



by Bronwen Keighery and Greg Keighery

New plant discoveries in Perth's backyard

New species of plant are continually being discovered on Perth's doorstep. Who knows what else is still out there waiting to be found?

During the past 12 months, television and print media have reported on expeditions discovering new species of plants on remote peaks in exotic locations like New Guinea and South Africa. In the meantime, continuing detailed studies of our bushland routinely uncover new plants on Perth's doorstep that go completely unreported.

Such discoveries should perhaps not be unexpected since south-west Australia, the area west of an imaginary line stretching from Shark Bay to Israelite Bay, is an internationally recognised biodiversity hotspot for flowering plants and Perth is central to this region.

Flora hotspot

About 8,000 species of flowering plants occur in the south-west of Australia and about 6,000 of these are only found here. It has also long been known in botanical circles that plants are not distributed uniformly across the south-west, but rather concentrate in a variety of nodes of high species richness and local endemism. Some of these nodes are large, like the southern (Albany to Esperance) and northern (Jurien Bay to Kalbarri) sandplains. These sandy soils are remarkable for both species richness and endemism in a range of shrubs from the banksia, myrtle,



pea and heath families. Conversely, the wet forests of the south coast are diversity centres for herbaceous groups such as the sedges, trigger plants and a wide variety of endemic species such as the tingle trees and Albany pitcher plants, whose ancestors hark from ancient times.

Within these broad nodes there are smaller areas that are centres of locally endemic species—places like Stirling Range, Fitzgerald River and Lesueur national parks. Groups of plants also show different centres of species richness within the south-west, including the eucalypts in the Goldfields and the wattles in the north-eastern Wheatbelt.

Perth regional hotspot

While many of these areas have been long recognised and well documented, nearly two decades of detailed survey work on the Swan Coastal Plain and adjacent Darling Scarp has revealed that the area around Perth is itself a local hotspot of species richness and, to a lesser extent, endemism.

Many people have been involved in these decades of discovery. However, pivotal studies were the Southern Swan Coastal Plain Survey between 1992 and 1994 and the documentation between 1995 and 1998 of all of the plants in more than 70 bushland areas in the same area of the Swan Coastal Plain.

The Southern Swan Coastal Plain Survey focused on systematically comparing more than 500 fixed sites (in 10-square-metre quadrats) in the different plant communities on the

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Main *Fuchsia grevillea* (the Darling Range and scarp subspecies of *Grevillea bipinnatifida* subsp. *bipinnatifida*).
Photo – Jiri Lochman

Above One of the new soon-to-be-described species from within the *Melaleuca systema* complex, growing on the Muchea limestones near Bunbury.
Photo – Bronwen Keighery

Left Another new species soon to be described from within the *Melaleuca systema* complex growing on one of the Tamala limestone ridges north of Perth.
Photo – Greg Keighery



Right The newly recognised swamp tribonanthes growing in a clay pan on the Pinjarra Plain.

Far right One of a series of new *Eryngium*, the swamp devil, from a clay pan or vernal pool on the Pinjarra Plain. Vernal pools in California support a diversity of plants in the same genus.

Below right A spiky blue devil from a clay pan on the Pinjarra Plain. As the name describes, this new devil has prickly leaves and heads of blue-tinged flowers.

Photos – Bronwen Keighery



plain and involved scientists from government and the community as well as other members of the general public. The study provided data on the distribution and patterning of more than 1,400 plants and found 15 previously unknown species, three presumed extinct species and new populations of 10 declared rare plants. It also documented a series of rare plant communities, most listed as threatened (see 'Threatened plant communities of the Swan Coastal Plain', *LANDSCOPE*, Spring 1996).

The work on fixed sites and bushland area inventory continues today (see 'Bound by a love of flora', *LANDSCOPE*, Spring 2008). More than 1,500 quadrats are now included in these studies and more than 100 inventories of bushland areas have been made. The studies are helping with conservation planning north and south of Perth. The conservation planning projects include the update of the System Six report (the 1983 conservation plan for the Swan Coastal Plain), *Bush Forever* (the conservation plan for Perth's Swan Coastal Plain) and the Swan Bioplan Project, which is the current conservation planning project for the Swan Coastal Plain south of the Perth Metropolitan Region.

This work has raised the number of known flowering plant species recorded for the Swan Coastal Plain to more than 3,000, of which 1,700 are from the Perth Metropolitan Region alone.

