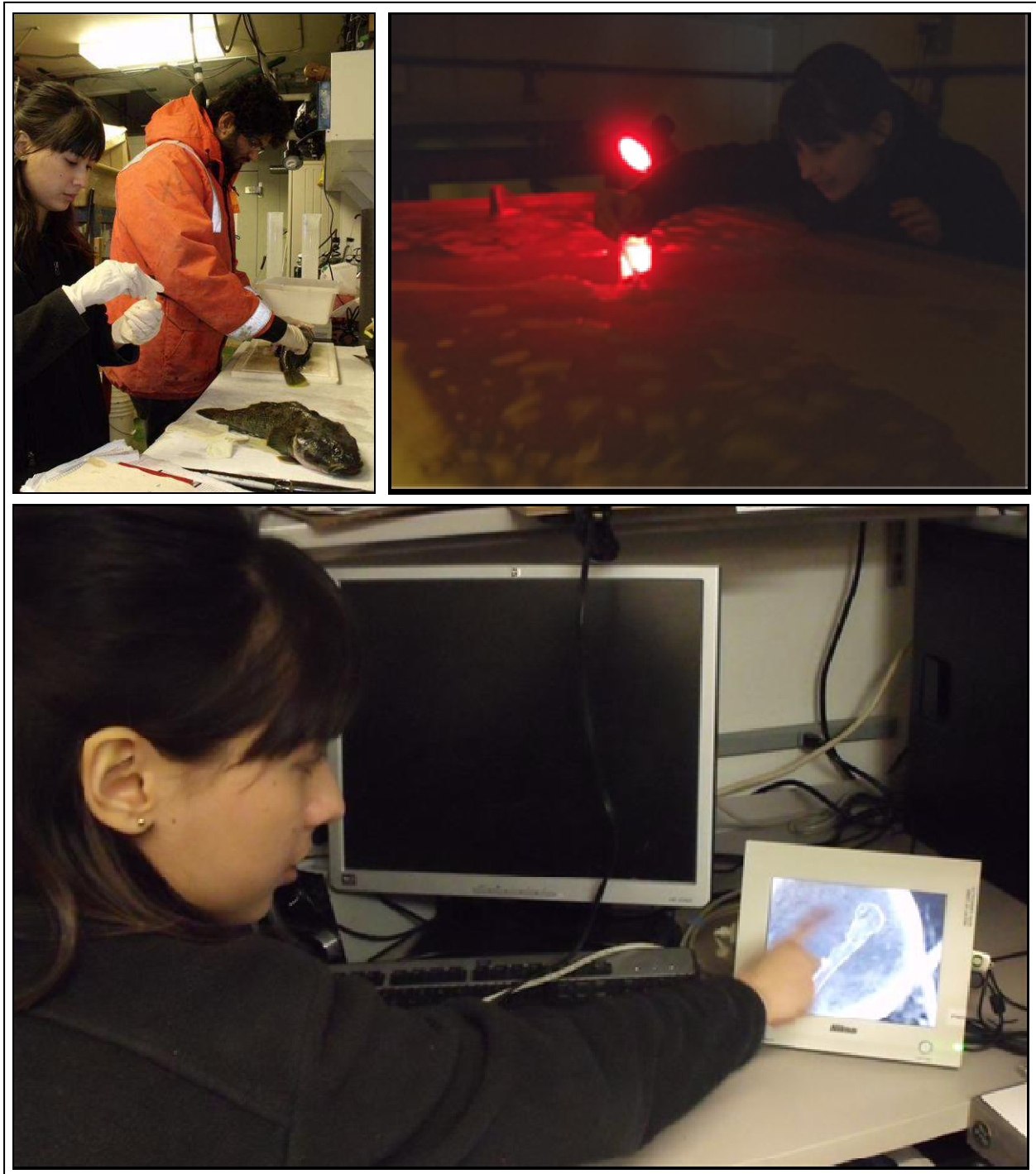


PALMER STATION MONTHLY SCIENCE REPORT

JULY 2013



The Postlethwait group (B-029-U) conducting ice fish research. Clockwise from top left: Undergraduates, Urjeet Khanwalkar and Ashley Nelson sampling tissues from *Notothenia coriiceps* (Image Credit: Graham Tilbury). Collecting *N.coriiceps* embryos from an incubator for sampling and observation (Image Credit: Yuki Takahashi). Photographing a two-month (approximately) *N.coriiceps* embryo, using a dissecting scope and a mounted camera (Image Credit: Graham Tilbury).

