

Weedy native plants in Western Australia: an annotated checklist

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ABSTRACT

An annotated checklist of 78 Western Australian native plant species with naturalized populations in Western Australia is presented. Information on natural and weedy distributions, habitat and establishment is presented for each species, along with voucher specimen details. Further information is provided on doubtfully naturalized species, species contributing to disruption of genetic integrity, and species of uncertain occurrence status.

Keywords: checklist, naturalised Western Australian vascular plants

INTRODUCTION

Any plant outside the checks and balances of its natural habitat can potentially be a weed. Western Australian native species are no exception and some are already serious weeds of the natural environment (Keighery 2002). With increasing attempts to restore, rehabilitate and revegetate disturbed land in Western Australia, it is vital that we understand the natural distribution and ecology of our native flora. This enables the use of local provenance material that should minimize the actual and potential introduction of potentially damaging weedy taxa. This paper seeks to list known weedy native species and provide information on their distribution and basic ecology. Native species with known weedy populations are listed in Appendix 1 (layout follows Keighery 2005). Appendix 2 lists doubtfully naturalized species, and Appendix 3 details species for which further study is required to ascertain native or naturalized distributions or status.

METHODS

This study is based on the examination of herbarium collections from KPBG (Kings Park and Botanic Garden herbarium) and PERTH (Western Australian Herbarium), supplemented with field observations by the author and literature records where relevant. Herbarium codes follow Index Herbariorum (<http://sweetgum.nybg.org/ih/>), and all specimens cited are housed in PERTH, unless otherwise noted. Taxonomy used follows Florabase (Western Australian Herbarium 1998–) or Australia's Virtual Herbarium (The Council of Heads of Australasian

Herbaria 2012), and regional distributions follow IBRA 7 Regions of Western Australia (Department of Sustainability, Environment, Water, Population and Community 2012). Natural distributions were sourced from the revisions and studies cited or from Florabase and the Australian Virtual Herbarium.

RESULTS AND DISCUSSION

Our understanding of the distribution and ecology of many native species has improved greatly over the past 50 years. However, erroneous interpretation of the origins or status of native plant populations can lead to misleading impressions of the true native ranges of a species, especially in broad-scale public databases such as those derived from herbarium data, such as Florabase (Western Australian Herbarium 1998–) or Australia's Virtual Herbarium (The Council of Heads of Australasian Herbaria 2012). This can affect the conservation status of a species, our understanding of a species' climatic envelop for climate change studies, and the ranges for local provenance of seed sources for rehabilitation. For example, there is a naturalized population of the highly restricted *Reedia spathacea* at Hamel, on the Swan Coastal Plain, several hundred kilometres north of the natural range of this localised endemic, and this could be misinterpreted as a localised, possibly threatened, occurrence of this species in the absence of data on the origin of this population. Similar issues can be noted in the south coast endemics *Kennedia nigricans* (weedy populations on the Swan Coastal Plain), *Hakea laurina* (weedy populations in the Jarrah Forest and Swan Coastal Plain) and *Kunzea baxteri* (weedy populations in the Esperance Sandplains). Perhaps the most extreme example of such misinterpretation was

the listing of a naturalized population of *Melaleuca diosmifolia* Andrews in the Stirling Ranges as a new record for this priority species in Florabase, despite the population being targeted for removal in the Management Plan (Allen & Herford 1999).

Of the 78 species listed here as having naturalized populations (Appendix 1), over 95% of these resulted from deliberate introductions into bushland areas or localized spread from nearby plantings. Although many of the species discussed below will likely remain only minor weeds of remnant bushland, there are a series of species (*Agonis flexuosa*, *Allocasuarina huegeliana*, *Calothamnus* spp., *Ceratopteris thalictroides*, *Chamelaucium uncinatum*, *Eucalyptus megacornuta*, *Hakea costata* and *Melaleuca lanceolata*) that have the capacity to completely alter the structure of communities that they invade. These are as damaging to the conservation of the remnant bushland invaded as are many exotic invasive species.

Currently, some horticulturalists and reserve managers are suggesting using species from 'drier' regions for revegetation in the light of climate change predictions (Department of Climate Change 2012). However, many of the serious bushland weeds documented in this paper—because they were the species used in horticulture and available for beautification, enhancement or revegetation attempts—are from 'wetter' regions than the areas they are invading and adversely affecting. This suggests that such species shifts are at best premature and could potentially cause serious weed problems in remnant bushland and result in an even greater loss of biodiversity than predicted through climate change models alone. Like any imported species, a risk assessment of the propensity to become weedy should be performed prior to any proposal to plant it in or around natural bushland. However, such assessments are complicated by the fact that we still lack basic biological information (e.g. limitations to population size, ecological range, etc.) for most native species.

Another ten species (Appendix 2) were recorded as doubtfully naturalized in areas outside their native ranges, but as yet are not truly established as self-sustaining populations, and should be monitored for potential further spread or eradicated if possible. Weeds can threaten biodiversity at the genetic level through mixing of local and introduced gene pools. Although poorly documented, there are several examples of genetic 'pollution' of local plant forms in Western Australia (e.g. see *Chamelaucium uncinatum*, Appendix 1). Other known examples include *Eucalyptus gomphocephala* DC: the seed produced by trees in Kings Park has many hybrid genes present (Coates et al. 2002), apparently because of extensive crossing to many species planted in the Botanic Gardens and along road verges in Kings Park. *Corymbia ficifolia* (F Muell.) KD Hill & LAS Johnson has also hybridized extensively with *C. calophylla* (Lindl.) KD Hill & LAS Johnson in Kings Park (GJ Keighery 16254) from plantings of trees along Fraser Avenue. There has also been extensive planting at Kings Park of non-local forms of *Acacia pulchella* and *Anigozanthos manglesii* D Don. The genetic consequences of these actions are presently unknown.

With increasing movement of plant species and local provenances through the landscape the potential for increased hybridisation and genetic 'pollution' is obvious. Forty-three taxa (Appendix 3) are listed for which further taxonomic/genetic study is required to ascertain native or naturalised distributions or status.

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APPENDIX 1

Annotated list of Western Australian native species with naturalized populations.

FERNS

Ceratopteris thalictroides (L.) Brongn. (Indian water fern)

NATURAL DISTRIBUTION: North Kimberley, Dampier Land, Victoria–Bonaparte IBRA Regions.

WEEDY DISTRIBUTION: Pilbara IBRA Region.

HABITATS: Permanent pools of the Fortescue and Robe Rivers.

FIRST RECORD: Millstream, *CA Gardner 3110*, 22 Aug. 1932.

OTHER RECORDS: Crystal Pool, Millstream, *RF Black s.n.*, 5 Sept. 1974; Deepdale Station, Robe River, *A Brealey s.n.*, 1995; Chinderwah Pool, Millstream, *P Bremmer s.n.*, 3 Oct. 1987; Crystal Pool, *MIH Brooker 2067*; Robe River, Pannawonica to Millstream road, *S Hunger & N Kilian 4256*; Millstream, *E Leyland s.n.*, 8 April 1990; Millstream, *AA Mitchell 1490*; *AA Mitchell 2671*; Robe River, *C Olsson 95*; Millstream, *GG Smith s.n.*, 2 Oct. 1976; Robe River, *MET Trudgen & S Maley MET 10097*; Millstream, *K Vollprecht s.n.*, 4 Aug. 1958; Millstream, *JAL Watson s.n.*, 6 Dec. 1958; Lily Ponds, Millstream, *PG Wilson & R Rowe 1011*.

NOTES: Millstream Station was first selected in 1864 under owners Alex McRae and Trevor McKenzie, and run by them until 1879 when the lease was purchased by Walter Padbury and William Loton (Withnell Taylor 2002) and run by them until 1914. Numerous species were introduced around the homestead to add shade and beautification along the river during this period. These included Tamarisk (*Tamarix aphylla*), Albizia (*Albizia lebbek*) and along the river Cotton Palms (*Washingtonia filifera*), Date Palms (*Phoenix dactylifera*), Bamboo (*Arundo donax*), Borassus Palm (*Borassus ?aethiopica*), yellow Oleander (*Thevetia peruviana*) and Oleander (*Nerium oleander*) (illustrated in Gordon 2004, p. 73). Several ornamental aquatics, Waterlilies (*Nymphaea macrosperma*) and the Indian Water Fern were planted into Chinderwarriner Pool adjacent to homestead. Hawkesbill turtles were even introduced into these pools in the 1930s (Gordon 2004, p. 17.), but they did not persist.

It is possible that plants of *Ceratopteris thalictroides* introduced into Millstream are not of Western Australian provenance since the species is found throughout the tropics.

GYMNOSPERMS

CUPRESSACEAE

Callitris canescens (Parl.) ST Blake

NATURAL DISTRIBUTION: Coolgardie, Murchison, Avon Wheatbelt, Esperance Sandplains, Geraldton Sandplains, Mallee, Swan Coastal Plain IBRA Regions

WEEDY DISTRIBUTION: Swan Coastal Plain, Jarrah Forest IBRA Regions.

HABITATS: Riverine edges.

FIRST RECORD: Jane Brook, John Forrest National Park, *G Keighery 11447*.

OTHER RECORDS: Hamel (cultivated?) *JJ Harding s.n.*, Jan. 1950; Botanic Garden (cultivated), *Anon. s.n.*

NOTES: I have observed this species along road verges, seeding in arboreta and from amenity plantings.

