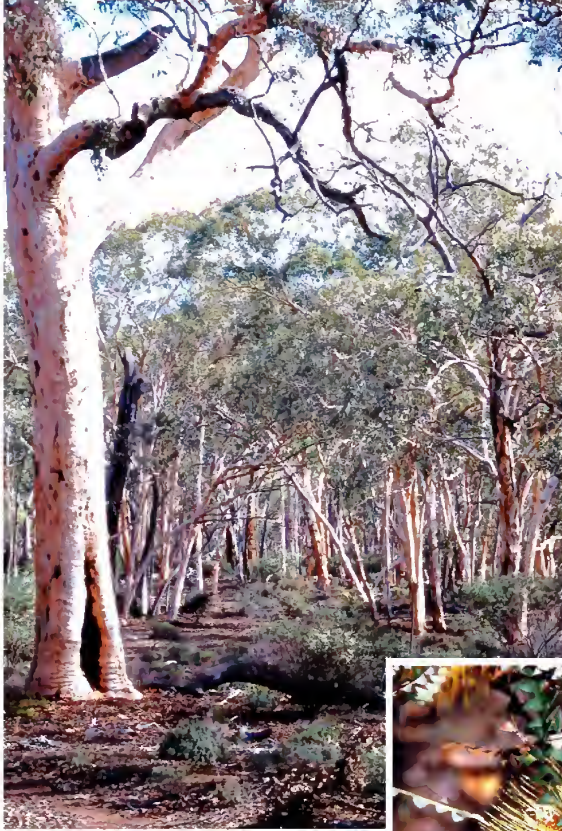




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Powderbark (*Eucalyptus accedens*)
woodland, Brown Mallet (*E.
astringens*) plantations and
Dryandra sp. photographed by
Kevin Coate at Dryandra Woodland

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No. 2

USE BY HONEYEATERS AND PARROTS OF A BROWN
MALLET PLANTATION AND AN ARBORETUM AT
DRYANDRA WOODLAND, WESTERN AUSTRALIA, AT A
TIME OF YEAR WHEN FEW OTHER NECTAR RESOURCES
WERE AVAILABLE

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ABSTRACT

We report on nectar foraging for five species of honeyeater and three species of parrots at a Brown Mallet (*Eucalyptus astringens*) plantation and an arboretum at Dryandra Woodland, Western Australia, during spring and compare these to nectar foraging on *Dryandra* spp. nectar in nearby shrublands. The arboretum and mallet plantations provide nectar when flowers are scarce in adjacent woodlands and shrublands and are therefore presently useful for the conservation of nectar-feeders in Dryandra Woodland.

INTRODUCTION

Many honeyeaters (Meliphagidae) and parrots (Psittacidae) use nectar and rely on a sequence of

nectar resources that differ in their spatial and temporal availability (Keast 1968; Ford 1977; Ford and Paton 1977). Because of the spatial and temporal

variability in nectar resources, identifying nectar resources in major habitat types is necessary to ensure that conservation of honeyeaters and parrots occurs on spatial and temporal scales large enough to accommodate the movements of the birds. The problem is that the incremental loss of even small nectar resources in the sequence may cause the progressive decline of nectar-feeders, regardless of the amount of nectar available at other times or locations (Recher 1999; Ford *et al.* 2001).

We studied the foraging ecology of honeyeaters in wandoo woodland and *Dryandra* shrublands in Dryandra Woodland in which we determined what honeyeaters were present during winter and spring, the nectar resources used by honeyeaters, and the temporal patterns of nectar availability and use (Recher and Davis 2011). We also monitored the use of nectar by nectar-feeders in an arboretum, dominated by *Banksia*, *Hakea*, and *Eucalyptus* species that are not native to Dryandra Woodland, and in a plantation of Brown Mallet (*Eucalyptus astringens*). Brown Mallet is native to Dryandra Woodland, but originally had a limited distribution within the reserve. However, extensive plantations of Brown Mallet were established in the 1920s and 1930s and these are now one of the most extensive habitats in Dryandra Woodland. Despite this, information on their use, if any, by

birds is limited. We report here on the use of nectar in the arboretum and a mallet plantation in August and October, 1997 by honeyeaters and parrots, and compare these to the use of nectar in naturally occurring *Dryandra* shrublands nearby.

METHODS

Dryandra Woodland is a Class A Conservation Reserve (centred on 32°45'S, 116°55'E) near the town of Narrogin, Western Australia. The two plots were chosen because of a seasonal abundance of nectar-rich flowers. The arboretum is located on Tomingley Road at the intersection with Firetower Road in Dryandra Woodland. The mallet plantation studied is adjacent to the arboretum. The mallet plot was approximately 14 400 m², with an average canopy height of 11 m. Mallet plantations at Dryandra lack an understorey, with few shrubs and little ground vegetation. The arboretum plot consisted mostly of 3–5 m shrubs, and was about 1 ha in area. The mallet flowered from August through October. At the same time, there was an abundance of blossom in the arboretum (primarily *Hakea* and exotic eucalypts).

The mallet plantation was visited by WED for 48 minutes in August 1997 over two days, when flowering had commenced, and 160 minutes over six days in October, 1997 when

the Mallet was in full flower. He visited the arboretum for 143 minutes in October, 1997. Plots were visited between 0700–1200 h, with a few visits in the afternoon. WED recorded the bird species, a single foraging manoeuvre for each bird foraging on nectar, and the plant species. WED tried to avoid repeat observations by moving continually, but some birds may have been recorded more than once. Wandoo (*Eucalyptus wandoo*) and Powderbark (*E. accedens*), the dominant eucalypts at Dryandra Woodland outside of the mallet plantations, flower during summer and autumn. During our study, only individual trees or branches flowered, and produced meagre nectar resources.

RESULTS AND DISCUSSION

Data were recorded for five species of honeyeaters and three species of parrots on the arboretum and plantation plots: Brown Honeyeater (*Lichmera indistincta*), New Holland Honeyeater (*Phylidonyris novaehollandiae*), Singing Honeyeater (*Lichenostomus virescens*), Red Wattlebird (*Anthochaera carunculata*), Western Wattlebird (*A. lunulata*), and Port Lincoln Parrot (*Barnardius zonarius*), Red-capped Parrot (*Purpureicephalus spurius*), and Western Rosella (*Platycercus icterotis*).

During winter and spring in Dryandra Woodland, inflorescences of *Dryandra* species were

the primary source of nectar for honeyeaters (Recher and Davis 2011). Species came into blossom in sequence with *D. nobilis* the first to bloom in abundance, with the smaller *D. sessilis* and *D. armata* following. When *D. nobilis* was in heavy blossom, few honeyeaters used the arboretum or mallet plantation where nectar was limited in comparison. As the abundance of nectar from *D. nobilis* lessened, Red and Western Wattlebirds shifted to foraging in the arboretum and mallet plantation.

Mallet commenced flowering in early August and became a primary source of nectar for Red Wattlebirds (n=31; 48 min), which had fed earlier largely on shrubland *Dryandra nobilis*, which had mostly finished blossoming by August (Recher and Davis 2011). By October, when *D. sessilis* and *D. armata* had largely finished flowering (Recher and Davis 2011), Red Wattlebirds foraged in the mallet, but in diminished numbers (n=11; 160 min). No Western Wattlebirds foraged in the mallet in August, but were the dominant honeyeater in October utilizing mallet (n=35; 160 min), and the arboretum (n=80; n=143 min). Port Lincoln Parrots foraged for mallet nectar in the plantation in August (n=13; 48 min) and October (n=40; 160 min). Red-capped Parrots (n=3) and Western Rosella (n=2) took mallet nectar in October, but not August. Brown Honey-

eatery used the mallet in October (n=6), but not in August, while continuing to forage in reduced numbers for nectar in the shrublands (Recher and Davis 2011). New Holland Honeyeaters also used the shrublands through October, but in October were recorded in the arboretum feeding on *Hakea* nectar (n=3). They were not recorded in the mallet in either August or October. The arboretum was the primary place of concentration in Dryandra Woodland of Singing Honeyeaters in October (n=6). They were recorded by both WED and HFR at the arboretum, where they foraged mostly on *Hakea* spp. They were not recorded in the mallet in either August or October. Other honeyeaters were rarely seen in either the arboretum or mallet.

With few eucalypts in flower and *Dryandra* species completing their flowering cycle, the mallet plantation and the arboretum were a major source of nectar for honeyeaters and parrots, particularly in October. While there are sound ecological reasons to replace the mallet plantations with the original woodlands of Jarrah (*E. marginata*), Wandoo, and Powderbark this should be done incrementally to allow nectar-feeders time to adapt to seasonal changes in nectar availability. Retaining the arboretum, or even enhancing it with further

plantings of nectar-rich shrubs, such as *Hakea*, would assist in retaining a full complement of nectar-feeders in Dryandra Woodland.

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VASCULAR FLORA OF DRYANDRA WOODLAND (LOL GRAY AND MONTAGUE STATE FORESTS)

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ABSTRACT

A checklist of the vascular flora of Dryandra Woodland is presented for the first time. Dryandra Woodland contains a vascular flora of at least 928 taxa; 813 are natives and 115 are weeds. Of these taxa 10 are non-flowering plants (7 natives, 3 weeds), 256 are Monocotyledons (219 natives and 37 weeds) and 662 are Dicotyledons (587 natives and 75 weeds).

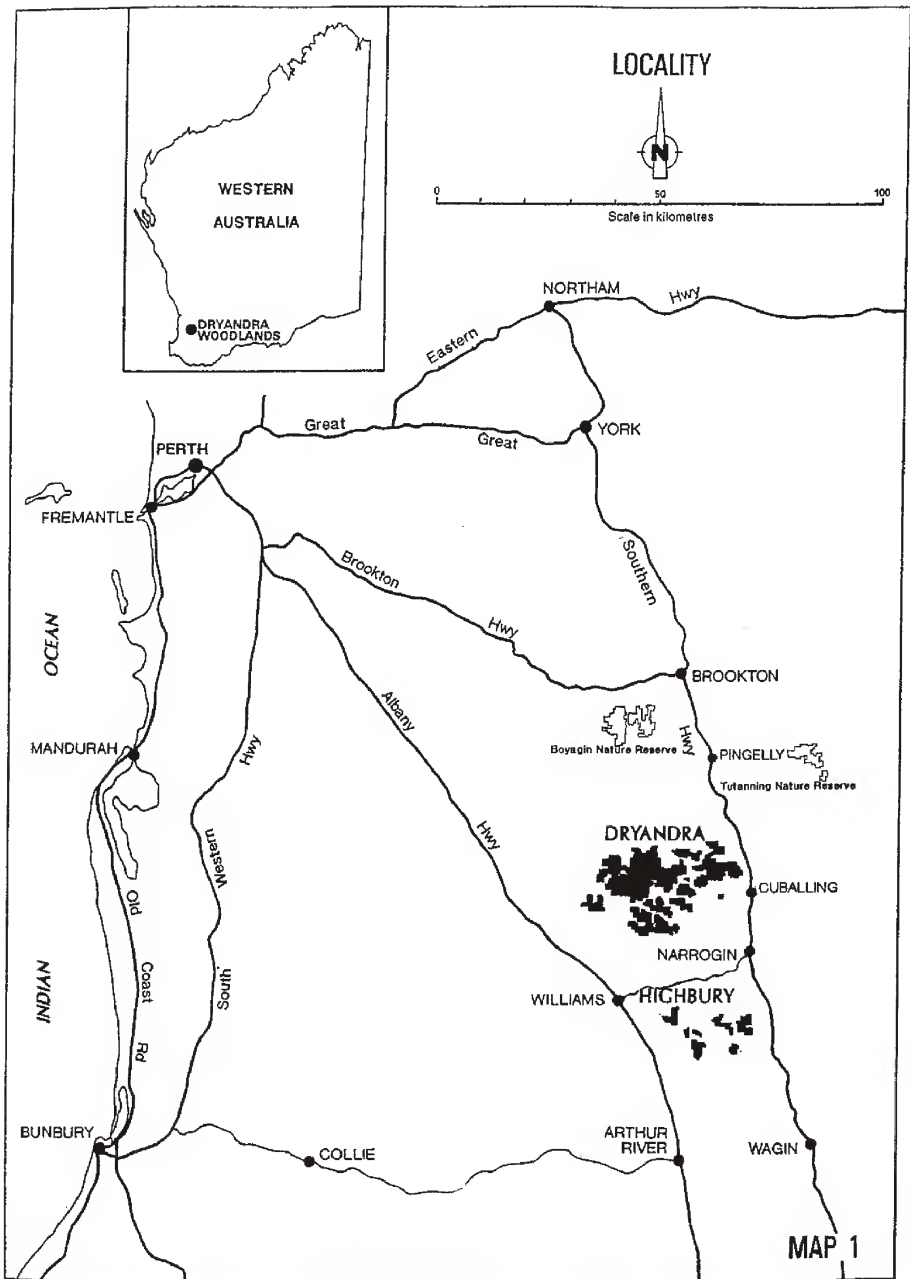
INTRODUCTION

Often referred to as Dryandra State Woodland or Dryandra Forest the Management Plan (CALM 1995) renamed the area comprising Lol Gray (State Forest number 52), Montague (number 53) and Highbury (number 52) State forests as Dryandra Woodland. In this paper we have studied the vascular flora of the first two blocks which are north of Narrogin (Map 1). Although these have always been historically referred to as Dryandra Forest (Roots *et al.* 2003), to avoid confusion we have used the name Dryandra Woodland.

Dryandra Woodland is located about 160 kilometres south-east

of Perth, and 22 kilometres north-east and north-west of Narrogin on the western margin of the Western Australian Wheatbelt, straddling the boundary between the Jarrah Forest and Avon-Wheatbelt Biogeographic regions (Department of the Environment and Water Resources 2007).

Dryandra Woodland comprises a total area of 27,947 hectares spread over 24 named forest blocks. Some of these are not contiguous, and there are 9 groups of discrete contiguous units (Department of Environment and Conservation, 1:50,000 Dryandra Map Sheet). The largest contiguous unit is formed by the



Map 1. Location of Dryandra Woodland and DEC Reserves and Forest (adapted from Department of Conservation and Land Management 1995).

Central Blocks of 12,192 hectares. The other eight units range in size from 87 hectares to 3,913 hectares. Prior to 1970 approximately 8,000 hectares of the woodland were converted to Mallet (*Eucalyptus astringens*) plantations to supply the tanning industry.

Dryandra Woodland experiences a typical Mediterranean climate receiving an annual rainfall of approximately 500–600 mm. The woodland has a low relief ranging from 240–440 metres above sea level, with the major landforms being low lateritic plateaus, slopes, flat sandplains and valleys.

Despite the Woodland being a large remnant of native vegetation of very high faunal and cultural significance (Serventy 1970 and CALM 1995), there is little published on the flora of Dryandra Woodland. This paper documents and discusses for the first time the vascular flora of this major reserve of the Western Australian Agricultural Zone.

SURVEY METHOD

Survey work in Dryandra Woodland Blocks was performed over many flowering seasons from 1983 to 2008, some of the latter period in conjunction with regional quadrat based survey work on the Salinity Action Plan (Keighery *et al.* 2004).

Opportunistic plant collections, that is collections made outside set quadrats, were made during vehicle and foot traverse at

various times of the year, especially during 1996 and 2008. Over 800 voucher collections were made and most are deposited in PERTH or KPBG.

Nomenclature generally follows that used that used in Florabase (Western Australian Herbarium 1998–), or in the most recent revisions. Conservation status of the flora is assigned in Smith (2010) as per Table 1.

GEOMORPHOLOGY AND SOILS

Dryandra Woodland lies on the Western Shield. The major landform units have been described by McArthur *et al.* (1977) as the Norrine and Noombling units. Norrine is a lateritic landform covering areas dominated by

Table 1. Categories of Conservation Listed Flora according to the degree of perceived threat

Category / Definition

P1 (Poorly known Flora) Taxa with less than 5 populations, which are under threat

P2 (Poorly known Flora) Taxa with less than 5 populations, at least some of which are not believed to be under immediate threat

P3 (Poorly known Flora) Taxa with several populations (more than 5), at least some of which are not believed to be under immediate threat

P4 (Rare Taxa) Taxa which are considered to be adequately surveyed and which while being rare are not currently threatened by any identifiable factors

lateritic duricrust, gravels and sand. Lateritic residuals are usually small and bounded by small escarpments. This unit occupies the upper landscape positions but occasionally extends as a spur to the lower slopes. The Noombling unit is an erosion surface covering areas stripped of lateritic materials, slopes are long and gentle and granite rock outcrops are common.

The other landform unit in the area, the Biberkine is a depositional landform which includes areas of alluvial valley fill and floors of major streams. This unit has been largely excised from the Woodland and is now cleared farmland.

