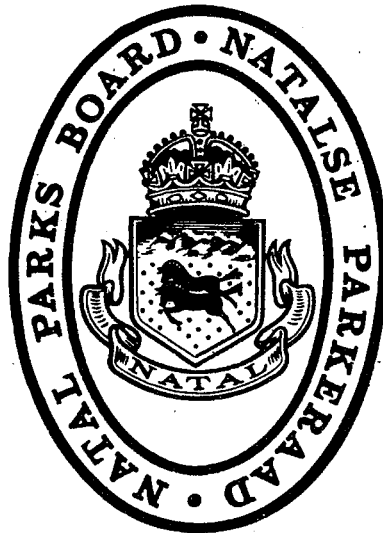


ST LUCIA DOCUMENT COLLECTION



Author HAW C R

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I. Introduction.

Over this period a number of data recording devices were installed and a routine developed for the collection and compilation of the data for use in the mathematical model.

2. System Elements.

- A: Mouth.
- B: Umfolozi River.
- C: Estuary and River feeding in (Mpate).
- D: Southern Compartment.
- E: Northern Compartment.
- F: False Bay and Rivers feeding in (Mzinene, Hlubluwe, Nyalazi)
- G: Mkuzi Swamp system.
- H: Eastern Shore marsh and dune system.

A. Mouth.

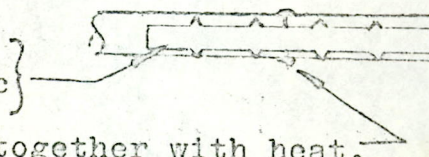
(I.) SEA WATER LEVEL RECORDER.

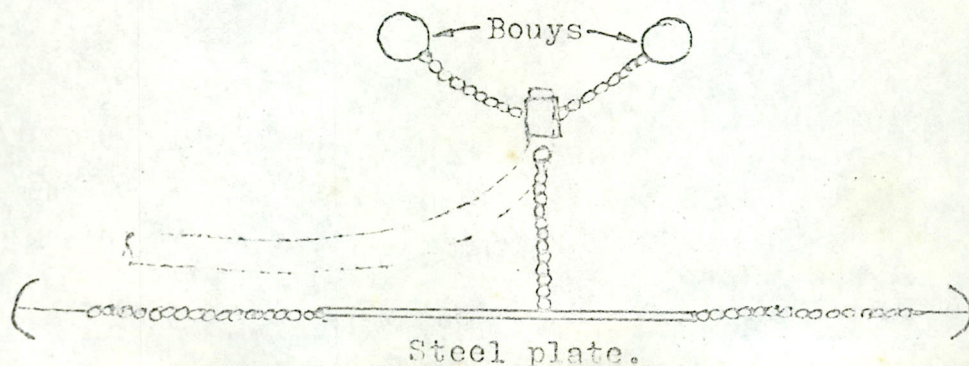
The recorder designed by Wits University was installed and operated for approximately four tidal cycles. The recorder well has been tied into the Mean Estuary datum and water levels in the recorder well were measured using an electrical probe. The water level recorder inside the Mouth was run simultaneously with the sea water level recorder. Over this short period the mean of the tidal curves in the sea appeared to be approx 0.5 m below the mean of those in the Estuary.

The reasons for the recorder breaking up are.

- (a) Poor system of coupling between different sections of pipe.
- (b) Insufficient anchorage of the pipe in the surf zone.

It is proposed to reinstall the recorder with the following improvements.

- (a) Couplings.
Steel peice turned to fit inside plastic pipe. }
Plastic pipes fused together with heat. } 
- (b) Anchors bound to the pipe in the surf zone at 50m intervals.
- (c) Anchor head.



A permanent sea water level recorder is essential for further research and consequent development of St Lucia and Richards Bay. Further work on a more permanent device should be done in conjunction with Mr. Anderson of the C.S.I.R who is interested in a similar recording of sea levels off Durban.

(II) Mouth water level recorder.

The water level recorder in the Estuary mouth is situated in a high velocity tidal current which may be causing a draw down in the recorder well.

(III) Mouth Cross Sections.

