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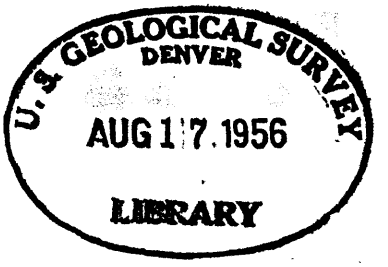

PETROLIFEROUS SAND OF THE CHIGNIK FORMATION AT CHIGNIK LAGOON, ALASKA

By

A. Samuel Keller and John T. Cass

This report is preliminary and has not been edited or reviewed for conformity with U. S. Geological Survey standards and nomenclature.

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In the summer of 1955, the authors spent a week in reconnaissance mapping along the northwest side of Chignik Lagoon, on the southeast side of the Alaska Peninsula. The field work was part of a preliminary reconnaissance study to be used in the planning of detailed petroleum investigations in Alaska. In the course of the study, fossiliferous petroliferous marine sands of the Chignik formation of Late Cretaceous age were found along the shore of Chignik Lagoon.

The location of the stratigraphic section in which the petroliferous sands were found is shown on the accompanying map (fig. 1). The rocks exposed in this area consist of sandstone, siltstone, shale, and conglomerate of the Chignik and Naknek formations. The exposed rocks strike about N. 20° W. and dip about 10°-15° to the northeast. Reports discussing the general geology of the Chignik area have been written by Atwood (1911), Martin (1921), and Knappen (1929); none of these reports describes the petroliferous marine sands.

The stratigraphic section in figure 2 shows these marine sands, as well as the other units of the Chignik and Naknek formations exposed along the northwest shore of Chignik Lagoon. All thicknesses given in the section are approximate.

Porosity and permeability determinations for three samples were made by the Fuels Branch Oil and Gas Laboratory of the U. S. Geological

Survey. Sample numbers followed by the designation "PP" on figure 2 indicate the positions of the samples that were used. Sample No. 55AKe25PP had an effective porosity of 13.1 percent, and an air permeability of 1.4 millidarcies; sample No. 55AKe26PP had an effective porosity of 9.1 percent, and an air permeability of 0.1 millidarcies; sample No. 55AKe29PP had an effective porosity of 7.0 percent, and an air permeability of 0.4 millidarcies.

The positions of fossils collected from rocks of the measured section are shown on figure 2. The locations of other fossil lots collected by the authors in the area are shown on the index map (fig. 1). The fossils in all the collections were identified by R. W. Imlay, of the U. S. Geological Survey; his identifications are given below:

Fossil lots from the Cretaceous beds in Stratigraphic Section A

(Positions shown in the column in figure 2)

FOSSIL LOTS		IDENTIFICATIONS
55AKe15F	(Mes. loc. no. 25702)	Canadoceras aff. C. newberryanum (Meek)
55AKe11F	(Mes. loc. no. 25701)	Inoceramus schmidti Michael I. balticus Boehm in Nagao and Matumoto Anomia sp. Glycymeris sp. Gastropods undetermined
55AKe20F	(Mes. loc. no. 25703)	Inoceramus aff. I. orientalis Sokolow Inoceramus schmidti Michael Anomia sp.
55AKe24F	(Mes. loc. no. 25707)	Canadoceras aff. C. newberryanum (Meek)

FOSSIL LOTS		IDENTIFICATIONS
55AKe23F	(Mes. loc. no. 25706)	Canadoceras aff. C. newberryanum (Meek) Inoceramus balticus Boehm in Nagao and Matumoto
55AKe22F	(Mes. loc. no. 25705)	Canadoceras aff. C. newberryanum (Meek)
55AKe21F	(Mes. loc. no. 25704)	Canadoceras sp. Inoceramus balticus Boehm in Nagao and Matumoto

Fossil lots from the Jurassic beds in Stratigraphic Section A

(Positions shown in the column in figure 2)

FOSSIL LOTS		IDENTIFICATIONS
55AKe16AF	(Mes. loc. no. 25712)	Phylloceras sp.
55AKe16F	(Mes. loc. no. 25711)	Aucella concentrica (Sowerby)(equals A. bronni Roullier) Lima sp. Delphinula sp.
55AKe17F	(Mes. loc. no. 25713)	Phylloceras sp. Aucella concentrica (Sowerby)
55AKe18F	(Mes. loc. no. 25714)	Aucella concentrica (Sowerby) Ammonite fragment Gastropod fragment
55AKe19F	(Mes. loc. no. 25715)	Phylloceras sp. Aucella concentrica (Sowerby)
55AKe14F	(Mes. loc. no. 25710)	Phylloceras sp. Aucella concentrica (Sowerby)
55AKe13F	(Mes. loc. no. 25709)	Phylloceras sp.
55AKe12F	(Mes. loc. no. 25708)	Phylloceras sp. Aucella concentrica (Sowerby)

Other collections of Cretaceous age in Chignik Lagoon area

(Locations shown on index map)

FOSSIL LOTS	IDENTIFICATIONS
55AKe9F (Mes. loc. no. 25697)	Anomia sp.
55AKe10F (in part) (Mes. loc. no. 25699)	Inoceramus cf. I. schmidti Michael Anomia sp. Gastropods undetermined
55AKe28F (Mes. loc. no. 25700)	Brachiopods undetermined Crinoid columnal Crustacean fragments Lima sp. Anomia sp.

