CANADA

DEPARTMENT OF MINES

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SECOND PRELIMINARY MAP

CHRISTIE BAY

DISTRICT OF MACKENZIE

NORTHWEST TERRITORIES

(MAP AND DESCRIPTIVE NOTES)

BY

G. M. Wright

OTTAWA

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DESCRIPTIVE NOTES FOR CHRISTIE BAY MAP, N.W.T.

INTRODUCTION

Christie Bay map-area occupies about 4,500 square miles of territory across the central part of the east arm of Great Slave Lake. It may be reached most readily throughout the year by chartered aircraft from Yellowknife, 120 miles west of Snowdrift, or, during the summer months, by boat and canoe from Yellowknife and other points on the lake.

Break-up occurs about the middle of June and freeze-up about the beginning of October for the inland lakes back from the basin of Great Slave Lake. Because of its large size and great depth, however, freeze-up and break-up are roughly several weeks later for the east arm of Great Slave Lake.

Conditions of travel within the map-area differ for the lake basin and for the higher, plateau areas to the north and south. The wide expanses of open water on Great Slave Lake and the prevailing west wind combine to make rough going during much of the latter part of the summer. In the plateau areas conditions are typical of the Canadian Shield, with numerous small lakes and a disorganized drainage, necessitating many portages. Snowdrift River, however, provides an excellent canoe route except for a few miles from its mouth, where, in descending from the Archaean uplands to the Proterozoic lowland, it becomes a series of falls and rapids and is unnavigable, as are other streams of the area in similar descents.

Snowdrift is the only permanent settlement in the map-area. The small population is largely Indian plus a few white trappers; the Hudson's Bay Company maintains a trading post there. During the summer of 1950 a fishing camp, catering to the tourist trade, was built and operated at Taltheilei Narrows. Commercial fishermen were operating in the general vicinity of Et-then Islands; their main catch is lake trout with subordinate whitefish.

Game is generally scarce in this region, particularly during the summer months, but numerous caribou were observed migrating south during early September of 1950 past the east end of Great Slave Lake. Fish are abundant, especially lake trout in the main lake. Ducks, grouse, and geese are fairly common.

PHYSICAL FEATURES

The main body of Great Slave Lake crosses the boundary between the Canadian Shield and the bordering area of Palaeozoic rocks to the southwest. The east arm of the lake extends at right angles to the contact for 175 miles into Precambrian formations. The basin of the arm is occupied by a wide belt of mixed hard and soft rocks that is bordered on three sides by uniformly more resistant formations, mainly granitic. Within the map-area, which covers the central part of the east arm, the general level of bordering lands and of numerous islands and peninsulas in the lake rises gradually from 450 feet above the lake in the southwest corner of the area to 800 feet in the northeast part, and reaches elevations of 900 to 1,000 feet a few miles inland from the north shore of the lake. The granitic uplands bordering the lake basin present for the most part a monotonous succession of low rocky hills and ridges, with local relief rarely exceeding 200 feet. The upland south of the basin rises abruptly along a fault escarpment (McDonald fault) 700 to 800 feet above the lake, whereas north of the lake rocky slopes rise gradually to plateau level at 1 mile to 4 miles inland. Rivers entering the lake basin follow either poorly defined valleys or deep gorges, and are unnavigable for 2 to 12 miles inland.

The monotonous aspect of the bordering uplands contrasts sharply with the rugged and picturesque topography within the lake basin. There, vertical cliffs of conglomerate, limestone, and diabase in places rise several hundred feet from the water, or form cappings over steep slopes of softer rocks, particularly shale. The relatively simple structure of the underlying rocks is particularly well reflected in the topography of the northern part of the lake. Large peninsulas (Pethei, Kahochella, Douglas) have steep to vertical north slopes rising in a series of cuesta-like forms to their maximum height, and thence sloping gently south parallel with the dip of the formations.

Glacial boulders are widely scattered over much of the map-area, but thick morainal deposits are confined mainly to the northwest corner, where they cover most of the bedrock. Bouldery hills, 50 to 100 feet high and composed of unsorted, angular, granitic boulders and coarse gravel, occupy much of the country to the north and west of McKinlay Lake; they range from irregular ridges and knobs to elongated drumlins whose long axes trend southwest, parallel with the direction of glaciation. Eskers composed of sand and coarse gravel

form ridges up to 40 feet high that can be traced for miles. Sand deposits of irregular form are scattered throughout the area, but few are of large extent. The area around Sandy Lake is thickly sand covered and much sand is found in the valley of Snowdrift River.

The map-area is generally sparsely timbered with spruce, birch, pine, tamarack, and poplar. Spruce trees are the most abundant, and range from 18 inches in diameter in parts of the lake basin to 6 inches or less a few miles back from the lake.

