

last year were observed, and modified Teflon flipper bands (Penney and Sladen, 1966) were put on 27 other adults and 143 chicks. Data collected on chick growth rate at approximately weekly intervals (160 weights taken from six samples) and on the movement of the rookery along the shelf cliffs (2.3 km in 42 days) agreed closely with those taken in the 1965-1966 season.

On December 12, after several days of southerly winds, the chicks of the more exposed enclave were seen floating to sea aboard pieces of broken ice. Chicks of the other enclave, which may be the site of the entire rookery next season, did not go out to sea until almost three weeks later, when the ice at that locality broke up. The consequences of the different times of rookery breakup are uncertain. The departure of the chicks of the more exposed enclave may have been premature, but many of them, under a partial covering of down, were well feathered and fat.

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Entomological Studies at Hallett Station

ELMER E. GLESS*

*Department of Entomology
Bernice P. Bishop Museum*

During the 1966-1967 austral summer, the second season of intensive study of mite life cycles was completed at Hallett Station.

* Permanent address: Department of Zoology and Entomology, Iowa State University.

During this second season, for the first time in Antarctica, a mite, *Stereotydeus belli* (Troussart, 1963) was reared *in vitro* from the tritonymph stage through adulthood, after which one of its offspring was reared through all immature stages to the adult stage.

Throughout the season, mites were kept in dishes containing an artificial medium upon which algae and moss were grown to supply natural food. These dishes were placed in refrigerated incubators and the mites were observed daily. The morphological changes that characterize each stage of growth were determined, enabling future identification of individuals in each stage.

A new species of mite of the family Eupodidae and genus *Protereunetes* was found and is being described. It was reared *in vitro* from the adult stage through all immature stages, but it did not complete the life cycle before the season ended. Two other species, *Eupodes wisei* Womersley and Strandtmann and *Coccorhagidia gressitti* Womersley and Strandtmann, were also reared *in vitro* from the adult stage through the tritonymph stage but not to adulthood again. These specimens did not survive the trip from Antarctica to the United States (Iowa State University).

Microclimatological data were accumulated and are being analyzed for a better understanding of the mites' ability to live in the harsh antarctic environment.

Snow Blindness in Animals

E. A. HEMMINGSEN and E. DOUGLAS

*Scripps Institution of Oceanography
University of California (San Diego)*

Part of a comparative study of snow blindness in animals was carried out at McMurdo Station in November 1966. Several animals were irradiated with known levels of short-wavelength ultraviolet light in order to determine the amount necessary to produce threshold corneal-tissue damage. Daily microscopic examinations of each eye were performed to assess the extent of the "snow blindness" that occurs and the condition of the cornea during the various stages of recovery. A complete series of observations was made of Adélie penguins and skuas. Incomplete measurements were made of emperor penguins and Weddell seals.

The unexpected findings showed that even though these animals are normally exposed to a very high level of ultraviolet radiation during the summer months, their tolerance levels are approximately the

same as, or even lower than, those of other animals studied that live in regions where much less solar radiation is received.

The absorption spectra for corneal tissue of the penguins, skuas, and seals were also determined. As in the cases of all other animals previously studied, these spectra showed that the cornea absorbs almost all of the damaging ultraviolet light.

Comparative Biochemistry of Proteins

ROBERT E. FEENEY

*College of Agriculture
University of California (Davis)*

During the past antarctic summer, a four-member team (John C. Bigler, Robert E. Feeney, Stanley K. Komatsu, and David T. Osuga) from the University of California (Davis) conducted studies for a third season at McMurdo Station and Cape Crozier on the comparative biochemistry of proteins. This continuing project has been divided into two phases: One concerns the egg and blood proteins of penguins, and the other, the proteins and associated biochemical activity of several species of fish that live in the cold waters surrounding Ross Island. During the intervals between field seasons, laboratory studies requiring more sophisticated physical-chemical equipment than is available at McMurdo have been carried out at Davis.

Egg and Blood Proteins of Penguins

During the 1966-1967 austral summer, samples of blood plasma were obtained from approximately 20 Adélie penguins. Ten of these were from a group of 16 that had received injections of two different antigens over a two-week period. The individual blood-plasma proteins of these samples are now being characterized. A sample of blood obtained from an emperor penguin is undergoing a similar examination. Of 30 Adélie eggs incubated at the McMurdo biological laboratory, 27 were fertile and 19 hatched. The birds were reared successfully for as long as 10 days on pieces of chopped fresh fish. This work was done as a prelude to a study of the role of egg proteins in the formation of blood proteins of the embryo and young penguin chick.

Proteins and Biochemistry of Cold-Adapted Fish

Approximately 2,000 fish were obtained, including 1,200 specimens of *Trematomus borchgrevinki*

and smaller numbers of *T. bernacchii*, *T. hansonii*, and *Dissostichus mawsoni*. Thirteen specimens of *D. mawsoni*, 10 of which were alive and averaged 50 pounds in weight, were brought up the ice hole in the fish house by a "trained" seal and collected and processed immediately. From almost all species, blood was obtained and blood plasma or sera extracted from it. Samples of muscle, liver, spleen, and eyes were taken also. All of the material was kept at a temperature below 4°C. before freezing. At the biological laboratory, preliminary examinations were conducted by electrophoresis and enzyme assay, and attempts were made to fractionate certain enzymes.

Two observations made of the fish blood were particularly noteworthy: (1) The electrophoretic patterns of six blood sera of *D. mawsoni* were found to be quite different from each other. The differences were so great, in fact, as to suggest wide divergence in the species or even different species. (2) Of a large number of blood sera of *T. borchgrevinki* examined, all of those taken from females with eggs contained a fast-moving component that was not present in those derived from the apparent males.

The production of antibodies by fish kept at 0°C. in tanks in the McMurdo laboratory was studied also. During periods of as long as a month after these fish had received injections of one of several antigens, the fish were bled at different times. The sera of these fish are now being examined.

Photosynthesis and Respiration of Antarctic Lichens

V. AHMADJIAN, T. P. GANNUTZ and
S. FRISHMAN

*Department of Biology
Clark University*

For 65 consecutive days last austral summer, the junior authors and Prof. O. L. Lange* of the University of Göttingen, Germany, studied gas exchange in response to environmental conditions in seven species of lichens in the vicinity of Hallett Station. These species are *Neuropogon* sp., *Caloplaca* sp., *Xanthoria* sp., *Candelaria* sp., *Parmelia* sp., and two *Buellia* spp. Concurrently, information was obtained on the following factors: temperature (at 30 points), water vapor, carbon dioxide, relative humidity, wind direction and velocity, light intensity, and snowfall. Seven microclimatic sites were also

* Prof. Lange acted as consultant for this project.