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COAL INVESTIGATIONS ON THE SOUTHWEST MARGIN OF THE HOMER DISTRICT, KENAI COAL FIELD, ALASKA, IN 1949

By

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INTRODUCTION

The present report presents the results of work in the 1949 field season and supplements a report by Barnes (1949) on coal investigations on the southern margin of the Homer district. Barnes' report covers investigations of coal-bearing rocks of the Tertiary Kenai formation in a coastal belt between Bluff Point, 1½ miles west of Homer, and the head of Kachemak Bay. The present report deals with similar coal-bearing strata of the Kenai formation exposed along the shore between Bluff Point and the village of Ninilchik (see index map), and is the result of investigations conducted between June 23 and September 8, 1949, by the writer, with the aid of F. J. Markewicz, field assistant, for the entire period and of D. M. Hill, geologist, after July 22. The field work comprised measurement of stratigraphic sections, tracing individual coal beds, and geologic mapping along the shore.

GENERAL DESCRIPTION OF THE AREA

Barnes (1949, p. 2) has defined the Kenai coal field as the coal-bearing part of the Kenai lowland, which lies between the Kenai Mountains on the east and Cook Inlet on the west and extends from Turnagain Arm south to Kachemak Bay. The part of the Kenai coal field south of Tustumena Lake and the Kasilof River, which drains it, was defined as the Homer district. The southwest margin of the Homer district is the subject of the present report.

The western part of the Homer district consists largely of a dissected rolling surface less than 500 feet in altitude. Anchor and Ninilchik Rivers, Stariski and Deep Creeks, and the upper parts of numerous smaller streams occupy broad open valleys or wander through poorly drained areas dotted with the small lakes and ponds typical of Alaskan muskeg. The lower courses of the smaller streams either cascade over nearly vertical bluffs to tidewater or flow in narrow steep-walled ravines that are now undergoing active erosion.

Steep beach bluffs, interrupted by gentler slopes where valleys in the preglacial land surface have been filled with unconsolidated sediments, truncate the upland surface. Nearly everywhere along the coast storm waves and high tides reach the base of the bluffs, which are consequently receding rapidly. Near Anchor Point, where the bluff is low and composed of poorly consolidated glacial and fluvial sands and gravels, retracing of a section line showed more than 80 feet of bluff retreat since 1918, the date of the survey by General Land Office (now Bureau of Land Management).

The climate of the Homer district (Barnes, 1949, p. 3) is characterized by cool summers, winters that are mild for the latitude, and low precipitation. July and August, the warmest months, have a mean temperature of 50° to 55° F; and January and December, the coldest months, of 13° to 23° F. The mean annual precipitation is about 17 inches at Kasilof and 27 inches at Homer.

The vegetation of the district is varied and uneven in distribution. Fireweed, bluejoint, wild celery, and other weeds and grasses are widespread. Spruce grows abundantly on well-drained slopes and in some of the smaller stream bottoms, but is generally too small for good lumber, though adequate for mine timbers and cabin logs. Alder and elderberry in dense thickets grow on the same terrain as the spruce and on some of the less steep beach bluffs. Groves of cottonwood grow on the bottomlands of some of the larger streams. Tangled masses of devil's-club and nettles are common in shaded ravines.

The principal population centers of the Homer district are Homer, Anchor Point, and Ninilchik, though homesteads are scattered along the bluffs overlooking the beach and along the new Sterling Highway, which connects Homer with the town of Kenai and with other roads leading to the Alaska Railroad and the city of Seward. The main industries of the district are fishing and farming. A large part of the male population is also employed part or full time by the Alaska Road Commission and a permanent staff is maintained by the Civil Aeronautics Authority at the Homer airport. Homer and Ninilchik are served regularly by both Pacific Northern Airlines and Alaska Airlines. Large aircraft can use the 5,000-foot gravel runway at Homer; but at Ninilchik, where the beach below high-tide line is used for an air strip, only small planes can land. At the end of Homer Spit a dock suitable for ocean-going vessels is connected with the town by 7 miles of good graveled road.

STRATIGRAPHY

The only bedrock formation exposed in the Homer district is the coal-bearing Kenai formation, which is of Tertiary age, and on the basis of plant fossils is placed in the Eocene series (Smith, 1939, p. 61). Quaternary glacial and fluviatile sediments, including till, gravel, sand, and clay, cover the greater part of the district. Bedrock is exposed only in the beach bluffs, in some stream beds, and on some of the higher slopes of interstream divides.