NEWS FROM THE LAB

By Janice O'Reilly, Assistant Supervisor of Laboratory Operations

Palmer Station bid farewell to the *ARSV Laurence M. Gould* (LMG) on 2 July, marking the end of a busy field season for two science groups, B-027-P (Amsler-McClintock) and B-036-L/P (O'Brien). Support staff, including fire technicians, equipment operators, divers, a biomedical technician, and a fire captain also headed north, leaving 22 people for the remainder of the winter. Two science groups remained among the winterovers, two members from B-029-U (Postlethwait) and two members from B-228-P (Amaral-Zettler).

Winterovers celebrated Mid Winter's Day with a fabulous dinner on 5 July prepared by our amazing station chef, Michael Hiller. The stillness of winter settled across the station, as air temperatures dropped, snow accumulated, and sea ice formed. It was a quiet, but productive time for the ASC team to focus on winter tasks and for grantees to pursue their research.

The wildlife seen near station during July consisted mainly of a variety of seabirds and very few seals. On 4 July hikers on Hermit Island observed approximately one dozen giant petrels soaring around the highest point of the island. On the same day approximately 10 Antarctic terns were seen perched on brash ice close to the island. On 7 July recreation boaters sighted eight Adélie penguins on the south shore of Janus Island. At the same location, on 21 July, boaters counted eight Adélie penguins on land and five swimming near the shore. On the same day, four Adélie penguins were seen on the east side of Cormorant Island, and approximately 20 blue-eyed shags were observed, most of them perched at their typical nesting site on the north side of the island. A flock of approximately 150 blue-eyed shags were seen flying and landing on open water off the east side of Litchfield Island on 12 July. Sheathbills, kelp gulls, snow petrels, and cape petrels were also observed during month, however not very frequently.

Seal observations were rare during the month. There were reports of one fur seal on the east side of Torgersen Island on 12 July, one fur seal in the backyard on 20 July, and one elephant seal on the northeast shore of Torgersen Island on 21 July. On three separate occasions one or two Weddells appeared on the sea ice of Hero Inlet during the mid-to-late part of the month.

JULY 2013 WEATHER

By Graham Tilbury, Research Associate

This month, increasing hours of daylight brought a noticeable change to the Palmer season. The month started with relatively high temperatures, caused mainly by the predominately northerly winds that blew for almost the first half of the month.

During an uncommonly stable period of six days early in the month, the average wind speed remained below ten knots. In contrast, the last week of the month was again dominated by consistently low speed winds, but from a westerly direction, resulting in much colder temperatures and causing the sea temperature to drop below freezing point. By the end of the month, the waters around Palmer had frozen solid, as far as could be seen from the station.

The maximum temperature for the month occurred on the 1st and was a warm +1.2C. Temperatures dropped almost daily from that point, reaching a minimum of -18.5C on the 30th, much colder than the low for June and considerably colder than the lowest temperature of -9.3C recorded for July last winter.

Relatively low wind speeds for the month averaged 9 knots. A short period of strong northerly winds, gusting to a maximum of 65 knots, occurred on the 17th day. Three days of northerly winds during the third week of the month brought with it the largest snowfall of 24cm. By month's end Palmer Station had accumulated 190cm of snowfall, some 50cm more than the total snowfall for the same period last year.

The sea temperature remained negative for the entire month. New ice formed on occasion, but it was not until the last week that the sea surface remained completely frozen solid.

