

ESTUARINE SYSTEMS

Too little/too much freshwater conundrum for Lake St Lucia estuary treasure

The Lake St Lucia wetland system, the largest estuary in South Africa, has been at the centre of much controversy over recent decades. A panel of experts has now re-iterated the need to protect this critical estuary and to ensure that it is no longer managed in isolation from the neighbouring region, writes Tony Carnie.



A skiboat heads out to sea from the mouth of Lake St Lucia.

Tony Carnie

Back in 2009, at the height of a prolonged drought, estuarine scientist Prof Alan Whitfield cautioned that: "Lake St Lucia is like a patient in intensive care. Critical decisions have to be taken now. The only long-term solution is finding a sustainable way of re-linking the life-artery of the Mfolozi River with the estuary."

More than a decade later – following some of the most severe flooding in recent memory along the KwaZulu-Natal coastline – so much, and so little, seems to have changed. Whereas the lake all but dried up into a sandy desert landscape during the winter of 2016, St Lucia seemingly has too much freshwater now following the recent severe downpours of rain.

There was so much water flowing through adjacent feeder rivers in mid-April that the recently reunited mouths of Lake St Lucia and the Mfolozi River broke open a natural pathway to the sea after another prolonged closure of the estuary mouth.

Such seasonal extremes (where there is either "too little" or "too much" freshwater) are common in many river estuaries around the world. These natural variations also shape the dynamic character of the meeting zones between fresh water from the land and salt water from the ocean. In the case of Lake St Lucia, however, the surrounding region has been modified so extensively over the last seven decades that the long series of human interventions have sparked intense public and scientific debate on how best to manage the recovery and long-term health of this national treasure.

Prof Whitfield, a senior scientist who has been studying the estuaries of KwaZulu-Natal and the Eastern and Western Cape for nearly four decades, stresses the critical, national importance of the St Lucia system relative to all other estuaries in South Africa. "When full of water, the St Lucia system covers an area of approximately 35 000 ha compared with a total South

African estuarine area of approximately 70 000 ha, constituting approximately 50% of the nursery habitat for estuary-associated fish species in the country. Within Kwazulu-Natal, St Lucia accounts for about 80% of the estuarine area in the province,” says Whitfield, Emeritus Chief Scientist at the South African Institute for Aquatic Biodiversity (SAIAB).

Because several marine species also use this estuary as a nursery area to rear the next generations of fish, he believes it is vital to ensure a connection between the sea and this lake. Yet, for several decades, managers have had to contend with the far-reaching consequences of a decision taken in the early 1950s to artificially separate the joint mouths of the St Lucia and the Mfolozi River, the lake’s largest freshwater source. That decision was taken partly to reduce the volume of riverine silt entering the St Lucia mouth and partly to avoid the back-flooding of sugarcane farms in the Mfolozi floodplain.

When this artery was severed, the volume of water entering the lake was reduced dramatically. Because there was less water to push open a channel to the sea, the mouth of the lake began to close off more frequently. This led to a series of management interventions to retain the connection to the sea via regular artificial breaching and dredging of marine and riverine silt accumulations.

While these interventions to maintain the linkage to the sea were partly successful, it became increasingly clear that St Lucia was running out of water. So, in 2010, Whitfield was appointed project leader of a Water Research Commission workshop on generating the information needed to consider relinking the Mfolozi River to the St Lucia estuarine system.

One of the main conclusions of the workshop report (**WRC Report No. KV 255/10**) was that: “There is now little doubt that

St Lucia will be unable to survive as a World Heritage Site unless it obtains Mfolozi River water (especially during droughts).”

Estuarine expert Prof Anthony Forbes, one of more than a dozen specialists who contributed to the report, summarised the matter thus: “What has happened at St Lucia can only be described as a national estuarine catastrophe with already visible ripple effects in terms of the collapse of the offshore shallow-water prawn fishery and the reduction in recruitment to populations of estuary-associated marine migrant fish.

