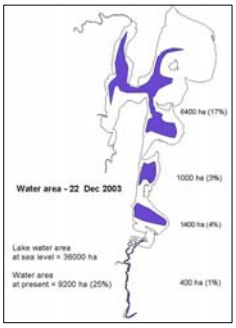
An IUCN member studies one of the world's unique estuaries

A group of Norwegian biologists and geologists from the Norwegian University of Life Sciences (an IUCN member since 1988) and their counterparts from the University of Natal, have studied St. Lucia, Africa's largest coastal lagoon during the past three years. Funded by NORAD through the Norwegian Council for Higher Education (NUFU), the research aims to understand how freshwater-sensitive animals and plants cope in periods when the salinity in the estuary becomes intolerable for them, and how to protect this unique ecosystem. Dr Sylvi Haldorsen, UMB project coordinator and vice-president of the International Union for Geological Sciences (IUGS) explains that the connection between geology and fauna in St. Lucia is unusual in a global context.

St. Lucia, situated on the coastal Mozambican plain in northeast South Africa, is Africa's largest coastal lagoon and has a richer biodiversity than any other of Africa's tropical or subtropical estuaries. For this reason, St Lucia was declared a World Heritage Site under UNESCO in 1999.



The St. Lucia lagoon is separated from the Indian Ocean by a 5 km broad coastal area, with up to 150 m high sand dunes. The estuary surface is ca 350 km^2, while the average depth is only around 90 cm. Direct precipitation accounts for about 45% of the estuary's freshwater supply, while the inflow from the four surrounding rivers is about 50%. The groundwater component is on average around 5%. Salt water penetrates into the lagoon through the tidal channel that connects St Lucia with the Indian Ocean and gives brackish water in the south. The inner part of the lagoon is virtually fresh as long as there is abundant precipitation in the inland catchment. However, severe droughts have occurred each decade over the past 50 years, lasting from two to five years and the discharge from the rivers subsequently decreases and stops completely. The salinity in the inner parts can then become up to three times the saltiness of seawater. The variation in salinity has resulted in continuous ecological changes.

What is different with the latest drought that started in mid-2002 is that the estuary mouth has been closed for almost three years, without any contact with the sea. Because of tremendous evaporation from the shallow water body, the estuary has been split up into several smaller, separate water bodies, without any link to each other. Salinity values of up to 130 per mille have been measured in the inner part of the estuary.

The research has focused on the groundwater supply in the estuary during droughts. Groundwater flow systems are known to respond slower to climate change than rivers. Due to the drop in the water level in the estuary during the last three years, the researchers have been able to observe a persistent groundwater flow from the tall coastal dunes into the estuary along its whole eastern shoreline. Based on a groundwater monitoring system they have used a groundwater simulation model, which indicates that the groundwater flow into the estuary can persist for at least a full decade.

During earlier droughts it has been observed that the ecology of the lake recovers very fast after the end of a period of drought. The researchers have now confirmed that this is because the groundwater flow into the estuary forms refuges for the saltwater sensitive plant and animal communities. Not only do the small organisms use the groundwater niches for their survival, the niches are also the source of drinking water for hippos, crocodiles, birds and large terrestrial herbivores. It also creates wallows, which are preferred by hippos and crocodiles to the hypersaline estuary water, as the lower salinity

levels do not irritate their eyes. The concentration of fish in such wallows, freshened by groundwater, can also act as a rich food source for crocodiles. The fresh water areas are also used by waterfowl, which feed in the saline water, but need to wash the salt from their plumage.

Although the groundwater flow into the estuary only forms about 5% of the freshwater inflow over an average of a decade, it is of critical importance for the resilience of the estuary and its unique ecology. Groundwater clearly becomes of critical importance to the lagoon's biodiversity during a long period of draught. Local natural resource managers are now using the project results to prevent damage of these critical pockets of groundwater, something that in the past had not been given much attention.

Contact information:
Dr Sylvi Haldorsen
Department of Plant and Environmental Sciences
Norwegian University of Life Sciences (UMB)
www.umb.no
E-mail: syhaldor@online.no