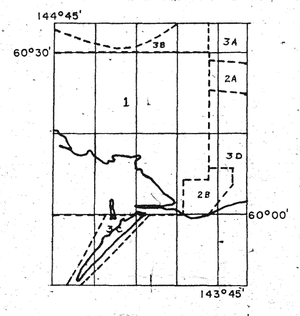
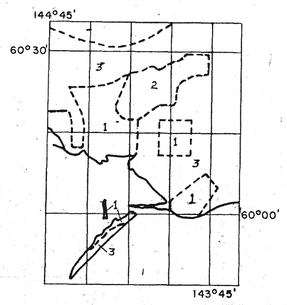
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY



BASE MAP COMPILATION DIAGRAM

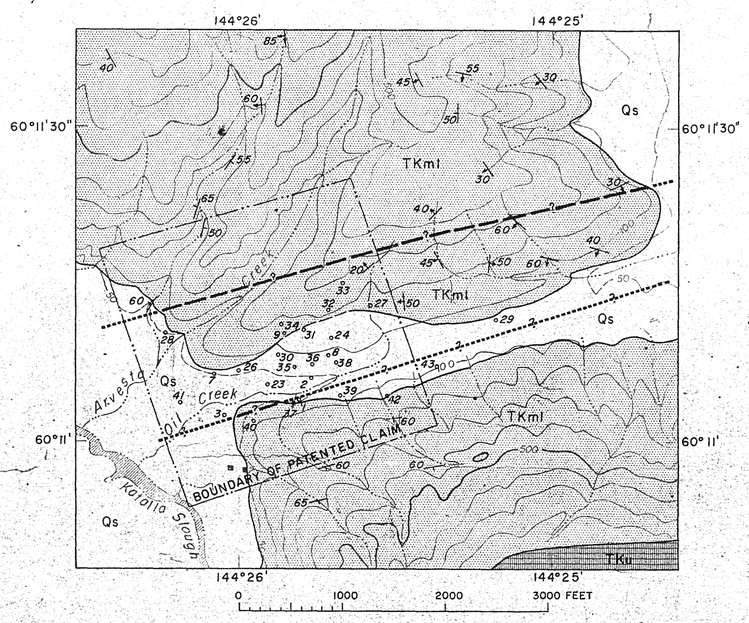
1. U. S. Geological Survey topographic maps of Cordova A-1, A-2, B-1, B-2 (1953) quadrangles, and unpublished compilation by multiplex methods in the Bering Glacier A-8 and B-8 quadrangles. From aerial photographs taken in 1950
2. Planimetry by stereotemplet and stereoplotting methods from aerial photographs taken in 1946 (area 2A) and 1954 (area 2B)
3. U.S. Geological Survey topographic maps of Bering Glacier (1951), Cordova (1951) and Middleton Island (1950) quadrangles, revised by photoalidade and projection methods from oblique aerial photographs taken in 1946 (area 3A) and from vertical aerial photographs taken in 1950 (area 3B), 1952 (area 3C), and 1957 (area 3D)