“These effects will certainly be felt for several years at least, beyond the point of any restoration or recovery of the St Lucia system. Resident species have lost huge areas of habitat while critical normal estuarine function in terms of the provision of nursery grounds for migrant fish and invertebrates and feeding grounds for piscivorous birds in the largest estuarine habitat in the country has been lost.”

Following that workshop, with financial support from the Global Environment Facility (GEF), a decision was taken to restore the natural link between the Mfolozi and that natural processes should be re-established as far as possible. Crucially, the iSimangaliso Wetland Park Authority also agreed to a recommendation from a subsequent workshop process that the mouth should no longer be breached artificially.

Hopes were high that, despite the risks of further sediment entering the estuary mouth, the relinking of the Mfolozi and lake mouths would gradually help to heal the water-starved lake. But towards the end of 2020, strong criticism emerged from a variety of stakeholders who were concerned that the lake mouth had remained closed for nearly six years despite relinkage to the Mfolozi.

Tony Carnie



A farm worker trims sugar cane stalks during loading operations in the Riverview area on the Mfolozi River floodplain.



One of several sugar cane fields inundated by water during the recent KwaZulu-Natal floods.

Commercial and subsistence farmers in the Mfolozi and Msunduze river floodplains were angered by back-flooding of their fields in the wet season. Tour operators were concerned about the increasing build-up of silt and reeds near Honeymoon Bend and with the Narrows section of the lake. Saltwater anglers and some scientists were worried about the fact that marine species had been unable to re-enter the lake for a prolonged period.

So, following a stakeholder workshop at St Lucia, the mouth was breached artificially in January 2021. This decision sparked immediate controversy and was condemned by a group of seven scientists who wrote an open letter to Forestry, Fisheries and Environment Minister, Barbara Creecy.

The scientists (Ms Nicolette Forbes, Prof Anthony Forbes, Prof Derek Stretch, Dr Barry Clark, Dr Jane Turpie, Prof Gerrit Basson and Mr Eddie Bosman) characterised this decision as a deviation from scientific, evidence-based decision making by the park authority. Not only did this contravene the GEF project team recommendation against further artificial breaching, it appeared that iSimangaliso had also ignored its own management strategy and the “disastrous impacts” of prior engineering interventions.

In response, Creecy appointed a five-member panel of experts that included WRC Aquatic Ecosystems Research Manager Bonani Madikizela. The panel was chaired by marine biologist Dr Nasreen Peer and also included social scientist Mrs Busi Ngcobo, economics researcher Dr Lindile Ndabeni and environmental fluid mechanics researcher Prof Derek Stretch. It was asked to advise on the significance and impact of the artificial opening of the estuary mouth and the “exceptional circumstances” that led to the decision to breach. It was also asked to develop guidelines for the immediate and ongoing management of the system.

In its report published in April, the panel concluded that the decision to breach the mouth artificially had directly contravene the GEF recommendations. However, said the panel, the breach did not appear to contravene the park’s maintenance management plan, nor did it appear to have had a significant impact on the lake’s ecology.

Nevertheless, the circumstances necessitating a breach were largely undefined and the park authority needed to revise the management plan to define explicitly, what was meant by “emergency/ecological reasons” to justify future artificial breaching.

The panel also set out possible “exceptional circumstances” that might justify future breaching. These could include a prolonged and “unprecedented closed-mouth state”; an exceptional build of the sand berm between the lake and the sea; excessive accumulation of sediments; a prolonged freshwater state; build-up of alien or submerged vegetation; a decline in faunal diversity or a decrease in the nursery function of the estuary.

Another significant finding was that the exceptional circumstances definition did not take sufficient account of social and economic circumstances – including the back-flooding of commercial and subsistence farms or the decrease in tourism and recreational angling during closed-mouth states or an increase in conflict between conservation and neighbouring communities.

There was also a need to improve communication between the park and local communities and to improve catchment management beyond the park boundaries and within the Mfolozi floodplain.

There should also be a “thorough and updated investigation” of water use licences and catchment management to ensure that

the lake system received a fair and adequate share of fresh water in a region under pressure due to farming, commercial forestry and groundwater abstraction.