GENERAL GEOLOGY

Two major unconformities are easily recognized within the succession of Precambrian rocks in the map-area, and these divide the formations naturally into three main groups. Surficial rocks of each group were invaded by igneous intrusions, and those of the older two groups were steeply folded, were probably mountain built, and were deeply eroded to nearly level plains before formations of the youngest group were deposited.

YELLOWKNIFE GROUP

The Yellowknife group(1, 2)[1] of sedimentary and volcanic rocks is the oldest recognized. These rocks were originally included in the Point Lake-Wilson Island group (Maps 377A and 378A), which was divided on the basis of a marked difference in lithology into the Point Lake phase, comprising sedimentary gneiss and schist, and the Wilson Island phase, consisting mainly of quartzite and schist, acidic volcanic rocks, conglomerate, arkose, iron formation, and dolomite. On later maps, Archaean sedimentary rocks corresponding with the Point Lake phase, and associated volcanic rocks of intermediate to basic composition, have been called the Yellowknife group, and this terminology is used on the accompanying map. The rocks included in the Wilson Island phase are not in contact with the typical Yellowknife group rocks from which they differ markedly in lithological character and degree of metamorphism, but they are older than the surrounding Proterozoic rocks and, therefore, are referred to in this report as the Wilson Island group.

[1] Numbers in parentheses are those of the map-units used on the accompanying map.

The intermediate to basic volcanic rocks of the Yellowknife group(1) are dark to light green, fine-grained andesites, dacites, and basalts that have been recrystallized and are now composed of fresh, green hornblende, plagioclase feldspar, and quartz. Pillows and ropy flow structures are well preserved, and some of the flows are amygdaloidal.

The Yellowknife sedimentary rocks are divisible into relatively unaltered types(2a), knotted quartz-biotite schists and hornfels, etc.(2b), and feldspathic paragneiss(2c). The less altered types(2a) are restricted to a narrow band along the axis of the Schist Lakes, and so far as known are not in contact with other Yellowknife rocks. Their present classification is based on some resemblance to Yellowknife sedimentary rocks in other areas. They are similar, however, to the sedimentary rocks of the Nonacho group to the southeast of this map-area, and may be correlative with these rather than with the Yellowknife strata.

The division between the other two facies of the Yellowknife group(2b, 2c) is based on degree of metamorphism, and contacts between them are drawn arbitrarily. In most places the beds strike northerly and dip steeply, but not enough reliable top determinations were made to indicate the nature of the folds.

Within the map-area, the Wilson Island group(A) occurs only around Basile Lake and southwestward beyond Basile Bay. It consists of a great thickness of northeasterly trending strata of green phyllite and chloritic schists, some of which retain pillow structures, and crossbedded quartzite, with interbeds of dolomite and iron formation. These rocks are correlated with the Tazin group as exposed in several areas between Great Slave Lake and Lake Athabasca.

GNEISSIC COMPLEX

A widespread group of gneisses(3), probably of several origins, is gradational into the Yellowknife rocks(1, 2) on the one hand, and into the granitic rocks(4) on the other. The most common type is a migmatitic gneiss, partly granitic and partly sedimentary or, less commonly, partly volcanic. In some occurrences, the non-granitic members are clearly recognizable as sedimentary, but in many places interaction between magma and invaded rock has produced a highly garnetiferous, contorted, banded gneiss of granitic aspect. Contacts drawn between areas of mixed gneisses(3) and granitic rocks(4), particularly where the latter are impure and gneissic, are arbitrary. The structural and genetic relationships are very

complex, as is shown in the La Loche Lakes area, where these rocks were mapped in considerable detail. Some of the rocks included in this group appear to be 'granitized' paragneiss; others are very fine-grained, banded, felsitic rocks that probably represent mylonitized granites. In occurrence, these hybrid rocks are restricted to the uplands bordering Great Slave Lake.

GRANITIC ROCKS

Granitic rocks(4) are mostly restricted to the uplands, and are closely associated with the rocks of the gneissic complex(3) into which they grade in many places. A few small bodies are found in the lake basin, exposed at the centres of anticlines and near faults. The granitic intrusions include a wide variety of rocks. They are light grey to pink, of medium to coarse grain, and are composed of quartz, plagioclase feldspar, microcline, and biotite, muscovite, or hornblende. Biotite granite and granodiorite(4) are the most common types; muscovite granite(4a) is not uncommon, but is not areally important. So far as known, all the granite throughout the area intrudes the rocks of the Yellowknife group, but granite of more than one age is probably represented.