The mouth cross sections change from day to day. There is a definite nett increase of sand accumulated in the Estuary over the last 6 months. Cross sections done monthly between the mouth and Honeymoon Bend would be advisable to establish the rate of silt and sand deposition in the mouth.

(B.) UMFOLOZI RIVER.

At present no hydrological data is being collected on the Umfolozi river mouth. The Umfolozi river catchment constitutes nearly half of the total St Lucia - Pongola catchment and includes some of the highest rainfall areas. Before any of the management or development plans (viz. reintroducing Umfolozi water into the Estuary/combined Umfolozi Estuary mouth) can be implemented it is essential that the model studies be done on the Umfolozi Estuary area. Before any data is collected it would be advisable (a) to investigate whether a physical or mathematical model would be more suitable and (b) to plan thoroughly what data and surveys are essential for the development of such a model. Consideration might be given to the following.

- (1) Permanent water level recordings in the Umfolozi river to establish head differences between the Umfolozi and Estuary.
- (2) Flow gaugings in the Umfolozi and Umsunduzi.
- (3) The extent of the tidal prism in the Umfolozi and the extent of salt water penetration up the river.
- (4) Simultaneous silt sampling in the Umfolozi and the Estuary to establish quantities of silt being transported by the river into the sea and by the sea into the Estuary.
- (5) Survey of the area especially cross sections of the river and mapping of the banks.

Consideration might also be given to the use of the Umsunduzi marsh as a silt trap.

(C) ESTUARY.

(I) Cross Sections.

Each of the ^{are} twenty six cross sections is clearly marked with fixed bench markson the banks next to them. The cross sections between the bridge and mouth are marked with circular ground control beacons for photo identification.

Gross sections should be surveyed as follows.

A level must be transferred from the bench mark to

temporary gauge plate in the water. Water level recordings must be taken at the start and completion of the bottom sounding procedure and the mean water level used for reducing bottom levels. The profile of both banks must be ascertained using a level, to well above the high water mark. These cross sections should be redone annually. Some of the chainages between cross sections taken off a tachy survey done previously of the estuary have been incorrect. Comparisons between taped distances and distances taken off photographs taken of the mouth have been reasonably accurate. A set of aerial photo's taken of the whole estuary on a 1:4000 scale would be very useful in this connection.

(II) WATER LEVEL RECORDERS.

Continuous water level recording stations were set up at the Bridge, First Narrows, Essengeni and Potters Channel. These were run simultaneously over model "V" runs and while the sea water level recorder was working. At present only the Bridge and Potters Channel recorders are in operation.

A device for recording flows has been installed in the First Narrows. At present it can only indicate direction but should be calibrated to give an idea of flow magnitudes. A system for damping out wave action on the instrument should be installed

(III) MPATE RIVER.

There is a flow gauging weir on the Mpate which is maintained by Dept. of Water Affairs.

(D&E) SOUTHERN & NORTHERN LAKE COMPARTMENTS & FALSE BAY.

(I) WATER LEVEL RECORDERS.

Four water level recorders are operating at present to establish the effect of wind on the lake surface. They are installed at Makakatana, south of Fanies Island, north of Fanies Island and near the Mkuzi mouth. Only the Makakatana recorder is tied in to the Estuary height control survey.

Two further water level recorders are established at Charters Creek and at Lister Point in False Bay. (Installed by Dept. of Water Affairs)

All the recorders in the Estuary and Lake are using a 1:5 metric scale on weekly charts.

Sets of readings indicating equivalent water levels were averaged off the recorder charts over long calm periods on the lake.

MKUZU MOUTH.	1,15	1,15	
LISTER POINT.	0,69	0,70	
FANIES NORTH.	0,68	0,70	
FANIES SOUTH.		0,85	0,82
CHARTERS CREEK.	0,78	0,81	0,76
MAKAKATANA.	0,37	0,39	0,35

There appears to be some discrepancy between the Charters Creek and Lister Point gauge plates. The Charters Creek gauge plate has been levelled from the bench marks of the Natal University survey (Datum \pm zero of gauge plate at the Estuary mouth.) 1.000 m on the Charters gauge plate is equivalent to the zero of the gauge plate at the mouth which is the mean estuary datum established by Dept. of Water Affairs.

