

(200)
N22 agk
no. 5

✓ U.S. Geological Survey.

PRELIMINARY REPORT ON GEOLOGIC INVESTIGATIONS IN THE
MAYBE CREEK AREA, ALASKA.

BY

Richard G. Bay
William A. Fischer

INTRODUCTION

During the summer of 1946 the United States Geological Survey continued its program of stratigraphic and structural investigations in the Naval Petroleum Reserve No. 4, northern Alaska. This report summarizes the results of work in the Maybe Creek area, except for a small area east of the headwaters of the Ikpikpak River.

The area studied includes approximately 300 square miles lying between latitudes 69°10' and 69°25' N., and between longitudes 153°30' and 154°10' W. (See inset, fig. 1).

The terrain is in general similar to that of the Uaiat region away from the flood plain of the Golville River. The topography is rolling and the hills have rather gentle slopes which are mostly less than 10 to 15 degrees. Relief may be as great as 500 feet.

In northern Alaska outbanks along large rivers afford the only good rock exposures and Geological Survey parties in the past have concentrated their studies in these areas. The emphasis of such work has necessarily been stratigraphic. However, there are no large rivers in the Maybe Creek area and consequently outcrops are not abundant. Rock exposures are

scarce along Maybe Creek and only a few scattered outcrops are found on the hillslope areas away from the stream. Float, thought to be only a few feet from its source, is common to many localities. Direct structural observations of the small isolated outcrops cannot be considered dependable because of possible slump, frost heaving and cross-bedding. It is necessary to map structural traces 1/ in detail with plane table and

1/ Term used to cover rubble horizons, breaks in topography, changes in vegetation, etc., all expressions of the underlying structure.

alidade in order to obtain reliable structural data. The emphasis of study in such "inter-stream" areas is necessarily structural rather than stratigraphic.

STRATIGRAPHY

Formations "E", "F", "G" and part of "H", all of Upper Cretaceous age 2/, are found in the Maybe Creek area. Approximately 5,000 feet of

2/ See "Geologic Investigations Naval Petroleum Reserve No. 4, Alaska, Report No. 1, 1945, pp. 6-7."

stratigraphic section is represented. Faunal Zones 3/ 2 and 3 are represented

3/ Ibid., p. 11.

in part.

The outcrops south of Maybe Creek, all part of Formation "X", are generally light gray to buff colored, fine- to very fine-grained sandstone which are calcareous in part. Some coarse sandstones and pebble conglomerates were seen. The conglomerates are composed largely of well-rounded black chert, milky quartz and quartzite pebbles. Coal seams up to eight inches thick were found and coal float is common in some streams and on some slopes. Silvery-gray bentonite also occurs in places.

Fine- to very fine-grained, calcareous sandstone in a stream cut 1.6 miles northwest of camp #6 (see fig. 1) yields the pelecypods Tellina sp? and the linguiform-shaped Inoceramus sp?, characteristic of faunal zone 2. On the basis of previous work 4/ the rocks in this area have

4/ Ibid. p. 11.

been correlated with the base of Formation "X".

Calcareous zones in a clay shale-mud shale exposure on Maybe Creek have yielded well preserved fossils of faunal zone 3 (see fig. 1), a small distinctive pelecypod Inoceramus sp?, and the cephalopod Scaphites sp? This shale section is correlated with the black shale facies of Formation "Y" at Umist Mountain.

The sandstones exposed north of Maybe Creek are generally medium-grained and noticeably coarser than those to the south. In places they contain fragments of fossil wood and carbonized plant remains. This same sandstone in the Wolf Creek area contains clay-siltstone nodules ranging in longest

dimension from one to eight inches. About four miles north of Maybe Creek, at longitude 153°43', an eight-foot bed of coal crops out. This coal bed is thought to be equivalent to the lower part of Formation "G". It is stratigraphically only a few hundred feet above the fossiliferous shale section of Formation "F" on Maybe Creek.

