Using Rainforest Research

Sex and the single species

November 1997

Suspended in the rainforest canopy some twenty metres above the ground, I find myself surrounded by a multitude of small, rose-like flowers hanging amongst the dark, glossy foliage. Their pleasant, fruity perfume permeates the canopy, overwhelming the smell of my own sweat and the necessarily liberal doses of mosquito repellent. Just metres away, trucks, buses and cars rumble down National Route One in an irregular cavalcade, oblivious to the antics of the research high above them in the canopy of one of Australia's rarest and most primitive flowering plants.

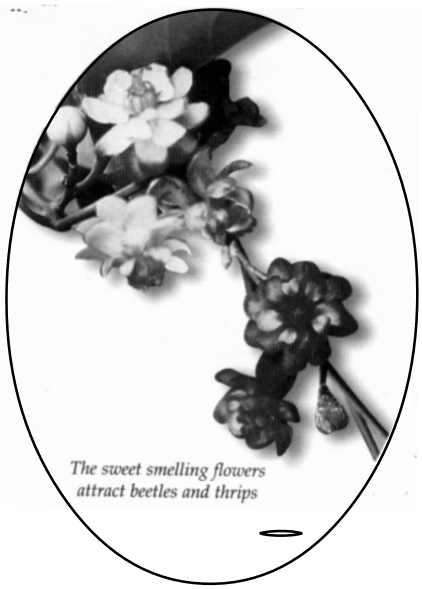
Stuart Worboys dangles precariously amongst the Idiospermum australiense

So how did I find myself in this awkward and extremely uncomfortable position? To answer this, allow me to take you back in time to 6 June 1902 when the German botanist Ludwig Diels disembarked near the confluence of Russell River and Harvey Creek, about fifty kilometres south of Cairns, just a couple of kilometres from my roadside tree. He traveled extensively through the lowland rainforests of the area, and amongst the specimens he carried back to Berlin were a few unusual rotting flowers and a leafy twig from one of the forest trees, which he later called *Calycanthus australiensis*.

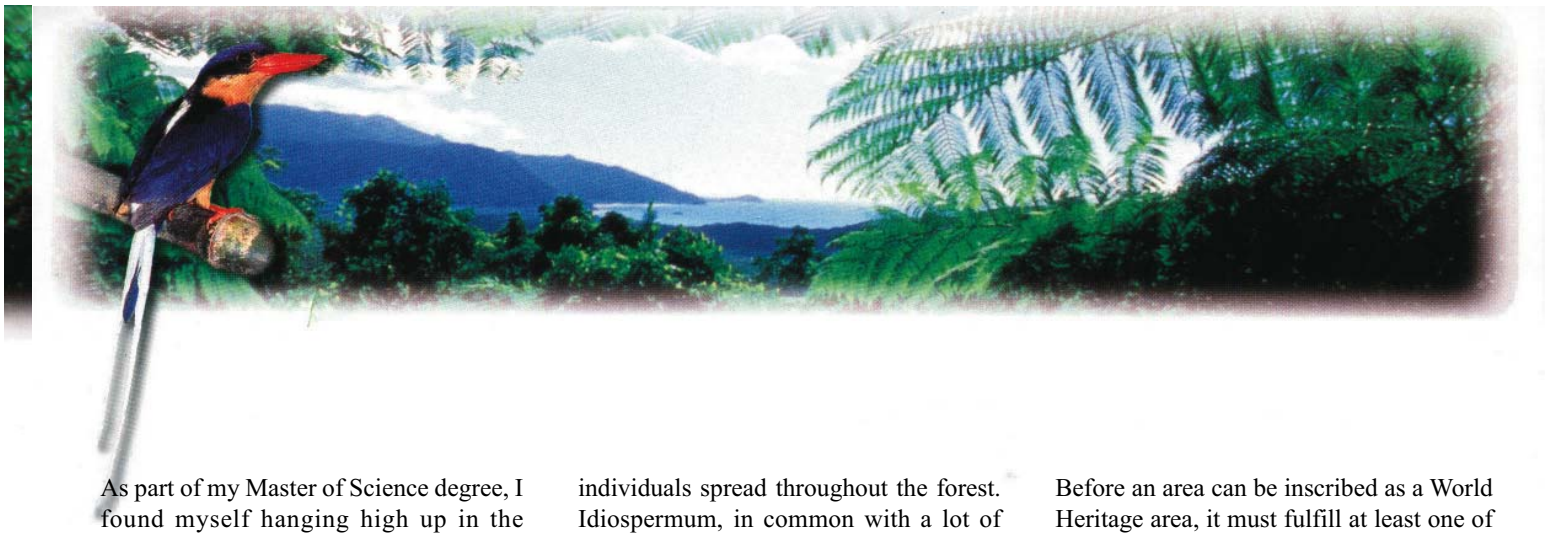
Nothing more was heard about the tree for nearly 60 years. The lowland forests around Harvey Creek were cleared for sugar cane farming, and the *Calycanthus* was thought lost. Then, in August 1971, on a property north-east of the Daintree township, four cattle died with symptoms suggesting some sort of poisoning. Fearing malicious intent, the police called in the government veterinarian to determine the cause of death. In the meantime, two more cattle died after distressingly violent seizures. Autopsies found enormous seeds in the animals' stomachs and a little scientific detective work soon discovered the entity responsible was none other than the long-lost *Calycanthus australiensis*.

