SHORT COMMUNICATION

On the ecology, distribution and conservation status of *Vittadinia blackii* (Asteraceae) in Australia

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***Abstract*:** Distribution records of *Vittadinia blackii* (family Asteraceae) across southern Australia show the species has a strong and moderately common presence across a broad range of climate zones and sites in South Australia, but a much more restricted occurrence in other mainland state's. Using the IUCN criteria, adopted by the separate state regulatory authorities vested with listing threatened species, *Vittadinia blackii* is considered to be not threatened in South Australia, but endangered in Western Australia, Victoria and New South Wales.

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Introduction

Vittadinia blackii N. Burb. (family Asteraceae) is a compact perennial sub-shrub growing to approximately 20–40cm high (Burbidge 1969) (Figure 1). It is readily distinguishable in the field from other taxa within the genus by its narrow, dark green grooved leaves (the only species with similar leaf type – *Vittadinia muelleri* – occurs in the dry sub-humid climates of Tasmania and the eastern Australian mainland from East Gippsland in Victoria through New South Wales into southern Queensland, with no over-lapping range with *Vittadinia blackii*). South Australia is the stronghold for *Vittadinia blackii* in southern Australia, but the species occurs across differing climatic zones with major disjunctions between populations in other states, particularly Western Australia. This paper assumes the taxonomy for *Vittadinia blackii* is not in question. Here the ecology and distribution of *Vittadinia blackii* and its current conservation status across four states is discussed.

Ecology of *Vittadinia*

With the exception of *Vittadinia australis* and *Vittadinia simulans* (which occur in New Zealand and New Caledonia respectively), *Vittadinia* is primarily an Australian genus. It comprises two sub-genera *Vittadinia* and *Peripleura* containing 20 and 9 species respectively, mostly restricted to southern and central Australia (Burbidge 1982). Two other closely related genera, *Eurybiopsis* and *Camptacra,* are found in northern Australia (Burbidge 1982). Detailed accounts of the ecology and/or seed biology of representatives of the genus are restricted to *Vittadinia muelleri* (Willis & Groves 1991; Trémont 1995) and *Vittadinia cuneata* (Facelli *et al.* 2005). In a study of the phenology of six understorey herbs

Fig.1. *Vittadinia blackii* growing on a mine rehabilitation site 40 km west of Pooncarie (far southwest New South Wales). Photograph Ian Sluiter 06/05/2010.

and short-lived perennials from a derived native grassland on the New South Wales Northern Tablelands (Trémont 1995), *Vittadinia muelleri* was found to initiate growth in the coldest months of the year (July) and to commence flowering in late October and fruiting in December with release of fruit maintained in some plants until May–June of the following year. Willis and Groves (1991) found *Vittadinia muelleri* exhibited a wide germination tolerance to varying light and temperature regimes, but noted that cold stratification also promoted germination.

Facelli *et al.* (2005) studied the ability of *Vittadinia cuneata* and four other taxa to persist in the soil seed store of an arid rangeland dominated *Acacia papyrocarpa* with an understorey of *Maireana sedifolia* and *Atriplex vesicaria. Vittadinia cuneata* was found to have 70% of seed still present after two years of burial within the soil, a result comparable with three of the other indigenous taxa studied. The studied concluded that most annual and short-lived perennial ground flora taxa in this southern Australian arid rangeland property were obligate winter annuals (Baskin & Baskin 1993) having mechanisms that prevented germination during the hottest months even when summer rainfall maybe plentiful; a strategy apparently deployed to avoid the inherent risk of desiccation after summer rainfall when water may evaporate too quickly for survival and effective plant growth (Facelli *et al.* 2005).

At the risk of applying broad brush ecology across other members of the genus *Vittadinia*, the published accounts of winter–spring emergence and growth, and persistent summer flowering and autumn fruiting are in accordance with the author's observations of other *Vittadinia* species including *Vittadinia cervicularis, V. dissecta, V. gracilis, V. cuneata, V. australasica, V. sulcata* and *V. pterochaeta* from semi-arid areas of northwest Victoria and southwest New South Wales.

