

## University of Colorado 1974 Field Season in Eastern Baffin Island

The summer of 1974 saw one of the largest research parties the University of Colorado has been able to mount operating along the eastern coast of Baffin Island. The early and widespread break-up of sea ice greatly assisted in the completion of the field programme in which a total of sixteen persons were involved. In addition to members of the University's staff, the following individuals from other institutions also participated in the programme: a member of the Department of Micropalaeontology of the University of Aarhus, Denmark; a soil scientist from the University of Pennsylvania, U.S.A.; a Quaternary geologist from Brock University, Ontario, Canada; and a Quaternary geologist from Grand Valley State College, Michigan, U.S.A.

### QUATERNARY GEOLOGY AND CHRONOLOGY

Six two-man parties and one additional individual were concerned with the sections of the programme described below:

Work undertaken in 1950 and again in the mid-1960s had indicated that to the north and south of Clyde River there exist extensive outcrops of multiple tills and marine sediments. Radiocarbon dates obtained from most sites were in excess of 30,000 years BP, and greater than 50,000 at two. During the summer of 1974, many previously-described sections<sup>1</sup> were revisited, extending from Clyde River to the north of Scott Inlet. In addition, many new sites were located and over 200 samples of shell and peat collected for dating by a variety of methods. Post-glacial marine limits along the outer coast appear to lie at elevations of 12-24 m, and above them the marine sediments date from pre-late Wisconsin marine oscillations. A 22-foot (7-metre) freighter was used for the journey from Clyde River to Broughton Island, many collections being made en route.

Raised marine sediments and tills were investigated on Broughton Island and northwards along the coast to Quajon Fiord. Specific attention was focused on collecting samples for micro-faunal analysis and delimiting different marine episodes. In addition, a number of sites were revisited on Broughton Island and northwards along the coast to Kivitoo and Quajon Fiord. Large (1000-g and over) samples of marine shells were collected from sites previously given dates of

over 30,000 years BP. These samples are now being dated at the University of Washington, Seattle, by an enrichment process which can enable dates of up to 70,000 years BP to be determined.

From a previous study of the surface weathering zonation at the head of Maktak Fiord<sup>2</sup> it had been concluded that there exist three broad zones, which can be distinguished one from another on the basis of a number of surface weathering criteria. Under the present programme, soil samples were taken from sites within each zone to see if they could be distinguished on the basis of degree of chemical weathering. Soil profiles were described, and samples sent to the University of Colorado for detailed laboratory analyses.

One field party mapped the southern part of the Baffin Island National Park, giving particular attention to (a) the delimitation of glacial periods on the basis of surface weathering of boulders, and (b) determining the elevation of local marine limits and lower strandlines. The latter research was concentrated on the mapping of the southern shore of Cumberland Peninsula from outer Kingnait Fiord westward to the head of Cumberland Sound. Ten shell samples were collected, which are in process of being dated. In addition, dating is in progress on 18 samples of soils and peats obtained from under thick deposits of aeolian, fluvial and organic origin.

Soil scientists established a soil chronosequence, and investigated the range of soil types existing within the southern part of Cumberland Peninsula. They sent samples south for laboratory analysis.

### PLANT COLLECTION

Specimens of vascular plants, mosses and lichens were collected from Broughton Island and from the head of Maktak Fiord, and sent to the University of Colorado Museum. By December 1974, a total of 86 vascular plants had been identified.

### CLIMATOLOGICAL STUDIES IN RELATION TO FAST ICE

Work done during the summer of 1974 concludes the field-measurement phase of the University of Colorado's study of the surface energy budgets of fast ice at Broughton Island. A micrometeorological station was operated at a site approximately one kilometre south of Broughton settlement, from late May until local break-up in early July. The programme of observation consisted of the periodic taking of profiles of wind, temperature and relative humidity; the continuous measurement of temperature at two metres, and net radiation over both saturated and

unsaturated surfaces; and transects of surface short-wave albedo. Salinity and temperature profiles in the ice and water were taken every 3-4 days. Comparative analysis of the data for 1972-74 is now in progress<sup>3</sup> in relation to the observed ice regime. The 1974 data should provide better estimates of the turbulent flux components of the energy budget than it was possible to make in previous summers.

Meteorological observations were continued near the base of the Broughton Island operations through mid-August. Results are now available of four summers and two winters of standard meteorological observations, and global solar and net radiation measurements as well<sup>4</sup>. The Atmospheric Environment Service Cooperative Observer station, with its twice-daily measurements of maximum and minimum temperatures and of precipitation, is now into its fourth calendar year of operation.

The summer of 1974 was unusually mild. The mean ablation seasonal temperature was 3.9°C at the Broughton DEW line weather station. In contrast, 1972 was the coldest (-1.2°C). The early part of June 1974 was dominated by anticyclonic synoptic weather patterns which greatly accelerated the fast ice ablation rate to give the earliest break-up in five years. Satellite-observed concentrations of pack ice in Davis Strait in late May were less than at the same time in 1973.

#### "BOAS" GLACIER SURVEY

With the resurvey of the "Boas" Glacier (67°35'N, 65°16'W) in August 1974, the mass balance measurements were extended to five balance years. Accurate measurements were not possible, because most ablation poles melted out during the warm summer of 1974. However, it is estimated that the net specific balance for the 1973-74 budget year was approximately -0.5 m water equivalent (w.e.).

Since the glacier was not visited in the spring of 1974, the winter budget could not be calculated. However, by extrapolating precipitation data from Broughton Island, about 60 km to the southeast, and using an empirically derived regression equation, the net specific winter budget was estimated to be 0.2 m w.e. The net specific budget for the summer ablation season was estimated to be -0.74 m w.e.

Analysis of the past five budget years shows that (a) the "Boas" Glacier exhibited a two-year alternation of large mass gains and losses during the first four years, and (b) the estimated net specific mass balance for the five-year period was -0.16 m w.e., in spite of the total net mass gains of 0.38 m w.e. during the first four years.

More complete results are about to be published<sup>5</sup>.

#### ACKNOWLEDGEMENTS

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J. T. Andrews

R. G. Barry

R. L. Weaver

Institute of Arctic and Alpine Research

University of Colorado

Boulder, Colorado 80302, U.S.A.

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