1.000 on the Lister Point gauge plates (levelled off Dept of Water Affairs B.M) should also be equivalent to the mean estuary datum. The above readings indicate ^{approx} 10 cm difference between these two gauge plates.

III) RIVERS FEEDING INTO FALSE BAY.

The Nyalazi and Hluhluwe have gauging weirs maintained by the Dept. of Water Affairs. A culvert under the road over the Mzinene could be callibrated for flow measurement but damming upstream on the river results in a negligible flow into the lake.

G. MKUZI SWAMP SYSTEM.

(I) Cross sections.

A 2km. long line has been opened up at the Southern extremity of the swamp. A cross section will be taken here shortly. Flow measurements in the channels of the Mkuzi river, here have been asked for. A problem exists in that periods of Southerly winds raise the water level in the North of the Lake and flow has been observed Northwards into the swamp at this cross section. In fact the major part of this section becomes flooded. When Northerly winds are blowing the water is confined to three or four definite channels and flows Southwards into the Lake. So here it would be necessary to have some indication of the direction of flow in conjunction with a water level measuring device.

The Natal Parks Board have successfully opened up a 6km. long line across the swamp 5km south of the Terezana Pan. An attempt was made to take a cross section here but it is extremely difficult to define the bottom. A 2,5m ranging rod was pushed right down and withdrawn with no trace of silt in one place. In other places silt traces were observed on the rod. A cross section would look something like this.

↑ Papyrus &
↑ Fragmites
↑ Reed
↑ Clear water
↑ Semi suspended
↑ Tangled roots
↑ Rotting
↑ Vegetation
↑ Silt conc'n
↑ Increases
↑ With depth.
↑ Pure silt.

Dept. of Water Affairs have installed a Water level recorder in the old Mkuzi river bed and will establish gauge plates on the Western and Eastern arms of the swamp, on this particular cross section.

A further cross section has been opened up in the narrow section of the Eastern arm in the vicinity of the Mbazwan pan. Water Affairs intended to install a water level recorder on the pan.

(II) Water Levels.

A Dept. of Water Affairs recorder is operating on the Mkuzi river at Thring's store bridge. (See current gaugings)

Two punch tape water level recorders have been set up on the Mpempe Pan and at the access site of the Demezana Pan. These are unreliable and will be replaced by monthly chart recorders.

Dept. of Water Affairs have installed a recorder on the recently opened Canal just South of Demezana Pan and on the swamp cross section 5km south of the pan.

The important data recorded by these instruments will be of no use until they have been tied into a height control survey.

(III) Current measuring.

Attempts by Dept. of Water Affairs to calibrate the bridge at Thring's store for flow measurements have produced inconsistent results because (I) Debris buildup at the bridge.

(II) Silt deposition and scouring causing a variation in the cross section under the bridge.

(III) In extreme floods the river breaks its banks above the bridge.

A more suitable site East of the bridge has been investigated which would be more stable and give good flow estimates during minor floods. The site is close enough to the existing water level recorder for this instrument to be used for stage measurement. During major floods water breaks the banks at a number of places between the bridge and Mpempe Pan.

Dept. of Water Affairs are planning to install a Parshall flume just south of Mpempe in the excavated canal.

Further current gauging has been done in the canal at sites just below the Sinqenya swamp and also at the Water level recording site below Demezana Pan.

A substantial flow in the Mbazwana stream feeding the Eastern arm of the swamp has been observed. A number of small streams also act as drains from the marshes on the Eastern shore of this part of the swamp.

Although the catchment of these streams is small it falls in the highest rainfall area of the system and ^{the} flow strongly even during the dry season. Measurement of flow in the main stream would be useful. The water in the streams is completely silt free.

Rough soundings in the fairly large Mbazwan Pan indicate 3-4 metres of clear water. A line across the Eastern arm of the swamp east of the Demezana Pan would give an idea of the contribution this section makes to the total amount of water in the swamp.

Top priority for future work in the swamp area is the height control survey.

(IV) Silt surveys.