There are no specific published accounts of the ecology of *Vittadinia blackii*. Notes on herbarium records suggest the species occurs across a wide variety of habitats including fire-prone mallee and hummock grass habitats, to woodland types with sandy soils and skeletal soil types that seldom burn. Jessop and Toelken (1986) suggest *Vittadinia blackii* grows "in woodland, mallee and cleared land on clay or limestone" in South Australia. In the Flinders Ranges, collector's notes also suggest a preference for rocky hillsides. Collection notes from a number of records from the Western Australian sites in the early 1990s indicate a preference for red, sandy clay loam soils, sometimes in depressions or associated with *Triodia* sp. (Hummock Grass) or *Eucalyptus salubris* (Gimlet). In western Victoria, collections from Wail were from a *Allocasuarina leuhmannii* (Buloke) – *Eucalyptus leucoxylon* (Yellow Gum) Woodland and at Pine Plains from *Callitris gracilis* subsp. *murrayensis* (Pine) – *Allocasuarina leuhmannii* Buloke Woodland. The remaining subpopulation in Victoria, in Bronzewing Flora and Fauna Reserve, was from a sandy swale under mallee. In New South Wales, the site 80 km northwest of Balranald was from mallee, and the site at Round Hill Nature Reserve is likely to be mallee. At a recently discovered site at the Ginkgo Mine 40 km west of Pooncarie, *Vittadinia blackii* was found growing in a mining rehabilitation site where soil was stripped from remnant vegetation containing primarily *Casuarina pauper* (Belah) – *Alectryon oleifolius* subsp. *canescens* (Rosewood) Woodland.

Table 1: Number of herbarium specimens of *Vittadinia blackii* held by Australian herbaria, sorted by State of collection (some herbaria may hold duplicates)

Herbarium	WA	SA	NSW	VIC
State Herbarium of South Australia	1	148	2	1
Western Australian Herbarium	2			
National Herbarium Melbourne	8	15	2	4
National Herbarium Sydney		6	2	
National Herbarium Canberra	1	3	1	
Canberra Botanic Gardens		3		
Tasmanian Herbarium		2		
TOTAL	12	177	7	5

Distribution and conservation status of *Vittadinia blackii*

The conservation status of plant taxa occurring at the state or regional level follow the criteria outlined in IUCN (2001). Terms such as population and subpopulation follow definitions as outlined in that publication. The IUCN conservation status categories and criteria for listing, have, by-and-large received universal acceptance amongst Australian state conservation agencies vested with assigning conservation status and, hence, have been adopted in this paper. The distribution and extent of a species is an important component in assessing conservation status.

South Australia is the stronghold for *Vittadinia blackii* in southern Australia, with the majority of Herbarium collections (Figure 2, Table1); the species is not considered as rare or threatened in that State but in the adjoining southern mainland states, the distribution of the species is widespread but more sporadic, and the conservation status is less clear.

South Australia

Vittadinia blackii occurs at a wide range of locations in semi-arid to sub-humid areas across South Australia from areas with less than 200 mm rainfall up to 400–500 mm per.annum (Figure 3). There are even occasional occurrences in the Adelaide Hills where 800–1,000 mm of rainfall per annum is received. The majority of South Australian collections, come from the Flinders-Olary Block Bioregion and the Yorke Peninsula part of the Eyre-Yorke Block Bioregion, with fewer from the Murray-Darling Depression Bioregion

and nearby bioregions. Occasional outliers near Lake Eyre South, Ceduna and the Lower Southeast of South Australia point to a distribution across arid, semi-arid and temperate (sub-humid) parts of the State. *Vittadinia blackii* is not listed as either rare or threatened in that State, and would not satisfy any of the IUCN criteria required for listing.

