

NOTE:

The analysis of geologic data collected in 1947 has resulted in some revision in the stratigraphic picture of the Upper Cretaceous and early-Tertiary sequences of rocks. In connection with this revision it has become advisable to drop the use of the term "formation" as the time-rock unit designations A through I and instead to use the term "zone." Use of the term "formation" will be more appropriate in a more detailed tongue-member classification of the Upper Cretaceous rocks.

In these 1947 preliminary reports the time-rock units formerly called Formations E, F, G, H, and I are now called Zones E, F, G, H, and I. However, some changes in vertical limits have been made. These are discussed in the reports concerned.

As the term is used in the October 1947 reports, Zone A is, in general, the sequence of rocks formerly called Formation A. Exceptions are on the Oolamnagavik and Kurupa Rivers where Zone A is equivalent to Formations A, B, and C. Zone A is dominantly a marine section of thick sandstone members separated by siltstone and shale. The thickness is fairly consistent, ranging from about 2,000 feet to about 2,500 feet as measured along streams from the Sagavanirktok to the Utukok Rivers. Zone A has proved to be a very persistent unit laterally. It has been recognized in the field on the Utukok, Colville, Kurupa, Oolamnagavik, Killik, Chandler, Anaktuvuk, Nanushuk, and Sagavanirktok Rivers.

All rocks between the top of Zone A and the bottom of Zone E are now classified as Zone D. This sequence of rocks thickens from east to west ranging from about 2,500 feet on the Nanushuk to about 5,000 feet on the Utukok River. On the Nanushuk River it is mainly a marine shale section which becomes sandy and contains some coal near the top. Although marine tongues are present in the sections that have been studied to the west, deltaic-coastal, and terrestrial facies form a large part of the section. The units into which Zone D can be divided differ from river to river and are called d-1, d-2, etc. These divisions apply only to a particular river or area and are not to be considered correlative.

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PRELIMINARY REPORT ON THE STRATIGRAPHY AND STRUCTURE
OF THE AREA OF THE COLVILLE RIVER BETWEEN NINULUK AND
PRINCE CREEKS, ALASKA

By

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INTRODUCTION

Geological Survey Party 4 began studies at a point on the Colville River 18 miles downstream from the mouth of the Killik River on July 19. From this point the studies were continued along the Colville River to near the mouth of Prince Creek. The investigation was completed on September 1 and the party returned to Umiat. A traverse was made along the lower half of Prince Creek and along one of its northern tributaries between September 8 and September 15. Canvas boats were used for transportation along the Colville River and a weasel was used to traverse Prince Creek. The party was composed of four members: R. L. Detterman and D. E. Mathewson, geologists; J. L. Townley, surveyor; and Charles Segal, cook.

The following discussion of the geology is referred to the map, figure 1, and to the columnar chart, figure 2, by means of camp sites and location of columnar sections.

Camp 1

A large bluff on the south side of the Colville River at Camp 1 exposed a thick, continuous section of beds which is correlated with Zones E and F. The section measured at this bluff is shown on columnar Section 1. Zone E, of which 1,000 feet are exposed, is composed largely of grayish to dark sandstone. It is mostly very fine to fine grained, weathers buff to light yellow-red, and partly calcareous. Some is crossbedded. Other beds are clayshale, siltstone, coal, bentonite, and conglomerate. Roughly 20 beds of coal, most of them from 10 inches to 2 feet thick, were present between about 300 and 650 feet below the top of Zone E. Twelve thin beds of bentonite were found mostly near or adjacent to coal beds. A bed of sandstone, 48 feet thick, containing a thin interbed of conglomerate which is three feet thick, is at about the middle of the bed of sandstone and is composed largely of chert pebbles. This bed can be traced eastward for about 10 miles. A sandstone containing thin lenses of conglomerate, observed at another point 8 miles farther east, is believed to be this same bed. Two thinner beds of sandstone containing chert pebble in thin layers are found at 150 feet and at 600 feet below the top of Zone E in the bluff near Camp 1.

