Araucariaceae symposium

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The pre-symposium tour

For a botanist brought up in a cold wet island off the northwest coast of Europe, with a grand total, not counting apomicts, of one endemic flowering plant species and just three indigenous conifers, the prospect of a field tour of the subtropical tip of New Zealand, famous for its many and wonderful endemic flowering plants, ferns and conifers, was irresistible. Even more so when the tour, the prelude to the IDS Araucariaceae conference in Auckland, was to be with knowledgeable local botanists, foresters and enthusiasts who could identify and make comprehensible a flora that to a stranger seems at first sight unfamiliar or, in the case of the tree-ferns, wholly alien.

Graeme Platt and Mike Wilcox were the organisers of a densely-packed four day schedule of visits to natural forests in various stages of growth and regeneration, historic gardens and sites, and forestry plantations where New Zealand's native species are being grown on a commercial basis.

March 9

We started our tour from **Auckland**, built on the narrow isthmus connecting Northland (the foot of New Zealand's upside-down broken-leg shape) to the rest of the North Island. The city lies between inlets of the Tasman Sea on the west and the Pacific Ocean on the east, and on leaving we passed the mangroves, *Avicennia marina* var. *australasica*, on the North Shore of the Waitemata harbour, on the Pacific side. We also saw dozens of magnificent specimens of Norfolk Island pine (*Araucaria heterophylla*), which, in the predominantly agricultural countryside of Northland, mark the locations of many older farmsteads and settlements; the highly formal and inevitably rather gawky architecture of the young trees becomes much more elegant with age as the lateral branches become more densely clothed in secondary and tertiary branches.

About an hour's drive away from Auckland, at the **Alice Eaves Reserve**, a good regenerating population of kauri trees (*Agathis australis*) on a hill provided us with an introduction to the rhythm of growth of *Agathis* species, both in New Zealand and elsewhere. The young trees, known as 'rickers' with their tall, almost fastigiate form and very slim trunks, still making their way up to the canopy, contrasted markedly with the huge trunks and spreading emergent crowns characteristic of the mature trees and familiar from books, postcards and photographs. In the comparatively dry forest understorey, by far the most impressive plants were the tree-ferns (*Cyathea medullaris* and *C. dealbata*) and the bright green, shaving-brush-like tops of the nikau palms (*Rhopalostylis sapida*), common in forests throughout Northland.

After lunch on the lawn of the Mansion House on **Kawau Island**, reached by boat from Sandspit and the home between 1862 and 1888 of Sir George Grey, an early governor of New Zealand, Graeme Platt and Mike Wilcox provided a

tour of the plants introduced by Grey to the island, a complete list of which would read like a subtropical nursery catalogue. A particularly interesting feature, both here and at other gardens in the area, is the extent to which plants from a very wide range of climatic and edaphic conditions grow well together in the fertile soils (commonly largely volcanic in origin) and mild climate. As well as comparative locals from similar climates, such as the Norfolk Island hibiscus (*Lagunaria patersonii*) and the Cook pine or pin colonnaire of New Caledonia (*Araucaria columnaris*), with its distinctive slight kink at the base of the trunk, deciduous English oaks (*Quercus robur*), Mexican pines (*Pinus patula*) and swamp-cypresses (*Taxodium distichum*) also appear to thrive here: one private garden in Auckland featured a healthy *Araucaria araucana* from the snow-covered Chilean Andes, surrounded by flowering frangipani (*Plumeria rubra*) familiar from gardens throughout the tropics. The downside of a climate so hospitable to a wide range of garden plants is of course the danger of invasive exotics, and it is sad to see as attractive a plant as *Agapanthus* become a difficult and invasive weed here.

At **Matakohe**, north of Sandspit, a large and well laid-out museum documents the history of kauri logging, with displays of equipment and of the uses to which the timber and resin were put. The process appears in many respects to have been more akin to quarrying or open-cast mining than to logging as usually understood, partly because the enormous size of the logs necessitated a quite different approach to getting the timber out of the forest, and also because large logs of kauri can be found buried underground (swamp kauri) and extracted for their timber, still unrotted after many hundreds of years. On one of the walls, a series of rings mark the circumferences of some of the largest kauris ever found, with a huge outer ring marking a tree of 8 m or more in diameter which was recorded in the 19th century on the Coromandel Peninsula to the east of Auckland. The extremely fine-grained timber of the oldest trees is actually relatively soft and easily worked, and the museum is filled with beautiful pieces of furniture fashioned from the wood, as well as a large collection of lumps of yellowish kauri resin, both dug from the ground and collected from the living trees.