Other collections of Jurassic age in Chignik Lagoon area

(Locations shown on index map)

FOSSIL LOTS	IDENTIFICATIONS
55AKe8F (Mes. loc. no. 25696)	Phylloceras sp. Aucella concentrica (Sowerby) Crustacean fragment
55AKe10F (in part) (Mes. loc. no. 25698)	Belemnite fragment Aucella concentrica (Sowerby) Lima sp. Camptonectes sp. Crustacean fragment

Imlay states concerning these fossil collections:

"The collections from the Naknek formation contain the common species found elsewhere in the Naknek such as Aucella concentrica (Sowerby) and certain undescribed species of the ammonite Phylloceras, the pelecypod Lima and the gastropod Delphinula. The presence of Aucella concentrica is good evidence of a late Oxfordian to early Kimmeridgian age and indicates a position low in the Naknek formation....

"The Inocerami from the Chignik formation show that its age is late Late Cretaceous. The species Inoceramus schmidti Michael, I.

balticus Boehm of Nagao and Matumoto occur in the Matanuska formation directly above beds containing I. undulatoplicatus Roemer, which is a world-wide Santonian marker. In Japan I. schmidti, and I. balticus occur in the same relative stratigraphic positions and Japanese paleontologists assign them to the Campanian and early Maestrichtian. I doubt much whether these species are as late as Maestrichtian, but a Campanian age seems reasonable.

"The ammonite Canadoceras is a common associate of these Inocerami in Japan, in the Matanuska formation, and in the Chignik formation. The Japanese consider Canadoceras to be of late Campanian to early Maestrichtian age in Japan. However in Vancouver Island it occurs in beds of Santonian to Campanian age and does not occur in the highest fauna which is possibly of early Maestrichtian age. In the Redding area of California, Canadoceras has been found in beds that are identified confidently as Coniacian on the basis of the presence of the ammonite Peroniceras. It appears, therefore, that the presence of the genus Canadoceras does not permit as close an age determination as the Inocerami."

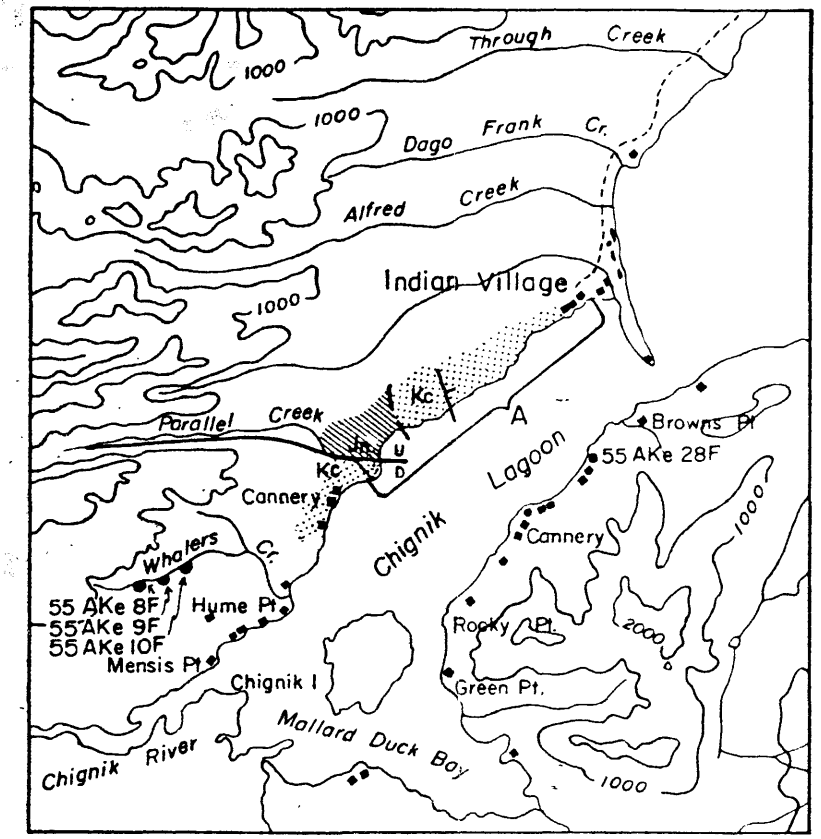
REFERENCES CITED

Atwood, W. W., 1911, Geology and mineral resources of parts of the Alaska Peninsula: U. S. Geol. Survey Bull. 467.

Knappen, R. S., 1929, Geology and mineral resources of the Aniakchak district, Alaska: U. S. Geol. Survey Bull. 797-F, p. 161-227.