Stan Blake, a botanist from the Queensland Herbarium, arrived on the scene only to find the anxious farmer had, quite understandably, removed the culpable tree and thrown all the remaining seeds into his pit toilet. Fortunately he found more trees and seedlings along the nearby rainforest creek. When he saw the seeds, he released they were unlike anything else in the world. They are the size and shape of slightly squashed cricket balls, divided into three or four segments, and possibly the biggest seed of any Australian native plant. With the image of these strange seeds in his mind, he renamed the tree *Idiospermum australiense*, which means "peculiar fruit from Australia". Today it is simply call the "idiot fruit". The species is so unique that it is the only species in its genera and is the only genus of the family *Calycanthacea* in the southern hemisphere.

Little is known about the natural history of this unique tree. Researchers have studied its primitive anatomy, and recently a new chemical called idospermuline was discovered in its seeds which may prove to be medically useful. Idiospermuline affects transmission of messages between individual nerve cells, and is the chemical responsible for the seizures in the cattle. Yet, like so many other poisons, in controlled doses it may be able to save lives. Although there has been a lot of laboratory-based work on the idiot fruit, not many people have gone out into the field to find out what makes it tick.



The sweet smelling flowers attract beetles and thrips



As part of my Master of Science degree, I found myself hanging high up in the canopy of some of the most spectacular lowland tropical rainforest in the country to study the sex life of the *Iiospermum.*

So far my research has uncovered differences in how the two main populations of the tree, which are separated by 140km, reproduce.

Unlike plants which have both male and female sex organs in their flowers, half of the flowers of Idiospermum in the northern population (Daintree) don't have any female sex organs, while all of the flowers in the southern population (Bellenden Ker) have female reproductive structures. This probably means that the two groups are evolving along different lines, and that the northern populations could be on their way to having trees of separate sexes, a trait quite common in tropical trees.

The flowers are like insect 'singles bars'. Attracted by the bright colours and sweet scent, tiny beetles and thrips gather and squeeze their way into the center of the blossom. Here they find a nice safe enclosed area, full of tasty pollen. Out of sight of predators, they can carry out their mating rituals and lay their eggs. When the eggs hatch, the larvae will have pollen and delicate flower tissues on which to feed. As the adults scrounge around inside the flower, they pick up some of the sticky pollen. If the next flower they visit is receptive, it will be pollinated and produce another of those enormous toxic seeds.

Many people who are aware of the diversity of trees in the tropical rainforests have an image of randomly scattered individuals spread throughout the forest. Idiospermum, in common with a lot of rare, tropical trees, isn't like that. It occurs in clusters ranging from a dozen individuals up to one hundred or so. This is expected, given their enormous seeds and their rarity. Their horribly bitter seeds (I know, I've tasted them) aren't eaten by anything, except for an occasional nibble

The cricket ball sized seed of Idiospermum australiense

by unknowing rats and musky rat-kangaroos. These native animals can cope with small amounts of the poisonous seeds.

As a consequence, they're not distributed throughout the forest like some tree species, they just sit where they fall. The large seeds, with their starchy storage reserves, give the seedlings a huge kick start in life. Also, given that the trees are rare, it's in their interests to huddle close together, so that pollinators are able to fly from tree to tree more easily. This prevents the genetic disaster of inbreeding.

Before an area can be inscribed as a World Heritage area, it must fulfill at least one of four criteria specified by the International Union for the Conservation of Nature. The Wet Tropics World Heritage Area is one of the few areas in the world that fulfills all four of these criteria. Initiators of the World Heritage bid cited the *Idiospermum* as one of the most important examples of the evolutionary history of the Earth's flora. *Idiospermum* also represents itself as a plant of outstanding biological value.

The idiot fruit is like a botanical dinosaur, a relic of the ancient rainforest flora of Gondwana which occupies a unique position in the Australian flora. With its many primitive characteristics, its rarity, its unique seeds, and the unusual tale of its accidental rediscovery, it symbolizes the anomalous and primitive lineage of the flora of the Wet Tropics World Heritage Area.

Stuart Worboys

For more information

*Stuart Worboys is nearing the completion of this thesis "Reproductive biology and population structure of a rare rainforest tree (*Idiospermum australiense*)" as part of his Master of Science degree.*

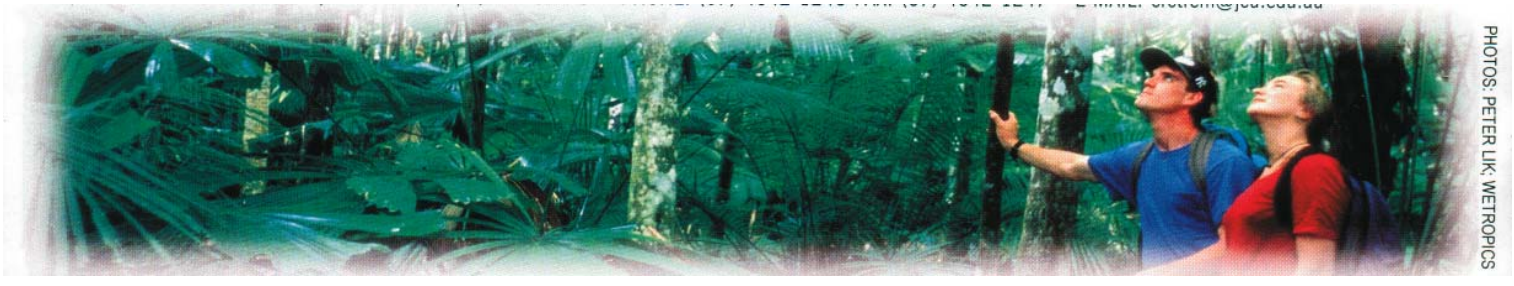
Stuart Worboys can be contacted through the:

Cooperative Research Centre for Tropical

Rainforest Ecology and Management
PO Box 6811
Cairns QLD 4870

Or

James Cook University of North Queensland
Department of Tropical Plant Sciences
Townsville Qld 4811



PHOTOS: PETER LIK: WETROPICS