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1908	Notes on Victoria Nyanza Survey
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NOTES 1 AD

ON VICTORIA NYANZA SURVEY,

by Commander (then Lieut.) R.N.

Method of Survey.

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My instructions in 1899 were to make a compass survey of the British part of the lake and report on likely traffic. As compass surveying was found very unsatisfactory, triangulation on ½ inch scale was resorted to. An astronomical base of about 45 statute miles was obtained from Namenya hill station in Inyala, to Gembe Hill station in Kasagunga, from this base triangulation with 5" theodolites was carried round north shore by graphic plotting. The triangulation failed in the Sesse Islands owing to bad weather and want of time. The mainland coast from Dumo Point being put in with patent log and compass.

For the southern or German part in 1902, the same system was followed, using the same base. Practically no error was found in the Anglo-German boundary 1° South parallel of latitude, obtained in 1900. The triangulation was extended round the south shore and up to Dumo Point on the west coast. The difference by graphic plotting on ½ inch scale, in the distance so found between Mohurn station on east shore, and Mizinda station on west shore, about 157 statute miles, and as found by the Anglo-German Boundary Commission who triangulated over my 1900 map of north part of lake, our stations being identical, was $\frac{1}{13}$ of $\frac{1}{4}$ of a mile on $\frac{1}{4}$ inch scale.

On my southern triangulation being calculated by the War Office, using their base instead of mine, ample connection having been made to their survey beacons on both sides of the lake, the distance between the same stations was

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found to differ 80 feet from the result given by their triangulation round the North Shore. 504

In the Report on my triangulation issued by the War Office, it is stated that "observations were made for most part to Hill tops with a theodolite." The observations were made in every case with a 5" theodolite. At first, the hill top, a prominent or the highest tree on it was observed to. On the next hill being reached, it was cleared if necessary, the highest tree being left for a mark. The position of the theodolite was marked by a cairn whenever stones were available, and later a second series of observations were made to the actual station, a small tree being cut and placed in the cairn, or a beacon built over it if the hill top was bare. In clear weather the stations so marked could be easily seen 30 miles, while tree marks were observed to up to 80 miles.

On the survey being started, there was no intention of calculating the triangulation, the graphic work plotted very well, and later it was known a check could be obtained from the Boundary Commission triangulated points. The Staff of the lake survey was never more than two officers, decreased in 1904 to one. The connection to the Commission's work was purposely made on both sides of lake for a check and the graphic method followed, gave a result that was practically correct and fulfilled the object of the survey, viz., to get as quickly as possible a map of the lake for the purposes of navigation.

Had the survey continued, observations for latitude would have proved its positions without reference to the other survey.

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Plane Tables were not used in the survey and very seldom are in any Hydrographical work. Reference to topography shows that there is very little that could be done with them while they would be quite unsuitable for mapping mountainous coast line, the majority of the fixing being done in boats in which of course they would be useless. I was pressed several times to use them by the Manager of the Uganda Railway, but they would, in my opinion, have only been useless lumber in already overloaded boats.

Level.

The level of the lake has been taken from the reduced levels of the Uganda Railway, and is placed at 3723 feet above mean low water level at Mombasa. Heights of hills were taken with Watkin Mountain Aneroids, and are shewn above lake level.

The zero of the Port Florence Gauge was set, and checked several times, 18.08 feet below the masonry bench mark set for reference, near the points of the ship yard siding, and marked 3744.88.

The soundings shewn are reduced to a level of lake at zero of Port Florence gauge.

In shallow parts of the lake it is very important that soundings should be referred to this level as neglect of this precaution may cause considerable expense in harbour works, alterations. (See Notes on Maps.)

The lowest level of lake registered to date on the Port Florence Gauge, has been 1'6" below zero on 20th Oct. 1902, and the highest 3'5" above zero on 14th May 1906. The height above level of old water marks on the shores, measured at various intervals, shew that the level may rise

to 5'1" on the Port Florence Gauge or about 4" above the present dock walls, while a strong S.W. wind, usual in the afternoons, would cause another rise of 1 foot.

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The level of Port Florence is much affected by wind, and the afternoon level is always with S.W. winds higher than in the morning. For this reason only the morning readings of the Gauge were referred to in the lake survey.

