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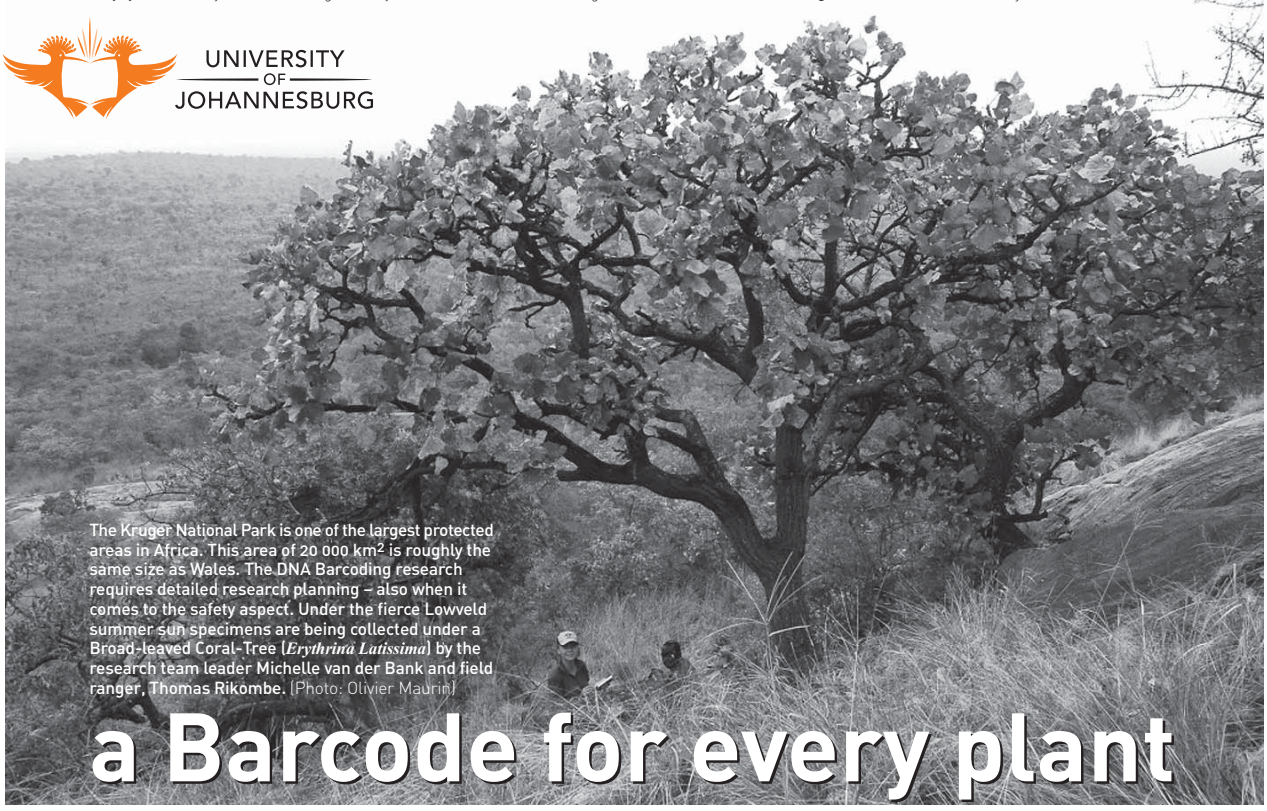
THE DNA BARCODING HERALD

A once-off newspaper. University of Johannesburg, January–December 2008. Johannesburg. South Africa. (**The DNA Barcoding Herald** should be read in conjunction with the UJ Calendar for 2008)



The Kruger National Park is one of the largest protected areas in Africa. This area of 20 000 km² is roughly the same size as Wales. The DNA Barcoding research requires detailed research planning – also when it comes to the safety aspect. Under the fierce Lowveld summer sun specimens are being collected under a Broad-leaved Coral-Tree (*Erythrina Latissima*) by the research team leader Michelle van der Bank and field ranger, Thomas Rikombe. (Photo: Olivier Maurin)

a Barcode for every plant

The 2008 calendar of the University of Johannesburg (UJ) focuses on one of the research projects of our Department of Botany and Plant Biotechnology in the Faculty of Science: ***DNA Barcoding the Flora of the Kruger National Park, South Africa***.

A group of scientist led by Dr Michelle van der Bank (University of Johannesburg, South Africa) and Dr Vincent Savolainen (Royal Botanic Gardens, Kew / Imperial College London) with a team of five senior UJ researchers (PhD student Olivier Maurin, two Honours students Genevieve Thompson and Flip Minnaar, Dr Renaud Lahaye and Dr Sylvie Duthoit), have started an ambitious project of collecting all the plant species of the Kruger National Park to use DNA sequencing and barcoding techniques to study this rich flora of South Africa.

What is DNA Barcoding?

It is a diagnostic technique in which the DNA sequence of a portion of a single gene is used for species identification. It is intended to promote rapid and inexpensive species identification. In animals, the mitochondrial *cox1* gene (CO1) has been identified as a suitable DNA barcode, however, in plants it is still unclear which marker(s) could be used as a DNA barcode.