VEGETATION

Beard (1979) described the original vegetation of the Dryandra area at a scale of 1:250,000 in six vegetation types:

1. Communities of granite rocks
2. Woodlands of Powderbark (*Eucalyptus accedens*) and Brown Mallet (*Eucalyptus astringens*) on lateritic uplands
3. Woodlands of Wandoo (*Eucalyptus wandoo*) on upper slopes
4. Woodlands of Marri and Wandoo on middle slopes
5. York Gum (*Eucalyptus loxophleba*) next to drainage channels
6. Flooded Gums (*Eucalyptus rudis*) lining creeks.

A detailed vegetation map at a

scale of 1:12,500 of Dryandra Woodland was completed by Coates (1993). Coates listed 11 vegetation associations:

1. Woodland of western lateritic plateaus (*E. accedens* with *E. marginata*, *E. wandoo* and *Corymbia calophylla*.)
2. Woodland of *Eucalyptus wandoo* (extensive)
3. Woodland of *Eucalyptus accedens* (extensive)
4. Woodland of *Eucalyptus astringens* (common, largely planted)
5. Woodland of *Corymbia calophylla* and *Banksia* (localised)
6. Woodland of *Eucalyptus loxophleba* (small areas)
7. *Allocasuarina huegeliana* low woodland often with *E. wandoo* (common but localised)
8. *Acacia acuminata* low forest to woodland (occasional)
9. Low, species diverse Kwongan (slopes below lateritic residuals)
10. *Dryandra* (now *Banksia*) and *Petrophile* tall Shrubland, > 2 metres (duplex soils, shallow gravely soils)
11. Lithic (granite) complex.

At both of these scales the vegetation reflects the dominant landforms.

1. On the plateau are woodlands of Jarrah, mixed Jarrah-Marri and Powderbark, *Eucalyptus drummondii* Mallee heaths or mixed tall Kwongan.

2. The slopes are dominated by Brown Mallet woodlands which grade into Wandoo and mixed Wandoo/Powder bark woodlands.
3. A few areas of flat sandy or duplex soils support Kwongan or Banksia woodlands.
4. The valley bottoms have low open woodlands of Jam, Marri or rarely York Gum and Flooded Gums.
5. Scattered through the woodlands are granite outcrops with their own distinctive flora usually edged by Rock She-oak low forests or woodlands.
5. Heath on deep or duplex sandy loam soils corresponds to Coates vegetation association 10
6. Lateritic uplands (Powderbark Wandoo, *Eucalyptus drummondii* mallee heathlands and some Mallet areas) corresponds to Coates vegetation associations 3, 4 and 9
7. Jam woodlands, wet flats and creeklines corresponds to Coates vegetation associations 6 and 8
8. Disturbed areas (Paddocks, tracks, plantations, water points), except for vegetation association 4 not mapped by Coates or Beard

FLORA

Results

The flora list (Appendix) places records of the vascular flora into the major vegetation/landform units following Beard and Coates:

1. Woodlands of the western lateritic plateaus (normally dominated by Jarrah), corresponds to Coates vegetation association 1
2. Wandoo woodlands, corresponds to Coates vegetation association 2
3. Sandy woodlands (Marri and Banksia), corresponds to Coates vegetation association 5
4. Lithic complex (includes *Allocasuarina* low forest), corresponds to Coates vegetation associations 7 and 11

Species Richness

Dryandra Woodland contains a vascular flora of at least 928 taxa (Appendix 1); 813 are natives and 115 are weeds. Of these taxa 10 are non-flowering plants (7 natives, 3 weeds), 256 are Monocotyledons (219 natives and 37 weeds) and 662 are Dicotyledons (587 natives and 75 weeds).

The Orchidaceae (73 natives, 2 weeds), Myrtaceae (70 natives), Proteaceae (66 natives, 2 weeds), Papilionaceae (65 natives, 12 weeds), Asteraceae (60 natives, 15 weeds), Stylidiaceae (37 natives), Mimosaceae (30 natives, 3 weeds), Epacridaceae (29 natives), Anthericaceae (29 natives), Goodeniaceae (29 natives) and Cyperaceae (29 natives, 2 weeds) are the most species rich families. These comprise over 60% of the known flora of Dryandra Woodland.

The above are the typical species diverse families of the kwongan (heathlands) of southern Western Australia. This was also demonstrated in the Salinity Action Plan Survey of the Western Australian Wheatbelt (Gibson *et al.* 2004) who found that the Myrtaceae, Proteaceae, Papilionaceae, Asteraceae, Mimosaceae, Cyperaceae, Orchidaceae, Epacridaceae, Poaceae and Stylidiaceae were the 10 most speciose families comprising 63% of the flora recorded. The herbaceous Monocotyledon families, which are species diverse in the higher rainfall Warren bio-region (Lyons *et al.* 2000); Haemodoraceae (13), Apiaceae (19) and Dasypogonaceae (10) are here reduced in diversity. The only exception being the Cyperaceae, containing genera which are diverse in sandy soils and wetlands and is therefore, diverse in both areas.

The largest genera are *Stylidium* (32 taxa), *Acacia* (30), *Eucalyptus* (23), *Caladenia* (22), *Banksia* (19), *Hakea* (16), *Leucopogon* (15), *Gastrolobium* (15), *Petrophile* (14) and *Drosera* (13). Again the Salinity Action Plan Survey recorded the largest genera as *Acacia*, *Eucalyptus*, *Banksia*, *Stylidium*, *Leucopogon*, *Schoenus*, *Grevillea*, *Hibbertia*, *Caladenia* and *Daviesia*.

Priority Flora

Dryandra Woodland contains no declared rare flora but has 18 species of priority flora (Smith 2010):

Acacia alata var *platyptera* (P4); scattered populations from Mogumber south to Dryandra.

Acacia deflexa (P4); scattered populations from Dryandra south-east to the Wittenoon Hills (NE Esperance)

Andersonia bifida (P2); apparently confined to duplex soils in heathland in Dryandra

Anigozanthos bicolor subsp. *exstans* (P3); Meckering to Dryandra

Asterolasia pallida subsp. *hyalina* (P2); apparently confined to lateritic soils in heathland in Dryandra

Banksia cynaroides (P4); occurs from Brookton to Harrismith

Banksia subpinnatifida var *subpinnatifida* (P2); occurs from Pingelly to Birdwhistle nature reserve

Chamelaucium croxfordiae (P2); recorded only from Boyagin & Dryandra

Darwinia sp. Dryandra (GK 9295), (P4); occurs from Dryandra to Westdale

Darwinia thymoides subsp. *bella* (P4); occurs from York to Dryandra

Gastrolobium ovalifolium (P4); occurs from Boddington to Narrogin and Kojonup

Gastrolobium stipulare (P4); occurs from Brookton to Highbury

Gastrolobium tomentosum (P4); occurs from Willams to Dryandra to Darkan

Grevillea crowleyae (P2); occurs from Darradine to Dryandra to Jarrahdale

Hibbertia montana (P4); occurs from York to Dryandra

Marianthus dryandra (P2); Dryandra

Persoonia hakeiformis (P2); occurs from Dryandra to Newdegate

Xanthorrhoea brevistylis (P4); occurs from Dryandra to Albany

There are three taxa that may be endemic to Dryandra woodland (*Andersonia bifida*, *Asterolasia pallida* subsp. *hyalina* and *Marianthus dryandra*).

Hybrids

Five naturally occurring inter-specific hybrids were located in Dryandra Woodland, including: *Lechenaultia formosa* x *tubiflora* (GK 9327), *Caladenia flava* x *reptans* (GK 14987) and a series of hybrid eucalypts (*E. accedens* x *incrassata* (Brooker 9955), *E. aspera* x *pluricaulis* (Rose 621) and *E. subangusta* x *wandoo* (GK 9302). It is unknown whether this is unusual or a reflection of the intensive collecting within the study area. In this context Tutanning Nature Reserve has one recorded hybrid eucalypt.

Weeds

115 naturalised alien species (weeds) recorded for Dryandra Woodland, a higher percentage (12.4%) of the total flora than for the Avon-Wheatbelt IBRA, 9.1% (Keighery and Longman 2004). However, Dryandra Woodland has a long history of settlement and management disturbance. As a consequence, 31 of the weeds (28% of the total) were only

recorded from highly disturbed sites such as tracks, fire breaks, Mallet plantations, old and current settlements and dam sites. Many of these species will never become major weeds of the bushland areas.

The presence of an arboretum in Dryandra Woodland has also added some very unusual non local native weeds to the list where these species have seeded into the surrounding bushland. These include several *Callitris* species, *Hakea bucculenta*, *Hakea francisiana* and hybrids of the last two species. Species obviously planted and not spreading were recorded, but are not listed in this paper.

Of the remaining weeds, approximately 17 (15% of the total) are the major weeds of Dryandra Woodland. Granites and Wandoo woodlands are the areas where weeds are having the greatest impacts. In these areas the most serious invasive weeds present are: *Asparagus asparagoides*, *Monoculus monstrosus*, *Brassica tournefortii*, *Moraea flaccida*, *Moraea collina*, *Freesia* hybrid, *Romulea rosea*, *Acacia pycnatha*, *Oxalis purpurea*, *Trifolium arvense*, *T. campestre*, *T. dubium*, *Lotus angustissimus*, *Avena barbata*, *Briza maxima*, *B. minor* and *Bartsia trixago*.

DISCUSSION

We consider that over 90% of the known flora of Dryandra Woodland has now been recorded, and that new records will mainly be

recorded after sporadic events such as wildfires.

Since the woodland straddles the boundaries between the Jarrah Forest Bio-geographic region and the Avon-Wheatbelt it is perhaps not surprising that at least 60 taxa (ca. 7% of the total flora), normally components of the Jarrah Forest are at or near their eastern range limits, e.g.: *Ptilotus stirlingii*, *Thysanotus multiflorus*, *Xanthosia cilata*, *Pithocarpa pulchella*, *Carex inversa*, *Astroloma ciliatum*, *Scaevola platyphylla*, *Jacksonia sternbergiana*, *Stirlingia simplex*.

Another feature of interest as demonstrated by the priority flora list are the number of species, chiefly of the Wandoo woodlands that are at, or near, their northern or southern limits in Dryandra Woodland. It is probable that many of the species recorded in Dryandra Woodland from the heath and lateritic uplands are at, or near their Western range limits, but further surveys in the near-by forest estate are required to quantify this observation.

In the Wheatbelt Salinity Survey (Gibson *et al.* 2004), 52% of species recorded were shrubs, 13.5% annuals, 11% perennial herbs, 7% geophytes and 4% sedges. At Dryandra Woodland, 48.4% of species were shrubs, 13.1% annuals, 12.6% perennial herbs, 15.8% geophytes and 7.1% sedges. This increase in geophytes and sedges is also reflected in the observed species richness of the predominately herbaceous families: Cyperaceae, Asteraceae,

Orchidaceae, Stylidiaceae and Goodeniaceae in Dryandra Woodland. This increase is a reflection of the higher rainfall, hence fresher wetlands that retain soil saturation for longer and hence have a longer growing period for Dryandra Woodland compared to the Wheatbelt as a whole.

With over 800 native taxa listed, the flora of Dryandra Woodland is diverse; however, since few comparable areas have been surveyed it is not possible to determine if this diversity is unusual at a quadrat, local area or regional scale.

There are some limited data at the quadrat scale in the Wheatbelt Salinity Survey (Gibson *et al.* 2004), which suggests that the western heaths are rich in shrub species (43–45 species/100 m²) and the western Wandoo woodlands are species rich in herbaceous species. The Western woodlands were the richest of all Wheatbelt vegetation types with a mean of 52.3 species per site. Dryandra Woodland with a combination of both western heaths and western woodlands is species rich at the quadrat and reserve scale.

The only large near-by reserve that has been intensively studied is Tutanning Nature Reserve (26 km. N.W. Pingelly and 25 km. east of Dryandra Woodland, Map 1). This reserve, with an area 5,200 hectares has a known flora of 697 species, including 35 weeds (Langley pers. com.) Unpublished surveys of Boyagin Nature

Reserve (Map 1) with an area of 6,700 hectares, by the authors have currently recorded 767 taxa, including 61 weeds.

These studies suggest that the plant communities at the western margins of the Wheatbelt are species diverse at the quadrat and local scale. At the regional scale, information suggests that *Banksia* woodlands of the Swan Coastal Plain and Whicher Scarp are richer at a quadrat scale (Gibson *et al.*, 1994; Keighery *et al.*, 2008). Heathland communities of the northern and southern sandplains are also richer, but all are highly variable.

A high rate of species turnover is also apparent. Comparison of the known native flora of Tutanning and Dryandra Woodland shows that 1,041 taxa were listed from both reserves, 609 taxa are shared between the areas, 304 are only found in Dryandra Woodland and 128 only in Tutanning. That is only 58.4% of their total floras are shared between the reserves. Although only partially surveyed similar differences are already apparent with the known floras of Boyagin nature reserve and Highbury Forest.

In summary the vascular flora of Dryandra Woodland reflects the bio-geographic position of the bushland, containing elements of the Jarrah Forest and Avon-Wheatbelt, with many species at their geographic margins, contributing to the high level of turnover noted between reserves. The plant communities them-

selves are species rich contributing to the floristic diversity recorded.

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Appendix 1. Dryandra Woodland Flora List

Habitat Code: 1 – Woodlands of the western lateritic plateau (normally Jarrah dominated), 2 – Wandoo woodlands, 3 – Woodlands of sandy soils (Marri and/or Banksia), 4 – Lithic complex (Granite herbfield, heath, shrubland and *Allocasuarina huegeliana* low forest), 5 – Heath on sandy loam soils, 6 – lateritic upland (Powderbark woodlands, Mallee, Kwongan and Mallet) 7 – woodlands on wet flats and creeklines (normally Jam rarely York Gum), 8 – Disturbed areas (paddocks, tracks, roads, plantations and settlement area). * Naturalised species

Scientific name	1	2	3	4	5	6	7	8
Adiantaceae								
<i>Cheilanthes austrotenuifolia</i>				+				+
<i>Pleurosorus rutifolius</i>				+				
Aizoaceae								
<i>Carpobrotus modestus</i>		+			+			
Alliaceae								
* <i>Allium triquetrum</i>								+
Amaranthaceae								
<i>Ptilotus declinatus</i>	+							
<i>Ptilotus drummondii</i> var <i>drummondii</i>	+				+		+	
<i>Ptilotus humilis</i> var <i>humilis</i>		+	+		+			
<i>Ptilotus manglesii</i>	+		+				+	
<i>Ptilotus polystachyus</i>			+					
<i>Ptilotus spathulatus</i>	+		+					
<i>Ptilotus stirlingii</i> var <i>stirlingii</i>	+							
Amaryllidaceae								
* <i>Amaryllis belladonna</i>								+
* <i>Narcissus tazetta</i>								+
Anthericaceae								
<i>Agrostocrinum scabrum</i>				+				+
<i>Arthropodium capillipes</i>	+			+	+	+		
<i>Arthropodium curvipes</i> subsp. nov.				+				
<i>Arthropodium preissii</i>								+
<i>Borya constricta</i>				+				
<i>Borya laciniata</i>								+
<i>Borya scirpioidea</i>		+						+
<i>Borya sphaerocephala</i>			+					
<i>Caesia alfordii</i>								+
<i>Caesia micrantha</i>	+		+					
<i>Caesia occidentalis</i>						+		
<i>Chamaescilla corymbosa</i> var. <i>corymbosa</i>				+				+
<i>Chamaescilla spiralis</i>		+	+		+			
<i>Corynotheca micrantha</i>	+		+					

Scientific name	1	2	3	4	5	6	7	8
<i>Laxmannia grandiflora</i> subsp. <i>grandiflora</i>		+				+		
<i>Laxmannia omnifertilis</i>					+			
<i>Laxmannia ramosa</i> subsp. <i>ramosa</i>	+	+					+	
<i>Laxmannia squarrosa</i>	+		+					
<i>Sowerbaea laxiflora</i>	+	+	+		+	+	+	
<i>Thysanotus asper</i>					+			
<i>Thysanotus dichotomus</i>	+		+					
<i>Thysanotus manglesianus</i>	+						+	
<i>Thysanotus multiflorus</i>		+	+					
<i>Thysanotus patersonii</i>	+	+					+	
<i>Thysanotus pyramidalis</i>		+						
<i>Thysanotus sparteus</i>	+		+					
<i>Thysanotus tenellus</i>	+							
<i>Thysanotus thyrsoides</i>	+						+	+
<i>Thysanotus triandrus</i>			+		+			
<i>Tricoryne elatior</i>	+	+						
<i>Tricoryne tenella</i>			+					
Apiaceae								
<i>Actinotus glomeratus</i>							+	
<i>Actinotus leucocephalus</i>	+							
<i>Daucus glochidiatus</i>	+	+	+	+	+		+	
<i>Eryngium pinnatifidum</i> subsp. <i>minor</i>		+					+	
<i>Homalosciadium homalocarpum</i>		+		+			+	
<i>Hydrocotyle alata</i>					+		+	
<i>Hydrocotyle diantha</i>					+		+	
<i>Hydrocotyle callicarpa</i>	+	+			+			
<i>Hydrocotyle pilifera</i> var. <i>glabrata</i>		+						
<i>Hydrocotyle rugulosa</i>		+				+	+	
<i>Platysace juncea</i>						+	+	+
<i>Trachymene cyanopetala</i>		+					+	
<i>Trachymene ornata</i>		+				+	+	
<i>Trachymene pilosa</i>	+	+	+				+	
<i>Xanthosia atkinsoniana</i>	+	+			+			
<i>Xanthosia candida</i>							+	
<i>Xanthosia ciliata</i>	+							
<i>Xanthosia huegelii</i>	+							
<i>Xanthosia singuliflora</i>	+	+						
Apocynaceae								
* <i>Vinca major</i>								+
Araceae								
* <i>Zantedeschia aethiopica</i>							+	
Asparagaceae								
* <i>Asparagus asparagoides</i>		+						+

