

Floristics of the *Banksia* woodlands

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Floristic studies are concerned with the botanical composition of vegetation. While the *Banksia* woodlands of the Swan Coastal Plain have been described in detail in recent vegetation surveys (eg Beard, this symposium, Heddle *et al* 1980), there is little published information on their floristic composition. The number of plant species in *Banksia* woodlands is relatively large and approaches that of kwongan (sclerophyllous shrublands), but is substantially lower than the Jarrah forest (Table 1). However, the *Banksia* woodland and kwongan values refer to individual vegetation types, whereas the Jarrah forest total covers a variety of vegetation types experiencing a range of topographic, edaphic and climatic factors. The limited data available suggest that species richness (species per unit area) of *Banksia* woodlands is less than in most heathlands (George *et al* 1979, Griffin *et al* 1983) but more than in some forest and woodland types such as Wandoo (Griffin & Hopkins, unpublished data from Mt Lesueur) and York gum/Wandoo (Lamont 1984). Milewski & Davidge (1981) recorded a cumulative total of 77 shrub species after sampling 52 consecutive 2 m² quadrats, while Dodd (unpublished) measured a mean richness of 28 shrub species and 3 tree species in 83 400 m² stands of *Banksia* woodland. The species richness is also very variable (16-53 species per stand; Dodd, unpublished), reflecting variation in edaphic, climatic and geographic factors (Havel 1968).

Broadly speaking, the *Banksia* woodlands are floristically representative of the State's south-western flora, since their dominant families and genera (measured by number of species) are also the dominant taxa throughout the south west. Although a large number of families is represented in *Banksia* woodlands, most species belong to only a few. The families of woody plants with the greatest number of species are the Proteaceae, Myrtaceae, Papilionaceae and, to a lesser extent, Epacridaceae (Table 1). Amongst non-woody plants, the most important families are the Orchidaceae, Cyperaceae, Haemodoraceae, Anthericaceae (part of Liliaceae *sensu lato*) and Asteraceae. These families, except the Orchidaceae, are also prevalent in kwongan. Indeed, the similarities are such in some areas that *Banksia* woodlands could be considered as kwongan with a *Banksia* canopy (but see Beard & Pate 1984). As in kwongan, some genera are often represented by several species within a single stand (eg *Banksia*, *Calytrix*, *Conostylis*, *Daviesia*, *Hakea*, *Hibbertia*, *Petrophile* and *Schoenus*). Other genera well represented throughout *Banksia* woodlands are *Acacia*, *Conospermum*, *Eremaea*, *Jacksonia*, *Leucopogon* and *Melaleuca*.

The dominant canopy species are *Banksia attenuata* and *B. menziesii*, with *Eucalyptus todtiana* and *Nuytsia floribunda* occurring less frequently. In some wetter stands, *B. ilicifolia* is present. In southern areas of the Swan Coastal Plain, *E. calophylla*, *E. marginata* and *Allocasuarina fraseriana* become increasingly important and, eventually, dominate (Beard, this symposium)

while *B. menziesii* is absent. *Banksia prionotes* may be present in some areas and is the dominant tree in woodlands on the Spearwood dunes near Jurien. The understorey shows much greater variation than the canopy. Species found commonly on both Bassendean and Spearwood dunes are *Bossiaea eriocarpa*, *Eremaea pauciflora*, *Gompholobium tomentosum*, *Hibbertia hypericoides*, *Lyginia barbata*, *Petrophile linearis* and *Xanthorrhoea preissii* (Dodd, unpublished). Some species occur frequently only on one dune system eg *Calytrix flavescens*, *Conostephium pendulum*, *Hibbertia subvaginata*, *Leucopogon conostephioides*, *Patersonia occidentalis* and *Scholtzia involucrata* on Bassendean dunes and *Mesomelaena stygia*, *Petrophile macrostachya* and *Leptospermum spinescens* on Spearwood dunes. None of these understorey or canopy species is exclusive to *Banksia* woodlands, however, and all can be found in other vegetation types, especially kwongan on sand. Many of the characteristic species also occur in the understorey of those coastal plain woodlands south of Perth, in which banksias form a secondary canopy beneath *E. calophylla*, *E. marginata* and *A. fraseriana* (Griffin, unpublished). *Banksia* woodlands lack floristic uniformity and, instead, consist of a number of different floristic types. Very few species are consistently found throughout the range of these woodlands. Only 13% of understorey species from 45 Bassendean dune sites and 11% from 31 Spearwood sites were found in more than 50% of stands surveyed by Dodd (unpublished). Havel's (1968) study of the vegetation of part of the northern Swan Coastal Plain defined seven types of *Banksia* woodland which reflected differences in topography and soil depth, moisture characteristics and degree of leaching. The two main factors that determined floristic composition, namely the degree of soil leaching and the moisture availability of the site (Havel 1968), have been found to apply to *Banksia* woodlands throughout the coastal plain (Dodd, unpublished).