To reduce the extent of sediment deposition into the area close to Honeymoon Bend, a technical task team suggested blocking off an existing “short circuit” link canal from the Mfolozi – though the full implications of this required further investigation and modelling.

Commenting on the findings and recommendations of the panel, Whitfield said there was no doubt that the original decision to relink the Mfolozi to the lake was the correct one. “The St Lucia system certainly benefited from the management decision to relink the Mfolozi River to the St Lucia Estuary. Effectively that decision saved Lake St Lucia from drying out completely during future droughts.”

Unfortunately, he said, the relinkage also came at the cost of high inputs of suspended silt due to the loss of the sediment filtering capacity of the Mfolozi Swamp which was destroyed to provide land for sugar farming almost a century ago.

The volume of water provided by the Mfolozi River during the decade prior to the artificial St Lucia Estuary breach in January 2021 was sufficient to fill up the lake system but not enough to naturally breach the berm. “This prolonged loss of marine connectivity had major implications for the continued survival of estuary-associated marine fish and invertebrate species that used the lake and estuary as a primary nursery area.

“Indeed, it got so bad that some species (notably mullet) either disappeared or were close to disappearing from the system altogether. That was why I supported the assisted breach (after having supported the natural breach policy at its inception) and was very pleased to note that the estuary berm was breached naturally in April 2022.

“Both mouth opening events were/are good for marine connectivity but the lack of accumulated silt and mud removal by the outflowing flood waters is cause for major concern. This is because there has been a compaction of these fine sediments over the long, closed phase and they are now almost impossible to remove during normal summer flooding by the Mfolozi River.”

While a repeat flooding episode on the scale of Cyclone Demoina might help to scour out The Narrows section, there was no guarantee of this in the near future. “Whilst I supported the GEF management plan in the first few years of its implementation, I became increasingly disillusioned as the period of mouth closure grew longer and longer – without any marine connectivity.”

Whitfield is worried that there were still no clear guidelines from the panel to the iSimangaliso Wetland Park Authority as to how the St Lucia mouth should be managed going forward – other than to say that, if there are exceptional circumstances, then it can be artificially breached. “This is not a helpful recommendation from a long-term estuary management perspective. Basically, a new plan for the management of the St

Lucia system needs to be developed and implemented and the panel did not make this recommendation.”

Dr Ricky Taylor, the former park ecologist who spent decades researching this lake system, is also worried that St Lucia is on the verge of “flipping” irreversibly from an estuary into a shallow freshwater lake – possibly within a decade, if the high silt levels entering the lake are not managed urgently. “Although I am critical of the GEF management strategy, whenever I was asked my opinion I always responded that we should give it a chance to see if it works or not,” said Taylor.

“My attitude changed radically in September 2020 when I saw the sediment accumulations and associated vegetation responses, learnt about the flooding of the Umfolozi floodplain by backing up of water and found out that almost no monitoring or assessment to this intervention was being done. There were (in my opinion) irreversible changes occurring and nobody was tracking the effectiveness, or otherwise, of the GEF management strategy.”

He notes that St Lucia is already on a long-term trajectory to becoming a shallow freshwater lake rather than a functioning estuary, so he believes it is crucial to slow this down by appropriate management intervention - including dredging and artificial breaching based on sound scientific advice.

While it was necessary to “salvage the essentials of the GEF strategy” to relink the Mfolozi to Lake St Lucia, the recent increase in muddy sediment loads had to be reversed.

“We cannot implement a management strategy that relies on ‘natural processes’ There has been too much damage to the natural processes in the catchment and Mfolozi flats. We do need human interventions. These must be guided by competent people - who understand the area, have historical background, have experience and have the latest scientific knowledge,” Taylor concluded.



Tony Carnie

At the height of a drought phase in early 2016 there was so little water in St Lucia that the lake bed was littered with dead fish.



The waters of the Mfolozi River flow chocolate brown in a canalised section of the river upstream of the lake.