

Hidden treasures: documenting localised variants of the flora of the Swan Coastal Plain

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Introduction

South-west Australia is well known as a biodiversity hotspot for flowering plants, with a known flora of over 8000 species and estimates of another 15–20% still to be named. The Swan Coastal Plain (the Plain), which includes most of the capital Perth, is a natural bioregion of mainly sandy soils stretching from Jurien Bay to Dunsborough. Several decades of detailed floristic studies (involving over 1100 quadrats and several hundred bushland areas) have recorded over 2500 native taxa for the Plain (Gibson *et al.* 1994; Keighery *et al.* 2008; Webb *et al.* 2009). While the principal aim of these studies was to understand the patterning, distribution and regional conservation of the native vegetation and flora (Government of Western Australia 2000) it has also enabled the compilation of a substantial database of species with attached ecological data. These detailed records and observations have enabled us to demonstrate that the flora includes a large number of distinctive localised variants of ‘widespread’ species.

Patterns of differences

The two major drivers of speciation on the Plain are distinctive habitats related to the different landform/soils and water availability, particularly patterns of inundation and waterlogging (here termed wetland habitats). Five major landforms are distinguished on the Plain: three parallel sand dune systems, from the coast inland: the Quindalup (Holocene), Spearwood and Bassendean Dunes; and inland the alluvial Pinjarra Plain and the alluvial/colluvial Foothills.

Landform/soils

On the Plain a number of taxa have very different forms occurring on different landforms and their associated soils. One example is the very common and well known pea Eggs and Bacon (*Bossiaea eriocarpa*). It was found to be a variable, widespread species that contains at least five distinct species, including two which regularly co-occur in the Foothills (Figure 1). Some of the forms re-sprout; others are killed by fire and re-seed.

Some other taxa that show similar speciation patterns are:

- *Banksia sessilis*, with *B. sessilis* var. *cygnorum* on the Spearwood Dunes;
- *Grevillea bipinnatifida*, with subsp. *pagna* on the Pinjarra Plain;
- *Eremophila glabra*, with two subspecies on the Plain, subsp. *albicans* on two coastal dunes (Quindalup and

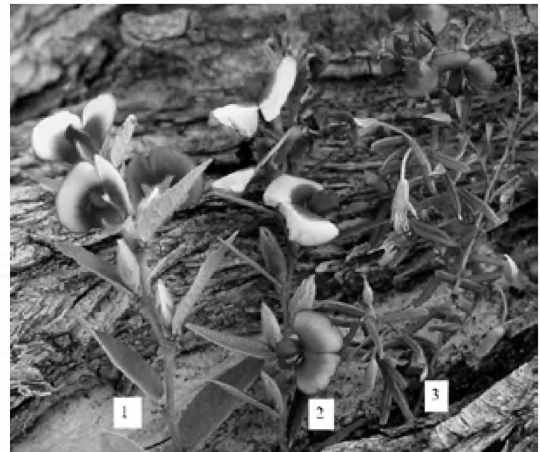


Figure 1. Three *Bossiaea* species that are found on the Plain, from left to right, *Bossiaea ornata* (1, widespread, uncommon in the Foothills); *Bossiaea* sp. Waroona (2, Foothills) and *Bossiaea eriocarpa* (3, widespread on Plain and elsewhere). Photos: Bronwen Keighery.

Spearwood) and subsp. *chlorella* in a few wetlands on the Pinjarra Plain and Dandaragan Plateau; and

- ‘*Grevillea thelemanniana* group’, with *G. preissii* on the shallow soils over Tamala limestone in the Spearwood Dunes and two subspecies of *G. thelemanniana* on the Pinjarra Plain.

Common speciation patterns relate to coastal locations (Quindalup and Spearwood Dunes) and the inland Pinjarra Plain/Foothills. A considerable number of taxa are yet to be formally recognised. Further detailed work will result in the separation of additional taxa in what is presently considered a single taxon, even when the species has been subject to recent taxonomic revisions. For example *Acacia pulchella* and *Hovea trisperma* both have large number of forms associated with different landforms/soils.

