

PALMER STATION MONTHLY SCIENCE REPORT

April 2010



Marine technicians, Amy Schaub and Chance Miller, deploy a string of fishing traps in Dallmann Bay off the stern of the *ARSV Laurence M Gould* for Bill Detrich's research group (B-037-P)

Image Credit: Christopher Seliga

NEWS FROM THE LAB

Christopher Seliga, Winter Assistant Supervisor of Laboratory Operations

April was a month of transition at Palmer Station. Station bustled with science and operational activities, Earth Day activities, and ships coming and going. Science continued with the station science group led by Chuck Amsler and Bill Baker. Additional science team members fished southbound on the *ARSV Laurence M. Gould* (LMG) in support of Bill Detrich and his team's investigation of cold adaptations and bone formation in Antarctic fish. The *RVIB Nathaniel B. Palmer* (NBP) also called upon Palmer Station this month as she transited north, returning to Punta Arenas, Chile after a successful science cruise along the Antarctic Peninsula.

The science scuba divers instigated an Earth Day clean up of rubbish in the water around the pier with on shore help from station personnel. The Palmer Station support staff turnover from the outgoing crew to the incoming Winterover folks went smoothly. This allowed both groups the opportunity to assist the science teams locally at Palmer (as dive tenders and bird census takers) and farther afield aboard the LMG (as fishing and sample sorting support).

Surprisingly, the weather has been amazing for the start of winter, allowing many people on station to go recreational boating and explore the backyard and glacier. The days are definitely getting shorter and the winter personnel are slowly getting into their routines as science continues here on the Peninsula.

APRIL WEATHER

Neal Scheibe, Research Associate

The arrival of the winter crew coincided with the arrival of winter weather at Palmer Station. Temperatures steadily decreased during the second half of the month. A high pressure system earlier in the month gave way to low pressure just a few days later, ushering in several stormy days before the month closed out with a week of gentle snows. Winds reached a high peak gust of 60 knots on April 4, with average winds during the last two weeks in the single digits.

The coldest temperature was on the 26th at -8.6°C and the warmest was on the 4th at 6.6°C. The average temperature for the month was -1.1°C, a half a degree warmer than a year ago. Sea surface temperatures did not consistently drop below zero until the second half of the month, preventing significant sea ice formation. Average sea surface temperature for the month came in at -0.04 °C.

Our first significant snow of the season yielded 38 cm of drift and accumulation at the snow stake by the end of the month after a couple of weeks of being clear. Palmer received 63 cm of snowfall throughout the month and measured a total 112.5 mm of melted precipitation, both well above this time last year.

THE FOLLOWING PROJECTS CONDUCTED RESEARCH AT PALMER STATION:

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

Charles Amsler and James McClintock, Principal Investigators, University of Alabama at Birmingham,

Bill Baker, Principal Investigator, University of South Florida

Personnel on station: Charles Amsler, Bill Baker, Margaret Amsler, Jason Cuce, Alan Maschek, Ruth McDowell, and Kate Schoenrock; Bill Baker arrived and departed with LMG10-03 on 16 and 25 April, respectively.

Although the weather was not particularly cooperative early and late in the month, we completed 48 research SCUBA dives during April. Included in that total were two dives for Earth Day collections of trash around the station pier. We are pleased to report that previous years' Earth Day dive efforts have noticeably reduced the amount of such material off the pier as there was much less to pick up than in the past. Algae from three outplant experiments were successfully recovered during April for interim measurements and redeployed for further growth. Two of the experiments were concluded by month's end and the last will be recovered early in May.

Diving also supported collections for numerous laboratory experiments including several different sets of amphipod feeding experiments on live macroalgae and on pure and semi-

purified compounds from sponges and tunicates. A suite of laboratory assays to examine oxidative burst responses of freshly-collected macroalgae continued throughout the month.

April was a particularly busy month for outreach. On 7 April we conducted live interviews via Skype with three Alabama television news programs and were interviewed on tape by another news program. On 28 April we conducted two video teleconference sessions with classes at a total of 24 Alabama high schools. As with the rest of the season, we have continued to post thrice-weekly journal entries on our UAB in Antarctica web outreach site along with linked photos on Flickr and videos on a UAB in Antarctica YouTube channel.

We are grateful for the generous and professional assistance of numerous RPSC staff. Phil Spindler, Chris Seliga, James Bucklin, Ryan Wallace, Brian Nelson, and Neal Scheibe deserve special thanks for facilitating our laboratory and diving operations. Jeff Otten went well beyond the call of duty in preparing for our videoconferences with the high school classes and was instrumental in facilitating the news program interviews. Bede McCormick also provided excellent support for the videoconferences.

