THOMPSON GLACIER SNOUT – AXEL HEIBERG ISLAND CANADIAN ARCTIC ARCHIPELAGO 1:5000

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Coverage, Surveying, and Plotting Information

The terminus region of Thompson Glacier (90.500 W, 79.467 N) is the focus of this map, which covers an area of approximately 12 km^2 on western Axel Heiberg Island, NU. The first 2-3 km of the lower terminus is visible in the map, as well as the margin of nearby White Glacier to the west. On the glacier, debris patterns, possibly related to surge behavior, are shown along with crevasses, supraglacial stream channels (active and abandoned), moulins, ice cliffs, and ablation mounds. The detailed features of the push moraine complex in front of Thompson Glacier are illustrated, as are the two major proglacial streams extending from the eastern and western margins. The intersecting troughs of patterned ground (polygonal terrain) are mapped in the foreland between the White and Thompson Glacier termini.

Contour intervals:	5 m
Field work:	summer 1960
Aerial photography:	August 2nd, 1960
Flying Height:	3050 metres a.s.l.

Photography by the Royal Canadian Air Force
Photogrammetric plotting by D. Haumann, N.R.C.
Draughting and graphical representation by J. Harrison, McGill University

Produced by the Photogrammetric Research Section of the National Research Council of Canada in conjunction with the Axel Heiberg Island Expedition of McGill University.

Map Reference

National Research Council, 1962, Thompson Glacier Snout, Axel Heiberg Island, Canadian Arctic Archipelago. Map at 1:5 000 scale. Photogrammetric Research Section, National Research Council of Canada, Ottawa, in conjunction with Axel Heiberg Island Expedition, McGill University, Montreal.

Site Description

Thompson Glacier is the second largest outlet glacier of the Müller Ice Cap and extends from the ice divide at 1600 m a.s.l in the upper reaches of the ice cap a distance of 35 km in a southerly direction towards Expedition Fiord (Müller et al., 1961). Early glaciological studies on Thompson glacier included measurements of summer ablation and ice thickness (approximately 450 m near the Eureka Pass tributary), however the mass balance measurements were limited to the 1960-1962 field campaigns (Müller et al., 1963). However, Phantom Lake, a large marginal lake that forms at the intersection of a glacial valley with the western margin of Thompson Glacier, was studied in detail by Maag (1969), and measurements of ice velocities along a cross-sectional profile of Thompson Glacier were recorded by Iken (1974). The evolution of the Thompson Glacier terminus and its advance behavior since 1948 is discussed in Cogley and Adams (2000). Evidence for the more recent retreat or decline in the rate of advance of the terminus is noted in Cogley et al. (2011) who also suggest that the impressive push moraines, previously studied by Kälin (1971), will likely cease to be active with the retreat of the terminus.

Cogley, J.G., W.P.Adams and M.A.Ecclestone, 2011, Half a century of measurements of glaciers on Axel Heiberg Island, Nunavut, Canada, Arctic, 64(3), 371-375.

Cogley, J.G., and W.P. Adams, 2000, Photographic resources for monitoring glacier fluctuations on Axel Heiberg Island. Arctic, 53(3), 248-259.

Kälin, M., 1971, The active push moraine of the Thompson Glacier, Axel Heiberg Island, Canadian Arctic Archipelago. Glaciology No. 4, Axel Heiberg Island Research Reports. McGill University, Montreal. 68p.

Maag, H., 1969, Ice Dammed Lakes and Marginal Glacial Drainage on Axel Heiberg Island, Canadian Arctic Archipelago, Axel Heiberg Island Research Reports, McGill University, Montreal, p. 147.

Müller, F. et al., 1961, Preliminary Report, 1950-1960, Axel Heiberg Island Research Reports, McGill University, Montreal. p. 47.

Müller, F. et al., 1963, Preliminary Report, 1961-1962, Axel Heiberg Island Research Reports, McGill University, Montreal. 241p.