The diversity is a result of the juxtaposition of major geological features like the granites of the Darling Scarp and sands of the plain as well



as highly diverse wind, water and erosional-deposited soils, limestones and ironstones. The area is also home to diverse wetlands, especially the clay-based vernal pools (seasonal pools that fill up in spring) which have very high species richness and local endemics. The big variation in rainfall across the area further contributes to species diversity.

New plant discoveries

New plants continue to be uncovered during this work. There have also been significant rediscoveries of species not seen for long periods.

Most of these discoveries are found in highly restricted and, until recently, poorly studied habitats.

One of these habitats is the limestone hill landscapes which line the coast north of Perth. This habitat is listed as a threatened ecological community and supports both the current widespread shrub *Melaleuca systema* and a new species related to this. The two species differ mainly in leaf characteristics, and were considered as local variants of the widespread but variable *Melaleuca systema* in the recent revision of the genus. However,



a new study has revealed both species growing together in several locations with no signs of hybridisation, or intergradation—a very good indication that these are two separate species.

Perhaps the most surprising new plants are a series of new grasses, recently included in a new grass classification. One of these is a salt-tolerant annual grass originally collected from the Vasse Estuary and identified as the widespread *Puccinellia stricta*, which was rediscovered after 70 years on the Leschenault Estuary. In 2007, Alex Williams, an expert in grasses who volunteers at the Western Australian Herbarium, named this as a new species—the Vasse puccinellia (*Puccinellia vassensis*).

Coincidentally, also in 2007, a new annual tumbleweed grass (*Lachnagrostis nesomyrtica*) was described by a Melbourne botanist. Allied to species normally growing in freshwater swamps, this new species had three subspecies described, one locally common upland grass restricted to Garden Island and two others restricted to seeps and woodlands on Rottnest Island.

The eastern alluvial flats of the Swan Coastal Plain, called the Pinjarra Plain, support a series of diverse wetland communities. The most diverse of these communities are associated with clay flats and depressions, also known as clay pans or vernal pools. It is on these habitats that more than 10 plants new to science have been recognised. These include the sedge Keighery's spikerush (*Eleocharis keigheryi*); the herbs Gibson's blue squill (*Chamaescilla gibsonii*),



Top left Two entities of the common hovea from the Bullsbrook Nature Reserve, soon to be recognised as different species.
Photo - Greg Keighery

Centre left The beautiful Bronwen's grevillea from the Whicher Scarp.

Left Graceful jacksonia (*Jacksonia gracillima*), recently described in a revision of the genus, was first recognised in the wetlands of the Jandakot area.
Photos - Bronwen Keighery

Right background The leaves of *Grevillea bipinnatifida* subsp. *pagna*.

Below right The golden flowered variety of *Lambertia multiflora* in the Talbot Road Bushland.

Photos – Bronwen Keighery

swamp devil (*Eryngium pinnatifidum* subsp. *palustre*), spiky blue devil (to be named as *Eryngium ferox*), swamp tribonanthes (*Tribonanthes uniflora*) and a tiny *Samolus*; and several shrubs, one *Astartea* species and one *Hakea* species. The surveys have also found that the highly restricted spider net grevillea (*Grevillea thelemanniana*) is composed of two separate forms, one in the Perth area and the other in the Coojarloo area. These are being described as separate subspecies, which will result in the southern subspecies being again confined to a few wetlands in the Perth area.

Another strange habitat on the Pinjarra Plain is the Muchea limestone. Associated with this limestone is a series of disjunct populations of many species characteristic of the coastal limestones. Because of its unique composition and the very few areas remaining, the vegetation of this habitat is a threatened ecological community and, on closer examination, it looks like some of these separated plants are unnamed species. These include two tussocky speargrasses, both initially placed with the coastal *Austrostipa flavescens*, which are now being recognised as separate species, one in Gosnells and Bunbury and the other only known from near Bunbury. These species are more closely allied to inland salt lake species. Other examples of new species in this habitat are a *Hibiscus* and a *Melaleuca*. The *Melaleuca* is another related to *Melaleuca systena*. It is expected that more new plants will be distinguished as studies continue.

Another interesting habitat is the foothills of the Darling Scarp. The well-known *Grevillea bipinnatifida*, one of the parents of the widely cultivated grevillea Robyn Gordon, has also been found to contain two separate



Understanding plant classification

All plants (and animals) are grouped and then named (classified) in a basic hierarchy of genus and species. The genus reflects their shared features and past histories while the species gives the particular features of that species. This is the binomial system established by Linnaeus that enables biologists throughout the world to immediately see what is related to what.

