U. S. COAST AND GEODETIC SURVEY.

Henry S. Hutchett, Superintendent

State: Alaska

DESCRIPTIVE REPORT.

Topographical Sheet No. 2440, 44

Locality: Coast of Yukon Delta

1899.

Chief of Party: G. R. Putnam
Coast of Yukon Delta
Alaska

Descriptive report to accompany the following topographic sheet.

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These sheets cover the coast line of the Delta with the exception of some portions near the Kavanak and Kuskokwim Mouths (see work of Tres 1879) and near the Apoon Mouth (see work of party of Assistant Pratt 1878). As far as known no white man had previously traversed the shore, and its position 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 except a few islands, except near Apoon bar where no vegetation near the shore but grass and reeds, and with extensive mud flats bare at low tide. There is in general firm banks only near the mouths of some of the outlets. These were found to be 60 feet by the river more than 300 metres wide at the coast. The following descriptive notes are taken from a report prepared by B. W. B最終 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 coast.

These are quite distinct characteristics that divide the Yukon Delta coast into three portions. The first extends from the Kuskokwim to the Kavanak and Kuskokwim Mouths, the second extends 25 miles from the Kuskokwim to the Geshkaenuk, and is characterized as very swampy; the third portion
is distinguished by patches of land, occasional bushes and patches of deep moss. In the southern section most of the shore line is a low bank from 2 to 3 feet above the outgoing
mud, with firm hard mud 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 petroglyphs. Loaded boats at any time
must keep out as far that seaward an indication of land
exists. With light draught boats there is no difficulty at
medium high tide in finding suitable camping spots.
Large 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 ones can be entered at any time in light draught boats;
namely the Kaorochunk, 5 miles north of the Aragon; the
Baguwarnorh, 17 miles from the Aragon, and the Kavunuk system,
25 miles from the Aragon, which can be entered by small boats at
any time. The Kaorochunk is hard to locate from the sea
except at high tide. On the Baguwarnorh 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
paddle around as for instance the Kwezuk which is shoal almost
at the coast line but is over half a mile wide, while the channels
of the Kavunuk preserve 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 seaward a vestige of wood exists except on the
banks of the Baguwarnorh. 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 Coquon (Kwikwalowsh mouth) and the Kawanak
mouth the distance is about 28 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 shoals of
the mouth of the Kweyukt. They make use here of the branch
channels of the Kweyukt, avoiding thus about five miles of
coast. No grass islands exist on this stretch except a semi-
arch of small islands about the Kweyukt entrance. The Kweyukt
and the Bayoumakik 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 brush can be seen, except some bushes near the
Kawanak. There are no habitations except one a mile up the
Bayoumakik. In all this area except in the neighborhood of the
Kwikwalowsh and the Kawanak, there are less than a dozen
habitations. Four (I think there are on the Kweyukt, two or three on
the Bayoumakik, 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 Kawanak
and Kwikwalowsh 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 stumps of wood at varying distances
from the shore. Eskimo life is 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
Kwikwalowsh mouth is one days journey in a kayak, and to the
Alouck 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 windward side are 5 or 6 miles of good land. Then one enters upon the north, or more land proper. Here the grass lands slope gradually down to the sea, and merge into the sand and silt of the ocean. During high tides being 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. Wharton saw not a sign of human beings, even in the distance in kayaks. The country is a paradise of water fowl and mosquitoes. One almost stumbles over the geese, and in the streams they scarcely get out of the way of the boat. To add to the utter desolation and disquieting influence the loam is present in force.

Travel along the coast is only possible at high water in small boats. At low water even an unloaded Etelborogh may be aground entirely out of sight of land. To enter even the largest stream 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 wood-stacks that mark the streams offering 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 camping purposes. As the rivers approach the coast at varying angles it is not often easy even after sighting a wood-stack 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 stream itself is dangerous as 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 if 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. Smaller distantly objects so that birds and men, and boats
and logs are not distinguishable at times.
The mud itself is exasperating. At very low tides far
out there is slightly firmer sand. Close 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 lonesome 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 Kikepak to the good lands near the Gichoke
while there are but few rivers affording good stopping places.
Three miles from the Kikepak there is a branch of the same;
at 14 miles the Raleigweneok; at 18 mile the Glongzhewik
and at 22 miles the Good. These streams are all marked
by the woodstacks, the Glongzhewik having two.