The scientific benefits of DNA barcoding include: (i) enabling species identification, including any life stage or fragment, (ii) facilitating species discoveries based on cluster analyses of gene sequences, (iii) providing insight into the diversity of life and, (iv) promoting development of a hand-held DNA "barcoder" that can be applied in the field for biodiversity inventories. When this technology becomes available it will help many non-scientists quickly and inexpensively to identify known species and retrieve information about them.

Producing a DNA barcode for the flora of the Kruger National Park

The Kruger National Park is one of the largest protected areas in Africa. This area of 20 000km² is roughly the same size as Wales. It now also forms part of the Great Limpopo Transfrontier Park, which links the Kruger National Park with Gonarezhou National Park in Zimbabwe and the Limpopo National Park in Mozambique. UNESCO has designated this new Transfrontier Park as a World Heritage Site. Various habitats and ecological regions exist within the boundary of the Kruger, with at least 16 recognised 'ecozones', each one characterised by specific vegetation, geology, soils, rainfall rate, and temperature. For example the vegetation and plant diversity found in the Malelane Bushveld Mountain (southern part of the Park) is very distinctive of what can be found in the Lebombo Mountains (eastern part of the Park) located on the border with Mozambique. In the northern part of the Park the Sandveld is divided in several fragments and represents a particularly interesting area in term of plant diversity. This area has many highly localised species, which enter from Mozambique or the Limpopo valley. Large rivers like the Limpopo, the Elephant and the Crocodile, as well as rocky outcrops spreading all over the Park, also represent places of botanical interest. Surprisingly, no comprehensive botanical inventory has recently been done in the Kruger.

Since the beginning of this project in September 2005, more than 2 000 plant specimens have been collected. This represents the most complete and recent inventory of the Park's flora, which will be useful to update datasets of the Scientific Services of the Kruger. This is also the largest and most diverse sampling ever made for barcoding purposes in a protected area.

To produce a barcode for the flora of the Kruger we have evaluated eight plastid DNA markers, across a phylogenetically diverse set of taxa, which include 19 families, 22 genera and →

In dramatic contrast to the field work in the Kruger National Park, sophisticated state-of-the-art laboratory equipment is required for the analysis. Renaud Lahaye is busy with DNA extractions in the Molecular Systematic Facility at the University of Johannesburg. (Photo: Olivier Maurin)

38 species. The results indicate that a combination of genes is recommended as a barcode for the flora of the Kruger, although *matK* alone correctly identified more than 90% of the species.

This study will improve the knowledge of plant biodiversity of the Kruger, as well as conservation management, by providing exact localities of native, alien, rare and endangered plants. It will also facilitate the future monitoring of botanical plots throughout the park by providing DNA-based taxonomic identification tools.

DNA barcoding of all trees and shrubs species is now nearly completed (300 species) and the DNA barcoding programme of herbs, grasses and bulbs is also well on its way.

A DNA Bank for the flora of the Kruger at the University og Johannesburg

A DNA bank was set up at the University of Johannesburg to limit bio-prospecting where DNA extracts of the flora of KNP will be held centrally and could be made available for the scientific community. DNA extracts will also be duplicated and transferred to the DNA bank of the South African Biodiversity Institute (Kirstenbosch, South Africa), and the Royal Botanic Gardens, Kew (UK).

Visit our website for more information at: http://www.uj.ac.za/botany/PlantMolecularSystematicsLaboratory/tabid/6755/Default.aspx

For this 2008 UJ Calendar project

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(All photographs taken with a Nikon D200 (60mm lens) on location during fieldwork in the Kruger National Park, South Africa.)

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The Royal Society
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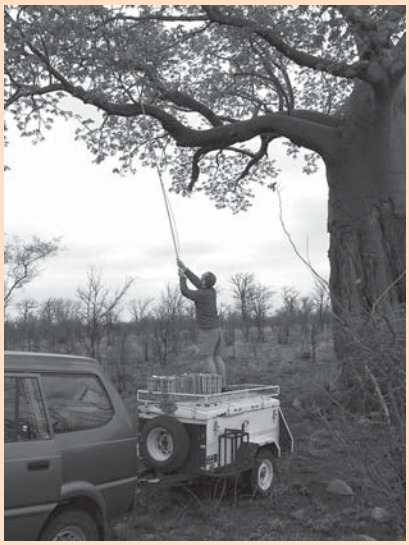
Collecting plant material in the Kruger is a laborious task that is often undertaken under difficult conditions, including seasonal rainfall – Olivier Maurin photographs and documents a flower of the Amarillis family (*Scadoxus puniceus*) on Skip Mountain. (Photo: Michelle van der Bank)

Each researcher has a preferred plant – Renaud Lahaye is observing a specimen of his favourite plant group: the Impala Lily family (Apocynaceae). (Photo Olivier Maurin)

Persevering in the rain on Skip Mountain: Renaud Lahaye collecting data under the vigilant eye of the field ranger, Thomas Rikombe. (Photo: Olivier Maurin) →



Often samples of plant material need to be taken as the fauna and flora unfolds and rarely in a predetermined manner, such as this Boabab Tree (*Adansonia digitata*) sample being collected by Olivier Maurin. (Photo: Michelle van der Bank)

The DNA Barcoding Herald is printed on Reviva Beige 85gsm and the Calendar's leaves are printed in four colours (spekta screen), matt aqueous varnished and spot UV varnished on 300gsm Magno Satin.The backing board of the calendar is printed in one colour on 295gsm Supreme Sulphate Board.