Western Australia

All known records of *Vittadinia blackii* in Western Australia occur over approximately 4,000 km² spread between Cape Arid National Park in the south, north to the Dundas Nature Reserve and west to Mt. Buraminya (except for an 1881 record from 3 km east-south-east of Eucla near the South Australian Border) (Table 2). Indeed all the records collected between 1990 and 2006 have come from a smaller (10 x 25 km = 250 km²) area 140 km northeast of Esperance, midway between the northwest corner of Cape Arid National Park and the southern edge of the Dundas Nature Reserve, near Mt. Buraminya. Notwithstanding relatively recent (1990–1992) collection notes by W. Archer, indicating the plant is common at collection sites within

Table 2: Herbarium specimens and records of *Vittadinia blackii* from southern Australian mainland states other than South Australia.

Herbarium No.	Locality	Lat.	Long.	Collector	Year	Notes
WESTERN AUSTRALIA						
See 'Notes'	~140km northeast of Esperance	32° 59'	123° 20'	Archer, W.R.	1990–1992	Five collections at MEL (MEL2018571A to MEL2018575A) and one at AD (AD99407177) and CANB (CANB471127) all by W.R. Archer between 1990 and 1992 from an area approximately 140km northeast of Esperance.
PERTH07517831	~140km northeast of Esperance	33° 10'	123° 20'	Edinger, D.J.	2006	
MEL1004481A	~140km northeast of Esperance	33° 27'	123° 28'	Brooks, S.	?pre 1900	
MEL30012A	~170 km east of Norseman	32° 00'	123° 25'	Brooks, S.	1886	
MEL1004514A	3 km east-south-east of Eucla	31° 43'	128° 52'	Oliver, J.	1881	
VICTORIA						
MEL2100277A	Wail State Forest,	36° 30'	142° 04'	Goods, M	2000	Growing in sandy clay loam with Buloke (*Allocasuarina luehmannii*) and Yellow Gum (*Eucalyptus leucoxylon*).
S01207 – FIS	Wail State Forest	36° 30'	142° 05'	Dickens, M.J.	2000	
MEL2328634A	Bronzewing Flora & Fauna Res.	35° 12'	142° 21'	Macfarlane, J.N.	2007	In open sandy swale under mallee.
MEL30017A	Pine Plains, Wyperfeld N.P.	35° 25'	141° 55'	Dallachy, J.	pre 1900	
M31430 – FIS	Pine Plains, Wyperfeld N.P.	35° 21'	141° 57'	Jaensch, S.	1993	Growing in a Pine (*Callitris gracilis* ssp. *murrayensis*) and Buloke (*Allocasuarina luehmannii*) Woodland
S23288 – FIS	Pine Plains, Wyperfeld N.P.	35° 24'	141° 55'	Beauglehole, A.C.	1986	
IH0480 – FIS	Pine Plains, Wyperfeld N.P.	35° 28'	141° 57'	Cheal, D.C.	1985	
MEL30010A	Near the Victorian and South Australian Border			Mueller, F.	pre 1900	
NEW SOUTH WALES						
NSW863000	Ginkgo Mineral Sands Mine ~40 km west of Pooncarie	33° 21'	142° 13'	Sluiter, I.R.K.	2010	Growing in minesite rehabilitation along with Bladder Saltbush (*Atriplex vesicaria*) and Bluebush (*Maireana* spp) species
NSW419518	Round Hill Nature Reserve	33° 05'	146° 21'	Hager, T.	1994	Linear *Vittadinia*
NSW573848	80km NW of Balranald	34° 03'	143° 01'	Mulham, W.E.	1970	Growing in Mallee; Also held at CANB (CANB648837)
MEL30016A	Interior of NSW	Unknown	Unknown	?Moore, C.	pre 1900	
MEL1004355B	Darling Desert	Unknown	Unknown	Unknown	pre 1900	

this area, the actual known extant distribution is extremely limited. The presence, however, of the species in this part of the state pre 1900 (Brooks – 2 collections), in the early 1990's (Archer – 7 collections) and in 2006 (Edinger – 1 collection) shows a reliable and apparently persistent history of occurrence.