Martin, G. C., 1921, Preliminary report on petroleum in Alaska: U. S. Geol. Survey Bull. 719.

Fig. 1



Base after Chignik Quadrangle, Alaska Reconnaissance Topographic Series, 1951

EXPLANATION

Upper Jurassic Upper Cretaceous — JURASSIC CRETACEOUS

Kc — Chignik formation

Jn — Naknek formation

Contact, approximately located

U / D — Fault

(U, upthrown side; D, downthrown side)

Generalized strike and dip of beds

● 55AKe28F

Location and numbers of fossil collections not shown on measured section

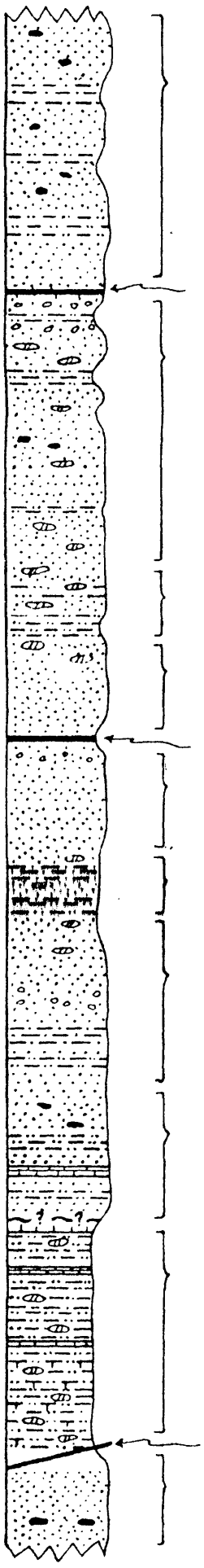
A

Location of stratigraphic section

FIGURE 1. -- MAP SHOWING LOCATION OF STRATIGRAPHIC SECTION ON CHIGNIK LAGOON, ALASKA

5 0 5 10 MILES

CONTOUR INTERVAL 1000 FEET



Interbedded green-gray fine-grained locally carbonaceous sandstone, hackly fracturing siltstone, and silty shale. Sandstones slightly to moderately argillaceous.

Thin coal seams and conglomerate

Brown to gray-weathering interbedded massive fine-grained marine sandstone and thin-bedded hackly fracturing siltstone. Large disc-shaped siltstone concretions. Abundant large ammonites and Inocerami.

55AKe21F
55AKe22F
55AKe23F

Massive to thin-bedded sandstone and siltstone. Large spheroidal limy siltstone concretions. Large Inocerami and ammonites common.

55AKe24F

Upper part of unit composed of brown-weathering, littoral to marine slightly argillaceous, fine-grained sandstone with large spheroidal limy siltstone concretions.

10' interbedded coaly shale and coal seams; coal seams as much as 2" thick. Fine- to medium-grained shaly-weathering sandstones with some conglomerate. About 75% of unit is oil-saturated, and much of the petroliferous sand section is quite friable.

55AKe29PP

Thin-bedded green marine fine- to medium-grained sandstone, siltstone, and silty shale. Massive disc-shaped limy siltstone and sandstone concretions.

Unit consists of green marine fine- to medium-grained sandstone. Sandstone massive, with interbedded pebbly sandstone, conglomerate, and silty shale. Grit conglomerate contains rounded black and green chert and white quartz. Conglomerate and sandstone abundantly fossiliferous. Conglomerate locally coquinoid. Lower sandstones locally petroliferous.

55AKe20F
55AKe26PP

Unit predominantly massively bedded light-gray to dark-green sandstone, fine- to coarse-grained, locally salt-and-pepper appearance. Entire section abundantly fossiliferous. Locally coquinoid green siltstone and sandstone with fossils forming zones 6"-1' thick. Upper part of unit contains disseminated carbonaceous material.

55AKe11F
55AKe25PP

Black to gray-green dense hackly fracturing locally limy and sandy siltstone. Dense buff-weathering limestone as concretions and thin interbeds. Pelecypods and ammonites common in sequence. Ammonites occur both along bedding planes and in disc-shaped concretions.

55AKe12F
55AKe13F
55AKe14F
55AKe19F
55AKe18F
55AKe17F

Fault (?)

Massive green-gray, orange-brown weathering fine-grained moderately argillaceous sandstone. Wood fragments and disseminated carbonaceous material in lower part of unit. Inoceramid, pelecypods and ammonites common.

55AKe16F
55AKe16aF
55AKe15F

Chignik formation (CRETACEOUS)

Nanek formation (JURASSIC)

Chignik formation (CRETACEOUS)

EXPLANATION

Sandstone
Silty shale
Coal
Conglomerate
Limestone
Carbonaceous material
Siltstone
Concretions
Limy siltstone

55 AKe 11 F — Position of fossil lots

55 AKe 25 PP — Position of samples for which porosity and permeability were determined

~?~?~ — Probable contact between Jurassic and Cretaceous

Vertical scale 1" = 200'

All thicknesses estimated

FIGURE 2. SECTION A AT CHIGNIK LAGOON