Comparisons of level with other spots was obtained by readings of temporary gauges referred to bench marks for the period of survey, compared with the average morning reading of the Port Florence Gauge for same period. The difference of level at various places and times, was always found to agree with the Port Florence differences.
It is very important that the same system should be followed in any future survey and proper attention be paid to Port Florence levels, while working elsewhere; by this means only will the mystification that was caused by the use of gauges without comparison and bench marks be avoided.
Attention should also be paid to the result of wind action on the level. The alteration of level is so slow that automatic recorders are quite useless, while its range at present is only recorded up to 4'11", with older watermark evidence up to 6'7".

Most of the bays are shallow, and have a bottom of very soft mud into which a sounding lead sinks easily. In such places correct soundings for detailed plans were obtained by raising and lowering the lead slightly until on its touching the mud, bubbles rose to the surface.

Compass correction.

It should not be forgotten that however good a chart or map may be, no safety whatever can be ensured by using it with a compass uncorrected for deviation or one of which the error is not properly known. The triangulated points of the survey are perfectly correct. As the change of variation is so small across the lake, the deviation should be obtained by testing the ships compass in some spot in about the mean of the variation, which can be done by placing the ship in a position from which two triangulated hill summits are in transit, such as Bega Island summit in transit with Kwasi Hill summit, Bugaki Tree or Loimi Island summit etc. etc. With the transit bearing, the compass should then be corrected with the magnets and its error all round should be found at that spot. Opportunity to do this can be easily got in calm weather, and it is of the utmost importance that it should be so done, and a report on each ships compass error made at quarterly intervals.

Referring to last para. page 45 No. 8CS Report of Colonial Surveys. The detail of the maps was practically only completed in coast line and useful topography, the survey only taking such soundings as were possible during the work except in detailed plans of harbours. The paragraph states that it will be probably some time before the traffic on the lake has so increased as to make more detailed survey necessary. As I have already pointed out that is not my opinion.

Referring to S. W. corner of northern map - if a ruler be laid along the soundings off the Bugabu coast to 33 66 66 66 it will represent the course of the S.S. "Winifred's" first voyage round the lake in 1903. It will be seen that she narrowly escaped what might have been

complete disaster on S. Muggua and Sybil rocks, ^ These unknown uses of the lead on that voyage gave a shallower sounding 33 which was at once marked as a danger and notice given of it, with instructions to use the lead in its vicinity. Later the rocks were reported. Later I found and reported the northern one's position, and later again, the S.S. "Sybil" was run on it. Without soundings no one knows what the ships pass over. For instance on the Port Florence-Entebbe run, from Ulugi Pt. on Businga Island the only sounding up to opposite Saga Island, 52 miles, is one of 140 feet 30 miles out, that I took on the first voyage of the S.S. "Winifred" and ships have been on that run for the last 5½ years. I know of no other soundings there.

I was told by the Manager of the Railway and others in Africa that any unknown covered rocks must be chanced by the steamers and that sounding gave no real safety.

I instructed steamers to use certain courses only as the lake was practically unsounded. I was told at the Colonial Office that it would not be possible to always keep them on exactly the same line. ^ The courses I gave instructions for, were laid down to clear known dangers and had they been roughly kept to, no grounding would have occurred to date. Contouring the bottom is the only way I know of finding dangers, and a view of the lake shores with a rise of 100 feet in lake level imagined, will show any observer that the contours of the land would give notice of any of the numerous conical hill tops just below that level. The hydrographical surveyor finds the broad base of the underwater hill, & climbs up it with his lead

The ships bottom, "channeling" unsounded waters, finds the top - with disastrous results.

A good deal of sounding could be done if the steamer Captains were instructed to use their sounding machines and recorders in unsounded waters, the recorders should be tested before and after use with lead lines. 50

The Port Florence-Jinja run could be shortened by surveying other channels. An expert hydrographical surveyor would be able to point out what further work was necessary and it seems a pity that work which is necessary should not be done on the lake which makes the railway pay, while so much is being done in surveying the rest of the country.

The coast line mapped amounted to 403¾ statute miles. exclusive of that in detailed plans.

R.H. Whitehouse

Commander, R.N.

The Under Secretary of State,
Colonial Office.