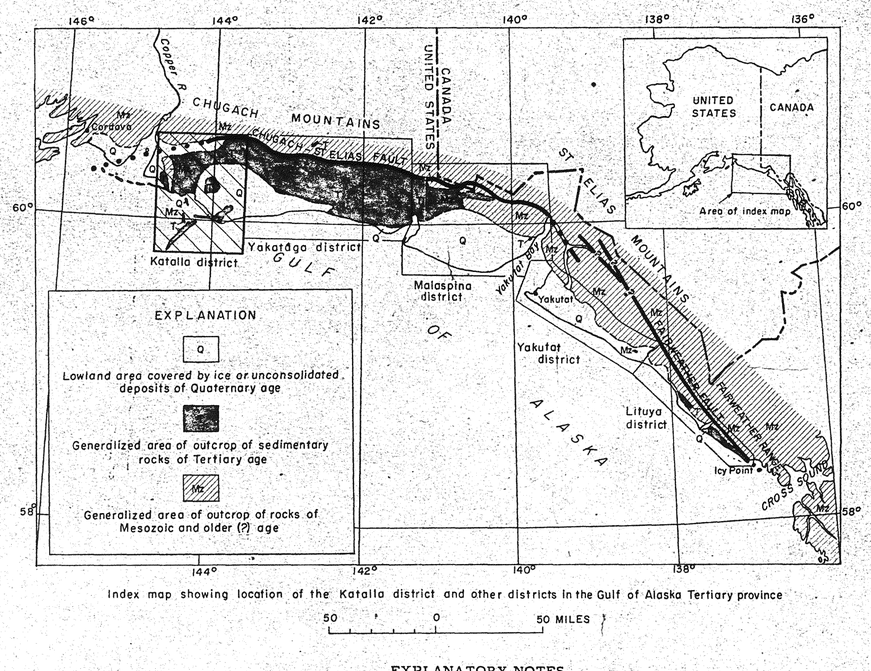
GEOLOGY COMPILATION DIAGRAM

1. Bedrock geology mainly from field mapping by D.J. Miller, D.L. Rossman, C.A. Hickcox, R.M. Vosburgh, and George Plafker, 1944-1953, supplemented by photointerpretation
2. Bedrock geology mainly from G.C. Martin (1908), pl. 5. Fold axes and attitude of beds added from field notes of Martin and others, 1903-1906; from field mapping by C.A. Fisher in 1909; and from field mapping by D.J. Miller, D.L. Rossman, and George Plafker, 1945 and 1953.
3. Bedrock geology mainly from photointerpretation, supplemented by field mapping by D.J. Miller in 1951 and 1953

Landforms and Quaternary unconsolidated deposits mainly from photointerpretation; in area north of lat 60° and west of long 144°, in part generalized from Reuben Kachadoorian (1960).



DETAILED GEOLOGIC MAP OF THE KATALLA OIL FIELD AND VICINITY, ALASKA



Index map showing location of the Katalla district and other districts in the Gulf of Alaska Tertiary province

EXPLANATORY NOTES

This map of the Katalla district is one of five maps at the same scale, showing the geology of the Gulf of Alaska Tertiary province (see index map). In this province, an arcuate belt more than 300 miles long and 2 to 40 miles wide, sedimentary rocks of Tertiary age are exposed or are inferred to underlie lowland areas covered by Quaternary unconsolidated deposits or ice (Miller, Payne, and Gryc, 1959, p. 37-47). Field studies were carried out in the province intermittently from 1944 to 1960, under the Geological Survey's program of petroleum investigations in southern Alaska.

The crystalline complex (Mzc) mapped in the northern part of the Katalla district appears from the air to consist of light-colored massive granitic rocks intruding crudely layered, hard rocks of predominantly green color, probably schists and other metamorphic rocks. Martin (1908, p. 26) reported fragments of granitic rocks, schists, gneisses, and greenstone on the glaciers flowing from this area. The rocks of the crystalline complex in this district are considered to be most likely of Jurassic age or older.

The rocks mapped as the volcanic unit (Mzv) north of the Chugach-St. Elias fault in the northeastern part of the Katalla district are correlated, on the basis of their appearance from the air and on aerial photographs, with the sequence consisting predominantly of lava flows and flow breccias, of probable early or middle Mesozoic age, in the adjoining Yakataga district (Brabb and Miller, 1960, p. 10-11). Argillite and graywacke were seen at two localities examined on the ground west of the foot of the Martin River Glacier and appear, from air reconnaissance, to be interbedded with volcanic rocks in spurs of the Chugach Mountains from long 144°08' to the west boundary of the map.

The volcanic unit (TMzv) mapped on Ragged Mountain and Wingham Island consist of interbedded volcanic and sedimentary rocks intruded by small bodies of granitic and more mafic igneous rocks. The bedded rocks are mainly flows, volcanic breccia, tuff, argillite, and graywacke, with minor amounts of slate, chert, and limestone. The volcanic rocks and the more mafic intrusive rocks show extensive alteration to chlorite and epidote.

