



The flowers of the 'new' species are small and sweetly scented.

An *Eidothea zoexylocarya* plant emerges from its hard, woody seed, one of two germinated by staff at the Royal Botanic Gardens, Melbourne. It may be the first time an *Eidothea* seedling has germinated in Victoria in at least 30 million years.

## A 'new' Proteaceae with an ancient tale

Three decades after CSIRO botanist Dr Bernie Hyland discovered the seeds of a mystery plant on Mt Bartle Frere in north-east Queensland, the species has been recognised as one of the botanical finds of the century.

The flowers of the newly-described species – a 20-40 metre tree superficially resembling a macadamia – establish its credentials as perhaps the most primitive living species of Proteaceae. The tree's large seeds, which are round on the outer surface and deeply convoluted inside, may even hold clues to the prehistory of the Australian flora, as they are identical to a fossilised nut found in 1883 in sedimentary rocks near Ballarat, 2500 kilometres south of where the species grows today.

A description of the ancient species can be found in Volume 16 of *Flora of Australia*, the first of two volumes covering the family Proteaceae. The description is by Hyland (from CSIRO Plant Industry and based at the Tropical Forest Research Centre at Atherton in Queensland), and Dr Andrew Douglas of the Royal Botanic Gardens, Melbourne. They have named the species *Eidothea zoexylocarya*.

The generic name, from Greek mythology, was an inspired choice. *Eidothea* was

a daughter of the sea god Proteus, after whom the family was named. *Eidothea zoexylocarya* becomes the sole representative of a newly recognised sub-family, the Eidotheoideae, bringing the number of primary branches in the family to seven.

In the early 1960s, Hyland was on a field trip to Mt Bartle Frere when he discovered several large nuts on the rainforest floor. Despite their extremely hard, woody shells, several had been chewed by native rats. Hyland could not identify the parent tree: it wasn't in flower, its leaves were hidden in the rainforest canopy more than 30 m overhead and the nuts were so unusual that he was unable even to guess at their affinities. These fruits have been sitting on Hyland's desk waiting for information to complete the puzzle.

Some 80 years earlier the great colonial botanist and founding director of Melbourne's Royal Botanic Gardens, Baron Ferdinand von Mueller, had encountered a similar problem when trying to identify the fossilised nut found in sandstone sediments overlaid by volcanic rocks near Ballarat.

Von Mueller described the fossil in an 1883 volume of the *Geologic Survey of Victoria*, in the paper 'Observations on new vegetable fossils from the auriferous drifts'.

Von Mueller referred to the fossil as: 'This grand fruit of probably a large tree of a long bygone age,' and tentatively assigned it to the olive family, naming it *Xylocaryon lockii*.

It was not until nearly two decades after Hyland's original discovery of the strange nuts on Mt Bartle Frere that the parent tree was identified. One of Hyland's CSIRO colleagues, Bruce Gray, found several trees in flower on Mt Bartle Frere in 1980, and obtained specimens of the leaves and inflorescences.

These herbarium specimens aroused the interest of Douglas when he arrived in Australia in 1995 to study the evolution and intra-family relationships of the Proteaceae. The Proteaceae is the archetypal Gondwanic family of flowering plants. The breakup of the southern supercontinent during the past 130 million years left its species scattered across the southern continents, as well as India, Madagascar, New Zealand, New Caledonia, New Guinea and the islands of the south-west Pacific. Fossil evidence indicates that proteaceous species once grew in Antarctica.

The family contains some of the world's most spectacular flowering plants, including Australia's banksias, dryandras, grevilleas, telopeas and hakeas, South Africa's proteas

and leucosperms, and Chile's waratah-like *Embothrium*. Fossilised Proteaceae pollen, leaves and fruits indicate the family was much more diverse in the prehistoric past and was a dominant component of the Australian flora until the continent's northward drift caused the climate to become drier and more seasonal some 30 million years ago.

Australia's rainforests are home to the Proteaceae's most primitive members: five of the seven sub-families occur only in tropical rainforests of Queensland. Of these, three – including the *Eidotheoideae* – are represented by solitary, distinctive species. These 'green dinosaurs' are probably survivors of the primary evolutionary radiation of the Proteaceae in the early Cretaceous, 135-110 million years ago.

Douglas made a field trip to Mt Bartle Frere in 1995 to collect fresh botanical specimens from the mystery tree. His microscope revealed its flowers to be simpler and less specialised than those of other Proteaceae species. During his analysis, he cross-sectioned one of the large nuts, revealing a deeply ribbed seed, somewhat like a walnut. When he showed

it to paleobotanist Andrew Rozefelds of the Tasmania Herbarium, Rozefelds remembered seeing a similar seed illustrated in an old book several years earlier.