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: H. William Detrich, Corey Allard, Xinjun He, Kristen Kuhn, John Postlethwait, José María Valpuesta, Hugo Yebenes, and Juan Carlos Zabala

Our field season began on 10 April with the departure of the field team from Punta Arenas, Chile, on board the *ARSV Laurence M. Gould* at the start of Cruise LMG10-03. After a smooth crossing of the Drake Passage, the *LMG* arrived at the Dallmann Bay fishing grounds on 14 April at approximately 12:00 LT. We commenced fishing for 36 hours at Dallmann by setting baited fish traps (16) and then switched to trawling operations. Upon recovery on 15 April, the traps yielded two of our target species: *Notothenia coriiceps* (27) and *Gobionotothen gibberifrons* (3). Due to the heavy sea state, we were able to accomplish only seven trawls (14-15 April), which yielded 22 *G. gibberifrons* and 3 blackfin icefish, *Chaenocephalus aceratus* (our third target species). At approximately 23:00 LT on 15 April, we set sail for Palmer Station, arriving there at 08:00 on 16 April. Fish were off-loaded to the Palmer Aquarium shortly after our arrival. On 17 April we began setting up the B-037-P laboratory at Palmer Station.

While Postlethwait, He, Valpuesta, and Zabala initiated our experimental program at Palmer Station, Detrich, Allard, Kuhn, and Yebenes sailed on 19 April for a fishing trip to Low Island. Eight Otter Trawls on 20 April yielded large numbers of *C. aceratus* and of *G. gibberifrons*. Deployment of 16 traps for 12 hours overnight produced 70 fish, mostly *N. coriiceps* and *G. gibberifrons*. Having captured substantial numbers of our three target species, we returned to Palmer Station, arriving at 08:00 on 21 April. Subsequently, the *LMG* sailed for Hugo Island, where four trawls were conducted at 700-m depth. Fishes captured included nototheniids, dragonfishes, eel pouts, and skates. The *LMG* returned to Palmer Station at 08:00 on 23 April, at which time it commenced preparations for departure from Palmer Station on 25 April.

We have two scientific major goals this season: 1) to examine cold adaptation of the folding of tubulin by the chaperonin CCT using proteins purified from Antarctic fishes (*G. gibberifrons* and *N. coriiceps*); and 2) to determine the ontogeny of cartilage and bone formation by embryos of robustly ossified and poorly ossified Antarctic fishes (*N. coriiceps* and *C. aceratus*, respectively). At Palmer Station, Valpuesta, Yebenes, and Zabala purified the protein-folding complex CCT from testis tissue of *G. gibberifrons*. Detrich, Allard, and Kuhn purified brain tubulin from *G. gibberifrons*. With these reagents in hand, we will be able to study the temperature dependence of protein folding in the near future. Meanwhile, Postlethwait, He, Allard, and Detrich began setting up for *in vitro* fertilization to obtain embryos of *N. coriiceps* and *C. aceratus* and collected numerous skeletal tissue samples from the two species for total transcriptome comparison in the US. As of the end of April, we have met our objectives and have produced numerous samples for study at our home institutions.

The ARSV *Laurence M. Gould* departed Palmer Station on 25 April en route to Punta Arenas, Chile. Postlethwait, He, and Valpuesta sailed northbound, while Detrich, Allard, Kuhn, Yebenes, and Zabala remained on station to continue the aforementioned studies. We await the arrival of two team members, Sandra Parker and Mo Hu, on Cruise LMG10-04. We thank the ship and station personnel for their excellent help in making the first part of our field season a great success.

PALMER STATION RESEARCH ASSOCIATE MONTHLY REPORT

April 2010

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. The handheld survey unit was tested for radio functionality, which was recently enabled for the new receiver. Inventory was taken of the project and the results sent to UNAVCO.

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 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 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. Full sample flasks were shipped back to Scripps.

**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 system collected data normally 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.

Archive data was shipped back to Stanford. During a power outage on 24 April, one and a half hours of data was lost. The system recovered and resumed normal data collection once power returned.

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.whoi.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. A station visit was made by a representative from the CTBT for annual maintenance. During a power outage, the system was connected to a backup generator as a precaution, though it was found that the existing uninterruptable power supply handled the outage alone.

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 most of the month. The system software locked up twice during the month, requiring a restarting of the data collecting software, but with minimal impact to daylight data acquisition.

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. Weather updates and satellite imagery were forwarded to the R/V LAURENCE M. GOULD and the R/V NATHANIEL B. PALMER.

The automated weather system performed normally for the month.