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PRELIMINARY REPORT ON THE GEOLOGY OF THE SADLEROCHIT RIVER AREA, ALASKA

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By

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INTRODUCTION

"The Sadlerochit River area" is the name that has been applied for purposes of convenience to that portion of the eastern part of northern Alaska shown in Figure 1. The map covers an area of about 1400 square miles. The center of this map is a point approximately 55 miles southwest of Barter Island, 90 miles west of the International Boundary, and 130 miles east of Umiat.

During the summer of 1948, a U. S. Geological Survey party made a reconnaissance geologic survey of a portion of this area. The route followed by this party is indicated by the locations of field camps, beginning with Camp 1 on the Okpilak River and ending at the mouth of the Sadlerochit River beyond the north edge of the map. The survey was accomplished by traverses from the various field camps, the locations of stations and other data being plotted on aerial photographs in so far as possible. Except in a few rare instances, traverses did not extend to points more than five miles from the various field camps. Use of aerial photographs enabled the party to tie together data from various traverses and to extend their interpretations for considerable distances beyond points they were able to reach. The result has been a more detailed picture of the geology in this area than would have otherwise been possible in the time available.

During April and May 1948, caches of food and equipment were established at nine points in the area along the route proposed for the party to travel. On May 31 the senior author and Arthur H. Lachenbruch, field assistant, together with their equipment and supplies, were transported by ski plane to the site of Camp 1 on the Okpilak River. The junior author joined the party at this point

on June 12. From this place the party moved camp by back-packing, following the route indicated by camp locations, until they reached the eastern end of Lake Schrader on July 5. The various camp sites were selected at or near caches that had previously been set out, so that it was not necessary to transport any food while moving camp. A canvas boat with a small outboard motor, which had been cached previously, was used for transportation on Lake Peters and Lake Schrader. On July 7 George Gryc and Lloyd Spetzman joined the party at Lake Schrader. Mr. Gryc remained with the party until July 17, making material contributions to the geologic studies in the vicinity of Lake Schrader. Mr. Spetzman, a botanist working for the Arctic Research Laboratory, remained with the party for the balance of the field season and made a study of the flora of the area. From the western end of Lake Schrader the party continued moving of camp by back-packing until they reached Camp 12 on the Sadlerochit River at the mouth of Neruokpukkoonga Creek. From that point the party moved in boats down the Sadlerochit River, arriving at the Arctic coast on September 1. The following day they were transported to Barter Island in a Coast and Geodetic Survey launch.

The Sadlerochit River area is part of the Canning River region, of which the geography and geology were first described by Leffingwell 1/. During the several years that Leffingwell spent in northern Alaska, he made three trips, each of one to two months duration, from the Arctic coast into the Sadlerochit area. One of these trips was up the Okpilak River, another up the Hulahula River, and the third through the eastern part of the Sadlerochit Mountains to Lakes Schrader and Peters. The geologyof the western part of the Canning River region was restudied in 1947 2/.

1/ Leffingwell, E. de K., The Canning River region, northern Alaska: U. S. Geol. Survey Prof. Paper 109, 1919.

2/ Gryc, George, and Mangus, M. D., Preliminary report on the stratigraphy and structure of the area of the Shaviovik and Canning Rivers, Alaska: U. S. Geol. Survey, 1947

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ILLUSTRATION

Figure 1. Preliminary geologic map of the Sadlerochit River area, Alaska. (Separate)

SEDIMENTARY ROCKS

Neruokpuk Formation (Pre-Cambrian ?)

The Neruokpuk formation is the oldest series of sedimentary rocks present in the Sadlerochit area. It unconformably underlies the Mississippian Noatak (?) formation. The formation makes up the bed rock of a large proportion of the country in the Franklin and Romanzof Mountains. However, the formation was studied in the Franklin Mountains only near the northern edge of its outcrop belt and in the Romanzof Mountains only above the forks of the Okpilak River where it was in contact with the granite. A small area west of the Sadlerochit River in Third Range and a considerably larger area west of Itkilyariak Creek in the Sadlerochit Mountains have exposures which probably belong with this formation.

The Neruokpuk formation consists largely of metamorphosd sediments. Carbonate rocks appear to be entirely absent. In the vicinity of Lake Peters quartzites make up about half of the total section. In color the quartzites range from light to dark gray and greenish gray, in grain size from fine to coarse. Some quartzites contain scattered granules and, occasionally, small pebbles, usually of quartz. The next most common rock types are phyllites of undetermined composition. The color ranges from light gray to black and, in addition, includes green and purple. The green and purple phyllites are occasionally interbanded. Less common rock types are black and white banded cherts (?), quartz mica schists and schistose quartzites, and dark gray massive argillite. At one place a rock was found that may be of igneous origin. It had a dark reddish color and a texture which appeared to be vesicular or amygdaloidal.

