



The lower Mfolozi floodplain. This is what much of the area would have looked like before being drained and cultivated for sugar.

Ricky Taylor

Intensive Operation on Cards to Save SA's Top Estuary

Ill-informed decisions of the past coupled with the worst drought experienced in recent history is threatening to choke the life from Lake St Lucia on the KwaZulu-Natal coast. Now internationally-funded investigations are underway to ensure the longevity of one the of world's most important estuaries. Lani van Vuuren reports.

Initially proclaimed as a game reserve in 1895, Lake St Lucia is arguably the oldest formally protected estuary in the world. The lake has a surface area of about 35 00 ha, making it one of the largest estuarine water bodies in Africa. St Lucia's international importance is gleaned from the fact that it has been declared both a Ramsar Wetland of International Importance and a World Heritage Site.

Significant numbers of bird and animal species call St Lucia home. More than a hundred invertebrate and fish species have been recorded in the system. It is especially this function as an estuarine nursery area for marine fishes which makes St Lucia most valuable. This service is estimated to be worth more than R600-million per annum to South Africa (when the system is functional). In addition it is a recognised breeding ground for about 20 aquatic bird species. There are also large animal species roaming the estuarine system, including large numbers of hippos and crocodiles. Some endangered species found in the area include the red duiker, Samango monkey, black rhino, serval cat and suni antelope.

HISTORICAL CONNECTION

Despite its elevated conservation status, as well as acting as a major destination for national and international tourists, St Lucia has been subject to a series of freshwater supply constraints over many decades that now threaten its rich biodiversity.

Water enters the lake from five rivers, contributing an estimated mean annual total of 295 million m³. The Mkhuze River, which enters the lake at its northern extremity, contributes 56% of the annual river flow. However, historically, the Mfolozi River, which has an annual runoff much larger than the sum of all the other rivers entering the system, also used to connect intermittently with St Lucia. This water was especially critical during drier periods.

“Crocodiles, dying from dehydration and lack of food, had to be airlifted by helicopter away from the worst-affected areas.”

“The Mfolozi and St Lucia used to combine in a common bay (St Lucia Bay), explains Dr Ricky Taylor, Ezemvelo KZN Wildlife's Regional Ecologist for St Lucia. “During wet periods when there was a surplus of freshwater entering St Lucia from its rivers most of the Mfolozi water would have gone out to sea. However, at the onset of droughts, the joint Mfolozi-St Lucia mouth would close. The Mfolozi was then naturally diverted into St Lucia.”

During these conditions drought flows in the Mfolozi replaced much for the water lost by evaporation from the large surface area of St Lucia, alleviating drought stresses. For the duration of the drought there would have been no connection of St Lucia to the sea. At the end of the drought, the water levels would rise in the whole system and back up into the swamps.

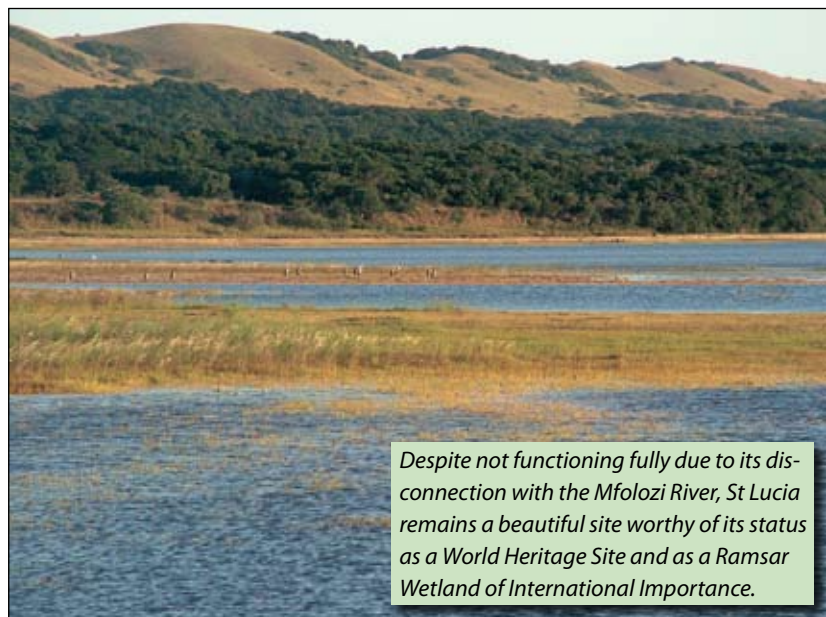
When high enough, the water overtopped the beach berm that had