The Kenai formation consists of partly indurated sand, silt, and clay in thin interfingering beds and lenses, with interstratified thin conglomerate lenses and many beds of subbituminous coal less than 6 feet thick. Ferruginous masses, both as distinct bands and as scattered nodules, are abundant throughout the formation.

The total thickness of the Kenai formation is not known, as neither top nor base is exposed in the areas studied. The total stratigraphic thickness represented by sections measured between Bluff Point and Troublesome Creek is about 1,150 feet. As Barnes (1949, p. 4) measured about 2,300 feet of stratigraphically higher strata between Bluff Point and the head of Kachemak Bay, the maximum known thickness of the Kenai formation in the Homer district is about 3,450 feet. The stratigraphic section exposed along the east shore of Cook Inlet between Anchor Point and Ninilchik, about 2,000 feet thick, is probably a duplication of part of that exposed east of Troublesome Creek, but the absence of recognizable key beds precludes any correlation between the two areas on the basis of available data.

The general similarity of stratigraphic sections throughout the Homer district indicates that fairly uniform conditions obtained over the whole area during the time of deposition. On the other hand, the lenticularity of individual strata and rapid changes in grain size along the bedding indicate that at any one place conditions were constantly changing.

The only unconformity recognizable for a distance greater than a few tens of feet is present in the bluff about 3 miles south of the mouth of Deep Creek in sec. 20, T. 2 S., R. 14 W. For several hundred feet sandstone terminates against a gently north-dipping irregular surface that is overlain by interbedded silty claystone, siltstone, and fine sandstone. As the bedding above the unconformity is parallel to that below, the writer considers this feature to be the record of a shift in the position of a major stream that cut a channel in its own floodplain sediments, shifted laterally, and deposited new and finer material in its old channel.

STRUCTURE

The structure of the Kenai formation exposed along the shore between Bluff Point and Ninilchik is relatively simple and is characterized by gentle folds, in which dips are everywhere less than 15° and generally less than 10°, superposed on a broader structure in which the strike is generally about parallel to the shore line and the dip is landward. Exceptions to this generalization, however, are found in strata exposed below mean low tide between points 0.6 mile southeast and 2.4 miles northwest of the mouth of Troublesome Creek. There the strike is generally normal to the trend of the shore line and the dips are variable and include the steepest measured in the southwest part of the Homer district. As these strata are above water for only a few hours per month, it was not practicable to make detailed observations upon which to base a valid interpretation of the local structure.

Bedrock exposures are restricted to too narrow a belt to allow determination of the general trend of folds, which are revealed only by reversals of the apparent dip of beds visible in the beach bluffs or in exposures well below high-tide level. On the basis of these incomplete data four synclines and four anticlines were distinguished. Six of these folds, with axes approximately at localities 4, 6, 14, 15, 16, and 17, are shown on the illustration of stratigraphic sections of coal-bearing strata between Bluff Point and Troublesome Creek. These sections were plotted with reference to a true datum, the beach; so the correlation lines reflect the structure. The other two folds are in strata exposed below mean low tide northwest of Troublesome Creek. Both folds are shown only by the upper surfaces of stripped coal beds, marked by numerous irregularities including several coalified tree stumps, which make accurate determination of attitude impossible.

Six high angle faults with stratigraphic displacements greater than 2 feet were observed between Bluff Point and Deep Creek. Three cut the Kenai formation about 0.6 mile southeast of the mouth of Troublesome Creek (see map). The aggregate effect of the three faults was to drop the southeastern block about 23 feet stratigraphically. However, the great discordance of strikes on opposite sides of this group of faults and the marked offsets in indicated by the small amount of stratigraphic displacement. The other three high-angle faults, about 4.8 miles north of Cape Starichkof, are normal. Their net effect was to drop the north side about 9 feet stratigraphically.

Two small thrust faults (not shown on geologic map), with displacements of less than a foot, were observed in T. 2 S., R. 14 W. south of Deep Creek. As both faults are exposed only in nearly vertical beach bluffs, it is possible that they are the result of slump.