Scientific name	1	2	3	4	5	6	7	8
Asphodelaceae								
Bulbine semibarbata		+		+				+
Asteraceae								
Actinobole uliginosa		+		+				
Angianthus tomentosus						+		
Argentipallium niveum		+				+		
* Arctotheca calendula		+		+			+	+
Asteridea nivea		+				+		
Blennospora drummondii			+	+		+	+	
Brachyscome glandulosa				+				
Brachyscome bellidoides		+						
Brachyscome iberidiifolia	+	+	+	+				
Brachyscome perpusilla var tenella								+
Calocephalus angianthoides				+				
Calotis hispidula		+		+				
* Carduus pycnocephalus				+				+
* Centaurea melitensis		+				+	+	+
Ceratogyne obionoides		+						
Chrysocephalum semipapposum		+						
Chthonocephalus pseudevax				+				
* Cirsium vulgare		+		+				
* Conyza albida								+
Cotula australis		+					+	
* Cotula bipinnata		+						+
Cotula coronopifolia				+			+	
Cotula cotuloides							+	
Cotula drummondii		+						
Craspedia variabilis	+					+		
* Dittrichia graveolens								+
Euchiton sphaericus		+						
Gnephosis drummondii		+						
Gnephosis tenuissima	+	+			+			
Helichrysum leucopsidum		+			+			
* Helichrysum luteo-album								+
Hyalosperma cotula				+			+	
Hyalosperma demissum						+		
* Hypochaeris glabra		+	+	+	+	+	+	+
Ixiolaena viscosa					+			+
Lagenophora huegelii	+	+	+		+		+	
Lawrencella rosea		+						
Millotia myosotidifolia	+	+	+		+		+	
Millotia tenuifolia		+			+		+	
* Monoculus monstrosus		+		+			+	+
Myriocephalus occidentalis		+						
Myriocephalus rhizocephalus							+	
Olearia elaeophila							+	
Olearia muricata	+						+	

Scientific name	1	2	3	4	5	6	7	8
<i>Olearia rudis</i>	+					+		
<i>Pithocarpa pulchella</i> var <i>melanostigma</i>	+							
<i>Podolepis canescens</i>	+	+						
<i>Podolepis gracilis</i>		+						
<i>Podolepis lessonii</i>		+				+		
<i>Podotrochea angustifolia</i>	+	+				+		
<i>Podotrochea gnaphaloides</i>			+					
<i>Pterochaeta paniculata</i>	+		+		+	+		
<i>Quinetia urvillei</i>	+	+	+		+	+	+	
<i>Rhodanthe citrina</i>	+	+			+	+		
<i>Rhodanthe corymbosum</i>		+	+	+				
<i>Rhodanthe laevis</i>		+						
<i>Rhodanthe manglesii</i>		+		+				+
<i>Rhodanthe pygmaea</i>		+						+
<i>Senecio glossanthus</i>		+						
<i>Senecio hispidulus</i>	+	+						
<i>Senecio pinnatifolius</i>		+				+		
<i>Senecio quadridentatus</i>		+						+
<i>Siloxerus filifolius</i>					+			
<i>Siloxerus humifusus</i>	+		+		+			
<i>Siloxerus multiflorus</i>		+			+			
* <i>Soliva sessilis</i>		+						+
* <i>Sonchus asper</i>							+	+
* <i>Sonchus oleraceus</i>		+	+	+		+	+	+
<i>Trichocline spathulata</i>	+							
* <i>Ursinia anthemoides</i>	+	+	+	+				+
* <i>Vellereophyton dealbatum</i>		+		+				+
<i>Waitzia acuminata</i> var <i>acuminata</i>	+	+			+	+		
<i>Waitzia acuminata</i> var <i>albicans</i>		+						
<i>Waitzia nitida</i>	+	+				+		
<i>Waitzia suaveolens</i> var <i>suaveolens</i>	+		+					
Boraginaceae								
<i>Halgania anagaloides</i>		+						
* <i>Echium plantagineum</i>		+						+
Brassicaceae								
* <i>Brassica tournefortii</i>								+
<i>Lepidium rotundum</i>		+						
Campanulaceae								
<i>Wahlenbergia gracilentia</i>	+	+	+	+	+	+		
<i>Wahlenbergia multicaulis</i>				+			+	
<i>Wahlenbergia preissii</i>				+				
Caesalpiniaceae								
<i>Labichea lanceolata</i>				+				

Scientific name	1	2	3	4	5	6	7	8
Caryophyllaceae								
* <i>Cerastium glomeratum</i>				+				+
* <i>Moenchia erecta</i>								+
* <i>Petrorrhagia dubia</i>				+				+
* <i>Polycarpon tetraphyllum</i>								+
* <i>Silene gallica</i> var. <i>gallica</i>							+	+
* <i>Silene gallica</i> var. <i>quiquevulnera</i>								+
* <i>Spergula arvensis</i>								+
Casuarinaceae								
<i>Allocauarina campestris</i>					+	+		
<i>Allocauarina huegeliana</i>				+				
<i>Allocauarina humilis</i>	+		+		+			
<i>Allocauarina microstachya</i>					+			
<i>Allocauarina thuyoides</i>			+					
Centrolepidaceae								
<i>Aphelia brizula</i>								+
<i>Aphelia cyperoides</i>				+				+
<i>Aphelia drummondii</i>		+		+				
<i>Aphelia nutans</i>				+				+
<i>Centrolepis aristata</i>	+	+	+	+				
<i>Centrolepis drummondiana</i>	+	+	+		+	+		
<i>Centrolepis inconspicua</i>								+
<i>Centrolepis glabra</i>								+
<i>Centrolepis pilosa</i>		+		+			+	+
<i>Centrolepis polygyna</i>		+				+		
Chenopodiaceae								
* <i>Chenopodium album</i>								+
Clusiaceae								
<i>Hypericum gramineum</i>		+		+				
Colchicaceae								
<i>Burchardia congesta</i>	+	+	+		+			
<i>Burchardia multiflora</i>				+				+
<i>Wurmbea dioica</i> subsp. <i>alba</i>				+				
<i>Wurmbea sinora</i>				+				
<i>Wurmbea tenella</i>		+		+				+
Convolvulaceae								
<i>Convolvulus angustissimus</i> subsp. <i>angustissimus</i>		+						+
Crassulaceae								
<i>Crassula colorata</i> var. <i>colorata</i>	+		+	+	+		+	
* <i>Crassula decumbens</i>								+

Scientific name	1	2	3	4	5	6	7	8
Crassula exserta	+	+			+		+	
* Crassula natans var minus				+			+	
Crassula pedicellosa		+					+	
Crassula peduncularis				+				
Cupressaceae								
* Callitris columellaris								+
Callitris roei								+
* Callitris verrucosa								+
Cuscutaceae								
* Cuscuta epithymum						+		
Cyperaceae								
Carex inversa							+	
Carex preissii		+						
Caustis dioica		+			+	+		
Chorizandra enodis							+	
* Cyperus tenellus		+		+			+	+
Gahnia australis	+	+			+	+		
Gahnia drummondii						+		
Isolepis congrua								
Isolepis cyperoides								
* Isolepis marginata			+				+	
Isolepis stellata						+		
Lepidosperma leptostachyum	+				+	+		
Lepidosperma pubisquameum					+	+		
Lepidosperma resinosum				+				
Lepidosperma sp. Boorabbin (K.L. Wilson 2579)		+		+				
Mesomelaena preissii	+	+						
Mesomelaena stygia			+					
Schoenus armeria					+	+		
Schoenus ?clandestinus (G.Keighery 14984)		+						
Schoenus curvifolius	+		+					
Schoenus minutulus					+			
Schoenus nanus		+		+			+	
Schoenus odontocarpus				+				
Schoenus pleiostemoneus	+		+					
Schoenus subbulbosus			+					
Schoenus tenellus								+
Schoenus trachycarpus		+						
Schoenus unispiculatus		+		+				
Tetragonia octandra	+	+						
Tricostularia compressa						+		
Tricostularia neesii		+						

Scientific name	1	2	3	4	5	6	7	8
Dasypogonaceae								
<i>Chaemaxeros serra</i>	+		+			+		
<i>Lomandra collina</i>	+							
<i>Lomandra effusa</i>		+			+	+		
<i>Lomandra micrantha</i> subsp. <i>micrantha</i>	+	+						+
<i>Lomandra micrantha</i> subsp. <i>teretifolia</i>						+		
<i>Lomandra mucronata</i>						+		
<i>Lomandra nutans</i>	+					+		
<i>Lomandra preissii</i>	+		+					
<i>Lomandra purpurea</i>	+							
<i>Lomandra suaveolens</i>			+					
Dilleniaceae								
<i>Hibbertia acerosa</i>		+						
<i>Hibbertia commutata</i>	+	+			+	+		
<i>Hibbertia exasperata</i>		+				+		
<i>Hibbertia hemignosta</i>		+			+	+		
<i>Hibbertia hibbertioides</i> var. <i>hibbertioides</i>		+				+		
<i>Hibbertia hibbertioides</i> var. <i>pedunculata</i>		+	+		+			
<i>Hibberia hypericoides</i>	+		+			+		
<i>Hibberia microphylla</i>				+		+		
<i>Hibbertia montana</i>	+					+		
<i>Hibbertia polystachya</i>		+				+		
<i>Hibbertia rupicola</i>		+						
Droseraceae								
<i>Drosera androsace</i>					+			
<i>Drosera bulbosa</i> subsp. <i>bulbosa</i>		+					+	
<i>Drosera erythrorhiza</i> subsp. <i>squamosa</i>			+					
<i>Drosera gigantea</i> subsp. <i>gigantea</i>								
<i>Drosera glanduligera</i>	+	+	+	+		+	+	
<i>Drosera hyperostigma</i>						+		
<i>Drosera macrantha</i> subsp. <i>macrantha</i>	+	+	+					
<i>Drosera menziesii</i> subsp. <i>menziesii</i>	+	+					+	
<i>Drosera purpurascens</i>		+						
<i>Drosera pallida</i>	+							
<i>Drosera spilos</i>		+						
<i>Drosera stolonifera</i>		+	+				+	
<i>Drosera subhirtella</i>		+					+	
Epacridaceae								
<i>Andersonia bifida</i>					+			
<i>Andersonia caerulea</i>	+		+		+	+		
<i>Andersonia lehmanniana</i> subsp. <i>pubescens</i>					+	+		
<i>Andersonia parviflora</i>		+			+			
<i>Astroloma cataphractum</i>		+			+			
<i>Astroloma ciliatum</i>	+	+						

Scientific name	1	2	3	4	5	6	7	8
<i>Astroloma compactum</i>		+			+			
<i>Astroloma drummondii</i>	+	+						
<i>Astroloma epacridis</i>	+	+				+		
<i>Astroloma pallidum</i>	+		+					
<i>Astroloma serratifolium</i>		+			+	+		
<i>Astroloma</i> sp.Tutanning (A.S. George 7779)		+			+			
<i>Leucopogon conostephioides</i>	+							
<i>Leucopogon dielsianus</i>		+			+			
<i>Leucopogon fimbriatus</i>		+			+			
<i>Leucopogon glabellus</i>	+		+					
<i>Leucopogon nutans</i>						+		
<i>Leucopogon obtusatus</i>		+						
<i>Leucopogon oxycedrus</i>	+	+						
<i>Leucopogon pendulus</i>				+				
<i>Leucopogon propinquus</i>	+					+		
<i>Leucopogon pubescens</i>						+		
<i>Leucopogon</i> sp.Boddington(D. Halford 80746)	+	+						
<i>Leucopogon</i> sp.Darling Range(F.&J.Hort 1804)	+					+		
<i>Leucopogon</i> sp.Great Southern(Cowan A586)						+		
<i>Leucopogon</i> sp.Wandering(F.Hort 419)						+		
<i>Leucopogon strictus</i>						+		
<i>Lysinema pentapeltum</i>	+		+		+			
<i>Styphelia tenuiflora</i>	+	+			+	+		
Euphorbiaceae								
<i>Beyeria lechenaultii</i>		+			+	+		
* <i>Euphorbia peplus</i>				+				+
<i>Monotaxis grandiflora</i> var <i>grandiflora</i>						+		
<i>Phyllanthus calycinus</i>	+							
<i>Poranthera ericoides</i>	+	+						
<i>Poranthera microphylla</i>	+	+			+		+	
<i>Stachystemon virgatus</i>	+							
Fumariaceae								
* <i>Fumaria capreolata</i>								+
* <i>Fumaria muralis</i>								+
Gentianaceae								
* <i>Centaurium erythraea</i>		+					+	+
* <i>Cicendia filiformis</i>		+					+	
* <i>Cicendia quadrangularis</i>		+					+	
<i>Sebaea ovata</i>				+			+	
Geraniaceae								
* <i>Erodium botrys</i>		+		+				+
* <i>Erodium cicutarium</i>		+						+
<i>Erodium cygnorum</i>	+				+		+	

Scientific name	1	2	3	4	5	6	7	8
<i>Geranium retrorsum</i>		+			+			
<i>Pelargonium littorale</i>							+	
<i>Pelargonium havlasae</i>		+						
Goodeniaceae								
<i>Anthotium odontophyllum</i>	+	+						
<i>Dampiera eriocephala</i>					+			
<i>Dampiera juncea</i>	+	+				+		
<i>Dampiera lavandulacea</i>	+							
<i>Dampiera lindleyi</i>	+	+			+			
<i>Dampiera obliqua</i>	+	+			+			
<i>Dampiera sacculata</i>			+					
<i>Dampiera wellsiana</i>					+	+		
<i>Goodenia berardiana</i>		+						+
<i>Goodenia coerulea</i>						+		
<i>Goodenia convexa</i>						+		
<i>Goodenia fasciculata</i>	+					+		
<i>Goodenia helmsii</i>				+				
<i>Goodenia incana</i>		+						
<i>Goodenia micrantha</i>								+
<i>Goodenia scapigera</i> subsp. <i>scapigera</i>				+		+		
<i>Goodenia ?quasilibera</i> (GK/JA 1539)					+			
<i>Goodenia pulchella</i>		+		+				
<i>Goodenia watsonii</i> subsp. <i>glandulosa</i>						+		
<i>Lechenaultia biloba</i>	+		+			+		
<i>Lechenaultia formosa</i>		+			+	+		
<i>Lechenaultia tubiflora</i>		+						
<i>Scaevola calliptera</i>						+		
<i>Scaevola humifusa</i>		+						+
<i>Scaevola platyphylla</i>	+							
<i>Scaevola repens</i>			+					
<i>Velleia cynopotamica</i>		+		+				
<i>Velleia trinervis</i>		+						
<i>Verreauxia reinwardtii</i>	+		+			+		
Gyrostemonaceae								
<i>Gyrostemon subnudus</i>				+				
Haemodoraceae								
<i>Anigozanthos bicolor</i> subsp. <i>exstans</i>		+						
<i>Anigozanthos humilis</i> subsp. <i>humilis</i>	+							
<i>Anigozanthos manglesii</i> subsp. <i>manglesii</i>	+							
<i>Conostylis aculeata</i> subsp. <i>bromelioides</i>	+	+	+					
<i>Conostylis petrophiloides</i>	+							
<i>Conostylis serrulata</i>	+							
<i>Conostylis setigera</i> subsp. <i>setigera</i>						+		
<i>Haemodorum discolor</i>	+	+				+		
<i>Haemodorum laxum</i>			+					