The sequence of volcanic and sedimentary rocks on Ragged Mountain and Wingham Island was previously considered to be Mesozoic or older (Martin, 1908, p. 26-27; Miller, 1951, p. 11-13). Assignment of these rocks to the volcanic unit (Mzv) of probable early or middle Mesozoic age is strongly supported by the similarity in lithologic character and degree of alteration, but because the paleontologic evidence suggests a younger age, the sequence on Ragged Mountain and Wingham Island is here mapped as a separate volcanic unit of Mesozoic or Tertiary age (TMzv). Samples of impure limestone collected at locality d4612 and d4613 on the west flank of Ragged Mountain contain diatoms and silicoflagellates which, according to K. E. Lohman of the U.S. Geological Survey, strongly suggest a late Eocene age. The limestone occurs as thin beds and lenses in a succession of about 400 feet of interbedded argillite and graywacke, overlain and underlain by volcanic rocks. An unlabeled limestone cobble in the collection of the California Academy of Sciences, which the catalog description and field notes indicate was collected at locality C29223 on the east shore of Wingham Island, contains many specimens of a Turritella. C.E. Merriam of the U.S. Geological Survey believes that the Turritella is probably a middle Eocene species, though it also resembles some variants of a Late Cretaceous species.

Martin (1908, p. 27-36) divided Tertiary rocks in the Katalla district into the Stillwater, Kushtaka, and Tokun formations (in ascending order) north of Bering Lake, and the Katalla formation, south of Bering Lake. He was uncertain about the age and relative stratigraphic position of the Katalla formation, which is now known to be the youngest formation in an apparently conformable sequence totaling at least 14,000 feet in thickness and ranging in age from Eocene to Miocene.

The Stillwater, Kushtaka, and Tokun formations are shown as they were mapped by Martin (1908, pl. 5), on the part of this map lying north of lat 60°17-1/2' and east of the inferred fault along the valley of Dick Creek and Bering Lake. The Stillwater and Kushtaka formations in this area are believed to be at least partly equivalent in age--the predominantly marine beds of the Stillwater interfinger with and grade eastward into the predominantly nonmarine beds of the lower part of the Kushtaka.

The undifferentiated sedimentary rocks of Tertiary age (Ts) mapped in the northeastern part of the Katalla district are believed to be mainly the lithologic equivalents of the Kushtaka and Stillwater formations of Martin. Marine beds equivalent to the Tokun formation and lower part of the Katalla formation, or older than the Kushtaka and Stillwater formations, may also be exposed in this area. At locality D242(T), on the crest of the ridge northeast of the Berg Lakes, black concretion-bearing siltstone like that of the Stillwater formation in the type area apparently is both overlain and underlain by coal-bearing sandstone typical of the Kushtaka formation. At one other locality examined on the ground, on the crest of the ridge just east of the right-angle bend in the Martin River Glacier and just south of the Chugach-St. Elias fault, the rocks are mainly medium- to dark-gray fine-grained sandstone, with minor interbedded siltstone.

Black, concretion-bearing siltstone and gray to greenish-gray dense sandstone predominate in a narrow belt mapped as undifferentiated Tertiary rocks (Ts) east of the Ragged Mountain fault. Red and green argillite occurs in the siltstone-sandstone sequence west of the small intrusive body (Ti) about 6 miles north of the mouth of Katalla River. Foraminifera collected at locality 55AKd48 west of Martin Lake, and at locality 51AMr204B southwest of the above-mentioned intrusive body, include species of Eocene age, according to Ruth Todd of the U.S. Geological Survey.

The undifferentiated sedimentary rocks of Tertiary age (Ts) mapped on the southwest flank and at the south end of Ragged Mountain are mainly hard, fine- to medium-grained gray, greenish-gray, and brown sandstone, dark-gray to black siltstone, and massive pebble-boulder conglomerate. These rocks are less altered than, and are believed to be in unconformable contact with the rocks of the volcanic unit (TMzv) of Mesozoic or Tertiary age.

Siltstone interbedded with pink- to buff-weathering gray sandstone comprise the undifferentiated Tertiary rocks (Ts) at the south end of Wingham Island. Marine mollusks collected from these beds are not closely diagnostic of the age but suggest correlation with the Katalla formation.

The deposits of Quaternary age in the area north of lat 60° and west of long 144°, and also the glacial history of the Katalla district, are described by Kachadoorian (1960).