The old book was the 112-year old edition of the Geologic Survey of Victoria, in which von Mueller had described his 'grand fruit'. The fossilised seed and the seeds from the Mt Bartle Frere species were nearly identical, confirming that *Eidothea* grew in Victoria in warmer, wetter times when Australia lay further south on the globe, and had not yet broken free of its sister continent, Antarctica. Because of uncertainty about the age of the sedimentary rocks in which it was found, the fossil could be anywhere between 30 and 70 million years old.

In their description of *Eidothea*, Douglas and Hyland say the morphology of the flowers and the fruit are unique to the Proteaceae family. In contrast to many 'modern' Proteaceae species – which have brightly coloured flowers that are specialised for pollination by birds and mammals – its clusters of small, sweetly scented cream flowers are apparently pollinated by insects.



A specimen of *Eidothea zoexylocarya*. The trees' seeds may hold clues to the prehistory of Australian flora.

While classified as vulnerable, this ancient species is not at imminent risk of extinction. Surveys have found numerous trees and seedlings on Mt Bartle Frere, and another population has been found at lower altitude in the Daintree Rainforest, north of Mossman. Staff at the Royal Botanic Gardens have succeeded in germinating two *Eidothea* seedlings, which are flourishing in a greenhouse. It may be the first time an *Eidothea* seedling has germinated in Victoria in at least 30 million years.

Hyland, Australia's most experienced rainforest botanist, wrote or co-authored chapters on six other rainforest Proteaceae genera in the new *Flora of Australia* volume, including another new genus, *Megahertzia*. *Megahertzia amplexicaulis*, formerly regarded as a species of *Orites*, grows near Mt Hemmant in north-east Queensland. Its name is actually a Latin pun on the name of one of the streams along which it grows, Roaring Meg Creek. The numbers of new species described by Hyland is indicative of his knowledge of rainforest botany.

Atherton horticulturists Gary Sankowsky and his wife, Nada, made the type collection of the new species in 1987. *Megahertzia* grows to about 10 m tall, on granitic soils in rainforests at altitudes from sea level to 700 m. Its cream inflorescences, which are up to 26 centimetres long, have a strong sour scent. Its floral structures and its winged seeds place it broadly within the sub-family Grevilleoideae, which includes *Orites*, *Grevillea*, *Telopea* and *Lomatia*. But it occupies an isolated position within the sub-family, and is not closely related to *Orites* or its sister genera.

#### More about the species

Douglas AW and Hyland BPM (1996) *Eidothea*, in *Flora of Australia*, Volume 16, Elaeagnaceae, Proteaceae 1, pp 127-9

George AS and Hyland BPM (1996) *Megahertzia*, in *Flora of Australia*, Volume 16, Elaeagnaceae, Proteaceae 1, pp 354-5.

Graeme O'Neill

## Know your flora

AUSTRALIA is home to more than 1000 species of Proteaceae. These are found in all but the most arid parts of the country, and yield a variety of commercial products including nuts (macadamias), timber, ornamental plants and cut flowers. A comprehensive guide to Australia's share of this ancient plant family can be found among the 522 pages of *Flora of Australia*, Volume 16, part of the reference series coordinated and edited by the Australian Biological Resources Study (ABRS).

*Flora of Australia*, Volume 16 draws together the work of numerous authors, artists and photographers. It introduces the Proteaceae in Australia, discusses pollination biology and the fossil record, and provides a synoptic classification of the family worldwide. The features of 488 taxa (including more than 70 new species) are described. Volume 17 will cover the remainder of Australia's Proteaceae, including *Grevillea* and *Banksia*.

The ABRS unit was established in 1973 to research and document the plants and animals of Australia. The unit, which has since become a program of the Australian Nature Conservation Agency, brings together the expertise of Australian and overseas scientists to prepare and publish authoritative books on Australia's flora and fauna. ABRS also manages a grants program, which provides support to scientists for taxonomic research.

The *Flora of Australia* series is designed to suit the needs of botanists, taxonomists, biogeographers, horticulturists, ecologists, environmental consultants and conservationists. Volume 16 is available for \$79.95 in hardcover and \$64.95 in softcover.

Contact: CSIRO Publishing, PO Box 1139, Collingwood, Victoria 3066, (03) 9662 7666, toll free 1800 645 051, fax (03) 9662 7555, email: sales@publish.csiro.au.