GREAT SLAVE GROUP

The Great Slave group of sedimentary and volcanic rocks(5-10) was deposited on an erosion surface developed on granitic intrusions and the upturned edges of the older sedimentary and volcanic rocks. For the most part, it forms an asymmetrical synclinorium, 150 miles long, occupying almost the whole of the lake basin, most of the east half of which lies within the map-area. The beds on the north limb commonly dip south at 5 or 10 degrees, but in the axial region and on the south limb they are generally folded into a more complex series of anticlines and synclines, with limbs commonly dipping from 30 to 70 degrees. The group is divided into two parts, which may be separated by an erosional unconformity.

The Lower part of the Great Slave group(5-7) comprises three formations, named, in ascending order, the Sosan, Kahochella, and Pethei. These are best seen on the north limb of the synclinorium (Kahochella and Pethei Peninsulas) where the structure is simple and the formations overlie one another with gentle south dips. There the Sosan formation(5) is perhaps 3,000 feet thick, and

consists of beds of sandstone, quartzite, and grit, with partings of shale and from 1 foot to 10 feet of arkose and conglomerate at the base. Where observed, the basal members rest on granite, and are composed largely of detrital material derived from it. The Kahochella formation(6) is composed of about 1,000 feet of shaly beds, with some laminated, argillaceous limestone, jasper, and oolitic iron formation. The iron formation is well exposed 10 miles south of Taltheilei Narrows, where it is associated with lava flows, tuff, volcanic breccia, and agglomerate. In some places these volcanic rocks(6a) have been mapped separately from the sedimentary part of the Kahochella formation. The Pethei formation(7) comprises about 1,500 feet of limestone and dolomite, some of which contains considerable, irregularly distributed argillaceous material. In places, notably near Taltheilei Narrows and on the islands just northeast of Utsingi Point, impressive exposures of algal structures occur in the Pethei limestone. On the south limb of the synclinorium, the Pethei formation is generally missing, and the rocks of the upper part of the Great Slave group rest on the Kahochella formation, suggesting that the two parts may be separated by an erosional unconformity.

The Upper part of the Great Slave group(8-10) occupies the central part of the synclinorium, where folding is more complex than in the north limb. In ascending order are: the Stark formation(8), consisting of possibly 1,000 feet of interbedded, varicoloured dolomite, red shale, and limestone, in part much brecciated; the Tochatwi formation(9), comprising a thick assemblage of shaly sedimentary rocks and massive sandstone; and the Pearson formation(10) of lava flows, with interbeds of argillite. In the Portage Inlet area, the Pearson formation forms vertical cliffs, which exhibit good columnar jointing and in outcrop resemble the sills of diabase(14) found in many parts of the map-area. Remnants of pillows have been reported from this formation.

Most of the strata of the Great Slave group are red or brown of various shades. Many show ripple-marks, crossbedding, and mud-cracks, and concretions occur locally in shale and argillite. They resemble the limestones and associated strata of the Belcher Islands in Hudson Bay, and may be of about the same age as the Animikie rocks of the Lake Superior region.

The Union Island group(B) is of unknown age relative to the Great Slave group, but like it was deposited during the interval that followed the erosion of the older granitic rocks(4) and preceded the deposition of the Et-then group. Within the map-area, the Union Island group is found only in the southwest corner; there it consists of buff-coloured dolomite, but elsewhere the dolomite is stratigraphically overlain by interbedded, varicoloured dolomites, red argillite, and black slate (Map 377A).

GRANODIORITE

Within the map-area, two formations of the Great Slave group are cut by stocks of granodioritic rocks(11). The main bodies of these rocks are arranged in two, more or less linear groups along or near the major fault passing through Murky Channel and south of Stark Lake--that is, along an axis of more intense deformation within the synclinorium. Six samples of these rocks, four from the Christie Bay map-area, and two from the adjoining Reliance map-area (Paper 51-26) were examined. All are reddish, massive, nearly equigranular, and medium to coarse grained. All the samples contained some quartz, and they varied in composition from hornblende granite and granodiorite to biotite granodiorite (most common) and biotite quartz diorite. Inasmuch as at least two of these bodies have given encouraging results to prospectors searching for radioactive deposits, all of them warrant careful examination, particularly near their contacts with older formations.

Kahochella sedimentary rocks in a bay 3 miles west of the southwest end of McDonald Lake are cut by white, microcline-albite-muscovite granite(11a).

ET-THEN GROUP

The Et-then group of coarse, clastic, sedimentary strata was deposited on an erosion surface developed on the granodioritic rocks(11) and older formations. The Murky formation(12) of conglomerate, with irregular lenses of sandstone, forms the base of the group, and carries closely packed, round boulders of a great variety of rocks representing almost every member of the older groups. The conglomerate varies greatly in thickness up to probably several thousand feet, and is locally missing. It forms prominent cliffs, and provides a magnificent exposure at the southwest end of Redcliff Island, where about 600 feet of

conglomerate, with interstratified sandstone, rises in a vertical cliff from the water's edge.