Oil and gas seeps were discovered in the Katalla district about 1896, and active exploration for petroleum began shortly after that (Martin, 1921, p. 11-34). At least 44 shallow wells were drilled in the district during the period 1901 to 1932 (Miller, Payne, and Gryc, 1959, table 3, p. 45-46). From 1902 to 1933 the Katalla field produced about 154,000 barrels of paraffin-base oil having a gravity of 41°-45° Bé. The productive wells are on a patented claim, the approximate boundaries of which are shown on the detailed map of the Katalla oil field and adjoining area. Federal oil and gas leases in effect at the end of 1960 covered most of the Katalla district south of lat 60°25' N., and south and west of the Bering Glacier.

Coal ranging in rank from low-volatile bituminous to anthracite occurs in the sequence of rocks of Tertiary age exposed in the part of the Katalla district lying east of the inferred fault along Dick Creek and north of lat 60°17-1/2'. The coal is associated mainly with the Kushtaka formation and equivalent strata in the undifferentiated lower Tertiary rocks (Ts), but it is also present locally in the Stillwater formation as mapped by Martin (Fisher, 1910, p. 1089-1090). The geology and coal resources of the Bering River coal field were treated in detail by Martin (1908, p. 65-94), and were reviewed more recently by Barnes (1951). At the end of 1960 coal-prospecting permits covered more than 18,000 acres in the Bering River field.

Selected references

Barnes, F.F., 1951, A review of the geology and coal resources of the Bering River coal field, Alaska: U.S. Geol. Survey Circ. 146, 11 p.

Brabb, E.E., and Miller, D.J., 1960, Reconnaissance traverse across the eastern Chugach Mountains, Alaska: U.S. Geol. Survey open-file report, 29 p., Aug. 10, 1960.

Fisher, C.A., 1910, Report on the Cunningham coal property, Controller Bay region, Alaska: U.S. Congress, Investigation of the Department of the Interior and of the Bureau of Forestry. Hearings before Joint Committee to investigate Interior Department and Bureau of Forestry, v. 2, p. 1073-1092.

Kachadoorian, Reuben, 1960, Engineering geology of the Katalla area, Alaska: U.S. Geol. Survey Misc. Geol. Inv. Map I-308.

Martin, G.C., 1908, Geology and mineral resources of the Controller Bay region, Alaska: U.S. Geol. Survey Bull. 335, 141 p.

_____, 1921, Preliminary report on petroleum in Alaska: U.S. Geol. Survey Bull. 719, 83 p.

Miller, D.J., 1951, Geology and oil possibilities of the Katalla district, Alaska: U.S. Geol. Survey open-file report, 66 p., Oct. 1, 1951.

Miller, D.J., Payne, T.G , and Gryc, George, 1959, Geology of possible petroleum provinces in Alaska: U.S. Geol. Survey Bull. 1094, 131 p.

Miller, D.J., Rossman, D.L., and Hickcox, C.A., 1945, Geologic and topographic map and sections of the Katalla area, Alaska: U.S. Geol. Survey prelim. rept. (map and mimeographed text).

EXPLANATION

UNCONSOLIDATED SEDIMENTARY DEPOSITS

The units listed below overlap in age and therefore are not arranged in stratigraphic order

Qs — Undifferentiated surficial deposits

Mainly glaciofluvial, fluvial, and lacustrine gravel, sand, and mud; includes lagoon and tidal-estuary deposits at present and former shorelines

Qg — Glacial moraine deposits

Undifferemtiated deposits of one or more glacial advances; mainly till, but includes lake and glaciofluvial deposits in places. Arrow indicates direction of ice movement as inferred from trend of elongate ridges and trenches

Qsp / Qsf — Marine shoreline deposits

Mainly sand; gravel in places.
Qsp, beach, beach-ridge, spit, and offshore bar deposits associated with present shoreline
Qsf, beach, beach-ridge, and spit deposits associated with former shorelines

Qes / Qed — Eolian sand

Qes, deposits with sparse vegetation cover, associated with present shoreline
Qed, vegetated dune deposits