The part of Zone F which is exposed above the thick bed of sandstone with conglomerate is 350 feet thick. It is entirely fissile clay shale and contains a few thin beds of sandstone near the base. The clay shale contains thin seams of bentonite throughout. A layer of limestone concretions mostly 5 to 7 feet in diameter is found about 100 feet above the base. A black "paper" shale extends from about 150 feet above the base to the top of the exposure and is at least 200 feet thick.

Specimens of *Inoceramus* sp. with chevron type growth ridges, with *Roudiaria* sp., *Protocardium* sp., and *Unio* sp., were found along thin layers between 600 feet to 850 feet below the top of Zone E. The fauna represents Faunal Zone 2. A non-diagnostic pelecypod fauna was found at several horizons for about 400 feet above the highest occurrence of *Inoceramus* sp. with chevron type growth ridges. *Inoceramus* sp., and the ammonites, *Scaphites* sp., and *Watinoceros* sp., were found along thin layers in a section 30 feet thick in the black "paper" shale. This fauna is Faunal Zone 3. A stratigraphic interval of 900 feet was measured between Faunal Zone 2 and Faunal Zone 3.

About a quarter of a mile south of the axis of the anticline at Camp 1 the beds on the south limb steepen from about 5° to about 45° and then shallow to about 5° within a short distance. This abrupt change in dip is interpreted as a sharp monoclinial flexure.

A section similar to that described at Camp 1 is exposed in places on both limbs of the syncline which crosses Ninuluk Creek east and south of Camp 1. A bed of pebble conglomerate, which has an exposed thickness of 15 feet on a hill slope, crops out along the line of strike of the thick bed of sandstone containing a 3-foot bed of conglomerate exposed at the bluff near Camp 1. Bedding traces seen from the air and on aerial photographs indicate that the two beds are correlative. Fissile clayshale containing large limestone concretions is exposed in the center of the syncline.

Camp 2

Outcrops in the vicinity of Camp 2 are limited to bands of rubble, sloughed cutbanks, and a few small outcrops. A bed of sandstone with thin lenses of chert pebbles, which has an exposed thickness of 20 feet, was seen at about water level on Ninuluk Creek just south of Camp 2. Clayshale and bentonite were found in rubble slides overlying this bed. The bed of conglomeratic sandstone marks the top of Zone E. *Inoceramus* sp., with chevron type growth ridges, Faunal Zone 2, was found in sandstone along a sloughed cutbank north of Camp 2. Two porosity determinations on the fossil-bearing sandstone showed porosities of 23.4% and 20.4%. This bed is believed to be correlative with one of the beds in which the same species of *Inoceramus* was found at Camp 1.

Camp 3

Several river cutbanks north and west of Camp 3 are small and for the most part consist mainly of rubble of sandstone. The sandstone is grayish to greenish in color, fine to medium grained, and argillaceous. Some are hard, non-porous, non-bedded, and siliceous. Another type is moderately well cemented, somewhat calcareous, and crossbedded in part.

Specimens of *Dentalium* sp., and several species of pelecypods, which are unidentified, were collected from the calcareous sandstone. This fauna, though not definitely diagnostic, is tentatively referred to Faunal Zone 1. The beds are probably in Zone D.

The lithology shown in columnar Section 3 is exposed along the southern tributary of the Colville River, just east of Camp 3. The lithology is similar to that described under Camp 1 with which most of columnar Section 3 is correlated. In the center of the syncline about 4 miles south of the Colville River black "paper" shale overlies a layer of large limestone concretions in fissile clay shale. The clay shales are Zone F. A bed of sandstone, which has an exposed thickness of 12 feet and contains thin layers of chert pebbles, underlies the clay shale and marks the top of Zone E. Pelecypods, which are non-diagnostic, were found in sandstone about 400 feet below the top of Zone E. The lowest beds, which are exposed at the mouth of the tributary, have been placed in Zone D on the basis of projection westward of known beds of Zone D from an adjacent tributary stream and probable beds of Zone D described north and west of Camp 3. The thickness of Zone E is roughly 1,300 feet.

