40. A GEOCHEMICAL ORIENTATION SURVEY FOR URANIUM AND BASE METAL EXPLORATION IN SOUTHWEST BAFFIN ISLAND

Project 750052; Uranium Reconnaissance Program

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Introduction

Uranium and thorium mineralization occurs sporadically in the Proterozoic (Aphebian) rocks of southwest Baffin Island. Interesting showings are located on Foxe Peninsula at 11 and 28 miles northeast of Cape Dorset (*see* Fig. 40.1); these have been described along with other occurrences by Laporte (1974). The radioactive minerals are found in coarse grained to pegmatitic granite sills and dykes and in associated metasediments, and their presence in these rocks is often marked by the characteristic yellow staining of secondary uranium ore minerals.

To date, exploration for radioactive minerals in southern Baffin Island has been strictly a geophysical effort. Companies using airborne radiometric methods at a reconnaissance scale have been relatively successful in Foxe Peninsula where the topography is relatively flat. However, in other parts of southern Baffin Island, particularly east and south of Frobisher Bay, the usefulness of airborne radiometric techniques may be considerably reduced due to a more hilly relief.

The work performed during the 1975 field season was carried out under the Federal-Provincial Uranium Reconnaissance Program (Darnley *et al.*, 1975). It was aimed primarily at investigating the applicability of various geochemical techniques for uranium exploration in southern Baffin Island. In addition to radioactive minerals, a geochemical approach will permit the examination of the potential of the region for other mineral commodities such as base metals and pegmatite minerals. This orientation survey is the preparatory phase for a more extensive coverage that may be undertaken by contract at a later date.

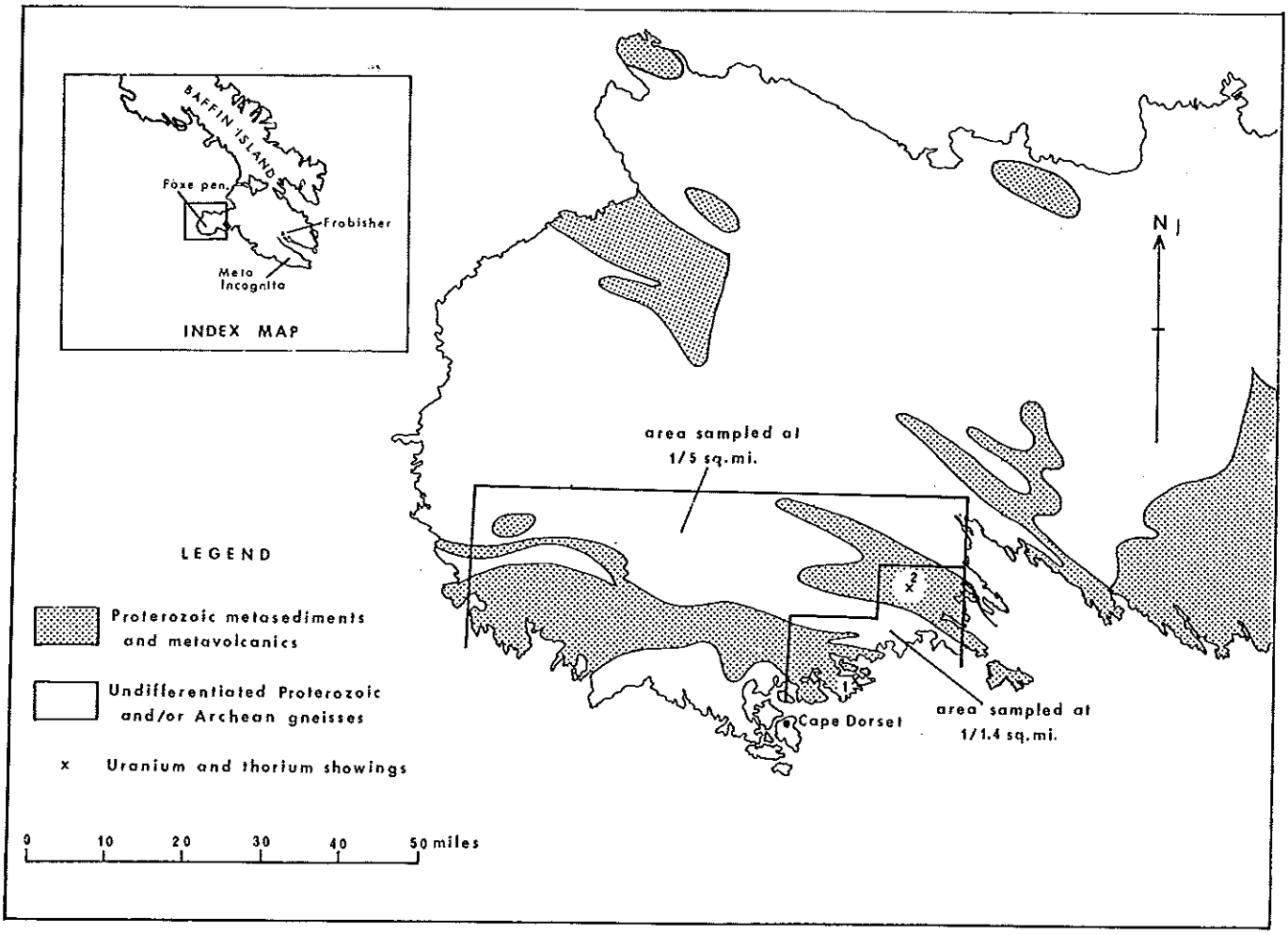

Figure 40.1. Outline of geology and location of study area.