Callitris columellaris F Muell. (white cypress pine)

NATURAL DISTRIBUTION: North Kimberley, Central Kimberley, Victoria–Bonaparte, Coolgardie, Central Ranges, Gascoyne, Great Sandy Desert, Great Victoria Desert, Little Sandy Desert, Murchison, Pilbara, Yalgoo, Geraldton Sandplains, Mallee IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain, Jarrah Forest IBRA Regions.

HABITATS: disturbed wandoo woodland, road verges.

FIRST RECORD: Dryandra, *G Keighery 12281*.

OTHER RECORDS: North Dandalup, *G Keighery s.n.*, 25 Aug. 1991.

NOTES: I have observed this species on road verges, seeding in arboreta and from amenity plantings. Naturalized plants could be of non-Western Australian origin.

Callitris pyramidalis (Miq.) JE Piggin & JJ Bruhl (swamp cypress)

NATURAL DISTRIBUTION: Geraldton Sandplains, Avon Wheatbelt, Swan Coastal Plain, Jarrah Forest IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Tuart/banksia woodlands.

FIRST RECORD: Listed as a weed in Kings Park by Barrett and Tay (2005). No voucher located.

OTHER RECORDS: None known.

NOTES: Previously in the genus *Actinostrobus*. Recorded along road verges, seeding in arboreta and from amenity plantings.

Callitris verrucosa (Endl.) F Muell.

NATURAL DISTRIBUTION: Coolgardie, Murchison, Great Victoria Desert IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain, Jarrah Forest IBRA Regions.

HABITATS: Wandoo woodland, tuart/banksia woodlands.

FIRST RECORD: Dryandra Forest, *G Keighery 12275*; Kings Park, *G Keighery 16407, 16408, 16409*.

OTHER RECORDS: Listed as a weed in Kings Park by Bennett (1995).

NOTES: Recorded along road verges, seeding in arboreta and from amenity plantings. The taxonomy of this and the following species follows Hill (1998) rather than Farjon (2005), who combined *C. preissii*, *C. tuberculata* and *C. preissii* subsp. *murrayensis* under *C. preissii*.

Callitris preissii sensu Hill is distinguishable on cone morphology, is highly disjunct from the other members of this complex and is genetically distinct (R Barrett, pers. comm.). Populations on the Swan Coastal Plain form a Threatened Ecological Community (Keighery et al. 1997). For these reasons material of the other *Callitris* taxa and/or populations should never be planted near natural stands.

***Callitris preissii* Miq. (Rottnest Island pine)**

NATURAL DISTRIBUTION: Swan Coastal Plain IBRA Region.

WEEDY DISTRIBUTION: Swan Coastal Plain, Warren IBRA Region.

HABITATS: Coastal heath, tuart/banksia woodlands.

FIRST RECORD: Windy Harbour, *G & B Keighery 380*.

OTHER RECORDS: A weed in tuart woodland in Kings Park, but native to river escarpment in Kings Park.

NOTES: Recorded along road verges, seeding in arboreta and from amenity plantings.

***Callitris roei* Benth. (Roe's cypress)**

NATURAL DISTRIBUTION: Coolgardie, Avon Wheatbelt, Mallee IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Tuart/banksia woodlands.

FIRST RECORD: Law Walk, Kings Park, *G Keighery 17210*.

OTHER RECORDS: None known. Listed as a weed in Kings Park by Barrett and Tay (2005).

NOTES: I have observed this species along road verges, seeding in arboreta and from amenity plantings.

MONOCOTYLEDONS**ARACEAE*****Colocasia esculenta* (L.) Schott var *aquatilis* Hassk. (taro)**

NATURAL DISTRIBUTION: North Kimberley, Central Kimberley, Ord Victoria Plains IBRA Regions.

WEEDY DISTRIBUTION: Central Kimberley, Dampier Land IBRA Regions.

HABITATS: Creeks and fresh water seeps.

FIRST RECORD: Beagle Bay, *KF Kenneally 10630*.

OTHER RECORDS: Beagle Bay, *AA Mitchell 3283*.

NOTES: The record of this native variant at Beagle Bay is definitely an introduction as plants were introduced by the administrators at Beagle Bay mission as a potential food source in 1900. However, this species is still restricted to a few fresh water seeps in this arid area. This variety was reported as introduced into a creek line at Mount Hart Station Homestead in 1980 and spreading rampantly downstream along a tributary of the Barker River. It is currently being eradicated (B Marmion, Minister for the Environment and Water, Media Statement, 27-10-2011; <http://www.mediastatements.wa.gov.au>). However, recent examination of fresh collections of this population by the author has found that it is the ornamental cultivar *Fontanesii* of the introduced var. *esculenta*.

CYPERACEAE***Reedia spathacea* F Muell.**

NATURAL DISTRIBUTION: Warren IBRA Region.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Swamps.

FIRST RECORD: Hopper et al. (1992); no voucher located.

OTHER RECORDS: None known.

NOTES: Recorded from a wetland at Hamel, south of Pinjarra. This area is the former site of the Forests Department Nursery from 1916 to 1990. Numerous species were cultivated and planted out around the old nursery site, including karri (*Eucalyptus diversicolor* F Muell.), waratah (*Telopea speciosissima* [Sm.] R. Br.) and *Lambertia inermis* R. Br. Several of these plantings, such as *Phorium tenax* JR Forst. & G Forst. and *Banksia integrifolia* L.f. have since naturalized.

HYDROCHARITACEAE***Hydrilla verticillata* (L.f.) Royle**

NATURAL DISTRIBUTION: Central Kimberley, Ord Victoria Basin, Ord Victoria Plains IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Permanent lakes, soaks and rivers.

FIRST RECORD: Soak on west side of aerodrome, Rottnest Island, *NG Marchant 69*.

OTHER RECORDS: Kent Street Weir, *Nelson s.n.*, 2 Feb. 1960; *NG Marchant s.n.*, 16 Feb. 1960; Helena River at Guildford, *JG Patterson s.n.*, 5 March 1969; Glendalough drain, north-end Mongers Lake, *Perth City Council s.n.*, 19 Sept. 1974.

NOTES: Only recorded from highly modified wetlands in the Perth Metropolitan area. Treated as introduced to the Perth region in Marchant et al. 1987. Research is required into the origin and relationships of the south western populations of this species.

POACEAE***Austrostipa tenuifolia* B (Steud.) SWL Jacobs & J Everett**

NATURAL DISTRIBUTION: Yalgoo, Coolgardie, Geraldton Sandplain, Avon Wheatbelt, Jarrah Forest, Swan Coastal Plain IBRA Regions.

WEEDY DISTRIBUTION: Jarrah Forest, Swan Coastal Plain IBRA Regions.

HABITATS: *Melalaeuca lanceolata*/*Callitris preissii* woodland and coastal heath.

FIRST RECORD: Muchea Nature Reserve, *GJ Keighery 16864*.

OTHER RECORDS: Woodvale Nature Reserve, *G Keighery 17219*; Beechina, *U Bell 67*.

NOTES: Spreading along road verges due to grading and mowing. Introduced by vehicles into Woodvale and Kings Park, now spreading rapidly along firebreaks and tracks. Southern end of natural range around Gingin on Swan Coastal Plain. The record of this species from Kings Park is also an introduction (Barrett & Tay 2005) as it was not recorded in detailed surveys previously and is restricted to road and trail verges.

***Chloris pumilio* R. Br. (windmill grass)**

NATIVE DISTRIBUTION: North Kimberley, Central Kimberley, Dampier Land, Victoria Bonaparte, Ord Victoria Plains, Tanami, Pilbara, Little Sandy Desert, Ashburton, Carnarvon, Geraldton Sandplain IBRA Regions.

WEEDY DISTRIBUTION: Avon Wheatbelt IBRA Region.

HABITATS: Weedy road sides.

FIRST RECORD: 7.6 km north of Three Springs, *BJ Lepschi & TR Lally 2690*.

OTHER RECORDS: None known.

NOTES: Introduced via trucks moving stock.

***Pseudoraphis spinescens* (R. Br.) Vickery (spiny mud grass)**

NATIVE DISTRIBUTION: Kimberley, North Kimberley, Central Kimberley, Dampier Land, Victoria Bonaparte IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Fresh water swamps and lakes.

FIRST RECORD: Herdsman Lake Regional Park, *G Keighery 17314*.

OTHER RECORDS: None known.

NOTES: How this species was introduced into the Swan Coastal Plain is unknown, but it may have been naturally introduced by waterbirds.

DICOTYLEDONS**ASTERACEAE*****Xerochrysum braceatum* (Vent.) Tzvelev (golden everlasting)**

NATURAL DISTRIBUTION: Pilbara, Avon Wheatbelt, Esperance Sandplains, Geraldton Sandplains, Mallee, Swan Coastal Plain, Jarrah Forest, Warren IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Tuart/banksia woodland.

FIRST RECORD: Woodvale Nature Reserve, *V English VE 02/95*.

OTHER RECORDS: Recorded as naturalized in Kings Park by Barrett and Tay (2005).

NOTES: Probably adventive rather than truly naturalized, occurring after fire in bushland and seeding from adjacent plantings. Plants have not been recently located at both sites. The record for the Pilbara is also highly disjunct and requires further study.

CAESALPINACEAE***Labichea lanceolata* Benth. subsp. *lanceolata* (tall labichea)**

NATURAL DISTRIBUTION: Esperance Sandplains, Geraldton Sandplains, Swan Coastal Plain, Jarrah Forest IBRA Regions

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: *Eucalyptus marginata* woodland over low woodland of *Banksia attenuata* and *B. menziesii*.

