Coast of Yukon Delta
Alaska

Descriptive report to accompany the following topographic sheets:

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These sheets cover the coast line of the Delta, with the exception of some portions near the Kawanak and Kuskokwim Mouths (see work of Varco 1879) and near the Apoon Mouth (see work of party of Assistant Pratt 1878). As far as known no white man had previously traversed this shore, and its portion on previous charts was out from 10 to 25 miles (it was further to seaward than had been shown).

The coast is low and marshy, the entire distance, with the exception of some portions near the Kawanak and Kuskokwim Mouths, was covered with marshy flats, except near the mouths of some of the streams. There were found to be 26 outlets of the river, more than 200 metres wide at the coast. The following descriptive notes are taken from a report prepared by Dr. W. W. Edmonds (who executed the work) and transmitted by me to the Superintendent Dec. 14, 1879.

This report describes more fully both the region and the work. There are quite distinct characteristics that divide the Yukon Delta coast into three portions. The first extends from the Kuskokwim to the Kawanak and Kuskokwim Mouths; the second extends 25 miles from the Kuskokwim to the Boklichenwhit, and is characterized as very swampy; the third portion...
is distinguished by getting point of land, occasional bushes and patches of deep moss. In the southern section most of the shore line is a low bluff from 2 to 3 feet above the outgoing sand, with firm hard sand and sand extending at low tide from 1 to 2 miles out to sea. At high water one can keep generally within a quarter of a mile of shore in light draught boats, such as Petroplophantes. Loaded boats at any time must keep out 2 or 3 for that reason an indication of land exists. With light draught boats there is no difficulty at medium high tide in finding suitable camping spots.

Larger streams enter the sea every few miles, and smaller streams and sloughs at every half mile or so. These all furnish favorable camping places and some drift wood for fires. The small streams cannot usually be entered at any time except in small canoes. The largest can be entered at any time in light draught boats; namely, the Kwaquelunkt, 5 miles north of the Quoogon; the Bagnominork, 17 miles from the Quoogon; and the Kwaquelunkt system, 20 miles from the Quoogon, which can be entered by small boats at any time. The Kwaquelunkt is hard to locate from the sea except at high tide. In the Bagnominork there is a conical stack of wood a mile up the river and the entrance lies up the coast from ahead of the stack. All the other streams but these mentioned shallow out at varying distances from the shore and as the sea bottom is hard they can be easily waded around. The widest streams are sometimes the easiest to pass around as for instance the Kwenug which is shoal almost at the coast line but is over half a mile wide, while the channels of the Kwaquelunkt present the depth some distance to sea.

The first ten miles of coast is marshy with slightly raised banks. There are innumerable sloughs and poor camping places, and the drift wood line is situated on slightly higher ground too far from the coast to be utilized. From here for another 8 miles the ground becomes even more marshy and seemingly a vestige of wood exists except on the banks of the Bagnominork. From here on however the banks become better and wood appears in quantity. Land may be
approached nearer and favorable spots for camping found almost anywhere. Loaded boats must however be anchored far from shore and outfit hauled or carried in to shore.

Between the Wrangell (Kwikelwolf mouth) and the Kavanat mouth the distance is about 25 miles. Natives may often be seen in their kayaks traveling over this stretch, making the distance in a short day. Only in one place do they take advantage of inland passages, namely to avoid the shallows of the mouth of the Kweqnf. They make use here of the branch channels of the Kweqnf, avoiding thus about five miles of coast. No grass islands exist on this stretch except a semicircle of small islands about the Kweqnf entrance. The Kweqnf and the Kangawol Knox rivers are used by the natives to go into the interior, even up towards the head of the delta, and are navigable for good sized boats except at the entrance.

The general appearance of this coast is of course desolate. No trees or bushes can be seen, except some bushes near the Kavanat. There are no habitations except one a mile up the Kangawol Knox. In all this area except in the neighborhood of the Kwikelwolf and the Kavanat, there are less than a dozen habitations. Four of these are on the Kweqnf, two or three on the Kangawol Knox, and the rest at the junction of the most important sloughs. They consist usually of but a single hut and are uninhabited the greater part of the year.

The first 5 or 6 miles on either side of the Kavanat and Kwikelwolf are characterized by good banks and deep and well defined streams; with scattered drift wood. Light draught boats can keep well in shore. Lines of brush extend along the main rivers a short distance from the coast. The better streams are all marked by stakes of wood at varying distances from the shore. Natives live in again manifest, the villages and single houses of this locality being the only ones along the whole face of the delta from beginning to end. From here to the Kwikwolf mouth is one days journey in a kayak, and to the Apron or to Kotlik it is a two days' trip. From here to Kotlik it takes two days in a good sailboat with favorable wind.
After leaving the first half there are 5 or 6 miles of good land. Then one enters upon the second half, or running lands proper. Here the grass lands slope gradually down to the sea, and merge into the mud and slime of the ocean. During high tides Beiny sea covers a half mile or more of grass lands, and at low tide a still greater area of mud is often exposed. No dwellings whatever are to be found here. For five weeks Dr. B. says not a sign of human being, even in the distance up keyako. The country is a paradise of water fowl and mosquitoes. One almost stumbles over the geese, and on the beaches they scarcely get out of the way of the boat. To add to the utter desolation and disquieting influence, the boom is present in force.

