

Plants from Kruger and Costa Rica help discover plant 'barcode'

Barcoding is no longer a term only affiliated to consumer goods. Thanks to the research efforts made by Dr Michelle van der Bank of the University of Johannesburg (UJ) and a group of international scientists, a gene has been identified to distinguish between the majority of plant species on earth.

This gene, which can be used to identify plants using a small sample, could lead to new ways of easily cataloguing different types of plants in species-rich areas like rainforests. It could also lead to accurate methods for identifying plant ingredients in powdered substances, such as in traditional Chinese medicines, and could help to monitor and prevent the illegal transportation of endangered plant species.

The team behind the discovery found that DNA sequences of the gene 'matK' differ among plant species, but are nearly identical in plants of the same species. This means that the matK gene can provide scientists with an easy way of distinguishing between different plants, even closely related species that may look the same to the human eye.

The researchers made this discovery by analysing the DNA from different plant species. They found that when one plant species was closely related to another, differences were usually detected in the matK DNA.

The researchers carried out two large-scale field studies: one on the exceptionally diverse species of orchids found in the tropical forests of Costa Rica, and the other on the trees and shrubs of the Kruger National Park.

This was a collaborative project between teams from South Africa led by Dr Michelle van der Bank of the Department of Botany and Plant Biotechnology at the UJ, the United Kingdom by Dr Vincent Savolainen, dual appointee at Imperial College London's Department of Life Sciences and the Royal Botanic Gardens, Kew and Costa Rica by Diego Bogarin, Lankester Botanical Garden, University of Costa Rica. The scientists' findings were published in the Proceedings of the National Academy of Sciences journal in February 2008.

Using specimens collected from Costa Rica, Dr Savolainen and colleagues were able to use the matK gene to identify 1,600 species of orchid. In the course of this work, they discovered that what was previously assumed to be one species of orchid was actually two distinct species that live on different slopes of the mountains and have differently shaped flowers adapted for different pollinating insects.

Dr van der Bank and her team were able to use the matK gene to identify the trees and shrubs of the Kruger National Park, also well known for its big game animals.

Dr Savolainen explains that in the long run the aim is to build on the genetic information the team gathered from Costa Rica and South Africa to create a genetic database of the matK DNA of as many plant species as possible, so that samples can be compared to this database and different species accurately identified. According to Dr van der Bank the electronic DNA barcoding database for the trees and shrubs of the KNP, which will include pictures, distribution maps and herbarium scans will be launched in mid April at the Science Network Meeting in the Kruger National Park.

"In the future we'd like to see this idea



Olivier Maurin and Herman van der Bank pressing specimen on top of Mlalen Hill

Olivier Maurin taking pictures of *Scadoxus* on Ship mountain

of reading plants' genetic barcodes translated into a portable device that can be taken into any environment, which can quickly and easily analyse any plant sample's matK DNA and compare it to a vast database of information, allowing almost instantaneous identification," Dr Savolainen says.

Although Dr Savolainen concedes that such technological applications may be some years away from realisation, he says the potential uses of the matK gene are substantial: "There are so many circumstances in which traditional taxonomic

identification of plant species is not practical – whether it be at ports and airports to check if species are being transported illegally, or places like Costa Rica where the sheer richness of one group of plants, like orchids, makes accurate cataloguing difficult."

The matK gene may not, however, be able to be used to identify every plant species on Earth. In a few groups of species, additional genetic information may be required for species-level identification because hybridisation – where species cross-breed and genetic material is

rearranged – may confuse the information provided by matK.

This research was funded by the Defra Darwin Initiative, the Universities of Johannesburg and Costa Rica, the South African National Research Foundation (Thuthuka program), the Royal Botanic Gardens, Kew, and the Royal Society.

Dr Holger Eckhardt, a SANParks ecologist based in Kruger says "The DNA-barcoding project from the University of Johannesburg will not only benefit the KNP by providing information on the distribution of

common and rare plant species but also highlight areas with endemism, i.e. areas containing species that only occur there and nowhere else. Another benefit will arise once the technology for scanning and identifying species in situ becomes available; using hand-held equipment to immediately identify species in the field will save an enormous amount of time since time for literature citing and training of people can largely be reduced."

photos courtesy Olivier Maurin

Local people's voices may help save lesser flamingo

Local people from Lake Natron voiced their concerns at a public hearing held on 24 January to the proposed soda ash plant there, which would threaten the world's largest population of lesser flamingo *Phoeniconaias minor*. "There is no need to accept a project that will later destroy us", said the traditional chief from Pinyinyi, one of the villages adjacent to Lake Natron. He likened the development to "taking a fish and throwing it into the bush".

About 80-100 people, including representatives from communities from around the lake, attended the meeting in Dar es Salaam Tanzania convened by the National Environment Management Council of Tanzania (NEMC). There was strong opposition to the proposed development. People representing local communities from around the lake lamented the lack of consultation in the environmental and social impact assessment. They think that the proposed factory would not deliver jobs for themselves as the plant would need educated and skilled workers. They fear that instead it would endanger employment gained from tourism, which benefits many locals, includ-

ing women who make and sell beadwork.

This meeting added further opposition to the development, which the BirdLife International Partnership has been working against over the past six months.

"We strongly believe that the cumulative impacts from the proposed facility have a high risk of causing extreme detriment to the lesser flamingo population should the project be allowed to be developed in Lake Natron area" said Lota Melamari, the chief executive officer (CEO) of WCST (BirdLife in Tanzania) at the public hearing.

The Lake Natron consultative group, which the BirdLife Africa Partnership is part of, rejected the project at the hearing. "The local community will lose their sources of livelihoods owing to over-use of water by the factory and their livestock economy risks being destroyed; but what will they get in return?"

The group insist that the best way to use the natural resources of Lake Natron is to enhance ecotourism, which is already thriving.

In a further recent development, WCST with

representatives from the BirdLife International Secretariat and the Royal Society for the Protection of Birds (BirdLife in the UK) briefed 22 of the 29 members of the Tanzania parliamentary committee on the environment on Lake Natron.

"This information will help us as we seek to understand the whole project and its implications and how to advise government on the way forward" said the chairman of the parliamentary committee. The committee also hopes to go to the site before giving their submissions to Parliament.

(BirdLife, WCST, photo Owen Newman/Naturepl.com)