Scientific name	1	2	3	4	5	6	7	8
Haemodorum simplex				+				+
Haemodorum sparsiflorum				+				+
Haemodorum spicatum	+		+		+			
Tribonanthes longipetala		+						+
Tribonanthes violacea				+				+
Haloragaceae								
Glischrocaryon angustifolium	+							
Glischrocaryon aureum		+			+			
Glischrocaryon flavescens		+			+	+		
Gonocarpus cordiger	+	+	+		+			
Gonocarpus nodulosus		+		+				+
Hydatellaceae								
Trithuria bibracteata								+
Trithuria submersa								+
Hypoxidaceae								
Hypoxis glabella var. glabella		+		+				+
Hypoxis occidentalis var. quadriloba		+						+
Iridaceae								
* Chasmanthe floribunda								+
* Freesia hybrid		+						+
* Gladiolus tristis								+
* Iris germanica								+
* Ixia maculata								+
* Moraea faccida		+					+	+
* Moraea collina		+					+	+
* Moraea setifolia		+					+	+
Orthrosanthus laxus var. gramineus	+					+		
Patersonia juncea					+	+		
Patersonia occidentalis var. occidentalis	+		+					
Patersonia pygmaea					+	+		
* Romulea rosea var. australis		+					+	+
* Romulea rosea var. rosea		+		+	+		+	+
Juncaceae								
* Juncus bufonius		+					+	
* Juncus capitatus		+					+	+
Juncus pallidus							+	+
Juncus pauciflorus							+	
Luzula meridionalis	+	+						
Juncaginaceae								
Triglochin calcitrapa		+					+	
Triglochin lineare							+	
Triglochin nana		+		+				

Scientific name	1	2	3	4	5	6	7	8
Lamiaceae								
Chloanthes coccinea	+				+			
Hemiandra incana		+				+		
Hemiandra pungens				+				
Hemigenia humilis		+				+		
Hemigenia incana		+				+		
Hemigenia rigida		+				+		
Hemigenia argentea		+				+		
Hemigenia wandoohana		+						
Microcorys barbata						+		
Microcorys capitata						+		
Microcorys ericifolia						+		
Microcorys subcanescens						+		
* Stachys arvensis		+						+
Lauraceae								
Cassytha flava	+				+			
Cassytha glabella		+				+		
Cassytha racemosa		+		+				+
Lentibulariaceae								
Polypompholyx multifida		+		+				+
Polypomphylx tenella		+		+				+
Utricularia menziesii				+				
Linaceae								
Linum marginale	+	+			+			
Lobeliaceae								
Isotoma hypocrateriformis	+	+	+			+		
Isotoma scapigera				+				+
Lobelia cleistogamoides				+	+	+		
Lobelia gibbosa	+				+	+		
Lobelia rariflora		+						
Lobelia rhombifolia		+	+					
Lobelia rhytidosperra	+	+		+				
* Monopsis debilis								+
Loganiaceae								
Logania campanulata	+							
Logania flaviflora					+			
Logania tortuosa					+			
Phyllangium sulcatum		+		+				+
Loranthaceae								
Amyema miquelii	+	+						
Amyema preissii								+
Nuytsia floribunda	+		+					

Scientific name	1	2	3	4	5	6	7	8
Lycopodiaceae								
Phylloglossum drummondii		+		+			+	
Lythraceae								
* Lythrum hyssopifolium								+
Mimosaceae								
Acacia acuminata		+		+			+	
Acacia alata var. platyptera				+				
Acacia applanata		+						
* Acacia baileyana								+
Acacia celastrifolia						+		
Acacia chrysocephala						+		
Acacia browniana var. intermedia		+			+			
* Acacia dealbata								+
Acacia deflexa					+	+		
Acacia dentifera		+						
Acacia drummondii subsp. candolleana		+						
Acacia drummondii subsp. drummondii		+						
* Acacia floribunda								+
Acacia gilbertii			+					
Acacia huegelii	+		+					
Acacia insolita subsp. insolita	+	+						
Acacia lanei		+				+		
Acacia lasiocarpa subsp. sedifolia		+			+	+		
Acacia latericola	+					+		
Acacia latipes subsp. latipes	+							
Acacia leptospermoides subsp. leptospermoides	+							
Acacia microbotrya		+					+	
Acacia pulchella var. glaberrima	+	+	+		+			
Acacia pulchella var. goadbeyi						+		
* Acacia pycnantha		+				+		+
Acacia rigida		+						
Acacia sp. 174 (J. Brown 228)						+		
Acacia saligna	+	+		+				
Acacia sphacelata subsp. sphacelata						+		
Acacia squamata		+						
Acacia stenoptera	+							
Acacia subflexuosa subsp. subflexuosa	+	+						
Acacia willdenowiana	+	+	+					
Molluginaceae								
Macarthuria apetala								+
Myrtaceae								
Baeckea camphorosmae		+			+	+		
Baeckea corymbulosa					+			
Baeckea crispiflora	+							

Scientific name	1	2	3	4	5	6	7	8
Beaufortia bracteosa						+		
Beaufortia incana						+		
Beaufortia micrantha var puberula								
Callistemon phoenicus							+	
Calothamnus planifolius var planifolius						+		
Calothamnus preissii						+		
Calothamnus quadrifidus	+				+	+		
Calothamnus sanguineus	+							
Calytrix angulata	+		+					
Calytrix flavescens			+					
Calytrix leschenaultii						+		
Calytrix simplex subsp. suboppositifolia		+						
Chamelaucium croxfordii		+				+		
Corymbia calophylla	+	+						
Darwinia sp. Dryandra (GK 9295)	+					+		
Darwinia thymoides subsp. bella		+				+		
Eremaea pauciflora	+				+			
Eucalyptus accedens		+				+		
Eucalyptus argyphaea						+		+
Eucalyptus aspersa						+		
Eucalyptus astringens						+		+
Eucalyptus drummondii						+		
Eucalyptus falcata						+		
Eucalyptus gardneri subsp. gardneri						+		+
Eucalyptus hebetifolia						+		
Eucalyptus incrassata					+			
Eucalyptus latens	+					+		
Eucalyptus loxophleba		+					+	
Eucalyptus marginata subsp. marginata	+	+						
Eucalyptus pachyloma		+				+		
Eucalyptus patens							+	
Eucalyptus phenax	+							
Eucalyptus pluricaulis subsp. pluricaulis						+		
Eucalyptus rudis subsp. rudis							+	
Eucalyptus thamnoides subsp. megista						+		
Eucalyptus uncinata						+		
Eucalyptus wandoo	+	+				+		
Eucalyptus ?accedens (mallee, GK & JA 1524)						+		
Eucalyptus x accedens (GK & JA 1530)						+		
Eucalyptus sp (GK & JA 1531)						+		
Hypocalymma angustifolium	+	+					+	+
Kunzea micromera					+			
Kunzea preissiana					+			
Kunzea ?recurva							+	
Leptospermum erubescens	+	+		+	+			
Leptospermum oligandrum			+					
Leptospermum spinescens	+				+			

Scientific name	1	2	3	4	5	6	7	8
Melaleuca acuminata								+
Melaleuca hamata		+						
Melaleuca incana subsp. incana								+
Melaleuca platycalyx					+			
Melaleuca pungens	+							
Melaleuca radula				+				
Melaleuca subtrigona		+						
Melaleuca tuberculata subsp. tuberculata							+	
Melaleuca undulata							+	
Regelia inops		+			+			
Rinzia fumana							+	
Thryptomene australis subsp. australis				+				
Verticordia bifimbriata	+							
Verticordia densiflora var caespitosa		+					+	
Verticordia grandiflora					+			
Verticordia huegelii var stylosa				+				+
Verticordia insignis subsp. compta							+	
Verticordia insignis subsp. insignis	+							
Verticordia pennigera		+						
Verticordia serrata var serrata		+						
Olacaceae								
Olax benthamiana	+				+	+		
Onagraceae								
Epilobium billardierianum subsp. cinereum							+	+
* Oenothera stricta								+
Ophioglossaceae								
Ophioglossum lusitanicum		+		+				+
Orchidaceae								
Caladenia barbarossa		+			+	+		
Caladenia cairnsiana			+		+			
Caladenia dimidia							+	
Caladenia discoidea	+		+					
Caladenia falcata				+				
Caladenia filifera		+						
Caladenia flava subsp. flava	+	+	+					
Caladenia footeana		+						
Caladenia hirta subsp. rosea		+		+				
Caladenia integra		+						
Caladenia latifolia				+				
Caladenia longicauda subsp. eminens	+	+						
Caladenia longiclavata		+						
Caladenia macrostylis	+							
Caladenia marginata				+				

Scientific name	1	2	3	4	5	6	7	8
<i>Caladenia nana</i> subsp. <i>nana</i>		+			+	+		
<i>Caladenia pendens</i> subsp. <i>talbotii</i>							+	
<i>Caladenia polychroma</i>		+					+	
<i>Caladenia reptans</i> subsp. <i>reptans</i>	+				+			
<i>Caladenia uliginosa</i> subsp. <i>candicans</i>		+						
<i>Caladenia uliginosa</i> subsp. <i>uliginosa</i>		+					+	
<i>Caladenia xantha</i>		+				+	+	
<i>Calochilus stramenicola</i>						+		
<i>Cyanicula gemmata</i>		+					+	
<i>Cyanicula sericea</i>		+			+			
<i>Cyrtostylis huegelii</i>				+				
* <i>Disa bracteata</i>		+						+
<i>Diuris corymbosa</i>	+	+		+	+			
<i>Diuris laxiflora</i>		+					+	
<i>Diuris setacea</i>		+						
<i>Drakaea glyptodon</i>			+					
<i>Elythranthera brunonis</i>	+	+	+		+			
<i>Elythranthera emarginata</i>		+	+					
<i>Ericksonella saccharata</i>		+						
<i>Eriochilus dilatatus</i> subsp. <i>undulatus</i>	+					+		
<i>Eriochilus scaber</i> subsp. <i>scaber</i>				+			+	
<i>Leptoceras menziesii</i>		+			+			
<i>Leporella fimbriata</i>	+	+						
<i>Lyperanthus serratus</i>	+							
<i>Microtis alba</i>							+	
<i>Microtis media</i> subsp. <i>media</i>		+		+				
<i>Paracaleana triens</i>	+							
<i>Pheladenia deformis</i>	+							
<i>Prasophyllum cyphochilum</i>		+						
<i>Prasophyllum macrostachyum</i>				+				
<i>Prasophyllum parvifolium</i>				+			+	
<i>Prasophyllum sargentii</i>	+							
<i>Pterostylis</i> aff. <i>nana</i>	+	+	+	+				
<i>Pterostylis barbata</i>	+	+	+	+				
<i>Pterostylis dilatata</i>				+				
<i>Pterostylis hamiltonii</i>		+						
<i>Pterostylis recurva</i>	+	+	+					
<i>Pterostylis sanguinea</i>	+	+	+	+				
<i>Pterostylis sargentii</i>		+						
<i>Pyrorchis nigricans</i>	+		+	+	+			
<i>Spiculea ciliata</i>				+				
<i>Thelymitra antennifera</i>				+			+	
<i>Thelymitra benthamiana</i>				+				
<i>Thelymitra crinita</i>	+		+					
<i>Thelymitra flexuosa</i>							+	
<i>Thelymitra graminea</i>						+		
<i>Thelymitra latiloba</i>		+						

Scientific name	1	2	3	4	5	6	7	8
<i>Thelymitra petrophila</i>		+		+				
<i>Thelymitra villosa</i>					+			
Orobanchaceae								
* <i>Orobanche minor</i>		+						+
Oxalidaceae								
<i>Oxalis exilis</i>	+	+		+			+	
* <i>Oxalis pes-caprae</i>								+
* <i>Oxalis purpurea</i>								+
Papilionaceae								
<i>Bossiaea concinna</i>		+						
<i>Bossiaea eriocarpa</i>	+	+	+			+		
<i>Bossiaea spinescens</i>				+	+	+		
* <i>Chamaecytissus palmensis</i>		+						+
<i>Chorizema aciculare</i>					+			
<i>Chorizema dicksonii</i>							+	
<i>Daviesia articulata</i>							+	
<i>Daviesia cardiophylla</i>					+	+		
<i>Daviesia costata</i>	+			+				
<i>Daviesia decipiens</i>							+	
<i>Daviesia decurrens</i>		+			+	+		
<i>Daviesia hakeoides</i> subsp. <i>subnuda</i>		+					+	
<i>Daviesia incrassata</i> subsp. <i>incrassata</i>	+							
<i>Daviesia longifolia</i>	+					+		
<i>Daviesia nudiflora</i>	+		+					
<i>Daviesia preissii</i>	+		+					
<i>Daviesia rhombifolia</i>		+					+	
<i>Daviesia triflora</i>								
<i>Eutaxia microphylla</i>					+			
<i>Dillwynia laxiflora</i>	+	+				+		
<i>Gastrolobium bilobum</i>				+				
<i>Gastrolobium calycinum</i>		+						
<i>Gastrolobium hookeri</i>		+						+
<i>Gastrolobium microcarpum</i>		+				+		
<i>Gastrolobium obovatum</i>						+		
<i>Gastrolobium ovalifolium</i>		+						
<i>Gastrolobium parviflorum</i>								
<i>Gastrolobium reticulatum</i>	+		+					
<i>Gastrolobium spatulatum</i>		+						
<i>Gastrolobium spinosum</i>		+				+		
<i>Gastrolobium stipulare</i>	+	+						
<i>Gastrolobium stowardii</i>						+		
<i>Gastrolobium trilobum</i>						+		
<i>Gastrolobium tomentosum</i>	+							
<i>Gastrolobium villosum</i>	+			+				
<i>Gompholobium burtonioides</i>		+			+			

Scientific name	1	2	3	4	5	6	7	8
Gompholobium confertum	+		+					
Gompholobium cyaninum	+							
Gompholobium knightianum	+	+	+					
Gompholobium marginatum	+							
Gompholobium preissii	+				+	+		
Gompholobium scabrum	+	+				+		
Gompholobium tomentosum	+							
Goodia lotifolia	+			+				
Hardenbergia comptoniana	+							
Hovea chorizemifolia	+				+	+		
Hovea trisperma subsp. trisperma	+		+					
Isotropis cuneifolia subsp. cuenifolia	+	+	+		+			
Isotropis drummondii		+			+			
Jacksonia alata			+	+	+			
Jacksonia condensata			+		+			
Jacksonia epiphyllum							+	
Jacksonia floribunda	+	+	+					
Jacksonia furcellata	+	+	+					
Jacksonia racemosa					+			
Jacksonia restioides					+			
Jacksonia sternbergiana	+		+					
Kennedia coccinea	+	+	+		+			
Kennedia prostrata	+			+	+		+	
* Lotus angustissimus		+		+			+	
* Lotus suaveolens		+					+	+
* Medicago polymorpha								+
Mirbelia dilatata	+					+		
Mirbelia floribunda		+						
Mirbelia spinosa					+	+		
* Ornithopus compressus		+						+
* Ornithopus sativus								+
Pultenaea ericifolia						+		
Sphaerolobium medium		+						
Templetonia drummondii				+				
* Trifolium arvense		+						+
* Trifolium campestre				+				+
* Trifolium dubium		+						+
* Trifolium glomeratum		+						+
* Trifolium subterraneum		+						+
* Trifolium tomentosum var tomentosum								+
Viminaria juncea							+	
Philydraceae								
Philydrella pygmaea		+		+				
Phormiaceae								
Dianella brevicaulis	+	+				+		

Scientific name	1	2	3	4	5	6	7	8
<i>Dianella revoluta</i> var. <i>revoluta</i>		+	+	+	+	+		
<i>Stypandra glauca</i>				+				
Pinaceae								
* <i>Pinus pinaster</i>		+				+		+
Pittosporaceae								
<i>Billardiera coriacea</i>	+							
<i>Billardiera erubescens</i>		+				+		
<i>Billardiera fraseri</i>				+				
<i>Billardiera fusiformis</i>	+			+	+			
<i>Billardiera variifolia</i>					+	+		
<i>Cheiranthra preissiana</i>				+	+			
<i>Marianthus bicolor</i>	+				+			
<i>Marianthus dryandra</i>						+		
<i>Pittosporum angustifolium</i>								+
Plantaginaceae								
<i>Plantago debilis</i>		+						
Poaceae								
* <i>Aira cupaniana</i>			+	+	+	+	+	
<i>Amphibromus nervosus</i>								+
<i>Amphipogon strictus</i>	+			+				
<i>Amphipogon turbinatus</i>			+					
<i>Aristida contorta</i>		+						
<i>Austrodanthonia caespitosa</i>	+			+				
<i>Austrodanthonia occidentalis</i>	+			+				
<i>Austrodanthonia setacea</i>							+	+
<i>Austrostipa compressa</i>					+			
<i>Austrostipa elegantissima</i>	+			+	+		+	
<i>Austrostipa flavescens</i>				+				
<i>Austrostipa semibarbata</i>			+		+		+	+
<i>Austrostipa trichophylla</i>	+	+				+		
* <i>Avena barbata</i>		+		+			+	+
* <i>Avena fatua</i>		+						+
* <i>Avena sativa</i>								+
* <i>Briza maxima</i>		+					+	+
* <i>Briza minor</i>		+		+			+	+
* <i>Bromus diandrus</i>		+						+
<i>Cymbyopogon obtectus</i>				+			+	
* <i>Cynodon dactylon</i>								+
* <i>Digitaria sanguinalis</i>								+
* <i>Ehrharta longiflora</i>		+	+	+			+	+
* <i>Hordeum leporinum</i>								+
<i>Lachnagrostis filiformis</i>							+	
* <i>Lolium multiflorum</i>		+		+				+

