The Orange River forms a green artery of life through the harsh and arid desert along the border of South Africa and Namibia.

Courtesy Senqu2Sea team

Scientists brave SA's mightiest river to kayak from source to sea

When Irrigation Department Director, Dr Alfred Dale Lewis, explored the lower reaches of the Orange River in December 1913 he walked most of the 400 km-long journey in one of the hottest years on record. Now nearly a century later, three young researchers of the University of Cape Town (UCT) have completed a similar adventure, traversing South Africa's mightiest river in kayaks from its source in the Lesotho mountains to its mouth on the West Coast of South Africa. Lani van Vuuren caught up with them following the completion of their 2 000-km journey.

While not as substantial as its cousin, the Zambezi, to the north, South Africa's largest river has always captured the imagination of those who gazed upon it. Local Khoi named it the Gariep, meaning 'big water' or 'great river', while the San's name for it meant 'Dragon River'. It was European commander, Colonel Robert Gordon, who gave the river its 'royal' name, naming the river after Dutch ruler, Prince William of Orange, 300 years ago.

For Masters graduate Sam Jack, PhD student, James Puttick, and, statistical science lecturer, Ian Durbach, the river offered the adventure of a lifetime as well as a chance to undertake rare extensive field research. "The Orange is the iconic South African river – long, ancient and traversing varied and incredibly beautiful scenery, from grass mountain highlands to rocky desert. We wanted to spend an extended period in nature, experiencing a long rather than a technically difficult adventure," explains the team.

VALUABLE RESEARCH

While enjoying the scenery the team also took time to undertake vital on-site research. With funding provided by the Plant Conservation Unit at UCT and the South African Environmental

Observation Network (SAEON) Arid Lands Node the team was able to undertake a true river mega-transect. These snapshots of entire river systems are becoming increasingly important due to the need for baseline monitoring in the face of unpredictable changes due to future climate change.

Photographic data, which consists of high resolution landscape panoramas, were taken at 40 km intervals, while photographs of the riparian vegetation were taken at 2 km intervals. This collection of photographic data forms a priceless baseline for monitoring vegetation and landscape change along the Senqu (as the river is known in Lesotho) and Orange River. The GPS position of photographs will allow future visitors to retake the images or allow comparison with historical images and assessment of the degree of landscape change in terms of, for example, development on the river banks and extent/composition of vegetation.

Diatom samples were also collected as part of a SAEON-sponsored project led by Dr Jonathan Taylor at North West University. Diatom data will hopefully shed some light on the status of present water quality along the length of the river. In addition, numerous diatom sampling locations were selected to coincide with points which had been previously sampled to enable comparisons to be made with regards to changes in water quality over time.

The team also collected water samples for an oxygen isotope project led by Roger Diamond of the Geology Department at UCT. These data are interesting for exploring the different conditions that exist within different tributaries' watersheds during rainfall events.

HIGHS AND LOWS

The team set off from Qachas Nek, in Lesotho, on 14 January and arrived at the Mouth at Alexander Bay just over two month later, on 16 March. They travelled an average of 40 km a day. An average day would see the team on the river around 08:00 and covering 20 km before breaking for lunch, then another 20 km before the late afternoon glare would force them to start looking for a suitable campsite. "Usually any flattish patch large enough for three would do, there were few days when we struggled to find a good grassy site," James tells *the Water Wheel*.

Jack, Puttick and Durbach would then spend the remaining few hours of daylight carrying out the scientific programme and taking care of chores. "There was surprisingly little spare time," says Durbach.

"The Orange is the iconic South African river – long, ancient and traversing varied and incredibly beautiful scenery."

Courtesy Senqu2Sea team

An example of dirty unfiltered water (left) and clean filtered drinking water (right).

Courtesy Senqu2Sea team

Local Lesotho youngsters take a closer look at the team's diatom sampling efforts.

While finding a place to spend the night was easy, finding clean water was not. Obtaining sediment free drinking water was a challenge, particularly in Lesotho, where the water in the main channel was heavily silt-laden. This required laborious daily filtering sessions.

The longest stretch paddled in a single day was about 62 km, paddling hard to reach the luxury of the Felix Unite camp near Noordoewer. The team resupplied their foodstocks whenever passing through or close to small towns, generally every three to five days. The longest stretch between resupply points was about ten days from the start of the journey in Lesotho, to Aliwal North.

The team's travel blog reveals many tales of adventure, from broken paddles and lost gear, to hot days, monkey thieves, and thunderstorm nights. The team learnt by bitter experience how to keep their equipment safe and dry – sometimes learning the hard way.

In general, the Orange River proved kind to the kayakers. "Some sections, for example, dams, took longer than expected, but we were generally able to make up time on other sections," Puttick explains. The team portaged around the Gariep and Vanderkloof dam walls; a handful of weirs deemed too dangerous to run; and a couple of waterfalls.