Travel along the coast is only possible at high water in small boats. At low water even an unloaded Fiteborough may be aground entirely out of sight of land. To enter even the largest bemes in empty boats one must drag the boat some distance over the flats until the river channel is entered. At high tide there is however no trouble.

The redeeming feature of this whole district are the high conical woodstacks that mark the streams affording safe stopping places. These stacks may be observed from some distance off shore even when out of sight of land, and are situated a mile or two up the river at the first proper camping spot. Usually there is enough old drift wood nearby for lighting purposes. As the rivers approach the coast at varying angles it is not often easy even after sighting a woodstack to find the river mouth. The water is so shallow that one cannot approach near enough to land to distinguish its features well. One may possibly be compelled to wade ashore and tramp the mud a mile or so each way to find the river entrance. The streams themselves shod so rapidly in the sea that at the distance one travels from shore, except at high tide, no river channel is run across. In finding the entrance, the first indication of elevated banks is at least a half mile up the river. Only one side of a river at any place has high banks, the channel side. It is not safe to camp lower down a river than at the first
woodstacks, and even there it is sometimes safer to sleep on
staging, as at any time after southerly winds the sea seems to
come inland a full mile or more, and this occurs with an
alarming rush and noise. At low tide, standing at the grass
edge, the sea is often invisible. For hours sea gulls may be
seen wading around in an inch or so of water a mile from
shore. Imagine distant objects so that birds and men, and boats
and logs are not distinguishable at times.

The mud itself is exasperating. At very low tide far
out there is slightly firmer mud. Closer in, the mud usually
uncovered is very sticky and wetted to walk on. Closer in
shore often the mud was covered with a thin layer of slime
or mud-moss. The shore is grassy and wet and swampy
and cut up by ditches. A few howsemen stumps half hidden in
the marsh, mark the course of some of the larger streams.
Travel on foot is impossible except along the outside mud
flats, wading out around the river mouths.

From the Kuneekpak to the good lands near the Glagoyewk
while there are but few rivers affording good stopping places.
Three miles from the Kuneekpak there is a branch of the same;
at 14 miles the Rualiogweengak; at 18 mile the Glagoyewk
and at 22 miles the Gowk. These streams are all marked
by the woodstacks, the Glagoyewk having two.

Along this stretch only distant views of illussors may be
obtained on fair days. All else is grass and water. From the
time of leaving the Bagnowewk where the last view of the
Kuneekpak was obtained, no elevations are visible until near
the Glagoyewk, a distant view of the tops of the mountains back
of "Hopback", and later on those behind Pt. Romand, is obtained.

The last stretch of coast of about 25 miles is the most
pleasant. The Apon Foss approaches the coast somewhat and
many rivers connect the sea and the Apon. These are all
well defined and have raised banks and are heavily lined
with willow and other bushes to within a short distance of the
coast. The wild cries of the loon and the gosse close to
disturb one, and the ptarmigan make their appearance.
along with the moss and berries and bushes. A large portion of the coast has raised banks close to which one can go in small boats at high water, and often even at low water. The mountains near Kotik and Romany become more and more distinct, and finally the noise of the river steamers may be heard, and at last the steamers themselves appear, gliding behind the lines of bushes. The coast is a succession of points dividing the river channels, and in many places sloughs or wider channels cut up the points into islands and afford local inland passages. Spots of brush often appear almost at the sea shore and patches of thick moss in places. Usually a grass margin occupies the shore line, indicating by its shown appearance the sweeping of the high tides. Even here one must select his camping places away from the coast. The sea is still shallow, but the river channels are better and extend further out to sea. They are no longer marked by woodstacks.

The lower parts of the rivers are bare, perhaps for a half mile or more from the coast. Then scattering brush and deep moss make their appearance. Later the brush becomes so thick one can scarcely penetrate it, while drift wood is piled up in the eddies.
Methods of Survey. The traverse line included on sheets 2440 to 2444 inclusive is 83 statute miles long. This difficult work was accomplished by Capt. W. G. Grover, accompanied by three men (rodman, boatman, and cook). The line closely followed the coast. There were 271 traverse stations at an average distance of somewhat less than 500 metres. The party, with its camp outfit and supplies, was carried in a Deltournemouth canoe and a small dory. Camps were made at convenient intervals and the coast worked in both directions from each. Great difficulties were encountered in establishing camps because of the shallow water and long sandy coast. The loaded boat sometimes could not be brought within a mile of the shore, and the outfit had to be carried through the sand. It was difficult to find land not subject to overflow during exceptionally high tides.