FIRST RECORD: East of Bowling Club, Kings Park, *GJ & BJKeighery 249*.

OTHER RECORDS: Barrett and Tay (2005) record this as naturalized at several sites in Kings Park.

NOTES: A dense monoculture of this species has formed through suckering in Kings Park, where it spread from amenity plantings.

CASUARINACEAE***Allocasuarina huegeliana* (Miq.) LAS Johnson (rock she-oak)**

NATURAL DISTRIBUTION: Coolgardie, Murchison; Avon Wheatbelt, Esperance Sandplains, Geraldton Sandplains, Mallee, Swan Coastal Plain, Jarrah Forest IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Plantings of this species have resulted in dense monocultures in Kings Park in banksia woodland after fires have killed the adults and stimulated germination of seedlings.

FIRST RECORD: Boomerang Walk, Kings Park, Perth, *GJ Keighery 13990*.

OTHER RECORDS: Bancell Road Reserve, north-east Yarloop, *G & B Keighery 369*.

NOTES: Soil dumping in old gravel pits has introduced this species into Bancell Road. In the Kings Park site, this species forms a dense monoculture and has the capacity to completely alter the understorey of banksia woodlands. This species is also spreading into heathlands in the western Wheatbelt in the absence of fire.

DILLENIACEAE***Hibbertia cuneiformis* (Labill.) Sm. (cutleaf hibbertia)**

NATURAL DISTRIBUTION: Esperance Sandplains, Swan Coastal Plain, Jarrah Forest, Warren IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Banksia woodland, coastal heath, *Eucalyptus rudis*/*Melaleuca preissiana* woodland.

FIRST RECORD: Hollywood Reserve, Nedlands, *GJ Keighery 16675*.

OTHER RECORDS: Blue Gum Lake, *K Brown 505*; Piney Lakes Reserve, Melville, *G & B Keighery 1316*; Pinnaroo Cemetery Bushland, *G Keighery 17313*; Kings Park, *G Keighery 17104*; Woodvale Nature Reserve, *G Keighery 17311*.

NOTES: Keighery (1998) discussed how this species, planted as an amenity species in the Naval Base on Garden Island, was self-seeding into disturbed bushland. At the other reserves mentioned above this species is seeding and spreading into relatively undisturbed bushland. At Woodvale and Piney Lakes the seeds are being introduced by birds from nearby gardens, as there are no plantings in these reserves. The species is also considered a potentially serious bushland weed in eastern Australia (Elliot & Jones 1990).

EUPHORBIACEAE***Euphorbia australis* Boiss. (namana)**

NATURAL DISTRIBUTION: North Kimberley, Central Kimberley, Ord Victoria Plains, Dampier Land, Carnarvon, Central Ranges, Gascoyne, Gibson Desert, Great Sandy Desert, Great Victoria Desert, Little Sandy Desert, Murchison, Pilbara, Tanami IBRA Regions.

WEEDY DISTRIBUTION: Avon Wheatbelt, Esperance Sandplains, Geraldton Sandplains, Swan Coastal Plain, Jarrah Forest, Warren IBRA Regions.

HABITATS: Weed of gardens, paddocks and wasteland.

FIRST RECORD: Merredin, *CV Cahill s.n.*, July 1952.

OTHER RECORDS: Saint James Church, Greenough, *G Keighery 16598*; Fonty's Pool, Manjimup, *L Fontanini 97*; 2.5 km west of Mundijong, *R Davis 8796*.

NOTES: Listed as a weed in Kings Park by Bennett (1995), probably introduced by soil movement along tracks. This species and the one listed below are native to the tropics and naturalized in disturbed areas in temperate Western Australia.

***Euphorbia drummondii* Boiss. (caustic weed)**

NATURAL DISTRIBUTION: North Kimberley, Central Kimberley, Ord Victoria Plains, Dampier Land, Victoria Bonaparte, Carnarvon, Coolgardie, Central Ranges, Gascoyne, Gibson Desert, Great Sandy Desert, Great Victoria Desert, Hampton, Little Sandy Desert, Murchison, Nullarbor, Pilbara, Tanami, Yalgoo IBRA Regions

WEEDY DISTRIBUTION: Esperance Sandplains, Swan Coastal Plain, Avon Wheatbelt IBRA Regions.

HABITATS: Weed in gardens, paddocks and waste land.

FIRST RECORD: South Perth, *G Perry 1294*.

OTHER RECORDS: Fremantle, *G Keighery 16348*; 20 km north of Dalwallinu, *M Clarke s.n.*, April 2006.

NOTES: Listed as a weed in Kings Park by Bennett (1995), probably introduced by soil movement along tracks.

***Homalanthus novoguineensis* (Warb.) Lauterb. & K Schum.**

NATURAL DISTRIBUTION: North Kimberley, Ord Victoria Plains, Victoria Bonaparte IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain, Jarrah Forest IBRA Regions.

HABITATS: Fresh water wetlands and creek lines.

FIRST RECORD: Nerrigen Brook, Armadale, *GJ & BJ Keighery s.n.*, 10 Jan. 1999.

OTHER RECORDS: Harvey River, *GJ Keighery 16889*; Yagan Reserve, *GJ Keighery 16858*; Broadwater Nature Reserve, *G.J. Keighery 16944*; Rosa Glen, *B Raynor s.n.*, 3Nov. 2006.

NOTES: Plants of this species grown in Perth were originally sourced from nurseries in eastern Australia, therefore, it is probable that material of this species naturalized in the south-west originates from eastern Australia.

FABACEAE***Kennedia nigricans* Labill. (black kennedia)**

NATURAL DISTRIBUTION: Esperance Sandplains IBRA Region.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Swamps, coastal sands, damplands.

FIRST RECORD: Mayfield Road, Waroona Shire, *GJ Keighery 14413*.

OTHER RECORDS: Melaleuca Park, *GJ Keighery 14467*; Two Rocks, *KC Richardson 119*.

NOTES: Self-seeding in several sites on the Swan Coastal Plain. Locally abundant along Mayfield Road verge.

GOODENIACEAE***Lechenaultia biloba* Lindl. (blue leschenaultia)**

NATURAL DISTRIBUTION: Avon Wheatbelt, Geraldton Sandplains, Jarrah Forest, Swan Coastal Plain IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Jarrah/banksia low woodland.

FIRST RECORD: Shenton Bushland, *GJ Keighery 17333*.

OTHER RECORDS: None known.

NOTES: This species was introduced into Shenton Bushland in gravel used for road surfacing. It is normally found in the

Perth area along the Darling escarpment and adjacent alluvial and colluvial soils of the Ridge Hill Shelf and Guildford Formation. Currently it is maintaining itself by vegetative spread and occupies about 300 m².

LAMIACEAE***Dasymalla teckiana* (F Muell.) BJ Conn & M Henwood**

NATURAL DISTRIBUTION: Avon Wheatbelt, Coolgardie, Yalgoo IBRA Regions.

WEEDY DISTRIBUTION: Jarrah Forest IBRA Region.

HABITATS: Open rail verges.

FIRST RECORD: John Forrest National Park, *GJ Keighery 11446*.

OTHER RECORDS: None known.

NOTES: Introduced to John Forrest National Park by railway construction. Previously known as *Pityrodia teckiana* (F Muell.) E Pritzel.

MELIACEAE***Melia azederach* L. (cape lilac, white cedar)**

NATURAL DISTRIBUTION: North Kimberley, Ord Victoria Plains, Central Kimberley IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain, Jarrah Forest IBRA Regions.

HABITATS: Jarrah woodland, sumps, road verges.

FIRST RECORD: Kwinana Beach, *G Keighery 9229*.

OTHER RECORDS: Kalgoorlie, *G Barrett s.n.*, Feb. 1992; Garden Island, *B Wykes 38/96*; Rottnest Island, *E Rippey 18*; Lake Joondalup, *L Sage s.n.*, 6 Nov. 1997; Stony Brook, *A McGilvray 4208*; McLarty Settlement, *G Keighery 13233*; Beckenham, *G Keighery 11444*.

NOTES: Does not appear to invade bushland, confined to highly disturbed sites. Frequently recorded in drainage sumps. The origin of naturalized plants is uncertain as early plantings were stated to be from seeds gathered in India or Cape Town, whereas the 90+ year old plantings at Houghton's Winery are supposedly from the Kimberley.

FABACEAE***Acacia acuminata* Benth. (jam)**

NATURAL DISTRIBUTION: Coolgardie, Murchison, Yalgoo, Avon Wheatbelt, Esperance Sandplains, Geraldton Sandplains, Jarrah Forest, Mallee IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain, Jarrah Forest IBRA Regions.

HABITATS: Jarrah woodland, winter wet *Callitris* shrubland.

FIRST RECORD: May Drive, Kings Park, *GJ & BJ Keighery 269*.

OTHER RECORDS: Listed as a weed in Kings Park by Bennett (1995).

NOTES: Introduced in John Forrest National Park and probably to the Swan Coastal Plain at Mundijong by railway construction. Planted as a feature in Kings Park and seeds prolifically after wildfires.

***Acacia amblyophylla* F Muell.**

NATURAL DISTRIBUTION: Carnarvon, Yalgoo IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Tuart/banksia woodland.

FIRST RECORD: Lovekin to May Drive, Kings Park, *GJ Keighery 16085*.

OTHER RECORDS: None known.

NOTES: Planted as a feature in Kings Park; seeds into bushland after fires.

