Short Papers and Notes

NOTES ON THE SHORELINE RECESSION ALONG THE COAST OF THE YUKON TERRITORY

The 150-km.-long stretch of the coast between Herschel Island and the Mackenzie Delta terminates in bluffs cut into Pleistocene silts, sands, and gravels. No bedrock has yet been observed; if present, its occurrence must be very local. The coastal bluffs, which are up to 50 m. high, are constantly being undermined by waves and by the melting of numerous thick tabular ground-ice sheets lying close to sea-level. As the ice sheets are found only in fine-grained sediments, coastal retreat is especially rapid along silty to clayey bluffs. Similarly rapid recession has taken place along the northern coast of Alaska[1] and from the Mackenzie Delta east to Langton Bay[2]. It is the purpose of this note to describe some of the geomorphological and historical evidence for recession of the coast of the Yukon Territory. The field observations were made while the writer was carrying out studies for the Geographical Branch, Department of Mines and Technical Surveys, Ottawa.

King Point

In the late summer of 1905 Roald Amundsen with his crew in the *Gjøa* were hopeful of completing the Northwest Passage by sailing west around Alaska, but ice stopped them near King Point, where winter quarters were established. The residence was built an estimated 10 to 15 m. inland from the beach, the magnetic observatory about 5 to 10 m. During the winter a member of the expedition, G. Wiik, died and was buried in the magnetic observatory. In 1908, 2 years after Amundsen's departure, Stefansson[3] photographed the ruins of the winter residence, which by then was nearly engulfed by the sea; by about 1911 every vestige had vanished. Furthermore, the Royal North West Mounted Police, at the request of the Norwegian Government, moved Wiik's grave inland in 1908, because it was in danger of falling into the water[4]. The R.N.W.M.P. moved the grave 230 m. inland and stated in its report that there was "now no danger of the sea encroaching on the present position of the grave". The respite gained was brief, because in about 1923 the grave marker was again moved inland, this time by some 140 m., and by another 100 m. in 1955. On July 13, 1957 the marker was only 7 m. from the edge of the coastal bluff and 20 m. from high tide level. According to these figures, cliff recession from 1906 to 1957 exceeded 450 m. As several of the distances were visually estimated, and some overlap in measurement may have occurred, the actual retreat may have been considerably less than the sum of the individual measurements. Even so, an annual rate of at least several metres may be safely inferred. A comparison of early photographs with the modern terrain adds corroborative evidence. A photograph taken in the winter of 1905-06 by Amundsen[6] shows the *Gjøa* anchored off King Point with Kay Point clearly visible in the background. This viewpoint could not be attained in 1957 until a position was occupied several hundred feet out to sea. In 1913 K. G. Chipman of the Canadian Arctic Expedition took a photograph at King Point[7]. A comparison with identifiable features in 1957 showed that the total recession for the 50-m.-high sand and gravel hills in the background exceeded 20 m. The foreground of the photograph shows extensive slumping from the melting of ground-ice sheets 2 to 5 m. thick. It is quite apparent that Amundsen's winter residence of 1905-06 was built over a seaward extension of the ice sheets, the same holding true for the area from which Wiik's grave marker was removed in 1908 and again in subsequent years. At King Point coastal recession since 1913 in the area underlain by ground-ice sheets has been at least ten times as rapid as in the higher sand and gravel area without ice sheets.

Sabine Point

When Captain John Franklin explored the coast in 1826, 6 days were spent near Sabine Point, which formed the eastern extremity of a wide though not deep bay[8] (Fig. 1a). Amundsen had no difficulty in locating Sabine Point in 1905. Fig. 1b shows that there is now only a smooth coast with nothing even remotely resembling a "point"; it is also impossible to distinguish any "point" in sailing along the coast. Although Franklin's map may exaggerate the depth of the bay and the prominence of the adjoining points, major smoothing of the coast in the past 150 years is evident.

Kay Point

The earliest map[9] of Kay Point, dating from Franklin's survey in 1826, shows a 4-km.-long island about 5 km. northwest of Kay Point. Today only a shoal under several metres of water marks the site of the former island.

Delta protection

Midway between Blow River and Shingle Point, just west of the Mackenzie Delta, an unnamed river has built its delta for 1 km. seawards from cut bluffs, which form the coast (Fig. 1c). The shape of the "mainland" coast suggests that the bluffs on either side of the delta have retreated about 300 m. since delta building began. Greater recession on the northwestern side is in agreement with the direction of storm waves.

Herschel Island

There is strong evidence to support the view that Herschel Island is a glacier ice-thrust feature whose profile,