A silt survey at the Southern end of Demezana Pan was undertaken at two weekly intervals during Dec. 1972 Jan. Feb. March 1973.

H. EASTERN SHORE MARSH & DUNE SYSTEM.

(I) Ground Water Observations.

Twenty ground water observation pipes have been installed South of Cape Vidal. Observations are recorded every two weeks. Two continuous ground water level recording instruments have been put in. One at Bhangazi the other on the Southern geophysical line investigated by Dr. Van Zyl. Priorities here are: (I) Height control survey tied in with the estuary network, connecting up each observation pipe (II) What is to be done with the data once enough is collected. In Australia on a similar investigation such as this data was collected over a period of two years.

(II) Geological Data.

Two mining companies are busy with drilling investigations of sand dunes North and South of Cape Vidal. The area they are covering extends from the beach over the dunes to the marshes west of the dunes. The following points were noted after examining results of the drilling.

- (1) Scattered patches of cemented sand occur throughout the dunes Drilling ceased once contact was made with these.
- (2) Cretaceous outcrops occurred only close to the beach.
- (3) The water table under the dunes appears to rise no more than two or three metres above mean sea level.
- (4) Each borehole has a level transferred from a trig beacon and is accurately established on a 400m x 400m surveyed grid.
- (5) Samples of the drilling are stacked at Cape Vidal and might be useful for analysis of the material in the dunes.

The mining companies involved are

K.P.C. Contact Mr. Hogan St Lucia
or Mr. Smith Richards Bay.

Goldfields mining and development.

Contact Mr. Campbell in their Geological Dept.
in Johannesburg.

3. ROUTINE DATA COLLECTION.

(A) Wind Recordings.

Continuous wind recorders are installed at the mouth and at Lister Point. Rolls are changed once a month and average velocities and direction every four hours are calculated from them. The mouth wind roll is sent to the Weather Bureau Pretoria.

Rainfall.

Daily checks are made on rainfall gauges at:

- (a) Mouth (N.P.B.; Reclamation)
- (b) Honeymoon Bend (Evaporation Pan)
- (c) Mission Rocks (Forestry Station)
- (d) Cape Vidal (Forestry Station)
- (e) Charters Creek (N.P.B. Evaporation Pan)
- (f) Lister Point (N.P.B. Evaporation Pan)
- (g) Fannies Island (N.P.B. Camp--)

These are collected and recorded on a single sheet at the end of every month.

Evaporation.

Daily readings are taken in Symons Evaporation Pans at:

- (a) Mouth (recently installed)
- (b) Charters Creek
- (c) Lister Point

These are adjusted for rainfall and recorded on a single sheet at the end of every month.

It is essential that the system is adhered to where evaporation and rainfall figures gathered at 8am on a particular day are recorded opposite the previous day's date.

Salinities.

Salinities are measured over the whole lake every two weeks by Mr. Joubert of N.P.B.

Copies of data collected A,B,C are distributed to

Messrs. T. Blok , I. Hutchinson, F. Joubert.

CONCLUSION.

With plans being drawn up for the development of St Lucia, it is essential that environmentalists, scientists and engineers can provide adequate answers to the problems and questions of the planners and developers. Without these answers one can expect mismanagement and an eventual "steam rolling" over conservationist ideals by the economics of modern progress.

The logical process involved in providing such answers start with research and surveys.

It would thus be highly desirable that a well equipped Research Centre be established at St Lucia, township. The basic requirements for such a centre are.

- (1) A director based at St Lucia.
- (2) Technicians with surveying, possibly hydro and even mechanical experience.
- (3) Librarian, for reducing and filing data and draughting.
- (4) African storeman.
- (5) Labourers.
- (6) Modern offices and store for instruments to include a library for filing all research work done on St Lucia for future reference.

Paragraph (6) is probably the most important. If good working facilities and well organised filing and storage facilities are provided it will be easier to obtain staff for the Research Centre, and encourage more scientists and engineers to work on the problem.

The centre could handle the collection and recording of data in all the fields of research being gone into at St Lucia.

An enormous amount of work has been done and published in a wide variety of fields. It would be a tremendous step to collect all this information and store it in one centre using modern library filing techniques.

C. R. HAW