The instrument used was a 7 inch engineer's transit, with a station rod similar to that employed on the Mexican Boundary Survey. Only one rodman could be used, because of the difficulties of transportation. The back sights were taken on stakes left to mark each station. The half distance was read as a check. It was necessary for a man to follow with the empty canoe to ferry across the deeper outlets. Some of the wider channels were triangulated across.

This traverse line is controlled by joining the Delta triangulation at its ends, the Kurdiwauk and A-poom-mouths, and at an intermediate point, the Kavannah and Kwikpak-mouths. These connections divide it into two sections, respective 23.6 and 59.3 statute miles in length, and each section was computed separately. The following method was employed in computing the traverse. The azimuth of the first line, derived from the triangulation, was carried through to the end, disregarding convergence of meridians, and the latitudes and departures computed for each measured length, as though the whole were on a plane surface. The sum of the latitudes and the sum of the departures were then taken as the two sides of a right
angle triangle, the solution of which gave the distance between the
initial and end points, and the azimuth of the latter from the
former. With this distance and azimuth, the latitude, longitude
and back azimuth at the end point were then computed by the
usual geodetic position computation. To obtain the positions of a
number of intermediate points for convenience in plotting the
work, the line was divided into a number of shorter sections,
each of which was computed by the same process as above, the
azimuth for each section being derived from the back azimuth of
the preceding. The same latitude and longitude for the first
point was obtained by the two computations, thus proving the numerical
accuracy, as well as the correctness of this method of computing
the traverse. A rigid computation of such a traverse would be to
use the geodetic position computation for each traverse station,
but this would be laborious and as proved above, unnecessary.

The traverse line was run between Aug. 5 and Sept. 8, in
21 actual working days. So great precision was expected in work,
done along this very marshy coast under the conditions ex-
perienced, and in the time possible, but it is thought the
work is sufficiently accurate for all practical purposes, in
view of the fact that most of this coast is not easily approachable
by white men. The closing errors were as follows: 1st section,
latitude 12.09, longitude 12.89; 2nd section, latitude 24.31,
longitude 38.10; these represent the differences between the
positions carried throught by the traverse and by the triangulation.
The traverse was adjusted to fit the triangulation by distributing
the discrepancy proportionately throughout the distance. The
coast located by this traverse line is from 11 to 25 miles to
eastward from the coast line published in 1873.

Additional notes in regard to the running of the traverse
line and the difficulties encountered, will be found in Dr. Edmonds' interiting report, transmitted Dec. 14, 1879.

On sheet No. 2440 the greater part of the topography (as far as
Gal. 50' sta) was put in by a plane table survey by Assistant
A. L. Flower, and is controlled by the triangulation extended by him
from that of 1878.
On sheet No. 2433 the topography along the coast south of 
Shawd River was by traverse and theodolite and studied 
by Mr. O'Brien. This was carried to connect with the 
work of the previous year carried up from the Kipnuk Resv. 
to God River. There is too much land along west of the 
shore with a slightly higher bank a little backed; this bank is 
lined with drift wood and there is fairly good walking along 
it's outer edge; back up the country in marsh and lakes 
and ponds as far as one can see. At Bogomallie there is an 
Alaskan settlement of 8 huts, all unoccupied at this season of the 
year; they are probably occupied at the seal hunting season. 
Two of these huts had been built since 1878.

Sheet No. 2433 also has a little topography near the junction 
of Kirklelaken with the Kwenkluk, to fill in part of a gap left 
in the sheet of 1878; also a sketch of the shore line for 75 miles 
up the Kwenkluk, with one line of soundings. The Kirklelaken 
work was done by Mr. O'Brien with a depth line, and up the Kwenkluk 
by S. W. Flower with soundings and is controlled by compass 
and log readings beyond the triangulation. S. W. Flower started to 
ascend the Kwenkluk and Aksalaka to the Kirklelaken, but 
was unable to go further with the launch on account of shoal 
water.

On sheet No. 2441 the connections of Bogomallie and some 
other sloughs are sketched from information from the natives. 
See sheet No. 2432 for further joining of these with the Kirklelaken.

On sheet No. 2444 four of the sloughs are sketched through to 
the Aspoon, having been traced by Mr. O'Brien in the season. 
The balance of the Sloughs is shown on one of Assistant Paris' 
sheets.

The projections are based on the St. Michael astronomical 
position carried through Assistant Paris' triangulation. The field 
results were used in the projections; to make them accord with 
the final office values, all latitudes must be increased 0.18 (or 
parallels moved north 6.5 metres) and all longitudes must be 
diminished 0.56 (or meridians moved west 8.0 metres). This is
a uniform correction to be applied to the projections of all the Yukon River and Delta work of 1879. The projections of work of party of Assistant Pratt in 1878, were made on different data, and a correction must be applied to join these to 1879 sheets.

E. P. Pattee
Assistant

May 25, 1900.
Photographic Illustration

Grande Delle Riviera Della

The complete description is

in the library and

(see additional notes in
correspondence)
Hauling boats in to Camp Wade
Dr. Bollands' universe party