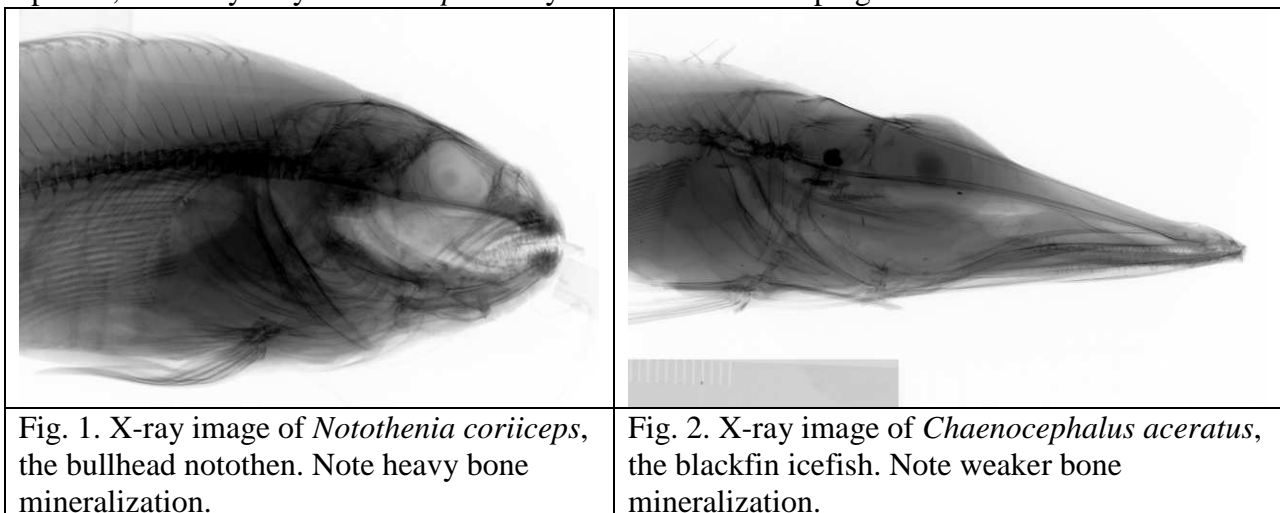
B-029-P: DEVELOPMENTAL MECHANISMS FOR THE EVOLUTION OF BONE LOSS

Dr. John H. Postlethwait, Principal Investigator, Institute of Neuroscience, University of Oregon, Eugene, and Dr. H. William Detrich, Co-PI, Northeastern University

Personnel on station: Ashley Nelson, Urjeet Khanwalkar.

The goal of this work is to understand the evolutionary mechanisms of bone loss in certain lineages of Antarctic Notothenioid fish. Figures 1 and 2 show X-ray images of animal we collected this season at Palmer Station. Figure 1 shows the head of an adult specimen of *Notothenia coriiceps*, the bullhead notothen and Figure 2 shows *Chaenocephalus aceratus*, the blackfin icefish. Besides the obvious difference in morphology of the cranium and jaw, note the difference in bone mineral density: bones of the jaw, fin, ribs, and cranium are much more dense in the bullhead notothen.

To investigate the developmental origins of these differences, we set up matings for several species; currently only *N. coriiceps* embryos of remain developing at Palmer.



- Current crosses:
 - *N. coriiceps* cross #7/8 (~2500 embryos)
 - Fertilization date varies (natural overnight spawning in the outside tank #2 over the course of several days around June 7th, 2013)
 - Individual females and male parents are unknown
 - Embryos vary in developmental age; the oldest were about 53 days post fertilization (dpf) on July 31st, 2013
 - Embryos are currently developing in a cascade tank in Environmental Room #1
 - *N. coriiceps* cross #12 (~500 embryos)
 - Fertilized on June 25th, 2013 (natural overnight spawning in the watch tank)
 - Female parents known, male(s) unknown
 - Embryos currently at 36 dpf on July 31st, 2013)
 - Currently being raised in two floating incubators in the indoor tank closest to the lab vestibule
- We currently have two indoor tanks running
 - Divided 'watch' tank by Environmental room #2 with gravid/milking *N. coriiceps* (6) that we are watching for spawning.
 - We will remove the divider when we have sampled all the *N. rossii*
 - Tank of *N. coriiceps* by lab vestibule contains more than 20 non-gravid females and some milking/non-milking males
- We have shut down Tank #1 outdoors and the one icefish tank indoors
 - The remaining *N. coriiceps* were consolidated into one tank
 - We no longer have any live icefish, as they have all been sampled for bone and other tissue samples.
- We have taken down the tray incubator as well as all the cylindrical incubators
 - Currently being packaged for return to PA in September
- A cascade tank has been set up in Environmental Room #1 as an incubator for *N. coriiceps* cross #7/8
 - Supplied with three aerators
 - We have not experienced any more issues with flooding or mass embryo death
- Sampling for histology, GSI, and RAD-sex continues on expired or spawned out individuals
 - Totals for this seasons:
 - *C. aceratus* – 281
 - *C. gunnari* – 99
 - *C. rastrospinosus* - 20
 - *P. georgianus* - 45
 - *N. rossii* – 46
 - *N. coriiceps* – 127 (and still counting)
 - *G. gibberiforms* -120
 - *T. hansonii* – 4
 - *P. charcoti* – 2
 - *G. acuticeps* – 1
 - A number of non-gravid female/male *N. coriiceps* are being dissected and sampled every day