***Acacia blakelyi* Maiden**

NATURAL DISTRIBUTION: Avon Wheatbelt, Geraldton Sandplains, Jarrah Forest, Swan Coastal Plain IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Tuart/banksia woodland.

FIRST RECORD: Boomerang Walk, Kings Park, *GJ Keighery 13062*.

OTHER RECORDS: Listed as a weed in Barrett and Tay (2005).

NOTES: Planted along tracks, seeding and established prolifically after fire. Several hundred mature plants now occur in Kings Park.

***Acacia celastrifolia* Benth. (glowing wattle)**

NATURAL DISTRIBUTION: Coolgardie, Avon Wheatbelt, Geraldton Sandplains, Esperance Sandplains, Mallee, Jarrah Forest, Swan Coastal Plain IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain and Jarrah Forest IBRA Regions.

HABITATS: Jarrah woodland and forest.

FIRST RECORD: 1 km north-east of Dwellingup, *G Keighery 13132*.

OTHER RECORDS: South-east of Pinjarra, *G & B Keighery 567*.

NOTES: Forms of this species have been widely used as road side plantings and for revegetation purposes, and plants now occur as localised escapes in the Darling Range and near Yarloop.

***Acacia hilliana* Maiden**

NATURAL DISTRIBUTION: Ord Victoria Plains, Dampier Land, Great Sandy Desert, Little Sandy Desert, Pilbara, Tanami, Central Ranges IBRA Regions.

WEEDY DISTRIBUTION: Jarrah Forest IBRA Region.

HABITATS: Winter-wet flats.

FIRST RECORD: Caladenia Hill Farm, 30 km east-north-east of Mount Barker, *M Luscombe 138*.

OTHER RECORDS: None known.

NOTES: Garden escape, perhaps not truly naturalized; requires an on-site inspection.

***Acacia lasiocalyx* CRP Andrews (silver wattle)**

NATURAL DISTRIBUTION: Coolgardie, Murchison, Avon Wheatbelt, Geraldton Sandplains, Jarrah Forest, Esperance Sandplains, Mallee IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Tuart/banksia woodland.

FIRST RECORD: Kings Park, 11 April 1973, *Selk 2266* (KPBG).

OTHER RECORDS: May Drive, Kings Park, *GJ Keighery 15357*.

NOTES: Planted as a feature at the end of the 'vista' in Kings Park in the 1960s. Seeds prolifically into adjacent bushland following fire; now largely eradicated.

***Acacia microbotrya* Benth. (manna wattle)**

NATURAL DISTRIBUTION: Murchison, Geraldton Sandplains, Avon Wheatbelt, Swan Coastal Plain, Jarrah Forest, Mallee, Esperance Sandplain IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Wet heath, tuart woodlands, banksia woodlands.

FIRST RECORD: Kings Park, *Selk 2357* (KPBG).

OTHER RECORDS: Collie River, Eaton, *G Keighery 14124*; Mundijong Road, Mundijong, *G Keighery 16271*; Point Walter Reserve, Melville, *G Keighery 17204*; Smyth Road Bushland, Nedlands, *G Keighery 17205*.

NOTES: Amenity plantings of this species have escaped in Kings Park (Bennett 1995). This species suckers strongly after fire, forming large clones.

***Acacia lasiocarpa* Benth. var. *lasiocarpa* (panjang)**

NATURAL DISTRIBUTION: Avon Wheatbelt, Geraldton Sandplains, Jarrah Forest, Swan Coastal Plain IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Disturbed *Melaleuca preissiana* low woodland and old railway embankment.

FIRST RECORD: Emma Treeby Reserve, Jandakot, *G Keighery 17980*.

OTHER RECORDS: None known.

NOTES: Introduced to Emma Treeby Reserve in the limestone fill for railway and roads through this naturally swampy area. *Acacia lasiocarpa* var. *bracteolata* Maslin occurs naturally in this area. The nominate variety occurs on calcareous sands and limestone outcrops near the coast.

***Acacia pulchella* R.Br. var. *pulchella* (prickly Moses)**

NATURAL DISTRIBUTION: Avon Wheatbelt, Geraldton Sandplains, Esperance Sandplains, Jarrah Forest, Swan Coastal Plain, Warren IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Jarrah woodland.

FIRST RECORD: Shenton Bushland, *KL Brown 287*.

OTHER RECORDS: Recorded as a weed from Kings Park by Barrett and Tay (2005), but no voucher seen.

NOTES: The normal taxon found in Shenton Bushland is *Acacia pulchella* var. *glaberrima* Meisn. This variety occupies well-drained sandy soils compared with the nominate variety, which occurs on heavier soils (laterites, loams, granite) or swamps in the Perth area, although the ranges overlap considerably. One of four species (*Acacia flagelliformis*, *Lechenaultia biloba* and *Dillwynia* aff. *cinerascens* [*GJ & BJ Keighery 562*]) introduced to Shenton bushland via laterite from the Perth Hills being used as road surfacing material. *Acacia pulchella* var. *glaberrima* and *Lechenaultia biloba* have spread, either clonally (*Lechenaultia*) or by seed (*Acacia*). *Acacia flagelliformis* and *Dillwynia* aff. *cinerascens* (*GJ & BJ Keighery 562*) have persisted with little evidence of spread.

***Albizia lebbek* (L.) Benth. (woman's tongue)**

NATURAL DISTRIBUTION: North Kimberley, Central Kimberley, Ord Victoria Plains IBRA Regions.

WEEDY DISTRIBUTION: Pilbara, Dampier Land IBRA Regions.

HABITATS: Invading creek lines in the Pilbara, spreading around the edges of Lake Kununurra and Lily Creek Lagoon in the Kimberley.

FIRST RECORD: Port Hedland, *ET Bailey 1-53*.

OTHER RECORDS: Dampier, *GJ & BJ Keighery 899*; Derby, *GJ Keighery 17503*.

NOTES: This species is naturalizing around many towns in the Kimberley and Pilbara where it has been extensively planted for shade. For example, it has been reported as spreading around Kununurra from non-local plantings (AN Start, pers. comm.), but no specimens from this area have been seen. The origin of *Bailey s.n.* is unknown, and it could represent cultivated or naturalized material. The form naturalized in the Pilbara and Kimberley is very different in appearance to plants from native Kimberley populations. Planted at Millstream Station in the early twentieth century and being eradicated (Anon. 2007).

***Paraserianthes lophantha* (Willd.) IC Nielsen subsp. *lophantha* (albizia)**

NATURAL DISTRIBUTION: Geraldton Sandplains, Swan Coastal Plain, Jarrah Forest, Warren, Esperance Sandplains IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Not recorded, but natural populations occur in wetlands and around granite rocks.

FIRST RECORD: Kings Park, no voucher seen.

OTHER RECORDS: None known.

NOTES: Recorded as a weed in Kings Park and Bold Park by Barrett and Tay (2005). A serious weed in Victoria and Tasmania in eastern Australia and in the Pacific Islands, South Africa, New Zealand and California.

MYRTACEAE

***Agonis flexuosa* (Willd.) Sweet var. *flexuosa* (peppermint)**

NATURAL DISTRIBUTION: Swan Coastal Plain, Jarrah Forest, Warren IBRA regions.

WEEDY DISTRIBUTION: Swan Coastal Plain, Jarrah Forest IBRA Regions.

HABITATS: *Banksia* low woodland with emergent tuart tall woodland in Kings Park, tuart tall woodland in Yanchep.

FIRST RECORD: Boomerang Walk, Kings Park, Perth, *GJ Keighery 16191*.

OTHER RECORDS: Yanchep National Park, *GJ Keighery 17015*; Lesmurdie Falls National Park, *GJ Keighery 17109*.

NOTES: In the Perth Metro area, the natural range is on the coastal Quindalup dunes and along the Swan River, between Fremantle and Claremont and north to Bold Park. Roadside plantings of this species were made in Kings Park in the 1930–40s and have subsequently spread widely into the bushland, especially after fires stimulated germination of seedlings. Currently being removed as part of the management plan for Kings Park.

***Callistemon phoenicus* F Muell. (lesser bottlebrush)**

NATURAL DISTRIBUTION: Pilbara, Murchison, Yalgoo, Coolgardie, Avon Wheatbelt, Geraldton Sandplains, Mallee, Jarrah Forest, Esperance Sandplains IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Wandoo, tuart/banksia woodland.

FIRST RECORD: Kings Park, Perth, *GJ Keighery 16402*.

OTHER RECORDS: Keighery and Keighery (2007) have recorded this species spreading from plantings in Middle Swan.

NOTES: Normally on or around winter-wet flats in the drier portions of this species' range, the capacity of this species to invade dry sites around Perth is surprising.

***Calothamnus chrysanthus* F Muell.**

NATURAL DISTRIBUTION: Carnarvon, Yalgoo, Avon Wheatbelt, Geraldton Sandplain IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Tuart/banksia woodland.

FIRST RECORD: Nature Trail, Kings Park, *GJ Keighery 16084*.

OTHER RECORDS: None known.

NOTES: Seeding and established in bushland in Kings Park, south-east of the DNA tower. Numbers of plants present at this site have increased dramatically over the past decade.

***Calothamnus graniticus* Hawkeswood subsp. *graniticus*.**

NATURAL DISTRIBUTION: Jarrah Forest IBRA Region.

WEEDY DISTRIBUTION: Swan Coastal Plain, Jarrah Forest IBRA Region.

HABITATS: Tuart/banksia woodland, road verges, jarrah woodland.