Scientific name	1	2	3	4	5	6	7	8
Microlaena stipoides	+	+					+	
* Molineriella minuta		+						+
Neurachne alopecuroidea	+		+		+			
* Paraphlois incurva							+	+
* Pentaschistis airoides		+	+	+				+
* Poa annua		+						+
Poa drummondiana	+			+	+			
Poa serpentum		+					+	
Spartochloa scirpoidea				+				
Themeda australis		+		+			+	
* Vulpia myuros	+	+	+	+		+		+
Polygalaceae								
Comesperma calymega	+	+	+					
Comesperma scoparium					+			
Comesperma volubile	+	+					+	
Comesperma virgatum							+	
Polygonaceae								
* Acetosella vulgaris		+						+
* Emex australis								+
Muehlenbeckia adpressa	+	+	+					
Persicaria prostrata							+	
* Polygonum arenastrum								+
* Rumex crispus								+
Portulacaceae								
Calandrinia calyptрата	+	+						
Calandrinia corrigioloides			+					
Calandrinia granulifera	+		+		+	+		
Primulaceae								
* Anagallis arvensis var. arvensis				+				+
* Anagallis arvensis var. caerulea		+		+				+
Proteaceae								
Adenanthos cygnorum	+		+		+	+		
Banksia acanthopoda					+			
Banksia armata var. armata	+	+			+			
Banksia attenuata			+					
Banksia bipinnatifida subsp. bipinnatifida	+	+						
Banksia columnaris					+	+		
Banksia cynaroides							+	
Banksia dallanneyi subsp. sylvestris		+						
Banksia drummondii subsp. hiemalis					+	+		
Banksia fraseri var. fraseri		+	+					
Banksia grandis			+					

Scientific name	1	2	3	4	5	6	7	8
<i>Banksia nivea</i> subsp. <i>nivea</i>	+	+				+		
<i>Banksia nobilis</i> subsp. <i>nobilis</i>	+	+				+		
<i>Banksia proteoides</i>						+		
<i>Banksia sessilis</i> var. <i>sessilis</i>	+					+		
<i>Banksia sphaerocarpa</i> var. <i>caesia</i>						+		
<i>Banksia sphaerocarpa</i> var. <i>sphaerocarpa</i>	+				+			
<i>Banksia squarrosa</i> subsp. <i>squarrosa</i>	+	+				+		
<i>Banksia stiposa</i>							+	
<i>Banksia subpinnatifida</i> var. <i>subpinnatifida</i>							+	
<i>Conospermum amoenum</i> subsp. <i>cuneatum</i>		+			+			
<i>Conospermum densiflorum</i> subsp. <i>densiflorum</i>	+				+			
<i>Conospermum filifolium</i> subsp. <i>filifolium</i>				+	+			
<i>Conospermum stoechadis</i> subsp. <i>sclerophyllum</i>		+		+	+			
<i>Conospermum stoechadis</i> subsp. <i>stoechadis</i>	+	+		+				
<i>Grevillea crowleyae</i>	+				+			
<i>Grevillea integrifolia</i>		+			+	+		
<i>Grevillea hookeriana</i> subsp. <i>hookeriana</i>					+	+		
<i>Grevillea leptobotrys</i>	+					+		
<i>Grevillea pulchella</i>	+	+						
<i>Grevillea tenuifolia</i>		+				+		
<i>Grevillea umbellata</i>					+			
<i>Hakea amplexicaulis</i>				+				
<i>Hakea ?anadenia</i> (Rose 659)						+		
<i>Hakea brownii</i>						+		
* <i>Hakea bucculenta</i> x <i>francisiana</i>		+						+
<i>Hakea erinacea</i>	+							
<i>Hakea gilbertii</i>					+	+		
<i>Hakea incrassata</i>		+						
<i>Hakea lehmanniana</i>		+				+		
<i>Hakea lissocarpa</i>	+	+	+			+		
* <i>Hakea multilineata</i>		+						+
<i>Hakea petiolaris</i> subsp. <i>petiolaris</i>				+				
<i>Hakea ?pritzelii</i> (Rose 281)						+		
<i>Hakea prostrata</i>	+	+	+		+			
<i>Hakea ruscifolia</i>		+				+	+	
<i>Hakea trifurcata</i>	+	+	+	+		+	+	
<i>Hakea undulata</i>	+					+		
<i>Isopogon crithmifolius</i>	+	+			+	+		
<i>Isopogon divergens</i>	+	+						
<i>Isopogon dubius</i>					+	+		
<i>Isopogon sphaerocephalus</i>	+			+				
<i>Isopogon teretifolius</i>					+			
<i>Lambertia illicifolia</i>		+				+		
<i>Persoonia elliptica</i>	+	+						
<i>Persoonia hakeiformis</i>					+	+		

Scientific name	1	2	3	4	5	6	7	8
<i>Persoonia quiquenervia</i>					+	+		
<i>Persoonia trinervis</i>					+	+		
<i>Petrophile brevifolia</i>					+	+		
<i>Petrophile circinata</i>		+			+	+		
<i>Petrophile divaricata</i>		+				+		
<i>Petrophile filifolia</i> subsp. <i>filifolia</i>	+				+			
<i>Petrophile heterophylla</i>	+	+				+		
<i>Petrophile imbricata</i>						+		
<i>Petrophile seminuda</i>		+						+
<i>Petrophile serruriae</i>		+				+		
<i>Petrophile squamata</i>	+	+			+	+		
<i>Petrophile striata</i>	+							
<i>Stirlingia latifolia</i>	+	+						
<i>Stirlingia simplex</i>				+				
<i>Synaphea flabelliformis</i>	+	+	+		+		+	
<i>Synaphea interioris</i>					+			
<i>Synaphea obtusata</i>		+						
Rafflesiaceae								
<i>Pilostyles hamiltonii</i>					+	+		
Ranunculaceae								
<i>Ranunculus pumilio</i>								+
<i>Ranunculus sessiliflorus</i>		+						
Restionaceae								
<i>Alexgeorgea nitens</i>			+					
<i>Desmocladius asper</i>	+		+					
<i>Desmocladius fasciculatus</i>								
<i>Desmocladius parthenicus</i>	+							
<i>Desmocladius flexuosus</i>					+			
<i>Harperia lateriflora</i>	+	+						
<i>Hypolaena exsulca</i>	+		+					
<i>Lepidobolus chaetacephalus</i>	+	+					+	
<i>Lepidobolus preissianus</i>					+			
<i>Loxocarya striata</i>	+	+			+			
<i>Lyginia barbata</i>	+		+					
Rhamnaceae								
<i>Cryptandra arbutiflora</i> var. <i>arbutiflora</i>		+					+	
<i>Cryptandra leucopogon</i>					+			
<i>Cryptandra myriantha</i>					+			
<i>Cryptandra nutans</i>	+	+						
<i>Cryptandra pungens</i>					+			
<i>Polianthion wichurae</i>							+	
<i>Stenanthemum coronatum</i>							+	
<i>Stenanthemum emarginatum</i>							+	

Scientific name	1	2	3	4	5	6	7	8
<i>Stenanthemum tridentatum</i>	+	+						
<i>Trymalium angustifolium</i>		+						
<i>Trymalium ledifolium</i> var. <i>lineare</i>	+	+			+	+		
Rosaceae								
<i>Acaena echinata</i>		+				+		
Rubiaceae								
* <i>Galium divaricatum</i>								
* <i>Galium murale</i>		+		+				+
<i>Opercularia apiciflora</i>	+	+						
<i>Opercularia vaginata</i>	+		+		+			
Rutaceae								
<i>Asterolasia pallida</i> subsp. <i>hyalina</i>							+	
<i>Asterolasia squameligerus</i>		+					+	
<i>Boronia busselliana</i>					+			+
<i>Boronia capitata</i> subsp. <i>clavata</i>			+		+			
<i>Boronia crassifolia</i>								+
<i>Boronia crenulata</i>								+
<i>Boronia ramosa</i> subsp. <i>anethifolia</i>					+			
<i>Boronia scabra</i> subsp. <i>scabra</i>								+
<i>Diplolaena graniticola</i>				+				
<i>Philotheca spicata</i>	+			+				
Santalaceae								
<i>Choretrum glomeratum</i>		+						
<i>Exocarpus sparteus</i>	+				+			
<i>Leptomeria ellytes</i>	+		+		+			
<i>Leptomeria pauciflora</i>	+							
<i>Santalum acuminatum</i>		+						
<i>Santalum murrayanum</i>		+				+		
<i>Santalum spicatum</i>								+
Sapindaceae								
<i>Dodonaea bursariifolia</i>		+				+	+	
<i>Dodonaea ceratocarpa</i>				+				
<i>Dodonaea humifusa</i>		+						
<i>Dodonaea pinifolia</i>					+	+		
<i>Dodonaea viscosa</i> subsp. <i>angustissima</i>				+				
Scrophulariaceae								
* <i>Bartsia trixago</i>		+		+				+
<i>Glossostigma drummondii</i>							+	
<i>Gratiola pubescens</i>							+	
<i>Limosella australis</i>							+	
* <i>Parentucellia latifolia</i>		+		+				
* <i>Parentucellia viscosa</i>				+				
* <i>Veronica arvensis</i>		+						+

Scientific name	1	2	3	4	5	6	7	8
Selaginellaceae								
Selaginella gracillima						+		+
Solanaceae								
Nicotiana rotundifolia				+				+
* Solanum nigrum		+		+			+	+
Solanum simile				+				+
Stackhousiaceae								
Stackhousia pubescens	+	+	+	+	+			
Stackhousia scoparia		+			+			
Tripterococcus brunonis	+	+			+			
Sterculiaceae								
Lasiopetalum bracteatum		+						
Lasiopetalum microcardium					+	+		
Thomasia foliosum		+			+	+		
Thomasia macrocalyx		+						
Stylidiaceae								
Levenhookia dubia	+	+		+		+		
Levenhookia leptantha					+			
Levenhookia octomaculata					+			
Levenhookia pusilla	+	+					+	
Levenhookia stipitata			+	+				
Stylidium adpressum						+		
Stylidium amoenum	+	+				+		
Stylidium androsaceum		+						
Stylidium brunonianum			+		+		+	
Stylidium calcaratum			+		+			
Stylidium caricifolium	+	+						
Stylidium carnosum		+						
Stylidium caricifolium	+	+			+			
Stylidium crassifolium							+	
Stylidium ciliatum		+				+		
Stylidium despectum		+						
Stylidium ecorne				+			+	
Stylidium emarginatum subsp. emarginatum				+				
Stylidium eriopodum						+		
Stylidium guttatum		+						
Stylidium hirsutum	+					+		
Stylidium inundatum				+			+	
Stylidium leptophyllum	+							
Stylidium lineatum	+					+		
Stylidium obtustatum	+	+						
Stylidium perula						+		
Stylidium petiolare	+							

Scientific name	1	2	3	4	5	6	7	8
<i>Stylidium piliferum</i>	+		+					
<i>Stylidium pulchellum</i>				+				
<i>Stylidium pycnostachyum</i>		+				+		
<i>Stylidium repens</i>			+					
<i>Stylidium rhynchocarpum</i>						+		
<i>Stylidium roseo-alatum</i>	+			+			+	
<i>Stylidium roseo-nanum</i>				+				
<i>Stylidium schoenoides</i>	+		+					
<i>Stylidium uniflorum</i>		+						
<i>Stylidium zeicolor</i>						+		
Thymelaeaceae								
<i>Pimelea argentea</i>				+			+	
<i>Pimelea cilata</i> subsp. <i>ciliata</i>				+				
<i>Pimelea imbricata</i> var. <i>imbricata</i>				+				
<i>Pimelea preissii</i>						+		
<i>Pimelea spectabilis</i>	+					+		
<i>Pimelea suaveolens</i> subsp. <i>suaveolens</i>	+					+		
<i>Pimelea sylvestris</i>						+		
Tremandraceae								
<i>Platytheca galioides</i>				+				
<i>Tetratheca hispidissima</i>	+				+	+		
<i>Tetratheca virgata</i>	+	+		+				
Urticaceae								
<i>Parietaria debilis</i>				+				
Violaceae								
<i>Hybanthus floribundus</i> subsp. <i>floribundus</i>	+		+					
Xanthorrhoeaceae								
<i>Xanthorrhoea drummondii</i>		+			+	+		
<i>Xanthorrhoea gracilis</i>	+							
<i>Xanthorrhoea brevistylis</i>		+						
Zamiaceae								
<i>Macrozamia riedlei</i>	+	+	+					
Zanichelliaceae								
<i>Lepilaena australis</i>		+						

BEHAVIOURAL OBSERVATIONS ON AN UNNAMED SPECIES OF SKINK *LIOPHOLIS* (FORMERLY *EGERNIA*) "CAPE RANGE" FROM CAPE RANGE

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INTRODUCTION

Social behaviour, in which individuals of a species form a cohesive group and interact with each other over extended periods, is rare among reptiles. Among Australian skink lizards until recently assigned to the genus *Egernia*, however, such social behaviour is commonplace and well-documented (Hutchinson 1993). In many species, the social unit is a family group consisting of adults and young animals of one or more age cohorts, but the nature of interactions within such units is not well-known. From late 2004, the opportunity arose to observe social behaviour in a captive breeding colony of what was then an undescribed species similar to *Egernia inornata*, and this paper presents the results of these observations. In a revision of *Egernia*, *E. inornata* has been placed in the genus *Liopholis* (Gardner *et al.* 2008), and the undescribed species is referred to here as *Liopholis* "Cape Range".

ORIGIN OF STUDY ANIMALS

The study animals were collected in October 2004 on the Learmonth Air Weapons Range

on the North West Cape (*ca.* 22°30'S, 113°45'E). The collection was carried out as part of an inventory fauna survey being conducted for the Department of Defence under a Licence to Collect Fauna for Scientific Purposes, and in 2009/2010 the specimens were maintained in captivity under SF006843, issued by the Department of Environment and Conservation.

Six specimens were caught from two locations in pitfall and funnel traps set along drift-fences in open shrubland and hummock (*spinifex*) grassland on shallow red sand over limestone. The six specimens were kept because they were initially thought to represent a major range extension for *E. inornata*, and two of these were lodged with the WA Museum. The remaining four specimens, three from one location and one from a different location, were kept under observation when it was noted that a female was pregnant (members of the group are viviparous).

CAPTIVE HOUSING

The captive specimens were initially maintained in a 60cm

vivarium on red sand taken from their collection location. The colony was moved to a 90cm vivarium in April 2009. They had continuous access to a "hot-rock", a shelter that simulated a burrow (two shelters provided from April 2009), water *ad libitum*, and were fed several times a week on commercial cat food (chicken), finely chopped apple and live food (termites, small crickets and small wood roaches). The vivarium was lit with a "repti-glow" light for approximately 10 hours a day. Heating and lighting were not varied over the year, but the artificial period of lighting was shorter than the summer daylength, so the lizards did experience seasonal variation in photoperiod. They also experienced seasonal variation in ambient temperature, with this varying from 22° to 30° C in summer and 16° to 20° C in winter.

DESCRIPTIONS OF CAPTIVE SPECIMENS AND BREEDING

Three specimens, collected on 8th to 10th October 2004, were still alive in March 2010. The fourth specimen died in April 2005 from injuries received during fighting. It is believed this specimen (a male) was from a different colony and was not accepted by the other animals. Based on subsequent observations on captive-bred animals, the three surviving specimens were adults (one male, two

females) at the time of collection and three or more years old. They displayed no growth in captivity: the male (lizard #1) had a SVL of 62mm in October 2004 and in February 2010. The two females (lizard #2 and #3) had SVLs of 56 and 57mm in October 2004 and February 2010.

From 2005 to July 2011, breeding occurred in January of 2005, 2008, 2009, 2010 and 2011. Mating and courtship behaviour were never observed. Breeding events were as follows:

January 2005. Wild-caught female (lizard #2), probably pregnant when collected, produced two young. One of these found dead in July. Second specimen (lizard #5) survived and still alive in March 2011. Gestation was approximately 10 to 12 weeks.

16th January 2008. Lizard #5 produced two young when just under three years of age. Therefore, sexual maturity in third year of life. She had an SVL of 56mm and has displayed little subsequent growth. When measured at the age of 15 months (April 2009), these two young had SVLs of 41mm and 44mm.

4th and 14th January 2009. Lizard #5 produced two young; her second brood. When measured at the age of three months, these young had SVLs of 30 and 36mm. At the age of 13 months, the larger of these had an SVL of 47mm.