formed. As the beach berm would have formed to a height of about 3 m to 3,5 m above mean sea level, the water in St Lucia backed up to this level before overtopping occurred. When it overtopped, it breached the berm, and a huge amount of water escaped, eroding away accumulated sediments, and rejuvenating the bay, explains Dr Taylor.

CHOKING THE ESTUARY

According to Prof Alan Whitfield of the South African Institute for Aquatic Biodiversity constraints to the functioning of the St Lucia ecosystem began in 1914 with the commencement of draining and canalisation of the Mfolozi Swamps to open up the swamp and river floodplain for sugar cane cultivation. The main canal, known as Warner's Drain, was completed in 1936 and the sediment filtering capabilities of the swamps in the Mfolozi River floodplain was effectively removed.

Prior to this the Mfolozi swamps acted as a huge filter – catching sediment and allowing only relatively sediment-free water to pass through. It was this sediment-free water that entered St Lucia during drought periods. As a result of these constructed canals, exceptionally high sediment loads from the Mfolozi River started entering the St Lucia system directly.



Despite not functioning fully due to its disconnection with the Mfolozi River, St Lucia remains a beautiful site worthy of its status as a World Heritage Site and as a Ramsar Wetland of International Importance.

Ricky Taylor

Dr Taylor says that by the 1940s, serious concerns were expressed about the rate of sedimentation in the combined St Lucia-Mfolozi mouth. "Then, in 1950, the whole mouth area choked up, completely blocking both systems from the sea. To save farms from being flooded by the backing-up Mfolozi water, a canal was dredged through to the sea to 'release pressure'. This became the new Mfolozi mouth." This action deprived St Lucia of its single largest freshwater supply.

It took five years to dredge enough of the sediment away to be able to open the St Lucia mouth (and another eight years to remove all the accumulated sediment). Between the 1960s and 1990s authorities adopted an 'open mouth policy' rather than allowing the St Lucia mouth to close naturally as it usually does during drought periods.

At the same time, an attempt was made to stabilise the St Lucia mouth by building hard structures. "This was a failure as it did not achieve the desired condi-

tion of having a self-scouring mouth," notes Dr Taylor. In addition, it resulted in significant build-up of salinity within the system as sea water entered to replace water lost through evaporation.

PROLONGED DEGRADATION

In the last 50 to 60 years increased human pressures on the remaining rivers entering Lake St Lucia (Mkhuze, Mzinene, Nyalazi and Mpati) have further reduced the runoff of rivers entering the system by about 20%. This is mainly due to irrigation abstractions, forestry plantations and evaporation from farm dams.

The estuary has also been affected by a series of droughts, which occur every ten years or so. A particularly severe drought occurred from 1967 to 1972. All the rivers entering St Lucia stopped flowing for most of this period. And due to the artificial situation in which the mouth was kept open, significant volumes of seawater entered the system. It also brought with it some 20 million tons of salt over the duration of the drought.

St Lucia is renowned for its pelican colony.



"This proved to be a lethal combination for the shoreline vegetation of St Lucia," notes Dr Taylor. "Large mammals such as hippos had difficulty in finding drinking water and the crocodiles, dying from dehydration and lack of food, had to be airlifted by helicopter away from the worst-affected areas."

In an effort to alleviate the condition, a canal was excavated in the Mkhuze Swamps to the north of the St Lucia estuary. "This was a panic reaction that has since then cost the taxpayer many millions of Rands to repair – and money is still being spent on it," says Dr Taylor.

