Primitive flowering plants

A seemingly insignificant flora family has surprised botanists, with new research showing it to be a primitive form of flowering plant.

by Greg Keighery

Western Australia is home to many strange, showy and wonderful plants, including the Albany pitcher plant (*Cephalotus follicularis*), the sundew family (*Drosera*), kingias, the everlastings, the banksia family and the southern heaths. But equally intriguing are the almost unknown tiny plants that inhabit many of our wetlands—members of the Centrolepidaceae, Hydatellaceae and Juncaginaceae families. These plants have ancient lineages stemming from deep in the past, when Australia was joined with other continents as the supercontinent Gondwana. Traditionally, these fascinating pygmy plants have been placed close to the grasses in their taxonomic classifications. But new research has revealed them to be more closely related to primitive flowering plants like the waterlilies.

Small but significant

Despite being wetland plants, these tiny plants are supremely well adapted to our dry climate. They are tiny and able to grow fast and furious in very ephemeral wetlands on granite rocks, seeps on salt lakes and clay pans. Most of these highly reduced species are wind pollinated (a few are water pollinated), with very simple flowers consisting of a single anther or ovary and no petals. Their dry pollen is usually held up to the wind and they have feathery stigmas to catch the pollen. Often the flowers and the whole plant are red in colour—a sunscreen to protect their delicate leaves and flowers. Because of their size and rather characterless flowers, few people notice these plants and their true relationships have long remained obscure.

The Hydatellaceae are a small southern hemisphere family of 10 species in the genus *Trithuria* (five in southern WA, one in New Zealand and one in India), with 80 per cent of species found in southern WA confined only to the area.

Until recently they were included in the family Centrolepidaceae—itself a southern hemisphere family of 33 species in four genera (*Aphelia*, *Brizula*, *Centrolepis* and *Gaimardia*). This family also has many species in southern WA, with 65 per cent of them endemic, normally dampland annuals. Some species have bristly fruits and are distributed on fur or feathers, some hold their seeds on the parent plant during summer but most shed them into the drying mud.

Defining the difference

In 1976, species of the Hydatellaceae family were segregated from the Centrolepidaceae family because of differences in their pollen, anther structure, embryological differences and seed anatomy. They also differ in many aspects of their biology from other members of the Centrolepidaceae. The Hydatellaceae are normally submerged aquatics, with thin soft leaves that often lack gas-exchanging openings called stomates. They shed their seeds into the drying mud and appear to have no specialised dispersal systems. Nearly half of the species have the sexes separated on different plants. However, some plants classed as wind-pollinated members actually appear to use water and several appear to be able to set seed without fertilisation.

Since being separated in their classification, the relationships of this small family have remained obscure, with numerous possible relationships proposed. But recently, using DNA studies, the Hydatellaceae has become regarded as a very primitive group

Above The female form of common trithuria (*Trithuria austinensis*), flowering in a granite pool in Cape Arid.

Right The male inflorescence of common trithuria.

Far right Claypan trithuria (*Trithuria bibracteata*), a bisexual plant, in flower.

Below The inflorescence of pointed centrolepis (*Centrolepis aristata*), showing pollen held in boat-shaped anthers.
Photos – Greg Keighery/DEC

of flowering plants, more closely related to basal flowering plants such as the waterlilies, rather than other monocotyledons, such as grasses or lilies. A very recent study suggests that they even nourish their embryos externally, more like a conifer than a flowering plant.

Despite being inconspicuous in flower and stature, *Trithuria* in the Hydatellaceae family has hit the scientific press with stories of its unusual nature and new classification. It again clearly demonstrates that small can be very significant.

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