FIRST RECORD: 1 km north-east of Dwellingup, *GJ Keighery 13133*.

OTHER RECORDS: Kings Park, *GJ Keighery 16918*.

NOTES: Seeding and established along roadsides north of Dwellingup and in Kings Park. Possibility of hybridization exists between scarp (subsp. *leptophyllus* Hawkeswood) and Cape Naturaliste (subsp. *graniticus*) subspecies.

***Calothamnus quadrifidus* R. Br. subsp. *quadrifidus* (one-sided bottlebrush)**

NATURAL DISTRIBUTION: Carnarvon, Coolgardie, Geraldton Sandplains, Avon Wheatbelt, Jarrah Forest, Swan Coastal, Mallee and Esperance Sandplains IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Wandoo/Marri woodland, Banksia woodland.

FIRST RECORD: Opposite Onslow Road, Kings Park, *GJ Keighery 16360*.

OTHER RECORDS: Talbot Road Reserve, Shire of Swan, *G & B Keighery 573*.

NOTES: Friends of Koondoola Bushland in the City of Wanneroo have removed over 5000 seedlings of this species, originating from amenity plantings, from banksia woodland in Koondoola (Keighery & Keighery 2007). The species also has self-perpetuating populations in Kings Park and from roadside plantings. There is significant risk of hybridization between local and introduced forms of this species.

***Calothamnus quadrifidus* subsp. *homalophyllus* (F Muell.) AS George & N Gibson (Murchison clawflower)**

NATURAL DISTRIBUTION: Avon Wheatbelt, Geraldton Sandplain IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Tuart/banksia woodland.

FIRST RECORD: Kings Park, *G Keighery 16914*.

OTHER RECORDS: None known.

NOTES: Plantings of this subspecies have resulted in dense monocultures in Kings Park after seeding into tuart/banksia woodland. Hybrids have been formed between this species and *C. validus* (*G Keighery 16917*) in Kings Park (*Keighery & Keighery 2007*).

***Calothamnus quadrifidus* subsp. *teretifolius* AS George & N Gibson (ironstone clawflower)**

NATURAL DISTRIBUTION: Swan Coastal Plain IBRA Region.

WEEDY DISTRIBUTION: Swan Coastal Plain and Jarrah Forest IBRA Regions.

HABITATS: Jarrah /marri and banksia woodland.

FIRST RECORD: Gravel Pit, Evans Road, *RJ Cranfield 15704*.

OTHER RECORDS: Wonnerup East Road, *RJ Cranfield 17648*; 5 km north of Brockman Highway on Sues Road, *RJ Cranfield 17654*; Ambergate Regional Park, *RJ Cranfield 17676*.

NOTES: Plantings of this subspecies have occurred along main road verges (e.g. Sues Road), next to experimental arboreta and in gravel pits in many parts of the Blackwood Plateau. This gives an apparently much wider range and ecological amplitude to what is an extremely restricted ironstone endemic of the base and slopes of the Whicher Range.

***Calothamnus rupestris* Schauer (mouse ears)**

NATURAL DISTRIBUTION: Avon Wheatbelt, Swan Coastal Plain, Jarrah Forest IBRA Regions.

WEEDY DISTRIBUTION: Jarrah Forest IBRA Region.

HABITATS: Road verges, jarrah/bullich/blackbutt Forest.

FIRST RECORD: Ten Mile Dam, Bramley National Park, *G & B Keighery 996*.

OTHER RECORDS: None known.

NOTES: Naturalized from plantings along road verges and forming a dense monoculture, subsequently spreading downslope into adjacent bushland.

***Calothamnus validus* S Moore (Barrens clawflower)**

NATURAL DISTRIBUTION: Esperance IBRA Region.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Tuart/banksia woodland.

FIRST RECORD: Kings Park, *G Keighery 16916*.

OTHER RECORDS: None known.

NOTES: Naturalized from plantings and forming dense monocultures in Kings Park.

***Chamaelucium uncinatum* Schauer (Geraldton wax)**

NATURAL DISTRIBUTION: Swan Coastal Plain, Geraldton Sandplains IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain, Jarrah Forest and Avon IBRA Regions.

HABITATS: Banksia low woodland, tuart tall woodland, coastal heath.

FIRST RECORD: Wambyn Nature Reserve, west of York, *GJ Keighery & JJ Alford 16*.

OTHER RECORDS: Wannamal, *GJ Keighery 16105*; Blue Gum Lake, *K Brown 310*; Talbot Road Reserve, Shire of Swan *GJ Keighery 11831*; Wireless Hill, Applecross, *GJ Keighery 14292*; Bullsbrook Nature Reserve, *GJ Keighery 11831, 14414 & G Keighery & B Keighery 582*; Devil's Elbow, Peppermint Grove, *GJ Keighery 13088*; 1 km north of Quairading on Tammin Road, *GJ Keighery 15510*; Boomerang Walk, Kings Park, Perth, *GJ Keighery 15689*; Woodvale Nature Reserve, *GJ Keighery 15948*; Troy Avenue, Marmion, *GJ Keighery 16632*; Yanchep National Park Entrance, *GJ Keighery 13618*; Burleigh Park, Chittering, *GJ & BJKeighery 145*; Shenton Bushland, Nedlands, *GJ & BJKeighery 561*.

NOTES: The natural range of this species in the Perth region is on the coastal Quindalup dunes in the Perth Metropolitan area. Hybridization with local native forms is occurring in Bold Park (*Barrett et al. 1999*).

***Eucalyptus conferruminata* subsp. *recherche* D Nicolle & ME French (Bald Island marlock)**

NATURAL DISTRIBUTION: Esperance IBRA Region.

WEEDY DISTRIBUTION: Warren IBRA Region.

HABITATS: Karri forest, road verges.

FIRST RECORD: Forest Grove National Park, *GJ Keighery 16628*.

OTHER RECORDS: I have observed this species seeding around roadside plantings at Augusta.

NOTES: Recorded as probably naturalized in Cape Le Grande National Park (*Nicolle et al. 2008*); in this area the subspecies is confined to offshore islands. A possible voucher is *Wajon 184*.

***Eucalyptus eyrthrocorys* F Muell. (illyarrie)**

NATURAL DISTRIBUTION: Geraldton Sandplains IBRA Region.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Tuart/banksia woodland. Limestone shrubland.

FIRST RECORD: Mount Eliza, Kings Park, Perth, *GJ Keighery 16081*.

OTHER RECORDS: None known, listed as a weed in Kings Park by *Bennett (1995)*.

NOTES: Seeded into bushland along limestone scarp in Kings Park, now largely removed.

***Eucalyptus gomphocephala* DC (tuart)**

NATURAL DISTRIBUTION: Swan Coastal Plain IBRA Region.

WEEDY DISTRIBUTION: Geraldton Sandplains, Esperance Plain IBRA Regions.

HABITATS: Road verges, paddocks.

NOTES: This species is self-seeding from plantations at Geraldton and Esperance. It has persisted for many years at the old telegraph station at Eucla. It is also naturalising from plantations in Victoria (*Carr 1993*).

***Eucalyptus lane-poolei* Maiden (butter gum)**

NATURAL DISTRIBUTION: Geraldton Sandplains IBRA Region.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Tuart/banksia woodland.

FIRST RECORD: Listed as a weed in Kings Park by *Bennett (1995)* and *Barrett and Tay (2005)*.

OTHER RECORDS: None known.

NOTES: Bennett (1995) notes that *E. lane-polei* self-seeded in Kings Park but has since died out. The species is listed as present by Barrett and Tay (2005). A survey to establish whether this species is still present would be desirable.

***Eucalyptus megacornuta* CA Gardner (warty yate)**

NATURAL DISTRIBUTION: Esperance IBRA Region.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Tuart/banksia woodland.

FIRST RECORD: Kings Park Arboretum, 7 May 1972, *Selk 493* (KPBG).

OTHER RECORDS: None known.

NOTES: Listed as a weed in Kings Park by Barrett and Tay (2005). Invasion into bushland by this species at Kings Park is discussed by Ruthrof (2004).

***Eucalyptus utilis* Brooker & Hopper**

NATURAL DISTRIBUTION: Mallee, Esperance Plains IBRA Regions.

WEEDY DISTRIBUTION: Jarrah Forest, Swan Coastal Plain IBRA Region.

HABITATS: *Melaleuca lanceolata/Callitris preissii* woodland and coastal heath.

FIRST RECORD: Moses Rock, *GJ & BJ Keighery 1064*.

OTHER RECORDS: Longreach Point, Rottnest, *GJ. & BJ Keighery 1790*.

NOTES: Self-seeding from plantings, now spreading rapidly. This species has spread into coastal heath at Rottnest following a wildfire that caused mass germination of seed.

***Kunzea baxteri* (Klotzsch) Schauer**

NATURAL DISTRIBUTION: Esperance IBRA Region

WEEDY DISTRIBUTION: Swan Coastal Plain, Jarrah Forest, Esperance Sandplain IBRA Regions.

HABITATS: Heath, jarrah and wandoo woodland.

FIRST RECORD: Bluff Knoll, *GJ Keighery 12179*.

OTHER RECORDS: Walyunga National Park, *G Keighery 13060*; 5 km. north of Dwellingup, *G & B Keighery 543*; Waroona, *G & B Keighery 1041*.

NOTES: This species and the following species were planted as ornamental features around the car park at Bluff Knoll in the late 1960s. With subsequent fires and the opening up of surrounding heath through the effects of dieback, both species are spreading down-slope. Plantings of this species at the entrance to Walyunga National Park are also spreading into adjacent wandoo woodland, and large populations have also established in old gravel pits and mine sites north of Dwellingup, from rehabilitation and amenity plantings by Alcoa.