GENERAL COMMENTS ON THE EXPEDITION FIORD MAP SERIES

Motivation

The maps covering the Expedition Fiord area of Axel Heiberg Island (1:100,000), including Baby Glacier (1:5,000), White Glacier (1:5,000 and 1:10,000), and Thompson glacier (1:5,000 and 1:50,000) were produced as part of a mapping campaign in support of the interdisciplinary research program initiated at the McGill Arctic Research Station under the leadership of Fritz Müller at McGill University (Müller, 1961; Müller, 1963a). These maps supported studies in geology, glaciology, meteorology, geophysics, zoology, permafrost geomorphology, and botany; together, they can be considered the some of the best quality maps produced for the Canadian high Arctic during the 20th century. Cogley and Jung-Rothenhäusler (2002) offer a clear and useful explanation of the region's cartographic history, the plotting methods, and the associated uncertainties. It is the primary reference for this summary.

Surveying, Photogrammetry, and Plotting

Fritz Müller and Peter Adams conducted the first surveys of the Expedition Fiord area in McGill University's reconnaissance campaign of Western Axel Heiberg Island in the summer of 1959 (Müller, 1961; Adams, 2007). The maps were produced using photogrammetry techniques alongside intensive ground surveys conducted throughout the summer of 1960 (Blachut, 1961; Haumann, 1961). The Royal Canadian Air Force carried out the air photo survey in August, 1960, and a particular effort was made to improve contrast in the glacier accumulation (snow covered) areas by surveying multiple times with the sun at different angles. As noted in the Preliminary Report: 1961-1962, "A detailed discussion of the factors pertaining to the production of these maps has been given in a series of articles in the 'Canadian Surveyor' (Blachut, 1963; Haumann, 1963; McKortel, 1963; Müller, 1963b)." Plotting of the maps was overseen by T. J. Blachut at the Photogrammetric Research Section of the National Research Council (of Canada) and the Army Survey Establishment supported printing of the maps. The digital copies of the maps provided here were scanned at the Canada Centre for Remote Sensing, Natural Resources Canada (Budkewitsch, 2002).

Coordinate System

The Expedition Fiord maps were plotted in a local plane coordinate system with a baseline defined by the coordinates of Astro 1 (Local: 30,000 m E, 60,000 m N; Geographic: 90.74280563 W, 79.41003063 N) and Astro 2 (Local: 36764.06 m E, 69598.47 m N; Geographic: 90.41190283 W, 79.49597503 N). Detailed information is missing from the earlier publications, however it has been estimated that the maps were plotted under a transverse Mercator projection (centered on Astro 1) on a Clarke 1866 ellipsoid (NAD27) (Cogley and Jung-Rothenhäusler, 2002). With these assumptions, Cogley and Jung-Rothenhäusler (2002) provide equations that will enable users to convert the local planar coordinate system to geographic coordinates.

SELECTED REFERENCES

Adams, P. 2007, Trent, McGill, and the North: A Story of Canada's Growth as a Sovereign Polar Nation. Peterborough, Ont. Cover to Cover Publication Services, p. 221.

Blachut, T.J., 1961, Participation of the Photogrammetric Research Section of the N.R.C. in the Jacobsen-McGill University expedition to Axel Heiberg Island in 1960, in Müller, B.S., ed., 1961, Preliminary Report of 1959-60, Jacobsen-McGill Arctic Research Expedition to Axel Heiberg Island, Queen Elizabeth Islands, 27-33. McGill University, Montreal.

Blachut, T.J., 1963, Photogrammetric and cartographic results of the Axel Heiberg Island expedition, Canadian Surveyor, 17(2), 79-80.

Budkewitsch, P., 2002, Scanned Maps, Expedition Fiord, Canada Centre for Remote Sensing, Natural Re- sources Canada, 588 Booth Street, Ottawa, ON, Canada K1A 0Y7. Four CD-ROMs.

Cogley, J.G., and F. Jung-Rothenhäusler, 2002, Digital Elevation Models of Axel Heiberg Island Glaciers, Trent Technical Note 2002-1, Department of Geography, Trent University, Peterborough, Canada. 45p.

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McKortel, T.A., 1963, The reproduction of the Thompson Glacier map, Canadian Surveyor, 17(2), 93-95.

Müller, B.S., ed., 1961, Preliminary Report of 1959-60, Jacobsen-McGill Arctic Research Expedition to Axel Heiberg Island, Queen Elizabeth Islands, McGill University, Montreal. 219p.

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Müller, F., 1963b, An arctic research expedition and its reliance on large-scale maps, Canadian Surveyor, 17(2), 96-112.

Access to many of these references is available through the Glaciology at Trent website: http://people.trentu.ca/~gcogley/glaciology/index.htm