Camp 4

A section about 4,600 feet thick is exposed in places along a southern tributary of the Colville River just east of Camp 4 on the south limb of the anticline just south of the Prince Creek syncline. The section is shown on columnar Section 4. The highest beds are exposed near the axis of the syncline about 6 miles south of the Colville River. Here *Inoceramus* sp. with chevron type growth ridges, *Tellina* sp., and *Protocardium* sp., were found in a bed of sandy limestone at the top of the section. This bed is tentatively correlated with a bed of calcareous siltstone and limestone 700 feet below the top of Zone E exposed at Camp 1, which contains *Inoceramus* sp. with chevron type growth ridges, in limestone concretions. The fauna belongs to Faunal Zone 2. *Protocardium* sp., was found 350 feet stratigraphically beneath. *Inoceramus* sp. subround *Dentalium* sp., and unidentified pelecypods were found between about 2,100 and 2,500 feet below Faunal Zone 2. This fauna is Faunal Zone 1.

Thin beds of coal and one bed of bentonite are found from 600 feet to about 1,500 feet beneath Faunal Zone 2. The lithology below the coal zone appears to consist largely of clayshale and siltstone with thin interbeds of light salt and pepper to greenish sandstone. The sandstone is mostly very fine to fine grained and thin to shaly bedded. Two beds of sandstone, one 8 feet thick and the other 10 feet thick, within 1,200 feet of the base of the section were the thickest observed. The color of the siltstone is grayish to greenish. The lithology beneath Faunal Zone 2 through the coal zone is similar to that described below the coal zone.

The coal zone is included in Zone D and probably represents the coal zone in Zone D exposed to the southeast along the Chandler River and the southwest along the Killik River. The lower part of the section exposed near the axis of the anticline is believed to be Zone A. Evidence for this is as follows: The thickness of the interval between the base of Zone E and the top of Zone A is in the general magnitude of 3,000-3,500 feet on the Killik, Chandler, and Nanushuk Rivers. Thus, even if no northward thinning of section occurs, this part of the section would be at least as low as Zone A.

About 250 feet of beds are exposed in a bluff of the Colville River just north of Camp 4. The upper 100 feet are clayshale, which contains thin interbeds of bentonite. The lower 150 feet are sandstone and siltstone. A bed of medium to coarse-grained sandstone, 33 feet thick, underlies the clay shale. The lower sandstone and siltstone beds are Zone E, and the overlying clayshales are tentatively referred to Zone E. The lithology is shown on columnar Section 5.

Prince Creek

The lithology on the north limb of the Prince Creek syncline (south limb of the Umat anticline) is exposed at places along a northern tributary of Prince Creek and along Prince Creek. The lithology of the beds exposed on the tributary of Prince Creek is shown on Columnar Section 6. The main rock type is poorly consolidated clayshale. Other beds are bentonite, coal, tuff, sandstone, and conglomerate. The beds of bentonite seem to be most closely associated with the beds of coal. Several beds of sandstone were seen but most of these were found on lower Prince Creek and are not shown on the columnar section. The sandstone is generally medium grained, very poorly indurated, light yellow-red, rather clean, and porous. One bed is 36 feet thick. Several highly fossiliferous zones containing a pelecypod fauna, which is unidentified, were found along the lower part of Prince Creek. At one place a coquina made up of waterworn shells was seen.

CONCLUSIONS

1. The interval between Faunal Zone 2 and Faunal Zone 3 has a measured thickness of 900 feet.
2. Faunal Zone 3 is roughly 300 feet above the top of Zone E.
3. The conglomeratic sandstone, which marks the top of Zone E, varies in thickness and amount of conglomeratic material over short distances. It can be traced or recognized over an east-west distance of about 18 miles.
4. The center of the anticline just south of Prince Creek syncline is probably at least as low in the Upper Cretaceous section as Zone A.
5. *Inoceramus* sp. with chevron type growth ridges appears to be restricted to a stratigraphic thickness of about 250 feet.
6. Zone E is roughly 1,300 feet thick.
7. Two coal zones are recognized; one, which is about 350 feet thick, and whose base is about at the top of Faunal Zone 2, and the other, which is about 900 feet thick, in Zone D, and whose top is about 600 feet below Faunal Zone 2.