12th January 2010. Lizard #5 produced one young, although it

is suspected that a second young was born and eaten. At this time there were four adults and four juveniles (one or two years old) in the colony. The colony was subsequently divided into separate vivaria, with Lizard #1 (wild caught male), lizard #2 (wild caught female) and lizard #5 (captive born female) in one enclosure, and Lizard #4 (wild caught male) and the surviving young of lizard #5 in the other enclosure.

3rd January 2011. Lizard #5 produced one young.

In summary, the wild-caught female, pregnant at the time of collection, produced two young

but did not breed again. Her captive-bred daughter bred for the first time at the end of her third year, and bred each year subsequently, bearing either one or two young on each occasion. The father is lizard #1, the surviving wild-caught male.

Measurements indicate that adult males are slightly larger than females. They are also slightly brighter in colour. Young animals are also brighter in colour than adults, being orange with a distinctly dark cap, compared with the tawny and more uniformly-coloured adults (see Figure 1). This distinctive juvenile colouration fades by the



Figure 1. Juvenile *Liopholis* sp. "Cape Range" raising its forequarters in an agonistic display towards an approaching adult.

age of one year. Little or no growth occurs after sexual maturity is reached (at the end of the third year of life for one female). The three wild caught animals were adult-sized when collected so were presumably at least three years old. They therefore had a minimum age of 11 years by July 2011 and showed no signs of senescence.

OBSERVATIONS ON SOCIAL INTERACTIONS

Social interactions between adults were limited. Lizard #4 died from injuries sustained in fights with lizard #1. This death was almost certainly due to inadvertently mixing animals from different colonies. No other fighting was observed but some injuries were sustained amongst the captive animals, consisting of scars across the back and the loss (followed by regeneration) of the tail in some cases. One animal also lost a digit. This suggests that occasional fights did take place, although some injuries, such as the loss of a tail-tip, could have been inadvertent when the animals were being fed. At least one of the wild-caught adults had a missing digit. When feeding, particularly on live food, adults would try to steal food from each other and would run away with food to avoid confrontations. On one occasion, lizard #5 (adult female) trembled when approached by lizard #1 (adult male). This was in February 2010 so was post-breeding.

Adults appeared less inclined to steal food from juveniles less than one year old than from other adults.

Interactions between adults and juveniles were more complex than interactions observed between adults and included clear agonistic behaviour. Juveniles in their first year of life and still displaying the contrasting bright orange body and dark cap employed posturing when approached by an adult, including when food was present. This involved raising and laterally compressing the body, particularly the fore-quarters, arching the neck and tilting the head to display the dark cap towards the approaching adult (see Figure 1). This appeared to appease the adult, which would otherwise be quite capable of stealing the food or even eating a young juvenile, although the young juveniles would also sometimes run away. The possible disappearance and presumed death and consumption of one neonate in January 2010 suggests that the appeasement display was not always successful, although this may have been an artefact of captive conditions and excessive colony size. Juveniles over a year old and in which the distinctive colouration had faded did occasionally attempt the posturing display when approached by an adult, but also ran away. Posturing was not observed in juveniles over two years of age.

In addition to the agonistic display, juveniles in their first year

of life would approach feeding adults and appeared to taste the food they were eating. While juveniles recognised live insects as food readily, they did not immediately recognise cat-food or finely-chopped apple as edible. By licking the food being eaten by an adult, they appeared to “learn” that this material was edible. This licking of food held by an adult did not involve theft of the food by the juvenile, and the adult did not try to avoid the contact as it would do if approached by another adult. The agonistic display was not used by juveniles approaching adults, only by juveniles when approached by an adult.

CONCLUSIONS

The social skink *Liopholis* “Cape Range” has distinctive early-juvenile colouration and behaviour that ensures young animals are accepted within the group, are able to feed amongst adults without themselves being eaten, and may also assist them in learning about novel foods. The behaviour emphasises the early-juvenile colouration and is used when the early-juvenile is approached by an adult. Such agonistic behaviour is well-documented among social mammals but is not well-recorded among the generally asocial reptiles. Brighter colouration among juvenile compared with adult specimens is common among

reptiles even in largely solitary species, but the juvenile *Liopholis* “Cape Range” are not simply brighter, but also have a distinctly dark cap that is presented to adults as part of the agonistic display. It is not known if such colouration and displays are found in other *Liopholis* species, or in other social species formerly assigned to *Egernia*.

The loss of the early-juvenile colouration and behaviour results in immature lizards (more than about a year old and certainly more than two years old) having to run from adults more often, and it may be at this stage that young lizards may move to the periphery of a colony and even disperse. Sexual maturity is reached in the third year of life and at least in captivity longevity is in excess of 11 years.

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A FEEDING TECHNIQUE OF THE BROWN HONEYEATER (*LICHMERA INDISTINCTA*)

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Brown Honeyeaters are one of the most widespread species of honeyeater in Australia and are common in the Kimberley region of Western Australia. In August 2011 while camped with my wife near a creek (17°08'59"S 125°12'12"E) off the Gibb River Road, we noticed Brown Honeyeaters coming into a *Brachychiton viscidulus* tree (commonly referred to as Sticky Kurrajong or Kimberley Rose) in bloom near our camp. These small deciduous trees endemic to the Kimberley, grow to about 7m in height. Their inflorescence is cauliflorous with 10–40 flowers on each node providing spectacular shows of large pink to red bell-like flowers when leafless during winter and spring (Wheeler 1992). They prefer rocky areas associated with the Devonian Reef System and sandstone or basalt commonly found along the Gibb River Road. As we watched, I noticed Brown Honeyeaters appeared to be more interested in the base of the flowers rather than the top. On closer examination, I could see a number of flowers had a hole pierced in the calyx and Brown Honeyeaters, instead of accessing the nectaries at the base of the sepals in the conventional manner, were bypassing repro-

ductive parts of the flower and taking nectar through the pierced hole. The only other honeyeaters in the area attracted to the flowers of the brachychiton tree were Little Friarbirds *Philemon citreogularis* and White-gaped Honeyeaters *Lichenostomus unicolor*. Both these species probed down the throat of the flowers in the style one usually associates with nectar seeking birds – and were not seen to use the pierced holes.

Intrigued by this discovery we spent some time (about 30 minutes) observing and taking photographs (see photos 1–4). We found that three to four Brown Honeyeaters repeatedly came into the tree, flying directly to flowers with pierced holes in the calyx without attempting in any way to access other flowers. However we could not tell if they were the same birds.

Over a number of years I have been puzzled when seeing holes with scarring around them in older aged *Brachychiton viscidulus* flowers, and wondered at the cause. I erroneously speculated that insects, possibly caterpillars rather than birds, may have been responsible for the holes during the budding stage of the flower.



LEFT: The pierced calyx of a *Brachychiton viscidulus* flower and a Brown Honeyeater.

BELOW: A Brown Honeyeater accessing nectar through a hole pierced in the calyx of a *Brachychiton viscidulus* flower. A second hole can be seen on the same flower.



LEFT: A Brown Honeyeater probing into a *Brachychiton viscidulus* flower. Scarring around the hole in an earlier flower can be seen on the right of the stem.



RIGHT: A Brown Honeyeater approaching a flower with a hole pierced in it.

DISCUSSION

There have been other reports of flower piercing by honeyeaters in Australia. In the *Argus* newspaper in 1929, there was a delightful article by Edith Coleman, in which she told her readers of the visitations to her garden of Eastern Spinebills *Acanthorhynchus tenuirostris*, mentioning that they pierced the base of her Snap Dragons *Antirrhinum* sp. for nectar (Coleman 1929). In *Fauna of Tasmania*, Green (1995) also mentions Eastern Spinebills puncturing the base of tubular flowers. Anecdotally from other sources it would appear this feeding technique by Eastern Spinebills is relatively well known.

In other suburban gardens in Eastern Australia, Yellow-faced Honeyeaters, *Lichenostomus chrysops*, have been recorded piercing the base of garden flowers such as Foxgloves – and White-plumed Honeyeaters *Lichenostomus penicillatus* piercing the long blooms of Fuchias to reach nectar (Kloot and McCulloch 1980), in a manner similar to Eastern Spinebills.

There does not appear to be much information on how widespread the practise of flower piercing is by other species of honeyeaters. Most of the data available relates to Eastern Australia and long tubular flowers rather than bell shaped flowers. On referring to the information in *Handbook of Australian, New Zealand & Antarctic Birds* (Higgins et al. 2001), we find White-eared

Honeyeater *Lichenostomus leucotis* when feeding on tubular flowers of Mountain Devil *Lambertia formosa*, have been observed to extract nectar by piercing the base of the perianth, not by inserting the bill into the perianth (Recher and Abbott 1970). White-plumed Honeyeaters *Lichenostomus penicillatus* sometimes pierce the base of tubular flowers such as *Tecoma*, *Correa* and *Lachenalia* or slit the flower from tip to base to access nectar (McCulloch 1977). Hindwood (1944) recorded Black-chinned Honeyeaters *Melithreptus gularis* piercing *Tecoma* and *Crotalaria*. Brown-headed Honeyeaters *Melithreptus brevirostris* and White-naped Honeyeaters *Melithreptus lunatus* have been known to peck slits at the base of the corolla of Mountain *Correa* to access nectar (Loyn 1985) and sometimes pierce bases of tubular flowers to reach nectar (Le Souef & Macpherson 1920). In Central Australia Grey Honeyeaters, *Conopophila whitei*, sometimes feed on *Eremophila* sp. by puncturing a hole in the side, not mouth, of tubular flowers (Roberts 1981).

CONCLUSION

There appears to be no mention of this feeding technique by Brown Honeyeaters in HANZAB or by Johnstone and Storr in *Birds of Western Australia* and it would be interesting to know if others have observed species other than Brown Honeyeaters

piercing the flowers of *Brachychiton viscidulus*, how widespread the practise is in the North of Western Australia and if other flowering plants with bell shaped flowers are similarly accessed. On several occasions I have noticed an unexplained hole at the base of flowers in the Malvaceae family. While there were many flowers on the tree we examined on the Gibb River Road, not all had been pierced – I estimated about fifteen.

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A NEW SPECIES OF DARWINIA (MYRTACEAE) FROM WESTERN AUSTRALIA

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ABSTRACT

A new species of *Darwinia*, *Darwinia terricola* Keighery (Myrtaceae) from the Blackwood Plateau, Western Australia is described.

INTRODUCTION

Over the past decade the Western Australian Department of Environment and Conservation and its predecessors has undertaken intensive floristic and reserve surveys of the Swan Coastal Plain (Gibson *et al.* 1994 and Keighery 1999). Currently these are being extended to the adjacent Blackwood Plateau and a detailed floristic survey of inter-zone between these areas, the Whicher Range, has been completed (Keighery *et al.* 2008).

A series of newly collected and newly recognised taxa are being located during these surveys and are currently being described. The Blackwood Plateau is no exception to the location of new taxa, especially in a series of very unusual shallow soil clay flats and seasonal ironstone wetlands. These habitats contain ap-

parently new taxa of *Grevillea*, *Hovea*, *Logania* and *Darwinia*. These taxa, like this new *Darwinia*, appear to have close relatives on the Whicher Scarp or Jarrah Forest.

TAXONOMY

Darwinia terricola Keighery
species nova

Frutex effusus vel prostrates. Foliis linearis, rectis, 4–9 mm longi, minus quam 1 mm latus, corporae oleosa non prominens, marginalis ciliatus.

Typus: 2.7 kilometres along Crouch Road from Great North Road, 34° 01.222'S 115° 32.468'E, 21-Nov.-2008, G.J. & B.J. Keighery 1423 (Holotype: PERTH).

A low spreading to prostrate shrub to 20 cm tall by 30 cm wide, multi-stemmed from a woody base. Leaves linear,

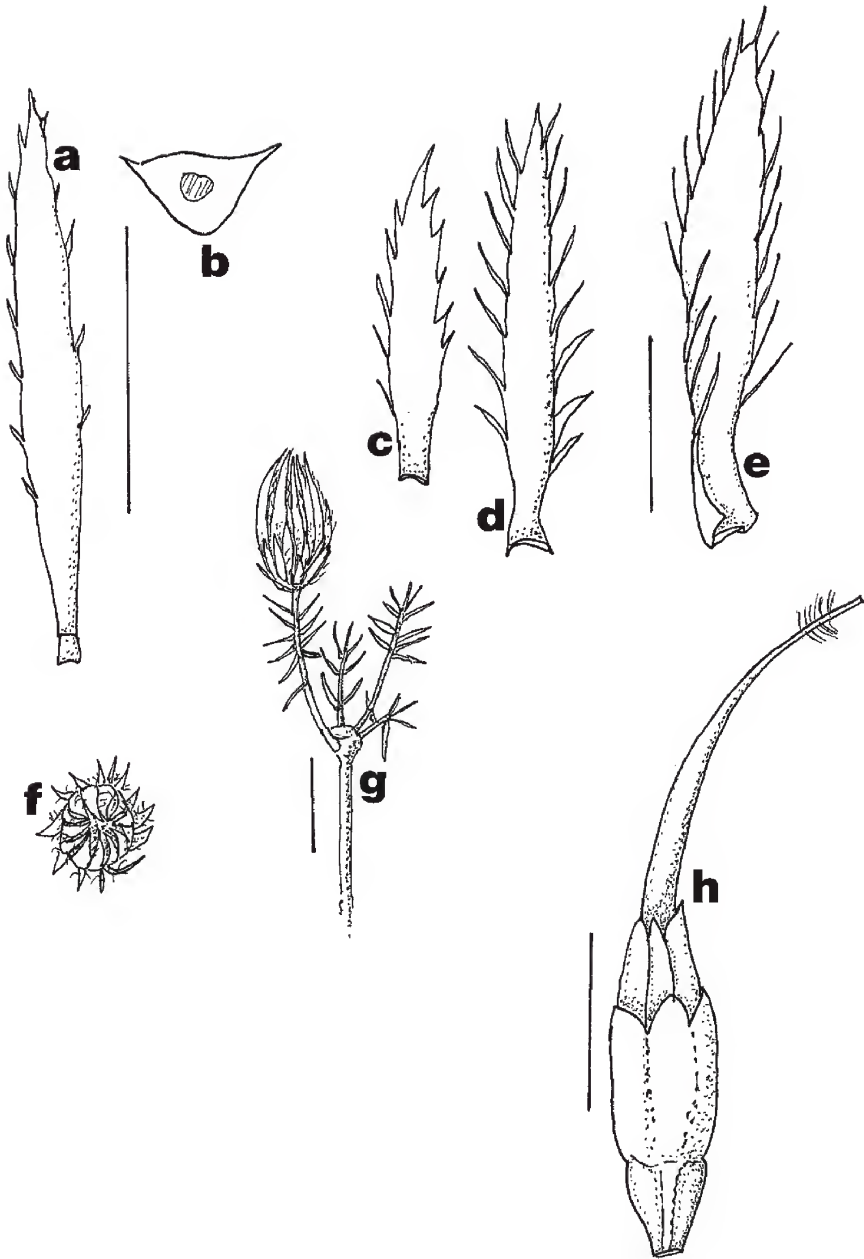


Figure 1. *Darwinia terricola*. a: Leaf, b: cross section of leaf, c: outermost floral bract, d: outer floral bract, e: innermost floral bract, f: top view of inflorescence, g: inflorescence, h: flower. Scale bars: a,c,d,e,& h =5mm, g =10 mm.

triangular in outline, green, crowded to scattered at ends of branches, not recurved, 4–9 mm long, less than 0.7 mm wide, oil glands not prominent, scattered cilia on sides. Inflorescence not nodding or erect, rather lying on the ground or on foliage to 17–18 mm wide and 10–12 mm long with 5–7 (rarely 9) flowers. Inflorescence bracts at first leaf like, in outline and colour, although longer at 9–13 mm long, then in several rows, reddish green, linear to narrowly ovate, 13–20 mm long with an expanded base to 2 mm wide, and coarsely ciliate along the margins, enclosing the flowers. Each flower base enclosed by two floral bracteoles, narrowly-ovate, strongly keeled translucent, brown, margins fringed, linear, 4–5 mm long. Floral tube brown, ribbed, 3–4 mm long, with 5 ridges. Calyx lobes, white, translucent, ovate, margins erose, c. 1 mm long. Petals white, margin entire, ca 2 mm long. Stamens ca. 1.2 mm long, filament linear, scarcely adnate at base to adjacent staminodes. Staminodes similar to stamens but slightly shorter. Style curved, 11–12 mm long, white, sub-stigmatic hairs in a ring below stigma, 1.5 mm wide.

Collections examined. 13.9 km east of Great North road on Crouch Road, 27-Sept.-2009, G.J. & B.J. Keighery 1623 (PERTH); 10 km east of Sues Road on Crouch road, 6-Dec.-2006, M. Spencer 149 (PERTH); Crouch Road, 19-Sept.-2005, R.J. Cranfield & B.G. Ward

891(PERTH); 5.4 km west of Jalbarragup Road on Crouch Road, 17-Jan.-1997, P. Ellery & A. Annel B54.7 (PERTH).