***Melaleuca diosmifolia* Andrews**

NATURAL DISTRIBUTION: Esperance, Jarrah Forest IBRA Regions.

WEEDY DISTRIBUTION: Esperance, Swan Coastal Plain IBRA Region.

HABITATS: Mallee heath.

FIRST RECORD: Bluff Knoll carpark, *G Keighery 12178*.

OTHER RECORDS: None known.

NOTES: Spreading from plantings (with *Kunzea baxteri*) into dieback-affected heath at Bluff Knoll. Collections of this weed have been cited as a newly-discovered population of this Priority 3 species (Thomson et al. 1993).

***Melaleuca lanceolata* Otto (Rottnest tea tree)**

NATURAL DISTRIBUTION: Coolgardie, Hampton, Murchison, Nullarbor, Avon Wheatbelt, Geraldton Sandplains, Mallee, Esperance Sandplains, Jarrah Forest, Swan Coastal Plain, Warren IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Tuart and banksia woodland.

FIRST RECORD: Boomerang Walk, Kings Park, Perth, *GJ Keighery 15687*.

OTHER RECORDS: None known.

NOTES: Plantings of this species have resulted in a dense monoculture in Kings Park in banksia woodland after fires have killed the adults and stimulated germination of seedlings. These dense stands have virtually no understorey species present in what is normally a species-rich open woodland.

This species has a number of poorly-defined morphological forms formerly treated as subspecies. If seed material from outside the Swan Coastal Plain was used in Kings Park, a non-local form could have been introduced.

***Melaleuca megacephala* F Muell.**

NATURAL DISTRIBUTION: Yalgoo, Geraldton Sandplains IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: *Banksia attenuata/B. menziesii* woodland.

FIRST RECORD: Reid Highway Bushland, Malaga, *GJ & BJ Keighery 1865*.

OTHER RECORDS: None known.

NOTES: Self-seeding from plantings, now spreading rapidly.

***Melaleuca nesophila* F Muell. (freeway melaleuca)**

NATURAL DISTRIBUTION: Esperance IBRA Region.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Banksia woodlands, sandy road verges.

FIRST RECORD: Old Two Rocks tip, *KC Richardson 28*.

OTHER RECORDS: None known.

NOTES: Spreading from plantings along many roads around Perth, especially along Morley Drive in Perth.

Melaleuca pentagona* Labill. var. *pentagona

NATURAL DISTRIBUTION: Esperance IBRA Region.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Tuart and banksia woodland.

FIRST RECORD: No voucher located.

OTHER RECORDS: None known.

NOTES: Listed as a weed in Kings Park by Bennett (1995) and Barrett and Tay (2005). I have recorded numerous seedlings around planted material and the species is apparently naturalising.

***Verticordia monadelpha* Turcz. var *monadelpha* (pink woolly featherflower)**

NATURAL DISTRIBUTION: Geraldton Sandplains, Avon Wheatbelt IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Banksia and tuart Woodland.

FIRST RECORD: Lovekin Drive, Kings Park, Perth, *GJ Keighery 16192*.

OTHER RECORDS: None known.

NOTES: Self-seeding in Kings Park from seed scattered in bushland as part of a 'beautification program' in the 1960s.

NYCTAGINACEAE***Boerhavia coccinea* Mill. (tar vine)**

NATURAL DISTRIBUTION: North Kimberley, Central Kimberley, Ord Victoria Plains, Dampier Land, Victoria Bonaparte, Carnarvon, Central Ranges, Gascoyne, Gibson Desert, Great Sandy Desert, Great Victoria Desert, Murchison, Pilbara, Tanami, Geraldton Sandplains IBRA Regions.

WEEDY DISTRIBUTION: Coolgardie, Avon Wheatbelt, Geraldton Sandplains IBRA Regions.

HABITATS: Road verges, paddocks and wasteland.

FIRST RECORD: Moora, *K. Dean s.n.*, April 1965.

OTHER RECORDS: Cunderdin, *G Keighery 7354*; Yandanooka, *A Carr 326*, *R. Soullier 452*; Mogumber, *BJ Lepschi & TR Lally BJL2478*; Green Hills Siding, *BJ Lepschi & TR Lally BJL342*; Wyalkatchem Railway Siding, *BJ Lepschi & SG Webster BJL3867*; Kalgoorlie, *G Barrett s.n.*, 3 May 1993.

NOTES: Spreading along transport corridors. Apparently native to islands and near-coastal areas south to Geraldton. Early collection by weed scientist from Moora, then Cunderdin in 1985 and the rest late 1990s.

***Boerhavia schomburkiana* Oliv.**

NATIVE DISTRIBUTION: North Kimberley, Central Kimberley, Dampier Land, Victoria Bonaparte, Carnarvon, Central Ranges, Murchison, Pilbara IBRA Regions.

WEEDY DISTRIBUTION: Avon Wheatbelt, Geraldton Sandplains IBRA Regions.

HABITATS: Riverine banks, wetlands, paddocks, road verges.

FIRST RECORD: Northam, *CV Cailles s.n.*, November 1952.

OTHER RECORDS: Northam Blades Brook, York, *JW Green 4968*; Avon River Bank, York, *G Keighery 7356*; Maiseys Wetland, Dowerin, *G Keighery 12262*; Jingemina Hill, Watheroo National Park, *G Keighery 15929*; Gwambygine Pool, York, *C Howell 271*.

NOTES: Spreading along transport corridors (railways and roadsides).

NYMPHACEAE***Nymphaea macrosperma* Merr. & LM Perry (water lily)**

NATIVE DISTRIBUTION: North Kimberley, Victoria Bonaparte IBRA Regions.

WEEDY DISTRIBUTION: Pilbara IBRA Region.

HABITATS: Riverine pools.

FIRST RECORD: Crystal Pool, *RF Black, s.n.*, 5 Sept. 1974.

OTHER RECORDS: Chinderwariner Pool, Millstream, *C Olsson 61*; Millstream, *K Vollprecht s.n.*, no date.

NOTES: Introduced as an ornamental, probably from overseas stock.

PITTOSPORACEAE***Pittosporum angustifolium* Lodd. (weeping pittosporum)**

NATIVE DISTRIBUTION: Ord Victoria Plain, Carnarvon, Central Ranges, Gascoyne, Gibson Desert, Great Victoria Desert, Nullarbor, Murchison, Pilbara, Tanami, Yalgoo, Coolgardie, Geraldton Sandplains, Avon Wheatbelt, Mallee, Esperance Sandplains, Swan Coastal Plain IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Tuart/banksia woodland.

FIRST RECORD: Woodvale Nature Reserve, *G Keighery 16270 & 16430*.

OTHER RECORDS: None known.

NOTES: Self-seeding into tuart/banksia woodland at Woodvale Nature Reserve from plantings.

PORTULACACEAE***Portulaca oleracea* L. (purslane)**

NATURAL DISTRIBUTION: North Kimberley, Ord Bonaparte, Ord Victoria Plains, Central Kimberley, Dampier Land, Tanami, Little Sandy Desert, Great Sandy Desert, Central Ranges, Pilbara, Carnarvon, Ashburton, Murchison IBRA Regions.

WEEDY DISTRIBUTION: Victoria Bonaparte, Dampier Land, Avon Wheatbelt, Esperance Sandplains, Geraldton Sandplains, Mallee, Swan Coastal Plain IBRA Regions.

HABITATS: Road verges, vacant lots, gardens.

FIRST RECORD: Gardner (1925) treated southern plants of this species as introduced. In southern Western Australia, this species is always found in 'weedy' habitats, unlike northern (tropical) occurrences which are mostly in natural habitats.

OTHER RECORDS: Northampton, *IB Shepherd 212*; 6.6 km south of Mogumber, *R Davies 2970*; Scarborough, *JF Smith 76*; Brixton Regional Park, *G Keighery 15933*; Lake Ngartiminy, *R Cranfield 22563*; 50 km north-east of Hyden, *JM Plint 328*; One mile east of Ravensthorpe, *E Tink 575 & 577*; 3 km north-west of One Arm Point, *BJ Carter 1168*; Disused tip north of meat works, *AA Mitchell 2144*.

NOTES: Bean (2007) lists this species as alien; however, Danin et al. (1978, pp. 177 and 201) in their worldwide review of this species noted, 'In Australia there is a high diversity of forms which differ from those in all other parts of the world' and, 'Most specimens that we have seen from different parts of Australia and New Zealand do not agree with our description of the subspecies from other parts of the world', which hardly fits an alien taxa. Native to tropical and arid Western Australia. Weedy form in temperate Western Australia and a few towns in the tropical north.

PROTEACEAE***Banksia undata* Endl. AR Mast & KR Theile var. *undata***

NATURAL DISTRIBUTION: Jarrah Forest IBRA Region.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: sandy jarrah-marri woodland.

FIRST RECORD: Shenton Park Bushland, *G & B Keighery 1793*.

OTHER RECORDS: None known.

NOTES: Initial introduction via garden plantings around buildings, subsequently self-seeding into adjacent wetland. Previously known as *Dryandra praemorsa* var. *praemorsa*.

***Conospermum huegellii* Endl.**

NATURAL DISTRIBUTION: Swan Coastal Plain, Jarrah Forest IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: sandy swamps.

FIRST RECORD: Emma Treeby Reserve, Jandakot, *G Keighery 16006*.

