60 knots on the 19<sup>th</sup>. The windy conditions gave way to plunging temperatures, which bottomed out at -15.9°C on the 24<sup>th</sup>. Only three days later, on the 27<sup>th</sup>, the high temperature for the month came in at 4.6°C on a calm, sun-filled day. These summer-like conditions drastically reduced the snow cover around station. The average temperature for the month of -3.3°C was a couple of degrees warmer than the August average.

Light precipitation for historically snowy August left the month’s snowfall at 29cm. This brought the annual total to only 206cm, which is about 40cm below the average for this time of year. The snow stake saw a maximum reading of 55cm on the 8<sup>th</sup>, but by the end of the month it was down to only 33cm.

The sea surface temperature was an average  $-1.7^{\circ}\text{C}$  for the month. Sea ice coverage for most of the month was thin. The exception was a brief period centered on the 24<sup>th</sup> which saw heavily packed ice leading away from station off to the horizon. The ice couldn't withstand the high temperatures and sunny weather that appeared on the 27<sup>th</sup>. The knockout blow to the sea ice came the following day with steady winds from the northeast that forced any remaining ice away from station.

## **B-037-P MICROTUBULE FUNCTION, PROTEIN FOLDING, AND EMBRYOGENESIS IN ANTARCTIC FISHES: AN INTEGRATIVE APPROACH**

H. William Detrich, Principal Investigator, Depts. of Earth and Environmental Sciences and of Biology, Northeastern University, Boston, MA

Personnel on Station: Corey Allard (B-037-P Detrich) and Irina Mueller (B-038-P Grim)

N.B. Since B-029-U and B-038-P are projects affiliated with B-037-P, this report encompasses work by all three projects.

We continued acclimating red-blooded notothenioid fish embryos (*Notothenia coriiceps*) to elevated temperatures and comparing their development to comparable embryos held at physiological temperatures. Control and experimental embryos were sampled throughout August to evaluate the effect of temperature on development, as well as to determine overall expression patterns and localization of genes involved in vertebrate skeletal development (B-037/038/029). Due to problems with increased fungal growth at the elevated temperatures, we successfully switched our acclimation set-up from a flow-through system to a closed system, allowing for more effective anti-fungal treatments.

Embryos held at ambient temperature were also sampled bi-weekly to determine the role of reactive oxygen species (ROS) in bone development of these animals (B-038). The production of ROS was successfully localized in intact, live embryos, and a standard procedure was established and applied to determine size and intensity of the ROS signal in embryos sampled throughout the season. Significant progress was also made towards troubleshooting the assay conditions for quantifying the activity of the antioxidant enzyme superoxide dismutase (SOD) in Antarctic fish embryos. This protocol will allow us to quantify SOD activity in frozen embryos collected for project B-038 over the time course of development. Additionally, activity of the antioxidant enzyme catalase was measured in frozen embryos, collected in June, July and August for B-038.

We thank the ASC Palmer Station staff for their continued support of our winter research activities, in particular their rapid and professional response to the seawater pump outage of September 3. The quick restoration of seawater flow saved the experiments outlined above.

**PALMER STATION**  
**RESEARCH ASSOCIATE MONTHLY REPORT**  
**August 2012**  
Neal Scheibe

**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 143 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 ran normally for 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 system ran as planned for the month.

**A-132-P: FABRY-PEROT INTERFEROMETER (FPI)**

Qian Wu, Principal Investigator, National Center for Atmospheric Research

The Fabry-Perot Interferometer observes mesospheric and thermospheric neutral winds and temperatures at Palmer Station. The Research Associate operates and maintains on-site equipment for the project.

The instrument ran well during the month.

**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 operated normally for the month.

**O-204-P: A STUDY OF ATMOSPHERIC OXYGEN VARIABILITY IN RELATION TO ANNUAL TO DECADEAL 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 O<sub>2</sub> (detected through changes in O<sub>2</sub>/N<sub>2</sub> 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 CO<sub>2</sub> 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 both TerraLab and the VLF Building.

