Plant discovery wonderland

By Stephen D. Hopper and Paul Gioia

The Southwest Australian Floristic Region (SWAFR) continues to rank amongst the top places on Earth where new plant species continue to be discovered. How could part of a developed nation like Australia have so many plants undescribed by science?

It comes down to history – of the landscapes of the SWAFR, and of the development of the science and practice of naming and classifying plants (taxonomy). The landscapes of the SWAFR include many OCBILs (old, climatically-buffered, infertile landscapes) that have provided conditions suitable for the persistence of plant species often in very small areas for millions of years. Such landscapes are mainly uplands, including the well known Stirling Range and Mt Barren peaks of the Fitzgerald River National Park, as well as more subdued hills such as lateritic mesas (e.g. Mt Lesueur), granite outcrops, banded ironstones, coastal headlands, perched swamps and even high sandplains. Some salt lake systems also afford exceptionally old refugia for plants as well.

As evolution is explored using DNA techniques in different plant groups, it is becoming clear that extinction rates have been reduced, and diversification into new species is common and ongoing. Hence there are many rare species dotted throughout the OCBILs of the SWAFR and these constitute the majority of new species being discovered in modern times.

Hydrocotyle phoenix *(fire pennywort) was discovered by Rob Davis in late 2015 in Northcliffe after the earlier summer fires of that year. The new species is a fire-responder, and while it comes up en masse, it has a highly restricted distribution. The* Hydrocotyle *then disappears completely the following year — waiting for the next fire event. Photo – Rob Davis.*

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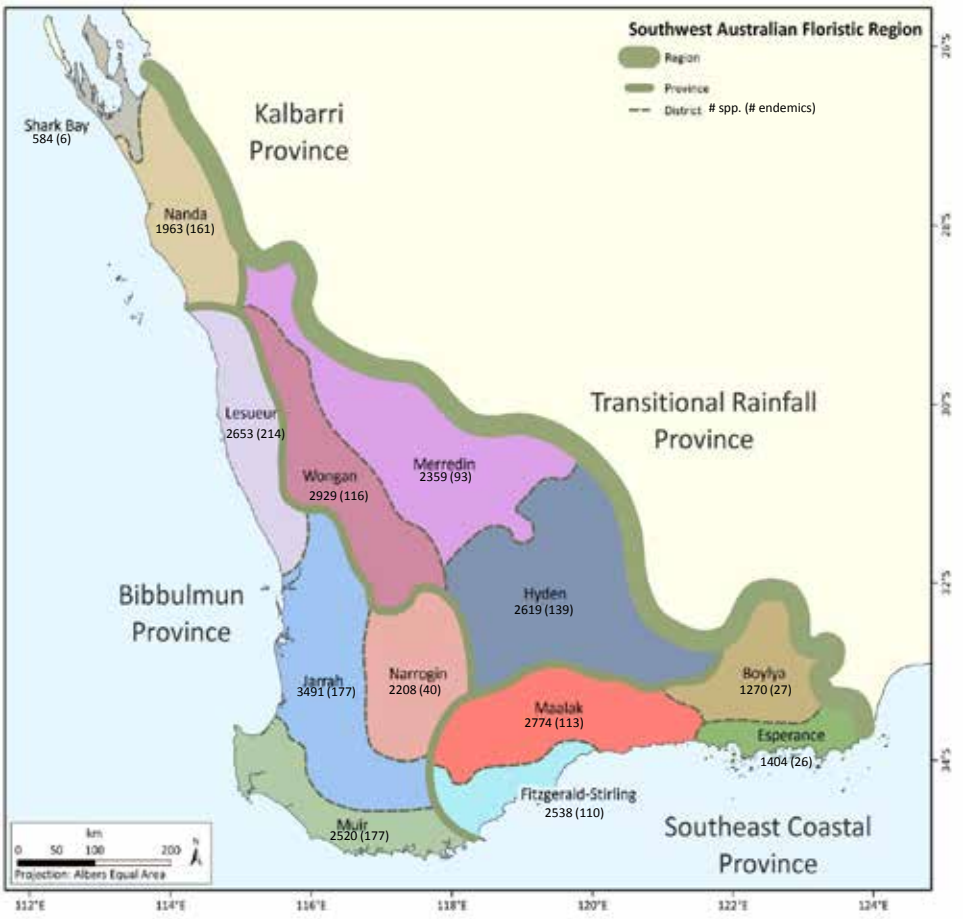
Pioneer taxonomists of the SWAFR such as Robert Brown and George Bentham from England and Ferdinand von Mueller, Victoria's first colonial botanist, described the majority of the 3600 species recorded in the SWAFR by 1860, a number which was still regarded as accurate a century later. The description of species over this period primarily involved study of herbarium specimens and the intuitive search for gaps in the morphological features of plants. If specimens with distinctive features were ascertained, they were named as species. If there were transitional specimens, botanists would lump the distinct forms into one species, sometimes naming the forms as varieties of the species, sometimes not.

Charles Darwin in the mid 1800s added more scientific rigour to this process by demonstrating that it was possible to observe reproductive interactions in the wild and grow plants in the glasshouse to experiment with their reproductive interactions. Botanists could test, by experimental pollination, whether different forms each bred true, and whether or not they produced sterile hybrids

when cross-pollinated. These new lines of biological evidence helped resolve differences of opinion among herbarium botanists about whether different forms were reproductively-isolated species or merely varieties.

It took more than a century for Darwin's approach to take hold in taxonomic studies of SWAFR plants. This was accelerated when DNA analyses provided a rapid means of documenting genetic relationships and reproductive interactions. It has been found that many species regarded as variable by traditional herbarium studies have turned out to be rich in undescribed Darwinian biological species.

In a recently published paper, we have developed a new phytogeographic map of the SWAFR (Fig. 1) based on an exceptional decade of collection and discovery of new species. We found that there had been an increase of 33 per cent in plant collections in the WA Herbarium and 10 per cent new species over the past decade. We examined areas of species richness and endemism, and developed the new map of plant districts and provinces for the SWAFR. The updated SWAFR has 8379 native vascular plants (82 per cent species and 18 per cent subspecies), of which 47 per cent are endemic and 49 per cent have been described since 1970. We found that Perth ranked amongst the most floristically diverse cities on Earth, alongside Cape Town, Sydney and Rio de Janeiro.



Gioia and Hopper's 2017 map illustrating the new botanical districts and provinces recognised within the Southwest Australian Floristic Region. Numbers for each district are of total taxa (species + subspecies) and number of endemics in brackets.

Further reading: Gioia P and Hopper SD (2017) A new phytogeographic map for the Southwest Australian Floristic Region after an exceptional decade of collection and discovery. Botanical Journal of the Linnean Society 184, 1–15.

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Working together to protect Bunbury's urban bushland

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including planting days, wildflower walks, cultural education events, the ever-popular night stalks, bird watching, dieback workshops, weed control days, rubbish clean-ups and educational activities with schools.

In recognition of the park's cultural and heritage significance, local Noongar people have been actively involved throughout the project to ensure cultural values are respected and included in management.

The success of the project is a tribute to the dedication of the project partners and the Bunbury community. As a result, the park has been left in a better condition as interim management returns to the landholders. The proposed Preston River to Ocean Regional Park is a wonderful asset for the South West Region and we look forward to its formalisation.

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The park is culturally important to local Noongar people. Photo – SWCC.