COAL BEDS

The coal of the southwest part of the Homer district, like that of the southern part of the district (Barnes, 1949, p. 6), occurs in many beds, all less than 6 feet thick, and well distributed throughout the thickness of the Kenai formation. In the known thickness of the formation it is impossible to find a 150-foot section without at least one coal bed. The coal of the southwestern part of the Homer district is identical in appearance with that of the southern margin of the district and is assumed to have the same physical and chemical properties. Analyses of coal from the vicinity of Homer, including several samples from the Homer coal mine, show it to be subbituminous, with an average heating value of 9,980 Btu, air dried, and to contain 4 to 20 percent ash (Barnes, 1949, p. 8).

Near Bluff Point individual coal beds can be traced continuously for only about a mile. In T. 5 S., R. 15 W., and in T. 6 S., Rs. 14 and 15 W., one bed can be correlated with considerable certainty for about 2 miles, but the outcrop is interrupted by a wide valley in the preglacial land surface. In only a few other localities is the exposed thickness of coal-bearing strata great enough and are dip components sufficiently low for the same coal bed to appear in more than one or two measured sections. Even in these short distances individual beds vary greatly in thickness, amount of bone, and number and position of partings. Such lateral variation in coal beds lends further support to the conclusion, based on similar variations in the intervening barren strata, that although the general environment during the deposition of the Kenai formation remained constant, any given locality was subject to ever changing conditions.

COAL RESERVES

The average heating value of several samples of coal from the Homer district is about 10,000 Btu, air dried. Therefore, according to the system prescribed by the Geological Survey for the classification of public lands (Smith et al., 1913, pp. 69-70), areas in the Homer district underlain by coal in beds only 1.5 feet thick could be classified as coal-bearing. However, as past mining practice has shown that beds of considerably greater thickness are necessary for profitable mining in Alaska, 2 feet was chosen arbitrarily as the absolute minimum thickness in calculating reserves in this area.

Thicknesses shown opposite coal beds in the small-scale stratigraphic sections on the accompanying illustration have been corrected for partings by the pricing method used by the Geological Survey, (Smith, et al., 1913, p. 70) which is based on the assumption that a given amount of coal in two or more benches is less valuable than if in a single bed.

In the absence of information on the inland extension of potentially minable coal beds, the tonnage figures in the accompanying table were computed on the assumptions that each bed extends inland for a distance equal to half the known length of outcrop and that each bed maintains the same average thickness as at the outcrop. No reserves were calculated for coal exposed below high-tide level. Each acre-foot of coal was assumed to equal 1,750 tons.

The tonnage figures given in the accompanying table are conservative and probably represent only a small fraction of the total coal in beds more than 2 feet thick in the southwest part of the Homer district, but available data do not warrant estimates for entire townships. Much more field work, consisting largely of exploratory drilling and trenching, will be required before coal resources farther inland can be estimated with any degree of accuracy.

Indicated coal reserves in part of the Homer district, Kenai coal field, Alaska

Township and coal beds	Average Thickness (feet)	Area (acres)	Tons	Totals
T. 6 S., R. 14 W.				
2 beds, more than 4.0 ft.	4.1	294	2,110,000	
4 beds, 3.0 - 3.9 ft.	3.2	422	2,360,000	
6 beds, 2.0 - 2.9 ft.	2.6	206	940,000	5,410,000
T. 6 S., R. 15 W.				
2 beds, 3.0 - 3.9 ft.	3.2	107	600,000	600,000
T. 5 S., R. 15 W.				
1 bed, 3.0 - 3.9 ft.	3.5	6	40,000	
5 beds, 2.0 - 2.9 ft.	2.7	359	1,700,000	1,740,000
T. 4 S., R. 15 W.				
1 bed, 2.0 - 2.9 ft.	2.0	103	360,000	360,000
T. 3 S., R. 15 W.				
1 bed, 2.0 - 2.9 ft.	2.5	2	10,000	10,000
T. 3 S., R. 14 W.				
1 bed, more than 4.0 ft.	4.5	26	210,000	
4 beds, 3.0 - 3.9 ft.	3.2	116	650,000	
2 beds, 2.0 - 2.9 ft.	2.8	19	90,000	950,000
T. 2 S., R. 14 W.				
3 beds, more than 4.0 ft.	4.6	173	1,390,000	
2 beds, 3.0 - 3.9 ft.	3.0	87	460,000	
3 beds, 2.0 - 2.9 ft.	2.8	93	460,000	2,310,000
TOTAL				11,380,000

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