TURNING THE TIDE

St Lucia is again experiencing a prolonged and severe drought which has lasted for eight years. With the knowledge gained from the previous droughts, the mouth was allowed to close naturally in 2002. For years no water from the Mkhuze River flowed into St Lucia (good rains at the start of this year, however, brought some



The low-lying sugar cane fields in the Mfolozi swamp have to have a network of drainage canals to remove water.

Ricky Taylor



SA Tourism

much-needed relief). "This drought has been as bad or even worse than the drought of 1967-72," maintains Dr Taylor.

Large-scale evaporation has caused significant water to be lost from the system (the effect was worst in 2006, when only 10% of the lake was left). Then the system divided into several compartments that were separated from each other. There have been some die-offs of fish, and the remainder concentrated in the smaller volumes of water. Since the mouth has closed, there has been little breeding of fish. Coastal storms in March 2007 resulted in very high seas which breached the sand bar at the estuary mouth and caused salt water to pour into the lake thus worsening salinity levels. At one stage authorities feared that the water would become hypersaline – such water is likely to kill all the protective vegetation along the lake margins.

In this degraded state this world-class estuary cannot function at its full

potential. "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 Mfolozi with the estuary," says Prof Whitfield.

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In an experimental initiative during the winter months of 2008, the Mfolozi estuary mouth was closed and a channel, constructed in the 1960s, linking the Mfolozi to the St Lucia system was opened up, thus allowing relatively sediment-free river water to flow into the St Lucia estuary. In the absence of the river flooding (and associated high sediment loads) the Mfolozi link was retained for six months, resulting in about 15 million m³ of water entering St Lucia. When the river came down in flood during the start of the rainy season, it breached to the sea, rendering the link ineffective.

"Although this pattern of manipulating the Mfolozi estuary mouth during winter can be repeated in the future it is not a solution to the St Lucia salinity



A jetty, high out of the water, indicates how much the water has dropped below normal levels.

Ricky Taylor



The mangrove-lined channel used to carry Mfolozi water into St Lucia in an effort to simulate the connection that linked the two systems to each other prior to the establishment of sugar.

that the future effects of global climate change could see these fields becoming un-farmable with a rise in sea level.

“If we could restore those low-lying swamp areas this would enable the Mfolozi to be linked permanently to St Lucia. This would ensure that the vital freshwater supplies necessary to prevent extreme hypersalinity and widespread desiccation within the lake would be delivered, as well as to assist with providing the necessary water volume to flush out the estuary when the mouth opens at the end of a closed phase,” says Prof Whitfield.

St Lucia is a resilient ecosystem, and if good freshwater flows can be restored to the system it can return to its full potential. Within the estuary there are a variety of habitats that will the maintaining founder stocks of plants and animals that will colonise the system once water levels are restored.

Ricky Taylor


problem, primarily because of the relatively small freshwater volumes delivered to the area during this low flow season,” explains Prof Whitfield. “We must find a way of re-linking the Mfolozi River to St Lucia permanently.”

At present, longer-term options are being investigated with funding from the Global Environment Facility of the World Bank. Studies are underway to investigate several restoration options. The ideal solution would be to re-establish parts of the Mfolozi area as swamp to filter out the river-borne sediment and then re-establish the connection to allow the Mfolozi to enter St Lucia.

However, there is bound to be much resistance for such a decision from stakeholders on the Mfolozi floodplain. Because of the rich soils and high moisture content the sugar cane fields on the Mfolozi floodplain are among the most productive sugar farms in South Africa. The land is also among the most expensive in the country.

An easier option might be to buy back

and rehabilitate some of the low-lying lands of the Mfolozi floodplain that was previously swamp, and is currently under sugar cane production. These low-lying fields are prone to flooding and require extensive canalisation and levees to protect them. Experts predict

Even in its degraded state Lake St Lucia remains one of the top estuaries in South Africa. However, the recent drought has shown very clearly that this resilient system cannot survive if the Mfolozi River remains permanently separated from this World Heritage Site. 



When the Mfolozi comes down in spate, it carries huge loads of sediment. It is because of this sediment load that the Mfolozi was separated from St Lucia in 1950.

Ricky Taylor