In the northeastern part of the Maybe Creek area shales predominate, though some coal float from Formation "G" is found on the lower slopes northeast of Wolf Creek. Three resistant pebble-conglomerate beds, each about 25 feet thick, stand out as distinct ridges northeast of Wolf Creek. These are similar to other conglomerates in the area, and are composed largely of well-rounded black chert, milky quartz and quartzite pebbles. The pebbles average one-half inch in longest dimension, but locally they are of granule size. The uppermost of these conglomerate beds is probably equivalent to the "bentonitic conglomerate" of Formation "H" which was used by Foran as a marker bed in mapping the Utaist anticline. The stratigraphic section immediately overlying this conglomerate is poorly exposed but one-half mile northeast in the vicinity of camp #1 (see fig. 1) the ridge is capped with a medium- to fine-grained, limonitic brown sandstone. This sandstone is a persistent ridge marker and can be traced eastward for 30 miles into the Utaist sandstone along the south rim of the Utaist anticline. In the vicinity of camp #1 this sandstone is underlain largely by black, carbonaceous mud shale which contains thin coal seams locally. In places chalky white volcanic material, probably silicified tuff, is interbedded with the black shale. Bentonites were also seen in this locality.

Interpretation of structural data in the Umist and Maybe Creek areas suggest that the thickness of sediments between the black shale facies of formation "F" and the Umist sandstone of formation "H" may be as much as 1,000 feet greater than studies made in 1945 indicated.

Eight sandstone specimens from formation "E" and "G" in the Maybe Creek area were submitted to the Fairbanks laboratory for permeability and porosity tests. Results are tabulated below:

<u>Specimen No.</u>	<u>Permeability - millidarcys</u>	<u>Porosity - %</u>
46A F1 27 (Fm. "E")	1,380	17.7
46A RY 98 (Fm. "E")	750	14.9
46A RY 99 (Fm. "E")	less than 10	5.3
46A RY 107 (Fm. "E")	no core sample - badly weathered	12
46A F1 2 (Fm. "G")	less than 10	3.2
46A RY 40 (Fm. "G")	no core sample - badly weathered	11
46A F1 62 (Fm. "G")	no core sample - badly weathered	14.2
46A RY 133 (Fm. "G")	less than 10	6.4

STRUCTURE

The general east-west regional structural trend which dominates most of Naval Petroleum Reserve No. 4 also persists through the Maybe Creek area. The folds are broad and open and measure about five to seven miles from crest to crest. Dips are mostly less than five degrees.

During the summer of 1946 three anticlinal structures were studied. Surface data were sufficient to permit mapping of closure only around a structural dome $4\frac{1}{2}$ miles north of Maybe Creek.

1. Maybe Creek Anticline and surrounding area:

The crest of the Maybe Creek anticline, two and one-half miles south of Maybe Creek, trends north 80 to 85 degrees east. This structure is about

six to eight miles broad, but the length is not known. The western end of this structure appears to plunge at longitude 154 degrees, though data are incomplete. Some outcrops and structure traces are found in this area, but to the eastward surface data are entirely lacking and further structural information would have to be gained by geophysical investigations.

Structural data indicate that the north flank is more steeply dipping than the south. Dips determined on the south flank by detailed surveying with plane table and alidade rarely exceed five degrees but those on the north flank are as much as 19 degrees though the average is about 12 degrees.

Sandstone in a stream cut 1.6 miles northwest of camp #6 ranges in dip from 20 degrees to 45 degrees north. This is stratigraphically the lowest bed exposed in the Maybe Creek area and suggests that folding in the Maybe Creek anticline may be more pronounced at depth. Exposures in this same stream cut yield fossils of faunal zone 2 which on the basis of previous work 5/ indicates that rocks exposed at the surface on the Maybe

5/ Geologic Investigations Naval Petroleum Reserve No. 4, Alaska.
Report No. 1, 1945, p. 11.

Creek anticline represent the lower 600 feet of Formation "E". The structure may plunge to the west at about longitude 154 degrees.

From the crest of the Maybe Creek anticline to the Colville River the strata dip generally southward, but two and one-half miles south of the anticlinal axis a minor syncline is believed present. It trends north 80 to 85 degrees east and plunges to the west at about longitude 153 degrees 57 minutes. This synclinal structure could not be traced to the eastward.