OTHER RECORDS: None known.

NOTES: Initial introduction via railroad works or by rail traffic; subsequently self-seeding into adjacent wetland. Normally found on alluvial or shallow granite soils along the Darling Escarpment.

***Grevillea curviloba* McGill. subsp. *curviloba* (grevillea)**

NATIVE DISTRIBUTION: Swan Coastal Plain IBRA Region.

WEEDY DISTRIBUTION: Swan Coastal Plain, Jarrah Forest IBRA Regions.

HABITATS: Drainage sumps and road verges

FIRST RECORD: Burley Park Reserve, Bullsbrook, *G & B Keighery 146*.

NOTES: This extremely localized and rare subspecies has been widely used as a roadside planting throughout the Perth area and is now seeding around Perth from these old plantings.

***Grevillea leucopteris* Meisn. (white plume grevillea)**

NATIVE DISTRIBUTION: Avon Wheatbelt, Geraldton Sandplains, Swan Coastal Plain IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Drainage sumps and road verges.

FIRST RECORD: Gill Charwell Reserve, Boronia Road, *G Keighery 12280*.

NOTES: Populations self-seeding around Perth from old plantings.

***Grevillea rosieri* McGill.**

NATIVE DISTRIBUTION: Avon Wheatbelt, Geraldton Sandplains, Swan Coastal Plain IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Road verges.

FIRST RECORD: 1.4 km along Offer Road from Henty road, Burekup, *G & B Keighery 150*.

NOTES: Populations self-seeding around Burekup from old plantings.

***Hakea bucculenta* hybrids CA Gardner (red pokers)**

NATURAL DISTRIBUTION: Carnarvon, Yalgoo, Geraldton Sandplains, Swan Coastal Plain IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Wandoo/powderbark wandoo woodlands.

FIRST RECORD: Dryandra State Forest, *G Keighery 12746*.

OTHER RECORDS: None known.

NOTES: Hybrid swarm of *Hakea bucculenta* ? *multilineata* invading wandoo and powderbark wandoo woodlands at Dryandra.

***Hakea multilineata* Meisn. (grass leaf hakea)**

NATURAL DISTRIBUTION: Coolgardie, Jarrah Forest, Avon Wheatbelt, Esperance Sandplains, Mallee IBRA Regions.

WEEDY DISTRIBUTION: Jarrah Forest IBRA Region.

HABITATS: Wandoo/powderbark wandoo woodlands.

FIRST RECORD: Dryandra, *G Keighery 12280*.

OTHER RECORDS: None known, but I have recently observed self-seeding in plantings in the Perth Hills.

NOTES: This and the previous species were planted in the arboretum at Dryandra and have self-seeded after fires, invading wandoo and powderbark wandoo woodlands at Dryandra.

***Hakea costata* Meisn. (ribbed hakea)**

NATURAL DISTRIBUTION: Jarrah Forest, Swan Coastal Plain IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Tuart/banksia woodland.

FIRST RECORD: Kings Park, *G Keighery 16083*.

OTHER RECORDS: Listed as a weed in Kings Park by Bennett (1995).

NOTES: This species was planted along the nature trail in Kings Park. It slowly spread over the past 30 years until a fire caused massive seed fall and germination, creating a monoculture of this species over several 100 m² with over 1000 mature plants.

***Hakea laurina* R. Br. (pincushion hakea)**

NATURAL DISTRIBUTION: Avon Wheatbelt, Esperance Sandplains, Mallee IBRA Regions.

WEEDY DISTRIBUTION: Jarrah Forest, Swan Coastal Plain IBRA Region.

HABITATS: Jarrah woodland.

FIRST RECORD: Lesmurdie, *J Gathe 21*.

OTHER RECORDS: 3 km east of Porongurup, *G & B Keighery 384*; Waroona, *G & B Keighery 1039*.

NOTES: Widely planted and beginning to naturalise widely; potentially a serious weed. A weed in eastern Australia (Carr 1993).

***Hakea pycnoneura* Meisn.**

NATURAL DISTRIBUTION: Yalgoo, Avon Wheatbelt, Esperance Sandplains, Geraldton Sandplains, Mallee IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Tuart/banksia woodland.

FIRST RECORD: Kings Park, *G Keighery 14028*.

OTHER RECORDS: Listed as a weed in Kings Park by Barrett and Tay (2005).

NOTES: Self-seeding in Kings Park plantings at the Arthur Fairall Playground in 1970, over 168 mature plants are now located in mixed tuart/banksia woodland after fire.

Hakea recurva* Meisn. subsp. *recurva

NATURAL DISTRIBUTION: Carnarvon, Murchison, Yalgoo, Geraldton Sandplain, Avon Wheatbelt, Coolgardie IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: *Banksia attenuata*/*B. menziesii* woodland.

FIRST RECORD: Reid Highway Bushland, Malaga, *GJ & BJ Keighery 1866*.

OTHER RECORDS: None known.

NOTES: Self-seeding from roadside plantings; now spreading rapidly.

RUTACEAE***Diplolaena dampieri* Desf. (southern diplolaena)**

NATURAL DISTRIBUTION: Warren, Jarrah Forest, Swan Coastal Plain IBRA Regions.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Tuart/banksia woodland.

FIRST RECORD: Woodvale Nature Reserve, *GJ Keighery 14389*.

OTHER RECORDS: None known.

NOTES: Self-seeded into banksia woodland at Woodvale Nature Reserve from plantings; now spreading rapidly. Northern end of natural range ends at Rockingham.

SAPINDACEAE***Diplopeltis petiolaris* Benth.**

NATURAL DISTRIBUTION: Geraldton Sandplains IBRA Region.

WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region.

HABITATS: Banksia low woodland.

FIRST RECORD: Marmion Bushland, Perth, *GJ Keighery 16634*.

OTHER RECORDS: None known.

NOTES: The substantial population of this species recorded at Marmion Bushland is either a large range disjunction (from near Dongara) or more likely a naturalized population from previous plantings at the nearby closed CSIRO Marine Research Laboratories.

SOLANACEAE***Solanum hoplopetalum* Bitter & Summerh. (thorny solanum)**

NATURAL DISTRIBUTION: Murchison, Yalgoo, Nullarbor, Geraldton Sandplains, and possibly Coolgardie, Avon Wheatbelt, Mallee IBRA Regions

WEEDY DISTRIBUTION: Geraldton Sandplains, Avon Wheatbelt, Swan Coastal Plain, Jarrah Forest, Esperance Sandplains, Mallee IBRA Regions.

HABITATS: At least 75 records in PERTH note road verges, paddocks, tracks, gravel pits as the habitat; few record this species in undisturbed bushland. The only records for the lower south-west (Swan Coastal Plain and Jarrah Forest) are entirely from road and rail verges.

FIRST RECORD: No locality (probably Narrogin), Narrogin Road Board s.n., 1 March 1923.

OTHER RECORDS: Selection from naturalized range: Riverside, Ajana, *D Porter 75*; Petrudor Rock Reserve, *M Hislop 1884*; 5.2 km north of Boyup Brook, *R Davis 4597*; 6 km north of Bullsbrook, *B Lepschi & T Lally 3332*; 2.5 km east of Kulin, Murray 488, Hopetoun Road, *E Tink 469*.

NOTES: Expanding along transport corridors. Lepschi (1996) notes that the natural range of *Solanum hoplopetalum* was arid and semi-arid Western Australia, and probably extended to parts of the Avon Wheatbelt and Mallee IBRA Regions. He did not consider that the species was native to Geraldton Sandplains, Swan Coastal Plain, Jarrah Forest or Esperance Sandplains IBRA Regions.

***Solanum lasiophyllum* Dunal ex Poir. (flannel bush)**

NATURAL DISTRIBUTION: Ord Victoria Plains, Great Sandy Desert, Little Sandy Desert, Gibson Desert, Central Ranges, Pilbara, Ashburton, Carnarvon, Murchison, Yalgoo, Nullarbor IBRA Regions, and possibly Geraldton Sandplains, Coolgardie, Avon Wheatbelt, Mallee IBRA Regions

WEEDY DISTRIBUTION: Geraldton Sandplains, Avon Wheatbelt, Swan Coastal Plain, Jarrah Forest, Mallee IBRA Regions.

HABITATS: Nearly all records from the weedy area of the species' range are from road verges or paddocks.

FIRST RECORD: Gingin, *CA Gardner 550*.

OTHER RECORDS: Selection from naturalized range: 23 km south-west of Wongan Hills, *B Lepschi & T Lally 2637*; 5 km north of Harvey, *G Keighery 16033*; 10 km east of Kulin, *AO Quicke 83*.

NOTES: B. Lepschi (pers. comm., 2012) noted that the natural range of *Solanum lasiophyllum* is likely to be similar to that of *S. hoplopetalum* but extends further south; naturalized populations are found from Jurien Bay south to Busselton.

APPENDIX 2

Doubtfully naturalized taxa.

ASTERACEAE

***Rhodanthe chlorocephala* subsp. *rosea* (Hook.) Paul G Wilson**

This taxon is commonly planted along road verges; however, like many planted or casually naturalized annuals it may not persist. It is, however, recorded as naturalized in Kings Park by Bennett (1995), but no voucher has been seen. There was also a record from Kensington Bushland (*BJ Lepschi & MH Brims 1944*) in 1995. Given the increasing use of this species in roadside plantings further records could be expected.