The Western Australian Dept. of Environment and Conservation (DEC) currently list *Vittadinia blackii* as 'not threatened' in Western Australia. However with an extant distribution in Western Australia restricted to just 250 km, *Vittadinia blackii* satisfies IUCN 'Geographic Range' criteria B1a, B1b, B1c, B2a, B2b and B2c relating to 'extent of occurrence' and 'area of occupancy' respectively. In particular, the species is known from less than ten extant sites over an area of < 5,000 km; and has suffered a demonstrable decline in extent in Western Australia with the species not being recorded from former sites north of Dundas Nature Reserve and from near Eucla. It is not known whether targeted searches have been made in these two former parts of the species distribution in Western Australia in recent years. Based on IUCN criteria for listing plants, *Vittadinia blackii* can be considered as endangered in Western Australia and should be considered for listing under threatened species schedules for that state.

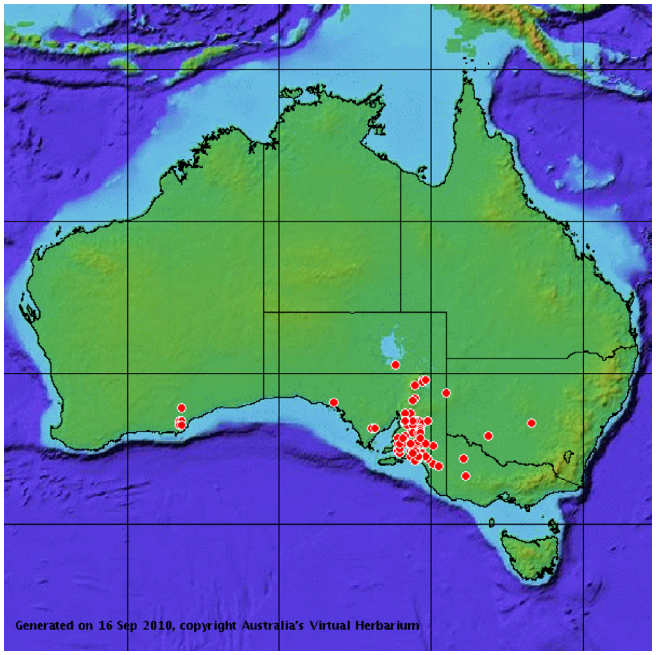

Fig. 2. Distribution of *Vittadinia blackii* across southern Australia as shown on Australia's Virtual Herbarium website on the 16th September 2010.

Victoria

There are six relatively recent confirmed records of the species in Victoria (Table 2) with all occurring in western Victoria; Wail State Forest (two records from 2000), Pine Plains (three records 1985, 1986 and 1993) and nearby Bronzewing Flora and Fauna Reserve (one 2007 record). One record from Pine Plains was recorded in a 1993 flora survey of the area (Sluiter *et al.* 1997) and was not supported by a herbarium specimen and so only 5 herbarium records are listed in Table 2. The Victorian Dept. of Sustainability and Environment (DSE) currently list *Vittadinia blackii* as vulnerable (DSE 2005) although that status will be elevated to endangered (David Cameron – DSE – personal communication) based on the fact that the species satisfies IUCN criteria A4, B2b, B2c and C2b. Specifically, the area of occupancy is less than 500 km, the number of subpopulations is five or less and there are 'extreme fluctuations in the numbers of mature individuals'. The species would also satisfy criterion C whereby there are likely to be less than 2,500 mature individuals in Victoria. Moreover, it is also likely that the species has experienced a loss of potential habitat in cleared Mallee dryland farming areas between the Big Desert and Little Desert (Criterion A – Reduction in Population Size).

