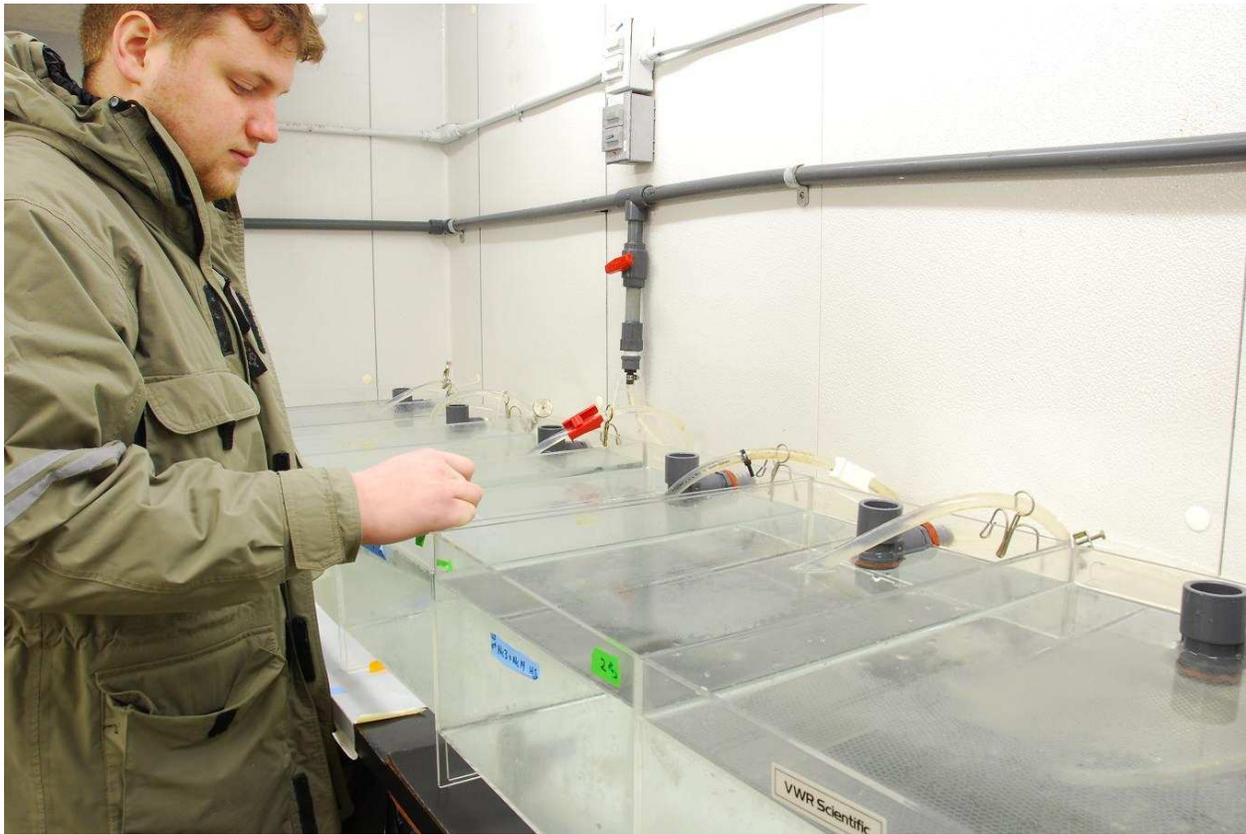


PALMER STATION MONTHLY SCIENCE REPORT
June 2010



Researcher, Corey Allard, from Northeastern University surveys hundreds of Black rockcod (*Notothenia coriiceps*) embryos.

Image Credit: Christopher Seliga

NEWS FROM THE LAB

Christopher Seliga, Winter Assistant Supervisor of Laboratory Operations

We bid farewell to the *ARSV Laurence M. Gould* (LMG) at the start of June, marking the end of a very successful field season for projects led by Bill Detrich (B-037-P) and Chuck Amsler (B-022-P). The remaining summer support staff also headed north, leaving eighteen people for the remainder of the winter. One science representative remains among the eighteen. Corey Allard, from Bill Detrich's group, will continue working with Antarctic fish (shown above), monitoring their embryos as they develop - a delicate endeavor.

Personnel celebrated Mid Winter's Day with a fabulous dinner on June 19th prepared by our amazing station chef, Keith Reimink. The wildlife seen near station consisted mostly of seals; fur, elephant, leopard, and Weddell, and various seabirds; giant petrels, blue-eyed shags, sheathbills and kelp gulls. A very friendly and tired male Weddell seal rested for a day on the road leading to our pier, and of course he became the talk of the station.

