U.S. COAST AND GEODETIC SURVEY.

Henry S. Drishett, Superintendent

State: Alaska

51655

DESCRIPTIVE REPORT.

Topographic 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 Kawanak and Kulepaf Mouths (see work of Fair 1879) and near the Apono Mouth (see work of party of Assistant Pratt 1878). As far as known no white man had previously traversed this shore, and its position on previous charts was out from 10 to 35 miles (it was further to seaward than had been shown).

This coast is low and marshy the entire distance, with no vegetation near the shore but grass and moss, and with extensive mud flats bare at low tide. There are in general firm banks only near the mouths of some of the outlets. These were found to be 26 outlets of the river more than 200 meters wide at the coast. The following descriptive notes are taken from a report prepared by Mr. E. A. O. Cooksey (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. There are quite distinct characteristics that divide the Yukon Delta coast into three portions. The first extends from the Kurekloak to the Kawanak and Kulepaf Mouths, the second extends 25 miles from the Kulepaf to the Geshkowutchik, 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 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 Petunoreconances. Loaded boats at any time must keep out as far that clearly 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 Kooselwhan, 5 miles north of the Avong; the Bagonowich, 17 miles from the Avong, and the Kowamish system, 25 miles from the Avong, which can be entered by small boats at any time. The Kooselwhan is hard to locate from the sea except at high tide. In the Bagonowich there is a conical stack of wood a mile up the river, and the entrance lies up the coast from abreast of the stack. All the other streams but those mentioned shallower 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 Kweeft which is shoal almost at the coast line but is over half a mile wide, while the channels of the Kowamish 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 two or three miles from the coast to be utilized. From here for another 8 miles the ground becomes even more marshy and apparently a vestige of wood exists except on the banks of the Bagonowich. 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 outfitted hauled or carried in to shore.

Between the Cooson (Kneeklawnk mouth) and the Kawanak 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 shoals off the mouth of the Kneeklawnk. They make use here of the branch channels of the Kneeklawnk, avoiding thus about five miles of coast. No grass islands exist on this stretch except a semi-circle of small islands about the Kneeklawnk entrance. The Kneeklawnk and the Bagumowik 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 patches near the Kawanak. There are no habitations except one a mile up the Bagumowik. In all this area except in the neighborhood of the Kuklawnk and the Kawanak, there are less than a dozen habitations. Four of these are on the Kneeklawnk, two or three on the Bagumowik, and the rest at the junction of the most important boughs. 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 Kuklawnk are characterized by good banks and deep and well defined streams; with scattered drift wood. Light draught boats can keep well inshore. Lines of brush extend along the main rivers a short distance from the coast. The better streams are all marked by stacks of wood at varying distances from the shore. Glimpses of 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 Kuklawnk mouth is one days journey in a kayak, and to the upper or to Kottik it is a two days' trip. From here to Kottik it takes two days in a good sailboat with favorable wind.
After leaving the harbor there are 5 or 6 miles of good land. Then one enters upon the ocean, or mounting 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 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 Goldsworthy saw not a sign of human being, even in the distance near 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 dispiriting influence the lom no present in force. Travel along the coast is only possible at high water in small boats. At low water even an unloaded steamer may be aground entirely out of sight of land. To enter even the largest streams 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 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 rivers at the first proper camping spot. Usually there is enough old drift wood near by 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 streams themselves shoot so rapidly in the sea that at the distance one travels from shore, except at high tide, no river channel is run across. On 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. Swinge 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 sand. 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 close is gassy and wet and swampy and cut up by ditches. A few house-like 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 Kuripeak to the good lands near the Ghekokealwhile there are but few rivers affording good stopping places. Three miles from the Kuripeak there is a branch of the same; at 14 miles the Qualiquweengak; at 18 mile the Glongzhewik and at 22 miles the Gawk. 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 time of leaving the Bagunowitk where the last view of the Kuripeak But is obtained, no elevations are visible until near the Glongzhewik, a distant view of the tops of the mountains back of "Hogback", and latter on those behind P. Rosary is obtained.

The last stretch of coast of about 25 miles is the most pleasant. The Aapun Pass approaches the coast somewhat and many rivers connect the sea and the Aapun. 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 gulls of the loon and the geese 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 Kotlik 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 clean 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 W.K.H. W., G. J. G., accompanied by three men (rodmans, boatmen, and cooks). 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 Prospector 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 marshy 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 wider channels were triangulated across.

This traverse line is controlled by joining the Delta triangulation at its ends, the Kuskokwim and Yukon mouths, and at an intermediate point, the Kawwah and Kuskokwak mouths. These connections divide it into two sections, respectively 33.6 and 57.3 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
take 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. No 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°59'; 2nd section, latitude 24°31',
longitude 38°10'; these represent the differences between the
positions carried through 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' inter-

On sheet No. 440 the greater part of the topography (as far as
the 4th sta) was put in by a plane table survey by Assistant
C. L. Flower, and is controlled by the triangulation extended by him
from start of 1878.
On sheet no. 24.33, the topography along the coast south of "Seaward" S.W. was by traverse and theodolite and study survey by Mr. Entwisle. This was carried to connect with the work of the previous year carried up from the Kowmukut River to Good S.W. There is too much land along most 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 lake with some islands and open water form the coast. and ponds as far as one can see. At Bogonidhe there is an Eskimo settlement of 8 huts, all unoccupied as 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. 24.33 also has a little topography near the junction of Kowmukut with the Kowmukut, 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 Kowmukut, with one line of soundings. The Kowmukut work was done in 1879, with respect, and that up the Kowmukut by G. L. Flower with steam launch, and is controlled by compass and log readings beyond the triangulation. Our Flower started to ascend the Kowmukut and Acukarok to the Kowkowalka, but was unable to go further with the launch on account of shoal water.

On sheet no. 24.41 the connections of Bogonidhe and some other sloughs are sketched from information from the natives. See sheet no. 24.32 for further joining of these with the Kowkowalka.

On sheet no. 24.44 four of the sloughs are sketched through to the Agoun, having been traversed by Mr. Edmunds in the cause. The balance of the Geogra is shown on one of Assistant Parish's sheets.

The projections are based on the H. Michael astronomical position carried through Assistant Parish's 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 parallel moved south 5.5 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 2 Assistant Pratt in 1878, were made on different data,
and a correction must be applied to join these to 1879 sheets.

[Signature]
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 Archive)
Hauling boats in to Camp Wade

Dr. Edmonds' traverse party