March 10

Trounson and Waipoua are New Zealand's most famous kauri forests, and today we had our first opportunity to see in them the gigantic sizes that kauris can attain. Tracks in the **Waipoua forest** lead to viewing points and platforms for the named giants 'Te Matua Ngahere' and 'Tane Mahuta', the biggest of all with a diameter of five metres. Although *Agathis* species usually shed their bark too quickly to support an extensive epiphytic flora, the upper surfaces of the first branches of these largest trees have great thickets of *Astelia* growing on them. The dynamics of forests with *Agathis* species are quite variable, from the ongoing regeneration of *A. montana* on the Massif du Panié in New Caledonia to a more periodic pattern typical of the 'southern conifer' recruitment strategy of regeneration after landscape-scale disturbance in some

other species. New Zealand kauri appears to be a late successional species, with the seedlings relatively intolerant of sunlight, and the other forest trees in the mature kauri forests are mainly members of the Podocarpaceae such as rimu (*Dacrydium cupressinum)*, tanekaha (*Phyllocladus trichomanoides)*, monoao (*Halocarpus kirkii*) and Hall's totara (*Podocarpus hallii)*. On the rougher bark of these species and on various of the tree-ferns and dicotyledonous trees, epiphytic cryptogams such as *Tmesipteris* and the filmy-fern *Hymenophyllum demissum* could be seen. Between Trounson and Waipoua, a reafforestation project uses manuka (*Leptospermum scoparium*), an early pioneer species, as a 'nurse' tree to provide shelter and shade for young kauri and other native trees of late successional phases, in an effort to reestablish natural forest cover over old farmland.

March 11
A visit to Waimate North Mission House allowed us to see some of New Zealand's first plantings of Norfolk Island pine and of European species such as *Quercus robur*, *Acer pseudoplatanus* and *Prunus laurocerasus*, as well as a particularly fine specimen of the native tree puriri (*Vitex lucens*). From there, a brief visit to the Wharepuke Subtropical Gardens and Nursery followed, before proceeding to the house at Waitangi where the treaty by which the Maori chieftains ceded sovereignty to the Crown was signed, and which is now maintained as a small museum with attractive grounds sloping down to the Bay of Islands, the early centre of European settlement and influence in New Zealand. After lunch a ferry trip to Russell, with its Catholic mission house and period garden, also permitted an inspection of some of the magnificent Norfolk Island pines planted along the coast.

March 12
This morning we visited **Glenbervie**, a plantation established almost 50 years ago by the former New Zealand Forest Service, and here we saw one of the few attempts at managing kauri as a plantation tree. Kauri plantations are economically and silviculturally difficult, for it is only the centre of the tree that produces the much-valued heartwood, and this central portion does not reach a commercially saleable diameter until the tree is nearly 80 years old, after which time the economic value of the tree correlates with its additional age. However, even to get the tree to that stage, close management is needed: in plantations, without the apical dominance secured in natural forests by the surrounding darkness, low branches can form which ruin the shape of the tree and lessen its subsequent usefulness and value. With *Pinus radiata* easier and cheaper to grow, and the marginal benefit in timber price from growing kauri easily outweighed by the enormous timescale necessary, during which two or more crops of *P. radiata* can be taken, the future does not look bright for commercial kauri exploitation in New Zealand, especially after the privatization of the country's forests.
From Glenbervie, we visited the rich forest at **Mair Park**, where we saw

abundant 'fruiting' kahikatea (*Dacrycarpus dacrydioides*), with beautiful and passably edible orange-and-purple 'berries' as well as *Dacrydium cupressinum*, kauri, and *Podocarpus totara*. New Zealand's diverse shrubby flora was well represented by lacebark (*Hoheria populnea*), mapou (*Myrsine australis*) and the ever-present climbing fern, supplejack (*Ripogonum scandens*). Also present was the rata vine (*Metrosideros perforata*), one of several climbing relatives in the Northland forests of the commonly seen pohutukawa or New Zealand Christmas Tree (*Metrosideros tomentosa*) that lines the coast in places and of which we would see a good set of plantings later that afternoon at the Wenderholm Regional Park.

After lunch, we visited the small but nonetheless impressive Fernery, Conservatory and Cacti House at Whangarei, maintained by the local council and including a purpose-built filmy-fern house for these beautiful, delicate plants: with the filmy-fern house at the Royal Botanic Gardens Kew now destroyed to expand the restaurant there, it was reassuring to see that these rather special little ferns, with leaves only a cell thick, are still treasured as they should be in New Zealand.

Pausing briefly to see captive kiwis at Maunu, we stopped for the last time near Albany to see a large specimen of *Araucaria angustifolia*, the Brazilian species of *Araucaria* and one of which we would subsequently hear more at the conference.