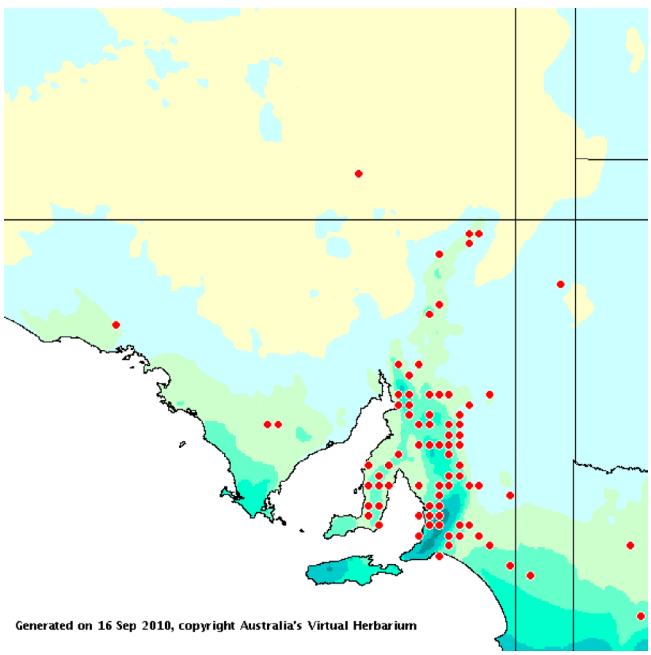

Fig. 3. Distribution of *Vittadinia blackii* in South Australia across rainfall gradients from ~200 mm near Lake Eyre South and ~800 mm in the Adelaide Hills.

New South Wales

Relatively recent records of *Vittadinia blackii* in New South Wales (Table 2) occur at Round Hill Nature Reserve in central New South Wales (one record from 1994), and in southwest New South Wales from 80 km

northwest of Balranald (one record from 1970) and a new 2010 record from 40 km west of Pooncarie. Although with widely separated occurrences, the distribution of *Vittadinia blackii* occurs over approximately 300 km in New South Wales.

There are also two pre 1900 records from western New South Wales (Table 2) but their precise locations are unknown. Cunningham *et al.* (1982) in their *Plants of western New South Wales* reported *Vittadinia blackii* as syn. *Vittadinia. tenuissima* "as *an uncommon species in the region, collected only from the Euston and Booligal districts in the south"*.

Vittadinia blackii is currently not listed on schedules of the NSW *Threatened Species Conservation Act* 1995 and is consequently considered to be not threatened within New South Wales by the Dept. of Environment Climate Change and Water. Based on IUCN criterion B1a, B1b, B2a and B2b, that is 'extent of occurrence' and 'area of occupancy' respectively, *Vittadinia blackii* can be considered endangered in New South Wales because:

- it occurs over an area < 500 km
- it has fewer than five known subpopulations; and
- is inferred to have suffered from extreme fluctuations in the number of known individuals.

With respect to the above criteria, the site west of Pooncarie contains less than 20 plants whilst the site northwest of Balranald contained, apparently, a sufficient number of plants to be considered "fairly common" in 1970. However, there have been no records of the species from that area for 40 years despite extensive baseline flora surveys of nearby properties by the author in both 1999 and 2000. On this basis, *Vittadinia blackii* may also satisfy IUCN criterion C whereby there are less than 2,500 mature individuals, although this cannot be determined accurately at this stage. Clearly *Vittadinia blackii* is rare and threatened in New South Wales. It is strongly recommended that the species should be listed for protection as an endangered species under the *Threatened Species Conservation Act* 1995, especially given potential threats in the southwest part of the State from increased areas of sand mining and currently active clearing and cultivation licenses.

Conclusions

The small shrub *Vittadinia blackii* found across southern Australia is moderately common over a wide geographic spread of sites encompassing arid, semi-arid and temperate sub-humid parts of South Australia and is not threatened in that state. In adjoining states records indicate generally small ranges with a low number of known sites. Based on IUCN criteria for listing threatened plant species, which are currently in use across most of Australia, *Vittadinia blackii* should be considered endangered in Western Australia, Victoria and New South Wales; and hence qualifies for listing under each state's respective threatened species schedules. Victoria currently recognises *Vittadinia blackii* as threatened and has recently reviewed its conservation status and recommended that status be upgraded from vulnerable to endangered. New South Wales and Western Australia should include the species in their threatened species schedules as well.

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