"One can paddle 99% of the Orange River system, but it helps to have some prior knowledge of obstacles along the way, such as weirs with a bad reputation, tricky rapids, the location of waterfalls and the preferred passage through sections where the river is highly braided," notes Puttick. "Navigation through braided sections of the river was sometimes slow and tricky. It forced us to be patient and made us appreciate the wide open channel when it finally arrived at the other end."

"All this data amounts to a thoroughly and carefully captured snapshot of the Orange River system; it is something we are quite proud of."

The most physically demanding stretches were the Gariep and Vanderkloof dams, due to the lack of flow and occasional headwinds accompanied by choppy water. The stretch from Augrabies to Noordoewer was also tough due to consistently high temperatures (upper 40s)

and hot winds, which often persisted throughout the night.

Any hardship was soon rewarded by breathtaking scenery, from enormous sheer cliffs, stately quiver tree forests, to unusual wild animal sightings and the sight of huge storm systems brewing.

VALUABLE DATA

The team returned home with a mountain of data, which will take some weeks to work through. A total of 61 diatom and water samples were collected; 53 isotope samples taken in tributaries of, and within, the Orange River, well over 1 400 GPS locations of interest, including around 500 water abstraction points and around 700 fish eagle, goliath heron and giant kingfisher sightings.

The team also recorded and photographed the location of all significant bird nesting colonies along the length of the river, as well as mining activity. Hundreds of points record the location of fishing activity, starting from the town of Aliwal North. In addition, Puttick studiously recorded bird species observed on a daily basis, amounting to a continuous record of species presence along the entire length of the river. These data will form the basis for several popular articles and specific data to be sent to experts in the relevant fields.

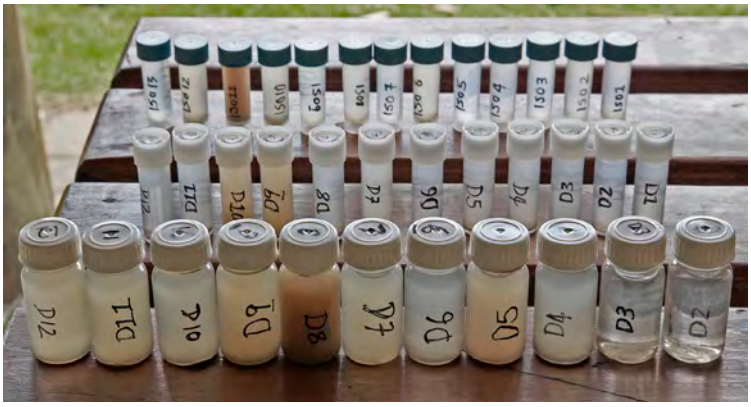
A significant observation was the extremely heavy silt load carried by the river during the rainy season, especially in the upper portion. The team happened to pass one of the tributaries, the Makheleng River, while it was in flood. “It had the colour and consistency of chocolate milkshake,” Jack says. “Sediment inflow such as this is projected to decrease the storage capacity of Gariep Dam by 80% by 2050.”

The team also clearly observed the effect weirs and dams have had

on the natural ecology of the Orange River system, mainly by evening out the natural variability of flow in the river. Apart from influencing the natural aquatic ecosystem, this has impacted the river's ability to flush itself out every few years during flood events. Alien invasive plants were found to dominate portions of the riparian vegetation in places. Despite these impacts the water quality below the Gariep Dam appeared reasonably good.

"All this data amounts to a thoroughly and carefully captured snapshot of the Orange River system; it is something we are quite proud of," says Puttick. "We hope it will be of much use as a baseline dataset and as a resource to current and future researchers of the Orange River system." SAEON and the Plant Conservation Unit at UCT will be primary repositories for the data.

- To read more about the team's exploits visit their Blog at www.senqu2sea.wordpress.com



Courtesy Senqu2Sea team

Top right: *Daily water samples reflect how silt loads vary in the river, mostly influenced by precipitation events.*

Middle right: *The team was struck by the scenery in Lesotho which indicated a heavy utilised land, with heavy siltation into the river as a result of erosion.*

Below: *The Vanderkloof Dam wall – the highest in South Africa. Dams provide vital water for agriculture, human consumption and hydroelectricity but have a major effect on the downstream ecology and natural cycles of the Orange River.*

LESSONS LEARNT AFTER TRAVERSING SOUTH AFRICA'S LARGEST RIVER

- Even a task which seems insurmountably large – like navigating a river more than 2 000 km long – is possible if one just chips away one small piece at a time.
- South African people remain generous and willing to help complete strangers at the drop of a hat.
- Humour and laughter are the best elements of a long journey. They help relieve tension and anxiety and bond people together.
- There is beauty and purity in a simpler life, closer to nature. Our country is enormously diverse, in people and cultures, in landscapes, vegetation, and geology.
- Never leave home without your harmonica.