The rocks seen in this formation above the forks of the Okpilak were a quartz mica schist and a greenish chloritic schist. The outcrops in Third Range assigned to this formation consist of light greenish gray banded chert with associated greenish phyllites and a small amount of dark gray argillite. In the Sadlerochit Mountains the rocks seen which are referred to this formation include light gray quartzite, dark gray banded quartzite, light greenish gray chert, and greenish-yellow, black, and maroon phyllites.

The thickness of the formation is unknown but is believed to be at least several thousand feet. As seen from a distance along the mountain sides, the bedding appears to be simple; but detailed examination reveals much small folding and suggests the possibility of overturns and repetition of section. In outcrops bedding is often difficult to determine. It is easily confused with foliation which often lies parallel to it, or nearly so. In some instances the foliation seems to be folded.

The postulation of an unconformity between the Neruokpuk formation and younger formations is based mainly on a difference in degree of metamorphism. The Neruokpuk does not show a high degree of metamorphism, but the degree is considerably greater than in the younger formations. For instance,

the bedding may usually be discerned without much trouble in the overlying formations. In the Neruokpuk, on the other hand, it is usually difficult and often impossible to make out the bedding. In the Franklin Mountains considerable variation was noted in the lithologic types occuring immediately below the contact. At two localities where the basal beds of the Noatak (?) formation were conglomerate, the contact appeared to be an undulatory surface with several feet of relief. However, the exposures at these localities were not complete enough to eliminate the possibility that the apparent undulations resulted from faulting.

Although showing considerably less metamorphism, the Neruokpuk formation is lithologically similar to the Birch Creek schist as described from the Yukon-Tanana region 1/, and the correlation of the two formations is suggested. Correlation of the Neruokpuk with any of the pre-Carboniferous Paleozoics south of the Brooks Range appears doubtful, because sections of all these ages from Cambrian through Devonian, and also of the pre-Cambrian Tindir group, contain significant thicknesses of limestone and dolomite, whereas in the Neruokpuk formation carbonate rocks appear to be entirely absent.

Noatak (?) Formation (Mississippian)

The Noatak (?) formation overlies the pre-Cambrian (?) Neruokpuk formation unconformably and is overlain with gradational contact by the Mississippian Lisburne limestone. Leffingwell described this formation as consisting of "...black shales, slates, and possibly minor amounts of sandstones,...." and said that it was at least 700 feet thick on the Canning River and about 1000 feet thick where seen on the Hulahula River about 30 miles south of the mountain front, a point which would be about 10 miles beyond the south edge of Figure 1. Leffingwell found no fossils in the formation. He mapped it as black shale of Mississippian or Devonian age. Smith and Mertie 2/ suggested that this formation might be correlative with the Noatak. In their work on the Canning River in 1947, Gryc and Mangus found plant fossils in the formation which definitely establish a Mississippian age. In regard to lithology they state that "...these shales are interbedded with quartzite, calcareous ironstone, graphitic coal seams, and slates," and they further state that the maximum thickness exposed on the Canning River does not exceed 500 feet.

In the Sadlerochit River area the Noatak (?) formation was seen in the northern part of the Franklin Mountains at several points for a total distance of about 12 miles along the strike. The easternmost exposures were on a creek about five miles east of Lake Peters. The westernmost were

1/ Mertie, J. B., Jr., The Yukon-Tanana region, Alaska: U. S. Geol. Survey Bull. 872, pp. 47-59, 1937.

2/ Smith, P. S., and Mertie, J. B., Jr., Geology and mineral resources of northwestern Alaska: U. S. Geol. Survey Bull. 815, p. 166, 1930.

in the area at the head of the Sadlerochit River about seven miles west of Lake Peters. Other exposures of rocks probably belonging to this formation were seen in Third Range on the Sadlerochit River and in the Sadlerochit Mountains in the drainage of Itkilyariak Creek. On the map (Figure 1) this formation is not differentiated from the Lisburne limestone.