CASUARINACEAE

***Allocasuarina campestris* (Diels) LAS Johnson**

Collected from Kings Park in 1972 (*Selk 1887* [KPBG]), and recorded as 'established in bushland' on the specimen labels, but not recorded by Bennett (1995) or Barrett and Tay (2005). Presumably this taxon has not persisted at this site.

MYRTACEAE

***Beaufortia elegans* Schauer**

Collected from Kings Park in 1972 (*Selk 1889* [KPBG]), and on the specimen label recorded as 'established in bushland' on specimen labels, but not recorded by Bennett (1995) or Barrett and Tay (2005). Presumably this taxon has not persisted at this site.

***Eremaea fimbriata* Lindl.**

Collected from Kings Park in 1972 (*Selk 1888* [KPBG]), and on the specimen label recorded as 'established in bushland', but not recorded by Bennett (1995) or Barrett and Tay (2005). Presumably this taxon has not persisted at this site.

***Eucalyptus todtiana* F Muell.**

Bennett (1995) records this species as persisting in Kings Park from original plantings. I am uncertain if this species has naturalized or is merely persisting at this site, as I have not seen any evidence of naturalized populations and the species is not mentioned in Barrett and Tay (2005).

***Melaleuca calothamnoides* F Muell.**

Naturalized (adventive) from plantings in bushland at Kings Park (*G & B Keighery 203*).

POACEAE

***Heteropogon contortus* (L.) P Beauv. ex Roem. & Schult.**

This species (*G Keighery 16299*) was introduced by vehicles into Woodvale Nature Reserve during the past five years. Plants of *Heteropogon* were subsequently eliminated.

RUTACEAE

***Diplolaena angustifolia* Hook.**

Naturalized (adventive) from plantings in bushland at Kings Park (*G Keighery 17136*). Currently only a few plants are present.

APPENDIX 3

Problematic species (naturally weedy taxa, native weeds of agriculture, range expanders and species with unclear native status) requiring further study.

Determining the natural and non-natural ranges of native taxa with weedy tendencies is difficult, and there are still several major issues to resolve, including:

1. *Native species that are naturally weedy, with unknown or poorly understood natural ranges*

These include many wetland species such as *Azolla filiculoides* Lam. and *A. pinnata* R. Br. (Azollaceae). Both of these ferns are native species but occur readily in man-made habitats (dams, ponds, etc.), and they are now rarely encountered in the wild. There seems no doubt that their current range does not reflect their natural range, and it is likely that the second species is an introduction into Western Australia, since the only known record is from an urban artificial wetland. Also in this category are *Bolboschoenus caldwellii* (V Cook) Sojak (Cyperaceae), *Epaltes australis* (Asteraceae), *Glinus lotoides* (Molluginaceae), *Gratiola pubescens* R. Br. (Plantaginaceae), *Lemna disperma* Hegelm. (Araceae), *Ottelia ovalifolia* (R. Br.) Rich. (Hydrocharitaceae) and several *Ruppia* (Ruppiales) species.

2. *Native species that are expanding their ranges as suitable habitats occur*

The perennial form of *Ptilotus polystachyus* (Gaudich.) F Muell. (Amaranthaceae) is a common weed of old paddocks and road verges. It has become more frequent in many reserves on the Swan Coastal Plain over the past 20 years. This species is probably expanding its range into the higher rainfall areas of southern Western Australia. It is dispersing naturally via wind, road works (e.g. grading) and vehicle traffic.

Wheeler et al. (1992, p. 856) noted that *Josephinia eugeniae* F Muell. (Pedaliaceae) is native to the Kimberley, Pilbara, Ashburton, Carnarvon and Murchison but 'introduced further south to near Mullewa and Cue.' However, there is currently little disjunction between the southern and northern limits of this species' range in the pastoral region, except for a single record at Canna in the agricultural zone.

3. *Native species that are agricultural weeds within their native ranges*

Podotheca gnaphaloides Graham (Asteraceae) is very common in poorly managed pastures on the Swan Coastal Plain, *Vittadinia australisica* (Turcz.) NT Burb. (Asteraceae) is an occasionally abundant paddock weed in the northern wheatbelt, and *Muehlenbeckia adpressa* (Labill.) Meisn. (Polygonaceae) is a weed of neglected pastures in the southern wheatbelt (Hussey et al. 2007). These agricultural weeds are not treated further in this paper.

4. *Species whose status as naturalized or native is unresolved*

ASTERACEAE

Cotula coronopifolia L.

There has been considerable discussion about the status of this species (e.g., see Romanowski 1994, 1995 and Heyligers 1995). Currently, Bean (2007) and Thompson (2007) regard the species as introduced from South Africa; however, distinct fresh and brackish ecotypes occur in Western Australia, suggesting the situation is more complex. Romanowski (2011) also noted that there is a Holocene pollen record for this species that indicates its long-term presence in Australia.

Helichrysum luteoalbum (L.) Rchb.

Variouly treated as native (Walsh & Entwisle 1999) or introduced (Lazarides et al. 1997) in Australia, but within Western Australia this species behaves as a weed, at least in the southern part of the state. For example, it has invaded Woodvale Reserve over the past 10 years, having never been previously recorded.

Senecio condylus I Thomps.

This species is a common roadside weed, especially along freeways around Perth. It has never been recorded in undisturbed bushland. This newly described species (Thompson 2005) may prove to be an introduction into Western Australia.

CHENOPODIACEAE

Salsola tragus L.

Rilke (1999) and Bean (2007) regard this species as alien. However, recent genetic data (Borger et al. 2008) shows that the Western Australian populations are native and should be regarded as *S. australis* R. Br. (Chinnock 2010).

JUNCACEAE

Juncus bufonius L.

Bean (2007) listed this species as alien, because it is remote from its presumed native range and it is weedy in Australia. However, Kirschner (2002) showed that the distribution of *J. bufonius* is less disjunct compared to its weedy segregate *J. hybridus* Brot. and noted that distinct forms are found in Australia.

5. *Pantropical weedy species*

Wheeler et al. (1992) listed 21 species for which native or naturalized status is equivocal. These are listed here with additional comments:

- *Aeschynomene indica* L. (Fabaceae). Pantropical.
- *Ammannia auriculata* Willd. (Lythraceae). Weed, introduced from tropical Asia, (native to tropical Africa, America and Asia) with rice crops.
- *Brachyachne ambigua* Ohwi (Poaceae). Although listed as a native in the Flora of the Kimberley, collections are noted as a town weed in Wyndham.
- *Canavalia ensiformis* (L.) DC. (Fabaceae). Native to tropical America, often not listed as a weed, for example Lazarides et al. (1997).
- *Cyanthillium cinereum* (L.) H Rob. (Asteraceae). Pantropical weed.
- *Cyperus brevifolius* (Rottb.) Hassk. (Cyperaceae). Naturalized or possibly native to the Kimberley Region.
- *Echinochloa elliptica* PW Michael & Vickery (Poaceae). A native species, frequently a weed of rice crops.
- *Hedyotis corymbosa* (L.) Lam. (Rubiaceae). Collected once from disturbed ground, probably introduced.
- *Ipomoea aquatica* Forssk. (Convolvulaceae). Pantropical, treated as native to Queensland and the Northern Territory though perhaps introduced to Western Australia.
- *Herissantia crista* (L.) Brizicky (Malvaceae). Pantropical weed, possibly native to tropical America;
- *Indigofera glandulosa* JC Wendl. (Fabaceae). Probably introduced from India.
- *Mnesithea granularis* (L.) de Koning & Sosef (Poaceae). Pantropical.

- *Panicum trichoides* Sw. (Poaceae). Treated by Wheeler et al. (1992) as possibly introduced to Australia, and by Webster (1987) as doubtfully native to Australia. Native to tropical America and Asia, introduced to tropical Africa.
- *Paspalum scrobiculatum* L. (Poaceae). Webster (1987) listed this as native, but as part of the *P. longifolium* Roxb. complex which is itself listed as a weed by Webster, though often listed as native and as such in the Australian Virtual Herbarium.
- *Phyllanthus amarus* Schumach. & Thonn. (Phyllanthaceae). Pantropical weed, native to tropical America;
- *Phyllanthus* sp. A [= *Phyllanthus lacerosus* Airy Shaw] (Phyllanthaceae). Native taxon, occurring in Western Australia, Northern Territory, Queensland and New South Wales.
- *Sporobolus* sp. A [= *Sporobolus blakei* De Nardi ex BK Simon] (Poaceae). Currently treated as native to Australia in Australian Virtual Herbarium.
- *Tribulus cistoides* L. (Zygophyllaceae). Pantropical weed.
- *Triumfetta* sp. C [= *T. pentandra* A Rich.] (Malvaceae). May be naturalized.
- *Urochloa reptans* (L.) Stapf. (Poaceae). Status uncertain. Webster (1987) listed this as doubtfully native to Australia.
- *Urochloa subquadriparia* (Trin.) RD Webster (Poaceae). Status uncertain. Webster (1987) listed this as introduced to Australia.

6. Eastern Australian-centred taxa

There are several species whose ranges are centred on eastern Australian that are currently considered introduced into Western Australia. *Acaena echinata* Nees (Rosaceae) was considered introduced by Orchard (1969), but is now regarded as native. *Acaena ovina* A Cunn. could also be considered as a native species, as there is no evidence that this taxon is introduced to Western Australia. *Acacia paradoxa* DC. (Fabaceae) appears to behave as a native species around Albany, but is naturally weedy and probably introduced to many sites outside this area. Both of these species should be subject to further taxonomic/genetic studies, and all of the above taxa require careful study to resolve the issues discussed.