One mile farther south a minor anticlinal flexure trending parallel to the major structure may be present.

The north flank of the Maybe Creek anticline is probably cut by a fault of large displacement which strikes east-west. The displacement is thought to decrease from east to west. Evidence for this fault is paleontological; faunal fragments tentatively identified as a linguiform-shaped Inoceramus sp? were discovered one and one-half miles southeast of camp #7 (see fig. 1). If these represent Faunal Zone 2 at the base of Formation "E" then 4,000 to 4,500 feet of the stratigraphic section are missing, as sandstones near the base of Formation "G" occur only a few hundred feet northwest of the outcrop containing the Inoceramus fossils. If the vertical range of the linguiform-shaped Inoceramus, which to date has been reported from only the base of Formation "E" and which has been considered diagnostic of that zone, is not restricted, the displacement along the fault may be considerably less than is indicated above.

The fault probably extends for some miles to the west and in the vicinity of longitude 153 degrees 50 minutes the displacement is inferred to be not greater than 2,000 feet and may be appreciably less if Formations "E" and "F" thin to the west from Uaiat.

2. Structural dome north of Maybe Creek:

The structural dome four and one-half miles north of Maybe Creek is about five miles broad and represents a "high" on a major anticlinal structure trending about north 60 degrees west. At longitude 153 degrees 40 minutes west this trend is nearly east-west. Dips on the structure

rarely exceed 2½ degrees and many are less than one degree. Vertical closure is estimated to be about 125 to 150 feet. In contrast to the Maybe Creek anticline this dome is more symmetrical. Stratigraphically the base of Formation "G" and probably the top of Formation "Y" are represented.

Air reconnaissance indicated another structural "high" along this anticline at approximate longitude 153 degrees 55 minutes west. The rocks exposed at the surface are probably near the base of Formation "G".

3. Wolf Creek anticline and surrounding area:

The Wolf Creek anticline is less well defined than either the Maybe Creek anticline or the dome just north of Maybe Creek. About 2,000 feet of stratigraphic section are represented in the north flank which is better exposed than the south flank but outcrops are scarce. Structure traces, though abundant, are generally straight line traces and are unfavorable for structural interpretation.

The small amount of surface data available indicates that the north flank of the Wolf Creek anticline dips more steeply than the south, and in this respect the structure is similar to the Maybe Creek anticline. Dips as great as 10 degrees were observed on the north limb of the structure but on the south limb no dips greater than 5 degrees were noted.

Air reconnaissance and studies of aerial photographs suggest that the Wolf Creek anticline may be a closed structure eight to nine miles long and perhaps six miles broad.

SUMMARY

During the summer of 1946 three anticlinal structures in the Maybe Creek area, Naval Petroleum Reserve No. 4, were mapped in part. The southernmost structure, the Maybe Creek anticline, is the lowest stratigraphically and is in Formation "X". The north limb is thought to be cut by a fault of large displacement. Surface data were insufficient, however, to delineate the structure.

North of Maybe Creek a structural dome about five miles broad was mapped. It has a vertical closure of 125 to 150 feet and is structurally a favorable oil trap. Rocks exposed at the surface are in Formation "G". If the lower horizons (e.g. Formation "B") are considered favorable potential reservoir rocks, this dome structure may be stratigraphically unfavorable for drilling. If the normal formational sequence exists, more than 8000 feet of sediments would have to be penetrated to reach Formation "B".

The Wolf Creek anticline is perhaps eight to nine miles long and six miles broad. Surface data were insufficient however, to permit mapping of closure. Closure would have to be delineated by geophysical methods. Rocks of Formations "F", "G" and "H" are exposed at the surface. Formations "G" and "H" have been eroded from the crest of the structure and in this area probably somewhat less than 8,000 feet of sediments would have to be penetrated to reach Formation "B".

Investigations in the Unist and Maybe Creek areas during the 1946 field season suggest that Formation "G" may be as much as 1,000 feet thicker than 1945 studies indicate. The stratigraphy of Formation "G" is poorly known in the Maybe Creek area.