The sandstone, quartzite, and minor conglomerate of the succeeding Preble formation(13) are coarse, feldspathic rocks, exhibiting excellent crossbedding and ripple-marks. The rock is usually buff coloured and quite massive.

The Et-then group may be correlated with the Athabasca series of the Lake Athabasca region and may be of Keweenawan age. The conglomerate and sandstone are nearly flat lying except in the vicinity of faults, where dips are up to 70 degrees. These faults are of great magnitude, commonly strike northeasterly, and are confined to the southern, more complexly folded part of the area. They have displaced the Et-then and all older rocks.

DIABASE

Dykes and sills of diabase(14) cut the rocks of the Et-then group as well as all older rocks and the large faults. A few steeply dipping dykes occur in the Archaean rocks, but they are not so numerous as in some areas north of Yellowknife. Within the basin of the east arm, however, dykes and sills are common. Sills, up to several hundred feet thick and scores of miles long, occur in the peninsulas of the northern part of the synclinorium. Their dip slopes are characteristically smooth and relatively flat; the forward slopes are cliffs exhibiting good columnar jointing. Locally, the sills are transgressive; on the north end of Et-then Island a 200-foot sill cutting upward through Pethei limestone is clearly exposed in a vertical cliff. In the more complexly folded rocks of the southern part of the area the diabase commonly occurs as moderately dipping dykes of irregular trend. Other dykes are vertical, strike slightly west of north, and cut both gently dipping and complexly folded strata and diabase sills as well as granitic rocks. The sills and moderately dipping dykes form prominent topographic features.

The diabase consists of a sub-ophitic, medium-grained aggregate of approximately equal amounts of pigeonitic pyroxene and labradorite feldspar with a little magnetite; quartz is not common. Edges of both sills and dykes are chilled to fine-grained basalt, whereas interiors of thick bodies approach coarse-grained gabbro.

One small body of coarse-grained hornblendite was observed on the east shore of La Loche Lake at the south boundary of the map-area.

ECONOMIC GEOLOGY

The volcanic and sedimentary rocks of the Yellowknife group are similar to those of the neighbouring Beaulieu River and MacKay Lake areas where many gold-bearing and several base-metal deposits have been found. Quartz veins are abundant in both volcanic and sedimentary rocks on the north shore of McLeod Bay and in the highly sheared green schists in Basile Bay. A little gold and silver have been reported from one vein near Basile Bay, and lead and zinc minerals occur in knotted schist 6 miles northwest of Thompson Landing, just north of the map-area. Quartz-calcite veins carrying disseminated chalcopyrite are found in Yellowknife sedimentary rocks and in muscovite granite west of the mouth of Burpee River, near Thompson Landing, and near the mouth of Barnston River. The same type of quartz-calcite vein with chalcopyrite occurs in granitic rocks at many points north of McLeod Bay. Nickel occurs in volcanic rocks 5 miles northwest of Sachowia Point. In general, the Archaean rocks southeast of the lake basin appear to be mainly granitic and not very favourable for prospecting.

Veins of quartz occur in the Great Slave group, in the dioritic intrusions, and in the Et-then group. They are not known to contain gold or more than trace of silver, but many of them carry calcite, barite, and chalcopyrite. Copper minerals are found in brecciated sandstone and in fractures in diabase near Taltheilei Narrows and on the islands 6 miles northeast of the narrows, on the south side of Tochatwi Bay, and at the east end of Portage Inlet, on the north shore of Stark Lake, on Murky Channel, near Pekanatui Point, and in carbonate veins cutting dioritic rocks at the southwest end of Et-then Island. Abundant copper stain can be seen on carbonatized volcanic rocks on the west side of the narrow bay a few miles north of Utsingi Point.

Cobalt bloom was observed on the west side of Taltheilei Narrows. Oolitic hematite beds as much as 30 feet thick are exposed 5 miles north of Utsingi Point; similar deposits, up to 20 feet thick, occur at several localities on Great Slave Lake but all are low grade.

Several occurrences of radioactive minerals are known within the map-area; most of them are indicated on the map. As previously mentioned, the small stocks of younger intrusive rocks(11) appear to be favourable prospecting ground. Most of the known radioactive occurrences apparently contain uranium minerals and are in or near granitic rocks, but one large, low-grade, sedimentary deposit of thorium and uranium occurs in ferruginous dolomite near the east end of McLean Bay.

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