Detailed Surveys

In order to gain geochemical information on the uranium sources and to recognize the mechanisms involved in the secondary dispersion of metals from these sources, much of our attention was concentrated in the two areas where exposed mineralization was reported (Fig. 40. 1). Near-surface soils were sampled at 50- or 100-foot intervals along several traverses across the mineralized zones. The samples will be analyzed for a suite of elements that will identify those that are enriched and thus indicate potential pathfinders. The results will also be examined against radiometric data obtained in the field with a portable scintillation counter.

To complement these data, several rock samples were selected from mineralized outcrops and will be analyzed for the same elements as the soils. It is interesting to note that molybdenite was found closely associated with radioactive pegmatites at both showings. Consequently, not only has molybdenum some potential as an indicator of uranium, but its distribution in the secondary environment compared to that of uranium may enable us to differentiate areas of pegmatite uranium mineralization from other areas where other types of uranium occurrences may be present.

In addition to the soil and rock surveys, sediment and water samples were collected from all streams, lakes and ponds that could be located within a one-mile radius of the showings. Hopefully, the results of this survey will contribute further to our knowledge of secondary dispersion of uranium and associated elements under the conditions prevailing in southern Baffin Island.

An experiment to evaluate the use of radon in soil-air as an exploration tool for uranium under arctic conditions was also carried out. Radon counts in soil-air were taken at 50-foot intervals along traverses that intersected overburden-covered prolongation of mineralized zones. Preliminary examination of the results tends to indicate that radon in soil-air has some potential as a follow-up tool in uranium exploration in arctic regions.

Reconnaissance Surveys

As shown on the 1: 250 000 topographical maps of southern Baffin Island, both lake density and lake sizes seem generally adequate for reconnaissance lake geochemistry at a density of one sample per five square miles. In most areas, however, a higher density could be achieved if required.

A helicopter-supported lake water and sediment sampling survey was undertaken during the month of August in a 1500-square-mile area of southern Foxe Peninsula underlain by Proterozoic metasedimentary rocks and undifferentiated Proterozoic or Archean gneisses (*see* Fig. 40. 1). Sampling was carried out at a density of one sample per five square miles in much of the area surveyed, but the density was increased to one sample in 1. 4 square miles (one sample from every lake shown on the 1: 250 000 topographical map) in 100-square-mile areas around each one of the two main showings.

The main objectives of this work were:

1. To evaluate the feasibility of lake water and sediment sampling in that area, and to gather basic information such as depths of lakes, nature and abundance of sediments, pH and specific conductivities of waters, presence or absence of suspensions in waters, etc.
2. To complete our research on the secondary dispersion of uranium and associated elements in proximity to exposed mineralization initiated with the detailed surveys.
3. To determine certain geochemical parameters such as background and threshold levels, correlations, etc. for various elements in areas of different geological environments in order to identify the most meaningful elements to be examined during the regional contract survey.

A conclusion with respect to the second and third objectives will not be reached until analytical data are available. As far as the technicalities of lake sampling are concerned, both the abundance of sediment in most lakes and the generally shallow depths make lake bottom sediment sampling a relatively easy task. The Hornbrook-designed tube sampler attached to a 30-metre ¼ inch sash-cord was efficient in most situations. For very shallow lakes (less than three metres) however, the Ponar jaw sampler was preferred. Lake water sampling using the Viking Helicopter-designed system (*see* Cameron and Durham, this publication, report 39) was very reliable. Sampling rate (waters and sediments) was in the order of 10 to 12 per hour.

On Meta Incognita Peninsula (southeast Baffin Island) the relief is considerably higher and more accentuated than in Foxe Peninsula resulting at times in very deep and wide valleys with steeply-rising walls. Although this is not generally the case, it happens that in areas of such topography, the number of lakes is insufficient and that streams would have to be sampled in order to maintain a one-in-five square mile sample density.

An orientation survey to assess the feasibility of stream water and sediment sampling as a complement to lake geochemistry was carried out in a 250-square-mile area on Meta Incognita Peninsula about 40 miles southwest of the town of Frobisher Bay. The streams were remarkably accessible as the helicopter pilot was generally able to land his aircraft in the valleys, within a few feet of the water, resulting in a sampling time equivalent to the time required to sample lakes. It was also found that the majority of the streams that are shown on the 1: 250 000 topographical maps were flowing in mid-August (supposedly the dryest period of the year) and that water samples were readily obtainable. Because two samplers were available, it also became practice to land the aircraft near stream intersections so that two streams could be sampled with no increase in the sampling time. Sediments however were generally difficult to collect and often non-existent due to the bouldery nature of many stream beds.

Summary

An orientation survey designed to evaluate the potential of exploration geochemistry in southern Baffin Island was carried out during the months of July and August, 1975. Two aspects were investigated, namely:

1. The feasibility of helicopter-supported reconnaissance geochemical surveying based on lake sediment and water sampling with occasional stream sampling in areas where lake density is insufficient.
2. The geochemical dispersion of metals in the secondary environment at both regional and detailed scales.

Many of the conclusions will have to await the analytical results but it can be said at this stage that no technical difficulties were encountered with the sampling aspect of the project except perhaps in the case of some streams that had no recoverable sediment. Fortunately, however, this problem affects only a very small proportion of southern Baffin Island.

References

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