Conclusions

Despite their simple structure and seemingly uniform appearance, *Banksia* woodlands are floristically rich and taxonomically diverse. Floristically, they appear to have close affinities to the kwongan of regions north of the Swan Coastal Plain. The woodland understorey exhibits a high degree of variability indicating responses by the component species to a range of environmental variables, of which edaphic factors are the most important. At the same time, the canopy shows little variation in composition. Hence, on the basis of their understorey composition, *Banksia* woodlands can be divided into a number of floristic types (mostly undefined as yet) in terms of topography, soil type and moisture status and geographic location. The degree of floristic variation found in *Banksia* woodlands has significant implications for conservation, since adequate conservation requires that the range of variation should be represented in reserves.

Table 1
Floristic composition of *Banksia* woodlands and adjacent vegetation types

	Families Genera Species			Dominant families of woody plants			Reference	
Banksia woodlands								
Jandakot	31	-	122	Myrt. (13/11)*	Papil. (8/ 7)	Prot. (7/ 6)	Epac. (7/ 6)	1
Perth region	45	122	236	Prot. (29/12)	Myrt. (19/ 8)	Papil. (17/ 7)	Epac. (11/ 5)	2
Perth region	57	-	377+	Prot. (33/ 9)	Myrt. (33/ 9)	Papil. (32/ 9)	Epac. (26/ 7)	3
Swan Coastal Plain	59	78	187	Prot. (33/18)	Myrt. (33/18)	Papil. (27/14)	Epac. (22/12)	4
Brookton	24	63	98	Prot. (23/24)	Myrt. (18/18)	Epac. (5/ 5)	Papil. (5/ 5)	5
Kwongan								
Mt Lesueur	43	131	287	Prot. (46/16)	Myrt. (33/12)	Papil. (28/10)	Mimos.(12/ 4)	6
Badgingarra	41	112	238	Prot. (51/21)	Myrt. (30/13)	Papil. (25/11)	Epac. (13/ 6)	7
Eneabba	50	162	429	Prot. (71/17)	Myrt. (55/13)	Papil. (27/ 6)	Epac. (19/ 4)	8
Eneabba	38	125	317	Prot. (61/19)	Myrt. (37/12)	Papil. (28/ 9)	Epac. (15/ 5)	9
Tutanning	-	-	315	Prot. (45/14)	Myrt. (30/10)	Papil. (23/ 7)	Epac. (11/ 3)	10
Other								
York gum/ Wandoo woodland	36	-	85	Mimos. (4/ 5)	Papil. (4/ 5)	Prot. (3/4)	Myrt. (3/4)	11
Coastal heath	66	192	413	Myrt. (56/14)	Prot. (42/10)	Papil. (21/ 5)	Mimos.(18/ 4)	12
Jarrah forest	95	-	784	Prot. (70/ 9)	Papil.(68/ 9)	Myrt. (63/ 8)	Mimos.(37/ 5)	13

References: 1 Milewski & Davidge 1981
2 Speck 1952
3 Marchant *et al* 1987
4 Dodd, unpublished
5 Beard & Hnatiuk 1981
6 Griffin & Hopkins 1985
7 van der Moezel *et al* 1987
8 Hopkins & Hnatiuk 1981
9 Griffin *et al* 1983
10 Brown & Hopkins 1983
11 Lamont 1984
12 Wills *et al* 1989
13 Bell & Heddle 1988

*First value = number of species; second value = percentage of total species

+Habitat descriptions suggest occurrence in *Banksia* woodlands

Endemic and rare species have not been assessed fully for *Banksia* woodlands. A number of rare and endangered species are discussed by Hopper & Burbidge (this symposium).

Until the regional variation of *Banksia* woodlands has been documented fully, the adequacy of existing reserves for encompassing the variation remains unknown.

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Dodd, J and Griffin, Edward Arnold. 1989. "Floristics of the Banksia woodlands." *Journal of the Royal Society of Western Australia* 71, 89–90.

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