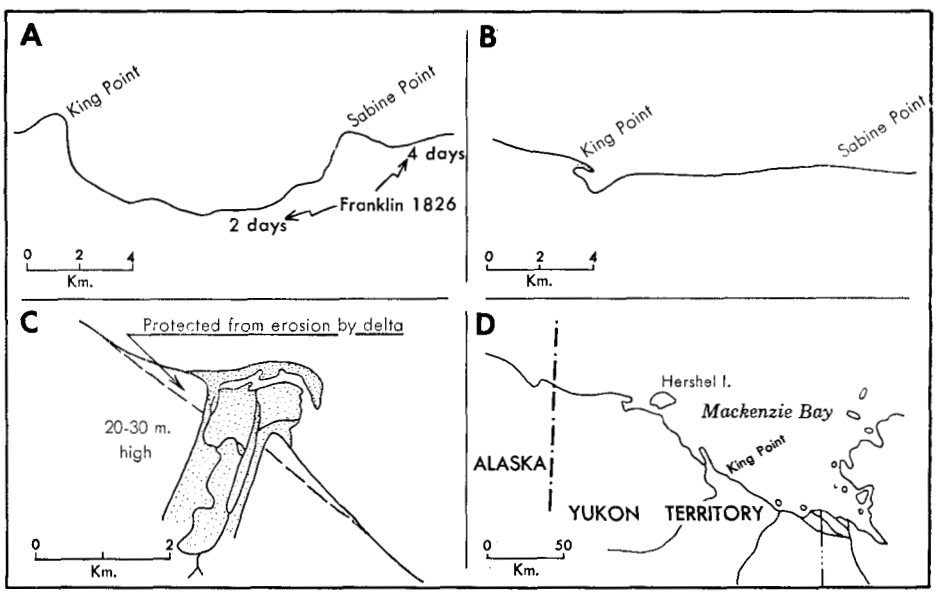

Fig. 1a-c. (a) Copy of Franklin's map of 1826 showing Sabine Point with the sites where he spent 4 and 2 days ashore. (b) The present coast of the area shown in (a); note the absence of any promontories at Sabine and King points. (c) The seaward growth of the delta is believed to have partly protected the adjacent mainland from excessive erosion, while the unprotected areas have been cut back. Recession has been greater on the stormy exposed northwest side.

broken only by wave-cut bluffs, forms a continuous curve with a submarine basin[10]. The projected land profile, as shown in Fig. 2, reaches the sea floor at the 15-m. submarine contour. The total amount of postglacial coastal recession is estimated at 2 to 3 km. along the southeastern coast, with an average recession of about 2.5 km.

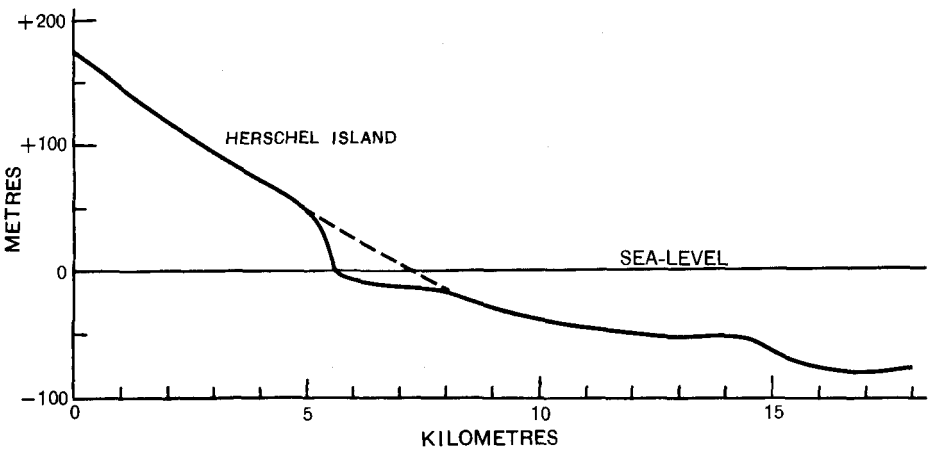

Fig. 2. The wave-cut bluff at Herschel Island suggests a recession of 2 to 3 km. The generalized profile runs from northwest to southeast.

Conclusion

From the proffered evidence and additional examples that could be cited, it is apparent that recession of relatively great magnitude has taken place along the coast of the Yukon Territory in postglacial and historic times. The most rapid recession has been in low bluffs of fine-grained sediments with a high ice content; in such areas a rate exceeding 1 m. per year may occur. Coastal retreat in sand and gravel bluffs tends to be less rapid. A collation of Alaskan data with those from the Yukon Territory and the District of Mackenzie shows that much of the coast between Point Barrow, Alaska and Langton Bay, District of Mackenzie is receding rapidly.

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[1]Leffingwell, E. de K., 1919. The Canning River region, northern Alaska. U.S. Geol. Surv. Prof. Pap. 109, 251 pp. MacCarthy, G. R. 1953. Recent changes in the shoreline near Point Barrow, Alaska. Arctic 6:44-51.

[2]Mackay, J. R. 1948. The Anderson River Map-Area, N.W.T. Ottawa: Geographical Branch. Mem. 5, 137 pp.

[3]Stefansson, V. 1951. My life with the Eskimo. The Macmillan Co., figure facing p. 36.

[4]Jennings, G. L. 1910. Royal North West Mounted Police Reports. Fort McPherson, 16th February 1910. Ottawa.

[5]Personal communication from Supt. W. G. Fraser, R.C.M.P., Ottawa.

[6]Amundsen, R. 1908. The North West Passage. London: Archibald Constable Co., Vol. II, p. 138.

[7]Geological Survey of Canada, Photo. No. 39587.

[8]Franklin, Capt. J. 1828. Narrative of a second expedition to the shores of the polar seas, in the years 1825, 1826, 1827. London: J. Murray, p. 122.

[9]Scott Polar Research Institute, Cambridge, England. Lefroy bequest, MS. 248.

[10]Mackay, J. R. 1959. Glacier ice-thrust features of the Yukon coast. Ottawa: Geogr. Bull. 13:5-21.