JUNE WEATHER

Neal Scheibe, Research Associate

June weather conditions were highly variable, with a few still, frigid days being pushed aside by several days of warm, gusty winds. Some of the more placid days came over the mid winter weekend, wedged between two extended windy periods. The average temperature for this month was -1.8°C , with a low of -11.6°C near the middle of the month and a high of 4.7°C early on. The peak wind gust for the month was recorded on the 13th at 81 knots and the average wind speed was 15 knots.

Beautiful sunrises gave way to equally stunning sunsets many times during the month, with several clear days during the month. The precipitation for June was 50.3 mm and 320.6 mm for the year, both up from this time last year. Only 4 cm of snowfall was recorded.

June's average sea surface temperature was -1.0°C , with no days above freezing. Despite the cooler temperatures, very little sea ice was seen during the month. Several decent sized bergs have taken up residence around the boating limits.

THE FOLLOWING PROJECTS CONDUCTED RESEARCH AT PALMER STATION:

B-037-P: PROTEIN FOLDING AND FUNCTION AT COLD TEMPERATURE: CO-EVOLUTION OF THE CHAPERONIN CCT AND TUBULINS FROM ANTARCTIC FISHES

H. William Detrich, Principal Investigator
Dept. of Biology, Northeastern University, Boston, MA

Personnel on Station: Corey Allard

The purpose of my 2010 field season is to study the effects of temperature change on the development of Antarctic fish species. My lab's interest in the use of Antarctic fish for this study stems from their slow speed of development, an evolutionary result of living in the cold waters of the Southern Ocean. This feature provides exceptional temporal resolution that will facilitate the analysis of mitosis and cytokinesis in developing fish embryos. These two critical molecular processes of the cleavage cell cycle may be perturbed or decoupled at supraphysiological temperatures, potentially accelerating or adversely affecting the development of the organisms. The fish species on which the study focuses is the Yellow-Bellied Rock Cod, *Notothenia coriiceps*, due to both its abundance in the area and relative hardiness. Research and specimen collections were performed both at Palmer Station and aboard the research vessel, *ARSV Laurence M. Gould*.

As the third month of research draws to a close, six clutches of *N. coriiceps* have been successfully obtained using an *in vitro* fertilization protocol developed by Doctors. H. William Detrich and John Postlethwait in their 2008 field season at Palmer Station. Embryos have been treated under a number of heat-shock conditions, and are preserved at strategic developmental time points for *in situ* and immunohistochemical analysis to be performed upon my return to Northeastern University in early October. The study also intends to identify developmental stages of particular sensitivity to thermal fluctuations. To accomplish this, heat-shock

experiments are performed at points of interest spanning the first two months of development. Through this research, we ultimately hope to address the capacity of Antarctic fish to survive in the warming Southern Ocean, and to better understand the dynamics of cell division.

PALMER STATION
RESEARCH ASSOCIATE MONTHLY REPORT
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Neal Scheibe

G-295-P GPS CONTINUOUSLY OPERATING REFERENCE STATION.
Bjorn Johns, Principal Investigator, UNAVCO

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

The GPS operated normally for the duration of the month.

G-090-P GLOBAL SEISMOGRAPH NETWORK (GSN) SITE AT PALMER STATION.
Rhett Butler, Principal Investigator, Incorporated Research Institutions for Seismology (IRIS)

The Research Associate operates and maintains on-site equipment for the project. Station PMSA is one of more than 143 sites in the GSN monitoring seismic waves produced by events worldwide. Data files are recorded to tape and also sent real-time to the U.S. Geological Survey (USGS).

The seismometer operated normally for the duration of the month. Archive data tapes were shipped back to the Albuquerque Seismological Lab.

O-202-P ANTARCTIC METEOROLOGICAL RESEARCH CENTER (AMRC)
SATELLITE DATA INGESTOR.
Mathew Lazzara, Principal Investigator, University of Wisconsin

The Research Associate operates and maintains on-site equipment for the project. The AMRC SDI 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 ingestor operated normally for the duration of 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 O₂ (detected through changes in O₂/N₂ ratio), which can aid in determining rates of marine biological productivity and ocean mixing. The results are also used to help determine the 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. Palmer Station is especially well situated for resolving signals of carbon cycling in the Southern Ocean.

The Research Associate collects samples fortnightly from both TerraLab and the VLF Building. A goal is that all sampling will eventually be moved to TerraLab. Samples taken from the station are sent to Scripps where the analysis of O₂ and CO₂ content takes place.

Sampling equipment and operations were per plan throughout the month. Following a brief power outages early in the month, a fuse needed replacing on the TerraLab air pump.

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

James Butler (Principle 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 (N₂O) and halogen containing compounds.

Palmer Station is one of many sites around the world providing data to support these projects. The Research Associate collects weekly air samples for Carbon Cycle Greenhouse Gases Group and fortnightly samples for Halocarbons & other Atmospheric Trace Species Group.