Etymology. Terricola, dwelling on the ground, a reference to this species preference for an unusual soil type and an allusion to its habit of lying and flowering on the ground.

Habitat. Occurs on shallow sandy clay over granite, in winter damp flats under a Mallee shrubland dominated by *Eucalyptus marginata*. This community is probably confined to the Blackwood Plateau.

Conservation Status. The entire known range of the species is in State Forest and proposed National Park. However, it does occur in a very restricted specialised habitat.

Comments. Related to *Darwinia oederoides*, a widespread species of the Jarrah Forest. It differs from *D. oederoides* in the small thin ciliate leaves, small inflorescences, and the longer curved style.

Flowering Time. Flowers in late spring to early summer, November to December.

Common Name. Blackwood Bell.

Notes. Plants are killed by fire. Response to dieback disease (*Phytophthora*) is unknown.

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A CHECKLIST OF THE NATURALIZED VASCULAR PLANTS OF WESTERN AUSTRALIA II: CHANGES 1994–2004

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ABSTRACT

Weed numbers continue to increase at a steady rate, but explanations of the causes are often lacking. Checklists of naturalised plants for Western Australia produced in 1994, 1999 and 2004 were used to collate the reasons for these new records.

Between these checklists the number of recorded naturalised taxa rose from 1,073 to 1,234. The major causes of these differences were increased survey effort which added 105 previously unrecorded weeds. Literature survey / taxonomic revisions added another 95, highlighting the importance of timely taxonomic studies of collections of weeds and the need to systematically incorporate this information into databases. During this period 47 species previously listed as naturalised were deleted, but 94 taxa on the verge of becoming naturalised were also added as garden escapes.

Despite many “new” records being the result of increased taxonomic effort, the number of naturalised species continues to increase at a steady rate (the number of completely new records occurring at a rate of approximately 10 per year over the survey period). Approximately 70% of these new weeds were deliberately introduced as ornamentals or for agriculture.

INTRODUCTION

In 1994 I prepared a checklist of the naturalized weeds of Western Australia, with particular reference to environmental weeds (Keighery 1995). This list was used as the basic list for “Western Weeds”, the State weed

field guide (Hussey *et al.* 1997). An interim updated list was prepared in 1999 (Keighery 1999) and a new checklist of weeds distributed in natural regions of Western Australia was prepared in 2003 (Keighery and Longman 2004).

The weed flora of any region is highly dynamic, with species previously recorded being shown not to be naturalised, being eradicated or failing to naturalise. However, the recorded weed flora of Australia continues to increase rapidly despite these corrections and deletions. This was also true for the decade between the checklists in Western Australia, where the number of recorded naturalised taxa recorded rose from 1,073 to 1,234, a rate of nearly 20 new records per year.

The reasons for these increases are of considerable interest to managers of weeds as they can indicate where to target education and prevention campaigns to slow these increases.

One method of quantifying changes to the weed flora of Western Australia is to examine the causes of the differences between these checklists. I was requested by the Weed Society to attempt to undertake such an analysis and this paper documents the changes in the decade between the 1994 list and the 2004 list.

This is the second in a series of papers dealing with the naturalised vascular plants of Western Australia. The first produced a new checklist of Weeds distributed in natural regions for Western Australia (Keighery and Longman 2004).

RESULTS

Table 1 summarizes the three

Table 1. Summary of Checklists of Naturalized Vascular Plants of Western Australia

Keighery 1994
6 Ferns; 7 Conifers; 318 Monocotyledons; 701 Dicotyledons Total: 1,032
41 listed as doubtfully naturalized Garden Escapes not listed
Keighery 1999
6 Ferns; 12 Conifers; 342 Monocotyledons; 795 Dicotyledons Total: 1,155
41 still listed as doubtfully naturalized 81 "Garden Escapes"
Keighery and Longman 2004
12 Ferns; 15 Conifers; 345 Monocotyledons; 862 Dicotyledons Total: 1,234
47 deleted (13 no longer naturalized; 34 no evidence) 94 "Garden Escapes"

checklists of the naturalised vascular flora of Western Australia. In 1994 there were 1,032 naturalised plant taxa recorded for Western Australia. This number rose to 1,073 if one included the 41 species Keighery (1995) listed as doubtfully naturalised for which there was an old herbarium specimen in the Western Australian Herbarium (PERTH) with no additional information apart from an often general locality.

In order to increase accuracy a new category of garden escape (Keighery 1983, 1986) was also introduced in the 1999 checklist. This was to document those species either:

- recorded as present in management plans, reserve or

- bushland checklists but lacking other information, or
- those which were known to be either spreading slowly via vegetative means or seed, or
 - present as a single population or very localised.

Such species are either in the process of naturalizing but are easily eradicated either by chance or deliberate action. These species now numbering 94 in total have a large component of Australian natives (25 of 94 or 26.6%), suggesting these may form a potential reservoir of future weeds (Keighery 2002). Recent statements in significant horticultural literature (Clayton 2006 – “There is no such thing as a native weed in Australia; plants that cause problems all come from overseas”) suggest that there is still a considerable need for public education in this area.

By 2004 the number of naturalised plants (species, subspecies and varieties) had risen from 1032 to 1234 (Table 1), an apparent increase of 19.6%, despite 47 species (4.6%) being deleted as no longer naturalized. These were almost entirely the 41 species listed as doubtfully naturalized in 1994.

The greatest percentage changes occurred in the ferns (6 to 12; up 100%), the Gymnosperms (7 to 15; up 114%) and in the Dicotyledons (701 to 865; up 18.7%).

Table 2 presents as an annotated list those taxa in family alphabetical order (following the checklist order) which were

added to the list of naturalized plants between 1994 and 2004, with details as to the source of the record (literature, field survey or a new record and the reference or voucher collection of that record). In order to have a complete checklist the 2004 list (Keighery and Longman 2004) should be read in conjunction with Table 2 presented here.

From these listings it is immediately apparent that the changes in the listings originated in two distinct categories, either

- 1: from survey work, or
- 2: from extensive review of taxonomic literature (revisions, Flora of Australia treatments, State and local Floras) and weed workers personal communications that occurred after the 1994 list was prepared.

NEW WEED RECORDS

There were 105 previously unrecorded weeds added to the list between 1994 and 2004 (Table 2), 27 of these were recorded in the tropical Kimberley, 5 in the deserts (ranging from the Tanami to the Nullarbor) and 73 from the Mediterranean southern Western Australia.

This paper also lists five new weed records (*Freesia laxa*, *Lapeirousia anceps*, *Arabidopsis thaliana*, *Heliophila* sp (Gunyidi) and *Euphorbia chamaesyce*) recorded for Western Australia since the publication of the 2004 checklist.

Table 2. Annotated List of changes to the Weed Flora of Western Australia 1994–2004.
Key: A.P.B. Agriculture Protection Board; det. Determined by expert

Taxon	Reason Introduced	Record Source	Location /date/voucher/reference
Ferns			
SALVINIACEAE			
<i>Azolla filiculoides</i>	Weedy native	Literature/survey	Keighery & Longman 2004
<i>Azolla pinnata</i>	Weedy native	Literature/survey	Keighery & Longman 2004
DENNSTAEADIACEAE			
<i>Histiopteris incisa</i>	Ornamental	New record	Keighery & Longman 2004
<i>Hypolepis dicksonioides</i>	Ornamental	Literature/survey	Brownsey 1998
<i>Pteridium esculentum</i>	Weedy native	Literature/survey	Keighery & Longman 2004
Gymnosperms			
CUPRESSACEAE			
<i>Callitris rhomboidea</i>	Timber	New record	Pemberton, 1997, Keighery 14587
<i>Cupressus sempervirens</i>	Ornamental	New record	Hamel, 1995, Keighery 14022
PINACEAE			
<i>Pinus canariensis</i>	Timber	New record	Pemberton, 2001, Turnbull 292
<i>Pinus halepensis</i>	Timber	New record	Perth, 1995, Keighery 14110
<i>Pinus palustris</i>	Timber	New record	Pemberton, 1997, Keighery 14588
<i>Pinus pinea</i>	Timber	New record	Reserve 32800, 1984, Burgmann 4272
<i>Pinus ponderosa</i>	Timber, food	New record	Hollyoake, 1/12/2001, Keighery s.n.
Monocotyledons			
AGAVACEAE			
<i>Furcraea selloa</i>	Ornamental	New record	Mosman Park, 1995, Lepschi & Lally 1780
<i>Yucca aloifolia</i>	Ornamental	New record	Busselton, 1990, G. Keighery 9116

Table 2 (cont.)

Taxon	Reason Introduced	Record Source	Location /date/voucher/reference
ALISMATACEAE			
<i>Sagittaria platyphylla</i>	Ornamental	New record	Canning River, 1997, Vincent s.n.
AMARYLLIDACEAE			
<i>Nerine bowdenii</i>	Ornamental	New record	Mount Barker, 1997, Keighery 14607
<i>Pancratium maritimum</i>	Ornamental	New record	Woodmans Point, 12/1999, Lyons s.n.
AREACACEAE			
<i>Phoenix roebelenii</i>	Ornamental	New record	Kununurra, 1996, Keighery 14397
ASPARAGACEAE			
<i>Asparagus plumosus</i>	Ornamental	New record	Bunbury, 1995, Keighery 14013
<i>Asparagus scandens</i>	Ornamental	New record	Denmark, 2001, K.Brown et N. Gibson 601
COMMELINACEAE			
<i>Murdannia nudiflora</i>	Unknown	New record	Mitchell Plateau, 1980, Keighery 2705
<i>Tradescantia albiflora</i>	Ornamental	New record	Yagan Reserve, 2004, Keighery 16855
CYPERACEAE			
<i>Cyperus laevigatus</i>	Unknown	Prev. considered cosmopolitan native	Listed as native by Wilson 2000a. In W/A listed as a weed by Paczkowska & Chapman 2000
HYDROCHARITACEAE			
<i>Elodea canadensis</i>	Ornamental	Literature, no specimens in PERTH	listed as a weed by Paczkowska & Chapman 2000
IRIDACEAE			
<i>Diectes grandiflora</i>	Ornamental	New record	Kalamunda, 2002, G & B Keighery 201
<i>Iris laevigata</i>	Ornamental	New record	Lake Powell, 2002, B & G Keighery 175
<i>Freesia laxa</i>	Ornamental		Canning Mills, 2003, Turton s.n.
<i>Lapierousta anceps</i>	Ornamental		Kalbarri, 2001, B & D. Bellairs 6223

JUNCACEAE					
Juncus effusus	Unknown	Literature record	Wilson 2000b		
Juncus gerardii	Unknown	Literature record	Wilson 2000b		
Juncus imbricatus	Unknown	Taxonomic and New record	Mount Barker, 1979, ID 1994		
JUNCAGINACEAE					
Triglochin bulbosa	Unknown	New record	Swan Valley, 1994, A. Worz 01		
POACEAE					
Agrostis capillaris var aristata	Unknown	Taxonomic.	Wheeler et al. 2002		
Agrostis capillaris var capillaris	Unknown	Divided into 2 varieties prev. only at species level			
Aristida ramosa	Unknown	Literature	Proposed as eastern Australian introduction (WA Herbarium, 1998-)		
Axonopus fissifolius	Lawn grass	New record	Gibb River Station, 1996, A.A. Mitchell 4441		
Bromus molliformis	Contaminant	Literature	Jacobs & Hastings 1993		
Bromus tectorum	Contaminant	Literature	Jacobs & Hastings 1993		
Cynodon nlemfuensis var nlemfuensis	Lawn grass	New record	Mitchell River Station, 1996, A.A. Mitchell 4350		
Digitaria aequiglumis	Unknown	New record	Bullsbrook, 1995, Lepschi & Lally 2486		
Eragrostis barrelieri	Unknown	Revision	Lazarides 1997		
Eragrostis mexicana	Unknown	Revision	Lazarides 1997		
Eragrostis tenuifolia	Unknown	Revision	Lazarides 1997		
Glyceria declinata	Unknown	Taxonomic review, 1996	Wheeler et al. 2002		
Oryza rufipogon	Unknown	Literature	Wheeler et al. 1992		
Panicum coloratum	Unknown	Literature	Webster 1987		
Paspalum plicatulum	Unknown	Literature	Webster 1987		
Paspalum scrobiculatum	?Weedy native	Literature	Webster 1987		
Sporobolus pyramidalis	Unknown	Weed of irrigated pastures	A.P.B. pers. com.		
Vulpia muralis	Unknown	Literature	Wheeler et al. 2002		

Table 2 (cont.)

Taxon	Reason Introduced	Record Source	Location /date/voucher/reference
POTAMOGETONACEAE			
Potamogeton crispus	Ornamental	Literature record Flora of Perth Region, 1986.	Mongers Lake, 1983, N. Marchant 83/1
Dicotyledons			
ACANTHACEAE			
Thunbergia alata	Ornamental	New record	Augusta, 1998, Keighery 15618
AIZOACEAE			
Trianthema portulacastrum	Unknown	Literature record	Wheeler et al.1992
Delosperma vinaceum	Ornamental	New record	Abrolhos Islands, Keighery 16023
AMARANTHACEAE			
Gomphrena celosioides	? Contaminant	Taxonomic review, 1995	Palmer 1998
Guilleminea densa	Lawn weed	New record	Broome, 1992, A.A. Mitchell 2214
Ptilotus polystachyus	Weedy native	Literature/survey	A.P.B., pers. com.
ANNONACEAE			
Annona squamosa	Ornamental	Literature record	Kununurra A. Start pers. com.
APIACEAE			
Anthriscus caucalis	Contaminant	New record	Capel, 11/2001, Reeves s.n.
Coriandrum sativum	Herb/ Ornamental	New record	Muchea, 29/10/1996, Hussey s.n.
APOCYNACEAE			
Allamandra cathartica	Ornamental	New record	Koolan Island, 1993, G. Keighery & N. Gibson 91

<i>Calotropis gigantea</i>	Ornamental	Literature record, naturalised collections Broome, Kalumburu 2001	listed by Forster, 1992, not listed by Forster, 1996
ASCELPIDACEAE			
<i>Orbea variegata</i>	Ornamental	New record	Boulder, 24/12/2002, P. Curry s.n.
ASTERACEAE			
<i>Ageratum conyzoides</i>	Ornamental	Literature ?naturalised, last record 1970, reported recollectd in 2000	PERTH collections sorted 1996
<i>Chrysanthemum segetum</i>	Ornamental		Bunbury, 1970, CV Cahill 01
<i>Chrysocoma coma-aurea</i>	Ornamental	New record	Kings Park, 1995, Keighery 14109
<i>Cotula australis</i>	Weedy native	Literature/survey	Keighery & Longman 2004
<i>Cotula coronopifolia</i>	Weedy native	Literature/survey	Keighery & Longman 2004
<i>Eclipta</i> sp. Perth (S. Lloyd s.n. 3/4/1998)	Ornamental	New record	Yule Brook, 3/1997, S. Lloyd s.n.
<i>Gazania rigens</i>	Ornamental	New record	Albany, 2000, Keighery 16029
<i>Leontodon hispidus</i> subsp. hispidus	Unknown	New record	Normalup, 1999, Funk 12225
<i>Matricaria recutita</i>	Unknown	New record	Coorow, 23/9/1998, P. Stubbs s.n.
<i>Senecio condylus</i>	?Weedy native	Revision, Thompson, 2005 record/survey	Mitchell Freeway, 2003, G. Keighery 16775
BORAGINACEAE			
<i>Cynoglossum amabile</i>	Crop weed	Re-collected in 2000,	A.P.B. pers. com.
<i>Myosotis discolor</i>	Unknown	A. P. B. pers. com.	Cowaramup, 1955, Royce 5177
BRASSICACEAE			
<i>Arabidopsis thaliana</i>	Unknown	New record	Yalgorup, 1996, Keighery 14455
<i>Cardamine</i> sp Jandakot (P.Luff s.n., 4/7/1969)	Contaminant	Collections ID by I. Thompson, 1998	
<i>Heliphilla</i> sp Gunyidi (R.Rees 42)	Unknown	New record	Gunyidi, 2003, R.Rees 42

Table 2 (cont.)