Along this stretch only distant views of islands may be
obtained on fair days. All else is grass and water. From the
注视 of leaving the Bagewonwok where the last view of the
Kuelbuck but is obtained, no elevations are visible until near
the Glongzhewik, a distant view of the tips of the mountains back
of "Hibbuck," and later on those behind "Bomand" is obtained.

The last stretch of coast of about 25 miles is the most
pleasant. The Apon Pass 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 brush to within a short distance of the
coast. The wild cries of the loon and the geese close to
disturb one, and the ztarnigan 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 Kotlik and Romanz 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 line 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 stains appearance the sweepings of the high tides. 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. Thin 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 sheet 2440 to 2444 inclusive is 83 statute miles long. This difficult work was accomplished by G. H. Ed. W. Giraud, accompanied by three men (rodman, boatman and coot). 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 Polkborough 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 low sandy coast. The loaded boats sometimes could not be brought within a mile of the shore and the outfit had to be carried through the mud. 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 wide channels were triangulated across.

This traverse line is controlled by joining the Delta triangulation at its ends, the Kuskokwim and Egegik mouth, and at an intermediate point, the Kawanak and Yukon mouth. These connections divide it into two sections, respectively 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 position 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 final 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 laboring and not proved above, unnecessary.

The traverse line was run between Aug. 15 and Sept. 8, in 21 actual working days. No great precision was expected in work, done along this very marshy coast under the conditions experienced, 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 24.09, longitude 128.87; 2nd section, latitude 24.31, longitude 38.76; these represent the differences between the positions carried straight 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 seaward from the coast line published in 1878.

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

On sheet No. 2440 the greater part of the topography (as far as 40° 55' 50") was put in by a plane table survey by Assistant L. Flower, and is controlled by the triangulation extended by him from site of 1878.
On sheet no. 2433 the topography along the coast south of "Meadow" is seen, was by traverse and theodolite surveys by J. T. Forrester. This was carried to connect with the work of the previous year carried up from the Kupnjuak River to God's Rest. There is too much land along west of the shore with a slightly higher bank a little back; this bank is lined with drift wood and there is fairly good walking along its outer edge. Back of the country is marsh and lakes with some great bays that run far from the coast. And ponds as far as one can see. At Bogomilet there is an Eskimo 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 Kupkleeu with the Kviueneut, to fill in part of a gap left on the sheet of 1878; also a sketch of the shore line for 7 1/2 miles up the Kviueneut, with one line of soundings. The Kupkleeu work was done by E. C. with assistant, and that up the Kviueneut by J. L. F. with steamer launch and is controlled by compass and log readings beyond the triangulation. Our steamer started to ascend the Kviueneut and Abulard to the Kupkleeu, but was unable to go further with the launch on account of shoal water.

On sheet no. 2441 the connections of Bogomilet and some other sloops are sketched from information from the natives. See sheet no. 2432 for further joining of these with the Kupkleeu.

On sheet no. 2444 four of the sloops are sketched moving to the Gulf, having been traversed by Dr. Edmunds in the course.

The balance of the reaches is shown on one of Assistant Faris' sheets.

The progress is based on the St. Michael astronomical position carried through Assistant Faris' triangulation. The field results were used in the projections; to make them accord with the final office values, all latitudes must be increased 0.15 (or parallel moved south 5.5 metres) and all longitudes must be diminished 0.56 (or meridians moved west 1.5 metres). This is
A uniform correction to be applied to the projections of all the Yukon River and Delta work of 1877. 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.

G.H. Putnam
Assistant

May 25, 1900.
Photographs illustrating
Coast of Yukon River Delta

(See complete descriptive list
on file in Library and Archives)

Names are written on backs of prints
(many additional negatives in Archives)