Where best exposed in the Sadlerochit area, in the belt in the northern part of the Franklin Mountains, the Noatak (?) formation ranges in thickness from 150 to 300 feet, the variation being due chiefly to the varying thicknesses of conglomerates which occur mainly at the base of the formation. East of Lake Peters the conglomerates, when present at all, are not more than a few feet thick. One mile west of Lake Peters the conglomerates are about 75 feet thick, and at the head of the Sadlerochit River they are about 125 thick. The conglomerates range from rock composed entirely of cobbles and pebbles to quartzites containing scattered pebbles, and are interbedded with quartzites, the grain size of which ranges from fine to very coarse. The predominant rock type represented in the pebbles and cobbles is white quartz. Less common rock types represented in the pebbles (quartzites, cherts, and argillites) are very similar to the more resistant types of rock in the underlying Neruokpuk formation. About one mile east of Lake Peters, where the conglomerate was only a few feet thick, the lithology was more exotic, the rock at that place consisting of subangular white quartz pebbles, one to two inches in diameter, set in a dark green fine-grained apparently chloritic matrix. Gryc, upon examining boulders of the conglomerate in the stream west of Lake Peters, stated that the lithology of the conglomerate is very similar to that of conglomerates in the Noatak formation at Chandler Lake.

Aside from conglomerates and quartzites, lithologic types seen in this formation are black shales (in part metamorphosed to slate and phyllite) containing lenses and beds of ironstone, black bedded cherts, and dark gray argillite. Some of the black shale may occur interbedded with the conglomerates and quartzites, but in general the formation is characterized by decreasing grain size upward. In the area east of Lake Peters, where the best exposures occur, the contact with the overlying Lisburne limestone is gradational and is taken at that point where limestone becomes predominant in the section. Some limestone is found below this contact interbedded with shale and chert, and shale occurs interbedded with the limestone above the contact.

A few plant fossils were found in the black shales in the Sadlerochit area, but they do not appear to be sufficient to determine the age. However, there can be little doubt that these black shales are correlative with those on the Canning River in which Mississippian plant fossils were found. The correlation with the Noatak formation of these clastic beds underlying the Lisburne limestone in the Canning and Sadlerochit areas is suggested on the basis of similarities in lithology, stratigraphic relationships, and age. In this report, therefore, these beds have been designated the Noatak (?) formation.

Lisburne Limestone (Mississippian)

The Lisburne limestone overlies the Mississippian Noatak (?) formation with gradational contact and is overlain conformably by the Permian Sadlerochit formation. The formation, about 2000 feet thick, is, because of its distinctive light bluish gray weathering, the most easily recognized stratigraphic unit in the Sadlerochit area. It is widely distributed throughout the area, forming the cores of the Sadlerochit Mountains, the Shublik Mountains, Third Range, and Kikittut Mountain, and showing up prominently in the folds along the northern edge of the Franklin Mountains and in the northern part of the Romanzof Mountains.

The most common rock type is gray crystalline limestone, which to a considerable extent seems to be bioclastic. Other limestones range from dark gray to black, some being crystalline, some oolitic, and some sublithographic. Nodular chert is common at many places in the formation but is especially abundant in the upper third. Dark-weathering dark gray limestones comprise the basal part of the formation near Lake Peters, but this same lithology was seen near the top of the formation in the Sadlerochit Mountains.

On the Hulahula River in the vicinity of Kikittut Mountain the exposed limestone approaches a thickness of 2000 feet. The base of the formation was not definitely identified but may have been exposed. A bench on the slopes of the mountains in this vicinity coincides with a change in the general appearance of the limestone. The limestone below the bench makes more prominent and massive outcrops and weathers to a darker color than does the limestone above the bench. The lower limestone is about 1200 feet thick, the upper about 600 feet. Outcrops of oolitic limestone were found in the lower limestone. Observation of talus indicated that it contains little chert but is rather siliceous and shows considerable quartz veining. The bench marks the horizon of a clastic member, consisting of black shale and siltstone and light-colored quartzite and sandstone, which is probably not more than 50 feet thick.

On the Okpilak River estimates of the thickness of limestone exposed ranged from 500 to 800 feet. The limestone is overlain by the Sadlerochit formation and is underlain by a series of quartzites, quartz mica schists, and phyllites with which are associated minor amounts of plant-bearing black slate and graphitic schist. The clastic section is at least 200 feet thick. It, in turn, is underlain by green schist.

The data gathered during a hasty traverse up Ahngayukasrakuvik Creek are rather confusing. Underlying the Sadlerochit formation there is exposed about 400 feet of limestone, ranging in color from light gray to black and in texture from crystalline to sublithographic. Chert nodules are common. Their color ranges from medium gray to black and is generally somewhat darker than the containing limestone. For the next 1/4 mile upstream there are no