BEDROCKS

Unconformity

Intrusive igneous rocks

Tku, Tkm, Tkl — Katalla formation

Tku, upper part, sandstone, siltstone, mudstone, conglomeratic mudstone, and conglomerate; marine
Tkm, middle part, mainly siltstone; interbedded with fine-grained sandstone in basal and uppermost parts; marine
Tkl, lower part, mainly sandstone, with minor siltstone; largely or wholly marine. May include upper part of Tokun formation locally at northeast end of Nichawak Mountain

Tkum, TKml — Katalla formation

Tkum, undifferentiated upper and middle parts
Tkml, undifferentiated middle and lower parts

Tt — Tokun formation

Interbedded siltstone and sandstone in upper part; mainly siltstone in lower part; marine. May include basal sandstone of Katalla formation in northeastern part of Katalla district, north of lat 60°17-1/2' and east of inferred fault along valley of Dick Creek

Tka / Tsr — Kushtaka and Stillwater formations

Tka, Kushtaka formation, sandstone, mainly arkosic; siltstone, and coal; nonmarine and marine
Tsr, Stillwater formation, mainly marine siltstone, but includes coal and thick beds of arkosic sandstone in vicinity of Stillwater Creek

Unconformity?

Volcanic unit

Mainly interbedded volcanic rocks, argillite, and graywacke. Includes small bodies of intrusive igneous rocks

Relations unknown

Mzc — Crystalline complex

Undifferentiated metamorphic and intrusive rocks

Volcanic unit

Mainly volcanic rocks; interbedded with argillite and graywacke in northwestern part of Katalla district

Ts — Sedimentary rocks, undifferentiated

Mainly sandstone and siltstone, marine and nonmarine. Coal-bearing at places in northeastern part of Katalla district

QUATERNARY
TERTIARY
JURASSIC OR OLDER

GEOLOGIC SYMBOLS

Contact — Dashed where approximately located; dotted where concealed; queried where inferred

Fault, showing dip — Dashed where approximately located; dotted where concealed; queried where inferred. U, upthrown side; D, downthrown side

Anticline

Syncline

Overturned anticline

Overturned syncline

Folds

Showing trace of axial plane and direction of plunge of axis; dashed where approximately located

Strike and dip of beds

Strike and dip of beds, up side not known

Strike and dip of overturned beds

Strike of vertical beds (90 is on up side where known)

Average strike and dominant direction of dip of tightly folded beds

Attitude of beds

Dashed strike bar indicates attitude estimated from ground or aerial photographs or from distant views

Oil seep

Gas seep

Location of well drilled for petroleum

Wells in Katalla oil field and vicinity shown only on detailed map. Numbers refer to table 3, U.S. Geological Survey Bull. 1094

C29174 + 15028 — Fossil locality, showing reference number

California Academy of Sciences locality numbers preceded by "C"; all others are Geological Survey locality numbers. Fossil localities not shown in area of more detailed mapping east of long 144°29', between the meridians 60°9-1/2' and 60°17-1/2'

GLACIERS AND LANDFORMS

Present margin of glacier or ice field

Maximum stand of glaciers during youngest Recent advance; coincides with boundary of Qg deposit in places. Dashed where approximately located, queried where inferred. Projections are on side toward ice

Maximum stand of glaciers during older Recent advance; coincides with boundary of Qg deposit in places. Dashed where approximately located, queried where inferred. Projections are on side toward ice

Maximum stand of glaciers where definite evidence of only one Recent advance is recognized; coincides with boundary of Qg deposit in places; not shown where coincident with present front of Bering Glacier. Dashed where approximately located. Projections are on side toward ice

Raised sea cliff. Line is at base of cliff and shows position of former marine shoreline; coincides with boundary of bedrock formation in places. Figure shows approximate altitude of former marine shoreline

Wave-cut bedrock surface overlain by thin or discontinuous unconsolidated deposits

Relatively flat erosion surface on bedrock, overlain by thin or discontinuous unconsolidated deposits; origin uncertain. Figures show approximate altitude

Landslide

Ridge line

Bedrock reef below mean high tide

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

GEOLOGY OF THE KATALLA DISTRICT, GULF OF ALASKA TERTIARY PROVINCE, ALASKA

By

Don J. Miller