Symposium Report

The conference opened in Auckland on Thursday morning with Professor David de Laubenfels, who has described more of the currently-accepted species in the family than any other scientist, presenting a controversial paper on 'New perspectives on the division of the Araucariaceae' which served to kick off the proceedings in style. He outlined the reasons for his decision to divide the genus *Araucaria* into two monophyletic genera so as to give a more even taxonomic treatment of the family as a whole, reflecting the similarities he feels exist between the separate genera *Agathis* and *Wollemia*. He intends to resurrect the genus name *Eutassa* for the species currently included in Section Eutacta (all the New Caledonian species, plus *Araucaria heterophylla* and *A. cunninghamii*) and publish the necessary fifteen new combinations accordingly in the *Proceedings* of the Conference.

A series of papers followed, drawing attention to the unique characteristics of the Araucariaceae as a whole, from the patterns of their crown morphology to their extraordinary axillary meristems, as well as their long and complex fossil record and the difficulties associated with interpreting the morphology of fossil remains. Sean Graham gave a particularly interesting paper on genome evolution across the family and the conifers as a whole, supporting the idea that the Araucariaceae and the Podocarpaceae (plus Phyllocladaceae) are one another's closest relatives and suggesting that the rash of recent results placing the enigmatic genus *Gnetum* among the conifers was due to statistical

artefacts such as long-branch attraction. A whole host of transferable microsatellites developed in the Araucariaceae was reported by a team from Queensland whose research will doubtless form a basis for much future work on the population genetics and phylogeography of many different species, and Graeme Platt outlined his theory of paleontology and ecology to explain the successional phases - altitudinal, temporal and latitudinal - of the flora of New Zealand and the world.

The next few sessions were devoted to *Araucaria*, with an impressively wide range of papers dealing not only with the actual and potential horticultural and forestry uses of the species but also historical aspects of *A. heterophylla* in New Zealand, the many points of cultural and ecological convergence between peoples on different sides of the world who depend on *Araucaria* seeds as a staple carbohydrate source, and the demography and reproductive biology of some of the New Caledonian and Australian species. Garth Nikles gave a fascinating introduction to the ongoing programme of genetic improvement being undertaken for hoop pine, *A. cunninghamii,* and the problems encountered in maintaining and utilizing the genetic resources of wild populations.

Friday saw a whistlestop conference tour of Auckland's many gardens, parks and volcanic hills with panoramic views over the city. As well as a further chance to appreciate the enormous range of trees and shrubs that can be grown in the forgiving maritime climate of northern New Zealand, a special highlight was an *Araucaria cunninghamii* entirely festooned with pollen cones - to a degree never seen before by the tour participants. A wonderful dinner, including the roasting of a large sack of bunya pine (*Araucaria bidwillii*) seeds which were subsequently passed around, was hosted by New Zealand IDS member Bev McConnell in her superbly-maintained garden, carved out of a hillside north of Auckland.

The last two days of the conference saw the focus shift from *Araucaria* in the southwest Pacific to the South American species, and then to the genera *Wollemia* and *Agathis*, with a paper by Mary Ryan and Trevor Whiffin offering a partially resolved phylogeny of *Agathis* and indicating that the New Caledonian species may form a monophyletic group within *Agathis* as they do in *Araucaria*. The focus of most of the *Agathis* work was the ecology and reproductive biology of New Zealand's own kauri, and although this is much the best studied species it was surprising to discover how little is still known about some aspects of its ecology - its fungal associates, for example.

The conference dinner that evening doubled as the celebration of the IDS's 50th birthday, marked with a suitably large cake (see p.24), and Lawrence Banks thanked the organizers fulsomely for their considerable efforts and the resulting success of the meeting; he also announced the award of an IDS plaque to Bob Berry's New Zealand arboretum, Hackfalls.

The last papers on *Agathis* and presentations on *Wollemia*, were given the next morning. *Wollemia* is the recently discovered third genus of theAraucariaceae,

which although clearly extremely well-known now in terms of its cultivation and conservation requirements still poses seemingly intractable problems for phylogeneticists, with a multi-authored presentation showing that its position within the family remains unclear despite sequencing several genes across the group in an effort to provide resolution: is it more closely related to *Agathis*, to *Araucaria*, or equally to the two of them? A panel discussion allowed a number of other questions about *Agathis* and *Wollemia* to be considered and also served as a chance to mark the recent, premature, death of T. C. Whitmore, the first and so far the last monographer of *Agathis*. With that, the highly successful first international symposium on the Araucariaceae finished, and participants began to disperse, some heading home and some remaining for the post-conference tour of New Caledonia.

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