A genus is a group of species that share similar characters and are genetically related. For example the native honeysuckle genus, *Lambertia*, is a group of shrubs with small heads of honey suckle-like flowers much loved by honey eaters.

A species is a group of populations with common characteristics and are usually capable of mating with each other to produce vigorous fertile offspring. For example the prickly honeysuckle or prickly lambertia (*Lambertia echinata*), grows in the south-west on Cape le Grand, around Albany and near Busselton. This level is the basic unit of classification.

A sub-species is a group of populations less distinct than a species, but based on readily identified characters and normally occupying a discrete geographical range. For example the ironstone lambertia (*Lambertia echinata* subspecies *occidentalis*) has yellow flowers and long narrow floral bracts and is confined to one population on the Busselton ironstones.

Varieties differ in minor ways from other populations. The golden lambertia (*Lambertia multiflora* var. *darlingensis*) with yellow flowers is distinguished from the red lambertia (*Lambertia multiflora* var. *multiflora*) with red flowers.

So the classification system is always ordered genus-species-subspecies-variety.



subspecies, one confined to the foothills between Harvey and Serpentine. New surveys along the southern foothills have uncovered a new very restricted triggerplant (*Stylidium korijekup*) in a small area at Harvey. Because this is the only known remaining remnant of this vegetation it is difficult to reconstruct this species' original range.

Species groups

These examples show a common feature of our rich and diverse flora. Detailed ecological and taxonomic studies are showing that many widespread species, previously considered to show continuous variation across their ranges, contain very discrete forms that are best



Above The beautiful red flowered variety of *Lambertia multiflora* from bushland in the Badjingarra area.



Left Wendy's logania is only found growing in a small area of the northern Whicher Scarp.

Photos – Bronwen Keighery

considered as a complex of closely related species. The newly segregated species can be very rare.

As an example, these include such well-known species as common hovea (*Hovea trisperma*) and common brown pea (*Bossiaea eriocarpa*). Despite being subject to recent excellent taxonomic revisions, these species contain populations that differ in morphology, habitats and fire responses, that are difficult to elucidate in a broader study.

Currently considered a widespread variable subspecies, common hovea contains at least three entities on

the Swan Coastal Plain, several of which co-occur. In Bullsbrook Nature Reserve both the very large flowered *Hovea trisperma* var. *grandiflora* and the coastal plain form of common hovea grow together, with no sign of hybrids or intergradation. Both of these forms re-sprout from a tuberous rootstock. At the base of the Whicher Range near Busselton the 'true' common hovea (a very small-flowered partially tuberous form, common through the jarrah forest from Perth to Albany, where the species was named) co-occurs with the coastal plain form.