- Embryos fixations continue for RNA-seq and Bounin's sampling
 - Done for unfertilized eggs, "sphere" stage, "shield" stage, 60-80% epiboly, and 10-15 somites
 - Fixations for in situs (whole and sections), ABAR, and van Kossa's will begin in early August
 - Photos of the embryos continue to be taken under a dissecting scope every day or every other day, depending on the rate of development
- Histology/GSI data (in the B-029 tissue log) have been electronically catalogued and updated

B-228-P: COLLABORATIVE RESEARCH: MICROBIAL COMMUNITY ASSEMBLY IN COASTAL WATERS OF THE WESTERN ANTARCTIC PENINSULA

Linda Amaral-Zettler, Principal Investigator, Marine Biological Laboratory, Woods Hole, MA; Jeremy Rich, co-Principal Investigator, Brown University, Providence, RI

Personnel on station: Madie Willis and Sean O'Neill

Despite Jeremy's departure on 2 July and boating restrictions due to ice, it has been an exciting and productive month for B-228. Our main objective for the month was to set up our first carboy experiment based on encouraging data collected from a preliminary experiment in June. We were also busy with microscopy techniques to confirm the accuracy of our flow cytometry cell counts, and the calibration of the fluorometer we will be using for the rest of the season to collect chlorophyll data.

Thanks to Ryan, who has been a huge help getting us out to station B, our team was lucky enough to participate in an OSAR drill on 25 July. After collecting our seawater samples, it was a special treat to see the OSAR team in action. The following day brash ice moved into Hero Inlet and froze together. This has kept us from going out in the zodiacs to sample from Station B; however, we've been able to continue collecting data on the winter microbial communities from our weekly sampling of the seawater intake.

The suspended boating has also given us more time to prepare for our larger scale carboy experiment, which is now up and running. Six 50L carboys were filled with seawater from the intake and three were amended with the diatom exudates that Jeremy brought down from New England. We're looking forward to seeing the results over the next week. We will also be prepping for the start of a sea-ice carboy experiment, which we hope to begin later in August.

Our project has continued smoothly in large part because of the help and understanding of the winter crew at Palmer station. Janice O'Reilly and Juliet Alla are irreplaceable in the lab, and the time involved with setting up the carboy experiment would have taken twice as long without help from Yuki Takahashi. Thanks also to Hugh Ducklow's group (B-045) for continuing to lend us supplies, and B-019 (Schofield) for their help with the fluorometer.

PALMER STATION
RESEARCH ASSOCIATE MONTHLY REPORT
July 2013
Graham Tilbury

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 during 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 site operated normally during 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 by measuring the wind-induced Doppler shift in the air's nightglow emissions. The Research Associate operates and maintains on-site equipment for the project.

The system operated normally throughout 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 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 both TerraLab and the VLF Building.

Scheduled air samples were collected 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 (N₂O) 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 were completed as scheduled 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. A BSI GUV-511 filter radiometer, an Eppley PSP Pyranometer, and an Eppley TUVR 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.
Absolute Calibrations were completed as scheduled.

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 Bonaparte Point automated weather station continues to run in test mode. The equipment is located on the TeraLab roof and awaiting a suitable opportunity for moving to Bonaparte Point..

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 station performed normally during 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.

The VLF system performed 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.

Satellite passes were captured normally throughout 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 operated normally throughout the month. As of the beginning of July, this project is no longer funded.

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 is installed in the Palmer Aquarium. The Research Associate downloads data and cleans the instrument on a weekly basis.

Weekly cleaning of the instrument and data downloads were performed as scheduled.

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 system shut down on July 25th due to detector head warming. Subsequent testing over the next few days indicated an apparent cooler unit failure. Several attempts were made to rectify the situation. The repair attempt is proceeding. First quarter samples were prepared for shipping back to HQ.

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 requisition for the tidegauge replacement has progressed to financial approval stage.

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 system operated normally during the month.