Wetland/dryland taxa

Wetland forms of more than 200 taxa have been observed. The water regime of the wetlands is a key factor, as is the landform/soil group in which the wetland occurs. For example what were previously considered wetland and upland forms of *Jacksonia sericea* are now considered to be separate species. These taxa also grow in different soil/landforms. Other examples include *Eremophila glabra* and ‘*Grevillea thelemanniana* group’ as described above. Wetland/dryland patterns are also found in *Verticordia plumosa* and *Chamaescilla gibsonii* (wetland) and *C. versicolor* (dryland).

Using the information in conservation planning and management

If we are to conserve the biodiversity (communities, species and genes) of the Plain and provide guidance for revegetation/restoration activities there, we need to document and be guided by this abundant variation and hence rapidly changing taxonomic landscape. A simple message for revegetation and restoration in a species rich and still partially known flora is *the benefit of correct provenance is insurance against taxonomic changes* (or more simply, the further away from the site, the more likely are major taxonomic problems). There are numerous examples, but several suffice.

- Australia wide issues: planting of *Casuarina glauca* from eastern Australia in significant wetlands when *C. obesa* was combined into this taxon.
- Regional issues: planting of *Dryandra nivea* (now *Banksia nivea*) in rehabilitation sites when *Dryandra lindleyana* (now *B. dallanneyi*) was the required taxon, before these were separated.
- Local issues: planting of horticultural forms of Geraldton Wax (*Chamaeleucium uncinatum*) in Bold Park, or the northern multi-stemmed forms of *Banksia menziesii* on the Freeway; both then hybridising with local native variants.

While the first rule is 'use local seed or propagules to minimise taxonomic issues', how does one know what taxa potentially contain un-named variants in such a diverse flora? Most regional vegetation and flora reports focus on listed rare flora under the *Wildlife Conservation Act 1950* (WA) and the *Environment Protection and Biodiversity Act 1999* (C'th) and WA listed Priority taxa. However our reports (and those of some other authors) use the term 'significant flora' for the rare categories as well as the categories outlined in Table 1.

The categories in the table are becoming an integral part of conservation planning, including that for Perth (Government of Western Australia 2000) and in the current forest management plan for production forests. Using these categories for the Busselton portion of the Plain (Webb *et al.* 2009) gave a total flora of 1387 native species; 91 state Declared Rare Flora (DRF)/Priority listed; 15 local endemics; 159 disjunct; 160 range ends; 189 habitat preferences; and 34 species with significant morphological variation. In the Whicher Scarp (Keighery *et al.* 2008) there were 917 species; 61 state DRF/Priority listed; 40 endemic; 100 disjunct; 81 range ends; 121 habitat preferences; 4 relictual; and 21 significant morphological variation. Currently a whole Plain database is being prepared for publication.

Table 1. Categories developed to encompass as much regional variation as possible within a set of codes suitable for use in data bases.

Geographic location	
r	populations at the northern/southern limit of their known geographic range
d	populations disjunct from their known geographic range
p	considered to be poorly reserved (applies to all Declared Rare Flora and Priority taxa)
s	significant populations in reference to location, population size, diversity of ages and/or health (applies to all Declared Rare Flora and Priority taxa)
u	uncommon in the area (generally applies to disjunct populations)
x	considered lost in the Swan Coastal Plain
Ecological preferences	
e	taxa endemic to the Swan Coastal Plain (or the area/region being considered)
h	taxa distinct habitat preference (wetlands/soil type)
a	relictual taxa
Morphological and/or genetic variation	
v	variant, not at taxonomic level
t	variant, significant taxonomically
g	genetic variant

Conclusion

The above lists flag species that one should be very careful about sourcing propagation material for the Plain. Unfortunately, with such a rich flora and increasing development pressures, waiting for genetic data on provenance and published taxonomic studies is not a feasible option since they will not be available for most species in the foreseeable future.

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