

## Estuaries

# The potential reconnection of the Mfolozi River to the St Lucia system was the subject of a recently completed WRC-funded project.

### Degradation of Mfolozi-St Lucia system

The Mfolozi River historically supplied much of the water to the St Lucia estuarine system. However, since the 1920s when sugar cane farming was introduced on the Mfolozi/Msunduzi floodplain, there have been progressive changes to the landscape for a number of reasons.

Historical evidence from early maps, supported by anecdotal evidence, indicates that changes in the Mfolozi/Msunduzi floodplain have had profound impacts on the Mfolozi Estuary and indeed on the whole St Lucia system. The main impact has been the deterioration of the water quality, especially with respect to suspended sediment, to the extent that in the early 1950s it was considered necessary to divide what was up to that time a common St Lucia/Mfolozi mouth into two separate entities.

The separation of the Mfolozi from St Lucia resulted in a major change in the way that St Lucia functioned. It became more sensitive to developments within the catchments of the river systems that flow directly into St Lucia.

These developments compounded the problem, in that much of the water which had previously fed directly into the various lake compartments was being diverted for agricultural and other uses. The development of forestry in these same catchment areas further contributed to periods of very low river flow, decreasing water level in the lakes, and the progressive rise in salinity.

Only recently have stakeholders started experiencing the full implications of the separation of the Mfolozi River from St Lucia for the well-being of the ecosystem, with the St Lucia lake virtually drying out completely for the first time in living memory. However, it is not simply the loss of this riverine influence on the salinity and water levels of the lake compartments that has caused the ecological 'pendulum' to swing off the scale and endanger St Lucia's World Heritage status. There are many other

impacts, some of which are well documented scientifically, while others are based primarily on observation or the behaviour of models.

### Consolidation of existing knowledge

The urgent need to consolidate all existing knowledge about the Mfolozi Estuary and associated floodplain, and its relationship to St Lucia, has increasingly been recognised. To meet this need, a workshop was convened in May 2010 by the Consortium for Estuarine Research and Management, under the auspices of Ezemvelo KZN Wildlife, to provide a platform for researchers who had information on the Mfolozi-Msunduzi estuarine system to give presentations describing their recent findings. The objectives were to develop a sound description of the system, its processes and its dynamics, to identify knowledge gaps and to set the course for future research.

The envisaged outcome was a report summarising the current understanding of the system, with particular emphasis on information required to enable reconnection of the Mfolozi to the St Lucia system. The ensuing report was structured around 14 contributions from various scientific disciplines, together with a synthesis section, all of which do indeed provide assistance in understanding how the Mfolozi/Msunduzi rivers and floodplain link with the functioning of the St Lucia ecosystem and how developments have impacted this functioning.

### Impacts of development

Developments have had the following impacts:

- The St Lucia mouth closes more frequently than in the past and, once closed, remains closed for much longer. Modelling has shown that the mouth, instead of staying closed for less than 30% of the time after closure, could now remain closed for as much as 80% of the time before breaching naturally.
- River sediment dynamics are affected. Mouth closure means that more river sediment during the high-flow periods

enters St Lucia than if the mouth was functioning naturally. Under natural mouth regimes, when the mouth is more likely to be open during wet periods, much of the river sediment would be flushed into the sea. Under closed mouth conditions these sediments may accumulate within the system.

- Marine sediment dynamics are affected. Marine sediments tend to accumulate inside the estuary mouth, carried in by inflowing tidal water. In the former configuration, the combined flow from the Mfolozi and St Lucia through a single mouth would have been stronger than is the case for either of the separated mouths. Thus marine sediment dynamics under natural conditions would be very different from current dynamics.
- Sediment flushing on a large scale would have occurred whenever the combined mouth breached, especially with a substantial head of water (estimated to have been approximately 4.6 m above MSL in one case) existing at the time of breaching. Through separation of the Mfolozi from the St Lucia system and with artificial breaching, this massive scouring process has effectively been lost.
- With biotic connectivity between the Mfolozi and St Lucia, freshwater prawns can breed prolifically in the Mfolozi wetlands and their larvae carried into St Lucia by small floods. It is likely that other species may exhibit similar behaviour when the two systems are connected.
- Prolonged mouth closure affects recruitment and breeding of fish species and crustaceans. For estuary-associated marine fish species in particular, once the populations in St Lucia have been reduced or wiped out locally, it takes several years after larval recruitment for populations to recover and be able to contribute to the South African marine spawner stock.

## The future

The Mfolozi system still has sufficient water to supply St Lucia but the problem that confronts management relates to the suspended sediment that is associated with summer river flow, especially during times of flooding. However, the consolidation of all available information on the Mfolozi/Msunduzi systems represents an important resource for management authorities in the area and could facilitate the development of a framework to guide the long-term conservation of this valuable heritage for all South Africans.

The end result of the exercise is also an endorsement for the re-linking of the Mfolozi and St Lucia estuaries and the implementation of measures that will reduce any excessive input of sediment from the former into the latter system. There is little doubt that St Lucia will be unable to survive as a World Heritage Site unless it obtains Mfolozi River water, especially during droughts.

With the most recent expert opinion available in condensed form, it would now be possible to proceed with rehabilitation measures with a greater measure of confidence. In this

connection, the utilisation of a Global Environmental Fund grant, recently obtained to implement remedial measures, should benefit from this consolidation of knowledge.

The socio-economic assessments included in the knowledge review constitute a start in addressing the re-linkage issues around the Mfolozi and St Lucia systems. They also highlight the value of the St Lucia system on a national basis and the need for more work in this area in order to convince administrators and politicians of the necessity to support bold management actions.

## Issues and ideas requiring further research and consideration

Individual aspects that were identified as requiring urgent research attention are the following:

- The linkage of the Mfolozi to St Lucia and how to divert large quantities of fresh water northwards when the St Lucia mouth is closed.
- How to reduce sediment input into St Lucia if the Mfolozi water is diverted.
- How to maintain the biotic connection between St Lucia and the sea in as near a natural state as possible.

A number of conceptual ideas were documented to help stimulate a debate that might ultimately lead to a successful management plan for this unique area. Foremost amongst these is a suggestion that the natural subsidence of the floodplain be used as a 'sink' for new sediments flowing down the Mfolozi River. Similarly, a number of useful ideas concerning the practical re-linkage of the Mfolozi to the St Lucia system and how this may be 'managed' to a degree using 'soft' engineering based solutions were advanced.

## Conclusion

The overwhelming sentiment emerging from the workshop was that the time for talking has passed and the time for action to ameliorate the extreme environmental conditions at St Lucia has arrived. The Mfolozi and St Lucia system cannot wait another decade whilst more research is undertaken – sufficient information is already available for management to implement a plan for the long-term benefit of one of South Africa's most important World Heritage Sites.

### Further reading:

To obtain the report, *A Review of Studies on the Mfolozi Estuary and Associated Floodplain, with Emphasis on Information Required by Management for Future Reconnection of the River to the St Lucia System* (Report No: KV 255/10) contact Publications at Tel: (012) 330-0340; Fax: (012) 331-2565; E-mail: [orders@wrc.org.za](mailto:orders@wrc.org.za); or Visit: [www.wrc.org.za](http://www.wrc.org.za)