Taxon	Reason Introduced	Record Source	Location /date/voucher/reference
Raphanus sativus	Food	New record	Abrolhos, 1987, J.J. Alford 687
Rorippa palustris	Unknown	Unknown	Hewson 1982
CACTACEAE			
(Austrocylindropuntia cylindrica) Cylindropuntia fulgida var mamillata	Ornamental	New record	Quobba Station, 18/9/2000, L.Stace s.n.
Cylindropuntia rosea (tunicata)	Ornamental	New record	Menzies, 22/10/2002, S. Januszkiewicz s.n.
Opuntia lindheimeri	Ornamental	New record, redet 1998	Chapman Valley, 19/2/1990, R.L. Chant s.n.
Opuntia vulgaris	Ornamental	New record	Queens Park, 1999, G. Keighery 15868
CAESALPINACEAE			
Detonix regia	Ornamental	New record	Koolan Island, 1993, G. Keighery & N. Gibson 59
Senna alata	Ornamental	New record	Koolan Island, 1993, G. Keighery & N. Gibson 77
Senna barclayana	Ornamental	Literature record	Randall & Barlow 1998
Senna tora	Ornamental	Literature record	Randall & Barlow 1998
CARYOPHYLLACEAE			
Cerastium comatum	Unknown	New record	Hillman N.R., 1999, Keighery & Gibson 799
Cerastium pumilum	Unknown	Taxonomic review	Adams pers. com.
Cerastium vulgare	Unknown	Taxonomic review	Adams pers. com.
Illecebrum verticillatum	Unknown	New record	Dunnsborough, 1996, Ohlemuller 252
Silene longicaulis	Unknown	Taxonomic review	Adams pers. com.
Stellaria multiflora	Unknown	Taxonomic review	Adams pers. com.
CASUARINACEAE			
Allocauarina huegeliana	Ornamental	New record, weedy native	Kings Park, 1995, G. Keighery 13990
CHENOPODIACEAE			
Atriplex amnicola	Fodder, rehabilitation	Literature record	Wilson 1984

Atriplex canescens	Ditto	Literature record	Wilson 1984
Atriplex lentiformis	Ditto	Literature record	Wilson 1984
Atriplex leptocarpa	Ditto	Literature record	Wilson 1984
Atriplex limbata	Ditto	Literature record	Wilson 1984
Atriplex semibaccata	Weedy native	Literature record	Wilson 1984
Atriplex undulata	Fodder, rehabilitation	Literature record	Wilson 1984
Chenopodium giganteum	Food, contaminant	Literature record	Wilson 1983
Chenopodium pumilio	Weedy native	Literature record	Wilson 1983
Scleroblitum atriplicinum	Fodder	New record	Ravensthorpe, 1999, E. Tink 361
Suaeda baccifera	Fodder	Literature record	Wilson 1983
CONVOLVULACEAE			
Convolvulus sabatius	Ornamental	New record	Claremont, 1996, Keighery 14041
subsp. mauritanicus			
Dichondra micrantha	Ornamental	New record	Woodvale Nature Reserve, 1992, Keighery 13522
Evolvulus nummularius	Unknown	New record	Kununurra, 1993, A.A. Mitchell 2832
Ipomoea batatas	Food	New record	Lake Kununurra, 1995, A.A. Mitchell 3846B
Ipomoea carnea	?Ornamental	New record	N.E. of Kununurra, 1992, A.A. Mitchell 2620
subsp. fistulosa			
Ipomoea pes-tigridis	Ornamental	New record	Kalumburu, 1992, A.A. Mitchell 2471
Ipomoea triloba	Ornamental	New record	Oombulgurri, 1998, A.A. Mitchell 5561
Operculina turpethum	Unknown	New record	Lake Kununurra, 1998, A.A. Mitchell 5572
CRASSULACEAE			
Bryophyllum delagoense	Ornamental	New record	Rat Island, 5/11/1999, Longman & Harvey s.n.
Crassula arborescens (ovata)	Ornamental	New record	City Beach, 1998, G. Keighery 15880
Portulacaria afra	Ornamental	New record	Kalgoorlie, 2002, G. & B. Keighery 157
EUPHORBIACEAE			
Euphorbia australis	Weedy native	literature record	Keighery & Longman, 2004
Euphorbia chamaesyce	Contaminant	Literature record / taxonomic revision	Keighery & Longman, 2004
Euphorbia drummondii	Weedy native	Literature record	Keighery & Longman, 2004
subsp. drummondii			

Table 2 (cont.)

Taxon	Reason Introduced	Record Source	Location /date/voucher/reference
<i>Euphorbia hirta</i>	Unknown	Literature record	Wheeler et al. 1992
<i>Euphorbia hyssopifolia</i>	Unknown	New record	Howatharra, 2001, Annon
<i>Euphorbia stevenii</i>	Unknown	Literature record	Keighery & Longman 2004
<i>Phyllanthus amarus</i>	Nursery weed	Literature record	Keighery & Longman 2004
GERANIACEAE			
<i>Erodium brachycarpum</i>	Unknown	Literature record	Western Australian Herbarium 1998-
LAMIACEAE			
<i>Ocimum tenuiflorum</i>	Herb	Literature record	Western Australian Herbarium 1998-
LYTHRACEAE			
<i>Ammannia auriculata</i>	Crop weed	literature record	Hewson 1990
MALVACEAE			
<i>Abutilon grandifolium</i>	Ornamental	New record	Kenwick, 1999, G. Keighery 15867
<i>Malva nicaeensis</i>	Ornamental	Reviewed, 1996	Albany, 1992, Croxford 6740
<i>Sida rhombifolia</i>	Unknown	Reviewed, 1996	Burekup, 2/1981, D. Rose s.n.
<i>Sida subcordata</i>	Unknown	Reviewed, 1996	Cape Bouganville, 1989, G. Keighery 10707
MARTYNIACEAE			
<i>Martynia annua</i>	Ornamental	Literature record	Western Australian Herbarium 1998-
MELIACEAE			
<i>Azadirachta indica</i>	Ornamental	New record	Kununnurra, 1995, A.A. Mitchell 4034
MIMOSACEAE			
<i>Acacia nilotica</i> subsp. <i>indica</i>	Fodder / shelter	New record	SE Wyndham, 2003, N. Wilson 0404
<i>Acacia saligna</i>	Crop/salinity	Literature record/ survey	

Albizia lebbeck	Ornamental	Literature record, Pilbara plants are definitely not native to area	Cowan 1998 gives as naturalised, native in Paczkowska & Chapman 2000
Prosopis glandulosa x velutina	Fodder, Shelter	Literature record	Perry 1998
MOLLUGINACEAE			
Glinus oppositifolius	Contaminant	Literature record	Keighery & Longman 2004
MYRTACEAE			
Eucalyptus camaldulensis	?Ornamental	New record	Coolup, 1996, G. Keighery 14366
Eucalyptus citriodora	Ornamental	New record	Kings Park, 1992, G. Keighery s.n.
Eucalyptus microcorys	Wood	New record	Margaret River, 1995, G. Keighery 14087
Kunzea baxteri	Ornamental	New record	Bluff Knoll, 1992, G. Keighery 12179
Leptospermum rotundifolium	Ornamental	New record	Nyamup, 1998, G. Keighery 15603
Melaleuca diosmifolia	Ornamental	New record	Bluff Knoll, 1992, G. Keighery 12178
Melaleuca linariifolia	Ornamental	New record	Blue Gum Lake, 1999, K. Brown 318
Melaleuca nesophila	Ornamental	New record	Two Rocks, K. Richardson 28
OLEACEAE			
Fraxinus rotundifolia	Ornamental	New record, previously Fraxinus sp.	Bridgetown, 1981, Keighery 4293
Syringia vulgaris	Ornamental	New record	Hovea, 1990, G. Keighery 11440
ONAGRACEAE			
Gaura lindheimeri	Ornamental	New record	Brunswick, 1996, G. Keighery 14349
OXALIDACEAE			
Oxalis compressa	Ornamental	New record, det. 1997	Toodyay, 23/7/1992, J. Dodd s.n.
PAPAVERACEAE			
Papaver somniferum subsp segiterum & subsp. somniferum	Ornamental	Collections redetermined by B. Lepschi, 1997	Divided into 2 varieties prev. only at species level

Table 2 (cont.)

Taxon	Reason Introduced	Record Source	Location /date/voucher/reference
PAPILLIONACEAE			
<i>Aeschynomene americana</i>	Unknown	New record, det. in PERTH by ST Reynolds 2001	Kununurra, 1992, A.A. Mitchell 2159
<i>Aeschynomene villosa</i>	Unknown	PERTH, by ST Reynolds, 1988	
<i>Alysicarpus ovalifolius</i>	Unknown	New record, det. in PERTH by ST Reynolds, 1996	
<i>Astragalus pelecinus</i>	Crop	New record	
<i>Canavalia ensiformis</i>	Unknown	revision, det. in PERTH by R. Cowan, 1996	Northampton, 10/2001, B. Shepherd s.n.
<i>Centrosema pascuorum</i>	Crop	New Record	
<i>Desmodium scorpiurus</i>	Unknown	literature record	Kitto Station, 1999, A.A. Mitchell & Brockway 5675
<i>Desmodium triflorum</i>	Lawn weed	New record	Pedley 1999
<i>Indigofera glandulosa</i>	Native crop weed	Herbarium search	Kununurra, 1995, A.A. Mitchell 4042
<i>Kennedia nigricans</i>	Ornamental	New record	Kununurra Sugar Cane Crop weed, 1978, Aplin 6285
<i>Melilotus officinalis</i>	?Fodder	revision, det. 1994 by AE Holland	Waroona, 1996, G. Keighery 14413
<i>Psoralea aff. graveolens</i>	Fodder	Literature record	Possibly not naturalised, last record 1964
<i>Retama raetum</i>	Ornamental	Taxonomic change from <i>R. monosperma</i>	Possibly not naturalised, one old record in crop at Harvey 1991 collection determined 1999

Stylosanthes hamata	Crop	revision, det. in PERTH by AE Holland, 1998	
Stylosanthes scabra	Crop	revision, det. PERTH, by AE Holland 1996	
Trifolium resupinatum var majus	Crop	Revision, det. PERTH, by AE Holland 2002	Two varieties prev. one species, no varieties
Trifolium vesiculosum	Crop	Ag Dept records 2001	
Vicia sativa subsp. cordata	Crop weed	Revision, det. PERTH, by AE Holland 1993	3 subspecies, previously two
Vicia villosa subsp. eriocarpa	Crop weed	Revision, det. PERTH, by AE Holland 1993	
PASSIFLORACEAE			
Passiflora edulis	Crop	Literature record, new record, prev. Garden escape	Blackwood River, 1990, G. Keighery 11981
PLANTAGINACEAE			
Plantago coronopus subsp. commutata & subsp. coronopus	Unknown	Two varieties prev. one species	Wheeler et al. 2002
POLYGONACEAE			
Muehlenbeckia adpressa	Weedy native	Literature record, A.P.B. records	
Persicaria maculosa	Contaminant	Revision, det. KL Wilson, 1997	
Polygonum bellardii	Contaminant	Revision, det. G. Perry, 1996	
PRIMULACEAE			
Asterolimon linum-stellatum	Unknown	New record	Garden Island, 1994, G. Keighery 13138

Table 2 (cont.)

Taxon	Reason Introduced	Record Source	Location /date/voucher/reference
RANNUNCULACEAE <i>Myosurus minimus</i> var <i>australis</i> & ? var <i>minimus</i>	Weedy native	Considered native 1994, Briggs & Makin- son 2000 state that there are native (var <i>australis</i>) and intro- duced varieties.	In WA listed as a weed by Paczkowska & Chapman 2000
ROSACEAE <i>Acaena echinata</i> var <i>subglabricalyx</i>	Unknown	Species complex, 5 varieties naturalised not 4	NSW collection
<i>Rubus rugosus</i>	Crop	revision, det. DE Symon. 2001	
RUBIACEAE <i>Oldenlandia corymbosa</i> var <i>corymbosa</i>	pan tropical weed	Literature record, Herbarium and Survey records	All collections from weedy , man made or highly disturbed sites
<i>Richardia scabra</i> Spermacoce assurgens	?lawn weed Ornamental	New record New record	Beverley Springs, 1994, A.A. Mitchell 3678 Kununurra, 1999, T. Handasyde 99/94
RUTACEAE <i>Diplolaena dampieri</i>	Ornamental	New record	Woodvale N.R., 1996, G. Keighery 14389
SALICACEAE <i>Salix humboltiana</i>	Ornamental	New record	Bennett Brook, 2002, Keighery 16420
SAPINDACEAE <i>Cardiospermum grandiflorum</i>	Ornamental	New record	Lynwood, 1995, G. Keighery 14037

SCROPHULARIACEAE						
Bacopa monnieri	Ornamental	New record	South Perth, 1995, Lepschi et Lally 1837			
Kickxia elatine into subsp. elatine & subsp. crinita	Taxonomic review	New record	Recorded only as K. elatine			
Linaria maroccana	Ornamental	New record	Perth, 1995, Lepschi et Lally 1932			
Lindernia crustacean	Lawn weed	New record	Wyndham, 1992, A.A. Mitchell 2146			
Nemesia strumosa	Ornamental	New record	Pingelly, 1998, G. Keighery 15361			
Veronica peregrina	Unknown	Literature record	Briggs et al. 1992			
Veronica plebeia	Unknown	Literature record	Briggs et al. 1992			
SOLANACEAE						
Datura leichhardtii	Unknown	Prev. considered native	Cowie et al. 2001			
Physalis angulata	Unknown	Prev. considered native	Symon 1997, Cowie et al. 2001			
TAMARICACEAE						
Tamarix pentaphylla	Ornamental	New record	York, 2002, G. et B. Keighery 232			
TILIACEAE						
Melochia pyramidata	Unknown	revision, PERTH det. I.Cowie1995				
Corchorus trilocularis	Unknown	revision, PERTH det. D.A. Halford, 1996				
Grewia asiatica	Ornamental	New record	Kununurra, 2000, A.A. Mitchell 6159			
Triumfetta pentandra	Unknown	revision, PERTH det. DA Halford, 1994				
VALERIANACEAE						
Valerianella locusta	Crop weed	New record, 2003	S. Lloyd pers. com.			
VERBENACEAE						
Phyla canescens	Ornamental	revision, det. 1996	Munir, 1993			
Verbena officinalis	Ornamental	New record	Ludlow, 1998, G. Keighery 15165			
VITACEAE						
Parthenocissus tricuspidata	Ornamental	New record	Gingin, 22/3/1999, G. & B. Keighery s.n.			

LITERATURE/TAXONOMIC CHANGES

There were 95 weeds added to the list by reviewing taxonomic revisions, Flora of Australia treatments, State and local flora treatments throughout Australia (Table 2). Others were from personal communication with weed workers in Western Australia. Sixteen of these were recorded in the tropical Kimberley, 5 in the desert and 74 from southern Western Australia. A significant component of these records were native Western Australian species acting as weeds in agricultural sites.

Taxonomic changes include species previously recorded without infraspecific categories recorded that now have been recognised, for example 2 subspecies or 2 varieties are recognized in *Agrostis capillaris*, *Acaena echinata* and *Papaver somniferum*.

There were several species previously considered as native that are stated as weeds in taxonomic revisions, e.g.: *Ammannia auriculata* or a number of native *Atriplex* species (7 species naturalized via salinity plantings) deliberately introduced outside their native ranges that are documented in the Flora of Australia treatment of the genus.

REASONS INTRODUCED

Of the taxa listed in Table 2, 89 were introduced as ornamentals, 30 for agriculture (fodder, shelter

or wood), 12 are weedy Western Australian native species and for 51 methods of their introduction are unknown. The great majority of new weeds continue to result from deliberate introductions.

DISCUSSION

By 2005 there were 1,239 naturalized vascular plant taxa recorded for Western Australia, composed of 12 Ferns, 15 Gymnosperms, 347 Monocotyledons and 865 Dicotyledons.

This paper highlights the importance of taxonomic studies of Australia's native and naturalised flora at a State and Australia wide level in uncovering and documenting previously unrecorded weeds. At least half of the "new" weed records from the survey period were the result of scrutiny of the available literature or taxonomic revisions of previously collected material. This suggests that supporting timely taxonomic scrutiny of current and past weed collections is vital to keeping out new and emerging weeds.

However, the documentation of the weeds of Western Australia displays a considerable lag time between discovery, identification and listing of new weeds, often exceeding 5–10 years. There are still many cases where species are listed as weeds in taxonomic reviews and/or revisions where this information has not been transferred to electronic databases. For example

Ammannia auriculata was listed as a weed of rice crops by Hewson (1980), but is still listed as native in Western Australia. Weed researchers and Herbaria need to actively search revisions to locate potential new weeds and establish clear guidelines to add these records to State and national databases.

As well there are numerous differences between States on the native or naturalized status of certain species, eg: *Helichrysum luteo-album* or *Cotula coronopifolia*. The continued development of Australia wide herbarium databases, especially the Australian Virtual Herbarium should reduce this problem. However, a national approach should not confer weedy or native status on difficult groups without caveats being transparent.

Increasing public awareness of all weeds, regular survey and the systematic survey of Northern Australia by the Australian Quarantine Inspection Service (AQIS) is leading to many new records. Unfortunately the number of new records is still increasing at approximately 10 per year over the survey period similar to past estimates Australia wide and shows little signs of slowing.

There is still a lack of awareness about the potential of both Australian and Western Australian natives to act as significant environmental weeds in Western Australia.

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THE WESTERN AUSTRALIAN NATURALIST

(Journal of the W.A. Naturalists' Club)

Editor

MR JOHN DELL

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