Sampling occurred regularly throughout the month.

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

James Butler, Principal Investigator, 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 (N<sub>2</sub>O) and halogen containing compounds. The Research Associate collects weekly air samples for the CCGG group and fortnightly samples for the HATS group.

Carbon Cycle and Halocarbon sampling occurred normally during the 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 290nm up to 605nm, four times per hour. Also collecting light spectra is a BSI GUV-511 filter radiometer, an Eppley PSP pyranometer, and an Eppley TUVR radiometer. The Research Associate operates and maintains on-site equipment for the project.

The UV monitor collected data normally for the month and all calibrations were carried out on schedule. Several errors were noted during the month that indicate that the wavelength potentiometer is starting to fail. The PI has been informed and will have the potentiometer replaced during the next site visit.

**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 Data Ingestor system. Data collected from this station is freely available from the University of Wisconsin's AMRC website. The Research Associate monitors data transmissions for the project and performs quarterly maintenance on the station at Bonaparte Point.

The automated weather station on Bonaparte Point stopped sending data during the last week of the month. It was decided by the PI that the instruments and electronics should be removed and shipped back to the University of Wisconsin for refurbishing. There is no current spare available to install, so the system will not collect any data until the instruments can be returned to Palmer Station.

**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 GPS operated normally for the duration of the month.

**A-336-P: ELF/VLF OBSERVATION OF LIGHTNING DISCHARGE, WHISTLER-MODE WAVES AND ELECTRON PRECIPITATION AT PALMER STATION.**

John Gill, Principal Investigator, Stanford University

Stanford University has been operating a Very Low Frequency (VLF) receiver antenna at Palmer Station since the 1970's. By receiving naturally and manmade signals between 1 and 40 kHz, the Stanford VLF group is able to study a wide variety of electromagnetic phenomenon in the ionosphere and magnetosphere. The Research Associate operates and maintains on-site equipment for the project.

Data was collected normally during the month.

**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 system operated normally for the month.

**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 collected data per plan for the month.

**B-466-P: FLUORESCENCE INDUCTION AND RELAXATION (FIRe) FAST REPETITION RATE FLUOROMETRY (FRRF)**

Deneb Karentz, Joe Grzyski, Co-Principal Investigators, University of San Francisco

The focus of this project is to identify and evaluate changes that occur in genomic expression and physiology of phytoplankton during the transition from winter to spring, i.e., cellular responses to increasing light and temperature. A Fast Repetition Rate Fluorometer (FRRF) with a FIRe (Fluorescence Induction and Relaxation) sensor was installed in the Palmer Aquarium. The Research Associate downloads data and cleans the instrument on a weekly basis.

The FRRF was cleaned weekly and data were sent to the PIs. The FRRF was offline for two days during construction activities in the aquarium lab requiring the power to be shut off. The FRRF operated normally otherwise.

**T-998-P: INTERNATIONAL MONITORING STATION (IMS) FOR THE COMPREHENSIVE NUCLEAR TEST BAN TREATY ORG. (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 RASA operated normally for the duration of the month. On the 16<sup>th</sup>, new filter rolls, mylar barcode tape, and sealing tape were installed as part of the annual maintenance of the RASA machine.

There were two instances of errors on the display screen of the station personal computer. These errors were corrected by restarting the server.

## **TIDE GAGE**

Tide height and seawater temperature are monitored on a continual basis by a gauge mounted at the Palmer Station pier. The Research Associate operates and maintains on-site equipment for the project.

The tide gauge operated normally during the month.

## **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 twice each 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 NOAA for entry into the Global Telecommunications System (GTS).

The weather station operated normally throughout the month. Scheduled inspections were carried out at the Gamage Point tower. The rain gauge was found to have a broken wind dampening structure. The metal rods surrounding the wind gauge have become worn away by the constant swinging of the wind dampening shields. One of the rods broke into two pieces, requiring a new rod to be fabricated and installed.