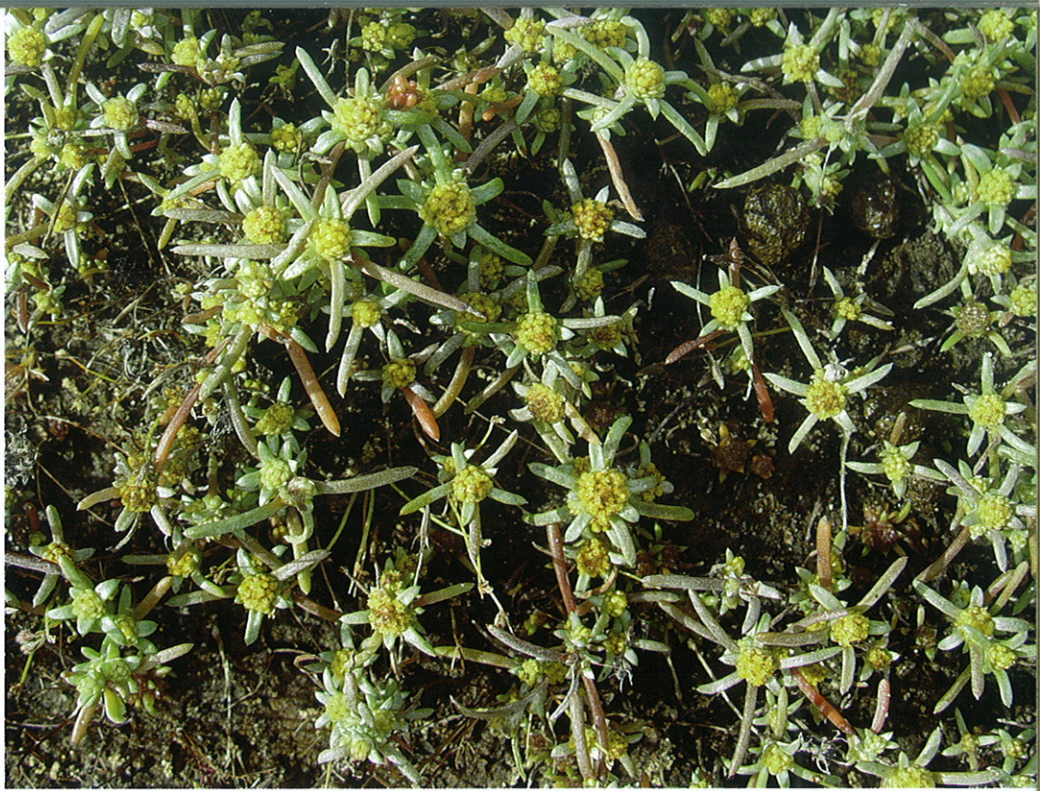
New hotspots

Not only are new plants being routinely uncovered but so too are new potential biodiversity hotspots. Past surveys have shown that the Perth area constitutes a biodiversity hotspot, and current work continues to uncover areas that deserve this ranking. People working on the Swan Bioplan Project have examined areas not covered by previous studies to ensure a more complete picture of the region. The surveys have focused on the Dandaragan Plateau (north of Perth) and the Whicher Scarp (east and south of Busselton).

Previously, surveys in the 1990s around Whicher National Park had uncovered a series of local endemics, such as the Whicher flannel flower (*Actinotus whicheranus*), Bronwen's grevillea (*Grevillea bronwenae*) and Whicher gastrolobium (*Gastrolobium whicherense*). Imagine the surprise when quadrat-based surveys of the

Right Star angianthus (*Angianthus drummondii*) is another of the many new plants found growing in clay pans on the Pinjarra Plain.

Below Female plants of the Whicher lomandra (*Lomandra* species) have male and female flowers on separate plants. It took years to find flowering male and female plants of this new species.
Photos – Bronwen Keighery



northern section of the Whicher Scarp uncovered a new series of local endemic species—Whicher lomandra (*Lomandra whicherensis*), Wendy's logania (*Logania wendyae*) and two new *Platytheca* species.

The subsequent report on the flora of the Whicher Scarp shows the area deserves to be considered as a separate biodiversity hotspot in itself. There are very high levels of species diversity (more than 90 species in 100 square metres) in some of the banksia woodlands, which is comparable to the northern and southern heathlands. This small area contains more than 900 species of flowering plants.

The report documented that the area has more than 40 endemics and 240 species of conservation significance (100 disjunct populations, 81 species at their range ends and 60 rare species). Of particular interest is the fact that several of these highly disjunct populations (*Lambertia rariflora* subsp. *rariflora* and *Lambertia echinata* subsp. *occidentalis*) are already formally described as separate entities from the main species populations. Preliminary estimates are that another 25 require genetic and taxonomic study. These

include the now very rare populations of *Dryandra baxteri* (threatened by *Phytophthora* dieback), which needs urgent management, the already rare *Dryandra mimica* and the Sabina River form of showy dryandra (*Dryandra formosa*), all of which may prove to be separate entities.

Outcomes and the future

The major aim of these detailed studies is to use the results to improve the reservation and conservation for many threatened communities and species on the Swan Coastal Plain. These improvements are reflected in the fall in the number of plants on the Swan Coastal Plain that were not protected in reserves from 261 in 1999 to 115 by 2005; and that most critically endangered communities have had habitat purchased and reserved.

Many of these previously unknown taxa are highly restricted and could have easily been lost forever without being recorded if their remnant habitat had been cleared, given the development pressures in the study area. It is a reminder that in a mega-diverse region of flowering plants on a world scale, there is no substitute for continuing careful survey of our flora both in the wild and in the laboratory. Accepting the current state of knowledge as complete will surely result in the loss of rare components of our unique biodiversity. We know there are many new plants still awaiting discovery in our bushland and segregation in the Western Australian Herbarium. The thrill of discovery still awaits a new generation of botanists if we keep the 'bush forever' in our city and surrounds.



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