Carbon Cycle sampling occurred normally during the month.

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

Mathew Lazzara, Principal Investigator, University of Wisconsin

The Research Associate monitors data transmissions for the project and performs quarterly maintenance on the station at Bonaparte Point. 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 weather station ran normally during the month.

A-109-P ANTARCTIC EXTREMELY LOW FREQUENCY/VERY LOW FREQUENCY OBSERVATIONS OF LIGHTNING AND LIGHTNING-INDUCED ELECTRON PRECIPITATION.

Robert Moore, Principal Investigator, University of Florida

Extremely Low Frequency/Very Low Frequency (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. Lightning source currents are estimated or directly measured by experimental observations of individual natural and rocket-triggered lightning flashes in North America. Together, the North American and Antarctic data sets are used to experimentally identify and analyze the components of lightning and the effects of lightning, such as lightning-induced electron precipitation, that are observed in the Antarctic, more than 10,000 km distant.

Data collection continued throughout the month.

A-306-P GLOBAL THUNDERSTORM ACTIVITY AND ITS EFFECTS ON THE RADIATION BELTS AND THE LOWER IONOSPHERE.

Umran Inan, 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 (uppermost layer of the atmosphere ionized by solar radiation) and magnetosphere (the area surrounding the earth dominated by the Earth's magnetic field and particles trapped by it). Many of these studies relate to the energetic releases associated with lightning. For example, Palmer Station's unique location enables it to pick up small bits of radiation from lightning strikes as far away as Africa, the USA, or the Pacific Ocean.

Changes were made to the automatic whistler detection and analysis (AWDA) computer software configurations to facilitate remote log in. The prior settings disallowed users from logging in after one failed attempt, which was too stringent.

Brief power outages early in the month resulted in system reboots, but otherwise data collection occurred normally during the month.

T-312-P TERASCAN SATELLITE IMAGING SYSTEM.

The Research Associate operates and maintains on-site equipment for the project. Throughout the month, the TeraScan system collected, archived, and processed DMSP and NOAA satellite telemetry, capturing approximately 25-30 passes per day. A weekly 85GHz SSM/I ice concentration image was produced and transferred to UCSB for B-032-P (Smith).

The system collected data normally during 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. Palmer's magnetometer is also a conjugate to the Canadian Poste de la Baleine station, allowing the study of conjugate differences in geomagnetic substorms and general auroral activity. The station Research Associate maintains the on-site system.

The system operated normally during the month.

B-390-P: THERMO-SALINOGRAPH

Vernon Asper, Principal Investigator, University of Southern Mississippi

Sea water is pumped continuously through a thermosalinograph (TSG) sampling system, recording the temperature, conductivity, salinity, and fluorescence. The real-time data, including graphs and web camera images of the ocean in the vicinity of Palmer Station, are compiled by a local server into web page format and relayed to a mirror site at Woods Hole Oceanographic Institute, which is a collaborator in the project. The URL for the WHOI mirror site is <http://4dgeo.who.edu/tsg/>.

The webcam and thermosalinograph operated normally during the month.

T-998-P: IMS RADIONUCLIDE MONITORING

Managed by General Dynamics

The International Monitoring System (IMS) radionuclide sampler is part of the Comprehensive Test Ban Treaty (CTBT) verification regime. The automated Radionuclide Aerosol Sampler and Analyzer (RASA) unit pumps air continuously through a filter for 24 hour periods, collecting particulates in the .2-10 micron range. The filter is then tested for particulates with radioisotope signatures indicative of a nuclear weapons test. The station Research Associate operates and maintains the instrument.

The system operated normally throughout the month.

ULTRAVIOLET (UV) SPECTRAL IRRADIANCE MONITORING NETWORK (UVSIMN)

A 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, while the sun is above the horizon. A BSI GUV-511 filter radiometer, which has four channels in the UV and one channel in the visible for measuring Photosynthetically Active Radiation (PAR), is located next to the SUV-100.

The UV monitor collected data normally for the month and all schedule calibrations were carried out.

TIDE GAGE

The Research Associate operates and maintains on-site equipment for the project. Tide height and seawater temperature are monitored on a continual basis by a gauge mounted at the Palmer Station pier. Although salinity (conductivity) is also recorded by the tide gauge, the measurements are incorrect and should not be used. Correct salinity data can be found on the TSG system.

The tide gauge operated normally during the month.

METEOROLOGY

The Research Associate acts as chief weather observer, and compiles and distributes meteorological data. At the end of the month a summary report is prepared and sent to interested parties. 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).

Scheduled inspections were carried out at the Gamage Point tower.

The temperature sensor on the PalMOS system is still reporting faulty data. All reports are using the backup modular automatic weather system (MAWS) for temperature data.