Flora Survey Report

Mining lease M63/602
East of Quallilup Lake, Dalyup

Supplementary report No. 2: *Austrostipa echinata* and *A. mundula*

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1 Introduction

During the period September to November 2017, Esperance Wildflower Society was commissioned by Triple M Transport (WA) Pty Ltd to conduct a vegetation survey of an area to the east of Quallilup Lake (Esperance Wildflower Society 2017). Triple M Transport currently operates a quarry for the extraction of limestone for agricultural purposes within mining lease M63/602. Ongoing sustainability of this operation will require expansion into other parts of the mining lease where suitable deposits of limestone occur. That survey (the initial survey) covered an area immediately to the east of the existing quarry. During 2018, a supplementary survey was conducted to extend the area of coverage to the east and north-east of the original survey.

During the original survey, a voucher specimen of a grass from the genus *Austrostipa* was collected and lodged with the Western Australian Herbarium (PER 08975108), where it was determined to be *A. echinata*—a species not previous recorded in WA. It is otherwise only known from South Australia, where it is listed as a rare species in Schedule 9 of the *National Parks and Wildlife Act 1972 (South Australia)* (Appendix A). It was subsequently added to the Census of Western Australian Plants and classified as Priority 1 (poorly known species potentially at risk).

Also during the original survey, the Priority 3 grass *Austrostipa mundula* was recorded growing on exposed limestone areas within and outside the survey area.

During the supplementary survey, a search for additional populations of *A. echinata* and *A. mundula* was conducted both within the survey area and in similar habitat to the north-east, south and south-west.

2 Method

2.1 Austrostipa echinata

The original collection of *A. echinata* was made in a shallow gully just below a north-facing slope of exposed limestone. In this location, the underlying limestone was overlain with greyish sand. The species was not encountered on the limestone areas where had it been present, it would have been obvious due to the open nature of the vegetation following the 2016 fire.

Two search strategies were implemented (Fig. 1):

- the track running through the survey area towards the north-east was traversed by vehicle, and any tall grasses with plumose inflorescences were examined;
- three transects were walked as part of the general survey of the area, with any grasses encountered were closely examined.

A visit was also made to the Shelly Beach area, 6 km to the west of the survey site to search for *Austrostipa* species there. This is the nearest readily accessible similar coastal area, and was also the western limit of the 2016 fire, so that both burnt and unburnt areas occur there.

The relatively open nature of the site and the prominent plumose inflorescences of the target species meant that any flowering *Austrostipa* could be clearly seen for 50m on either side of the track or transect.

Identification of many species within the genus *Austrostipa* is difficult, with small morphological differences serving to distinguish between taxa ((Everett *et al.* 2009; Jessop *et al.* 2006).

Everett *et al.* (2009) describe *A. echinata* as having "*leaf blade tightly rolled, pungent*" and "*awn 90 to 110 mm long".* However the related species *A. flavescens* is common in the survey area, occurring on both limestone and deep sand. This species exhibits considerable phenotypic variation. Individuals assigned to *A. flavescens* by the WA Herbarium exhibit leaf forms ranging from flat to tightly rolled and pointed, and also have relatively long awns. Due to the potential difficulty of

distinguishing between these species in the field, specimens having long awns and fine pointed leaves were collected and forwarded to the WA Herbarium for formal identification.

Figure 1: *Austrostipa echinata* search area (shaded orange). Original survey area shaded violet, extended survey area shaded green.

2.2 Austrostipa mundula

In the original survey, *A. mundula* was recorded as occurring sparsely across the area of exposed limestone on the eastern part of the site. It was not found in any of the areas of deep sand that were surveyed. The search for this species was therefore focussed on limestone areas within and to the south and south-west of the survey area.

Where plants were located, a measure of density was made by counting of the number of plants within a 10 m x 10 m quadrat.

3 Results

3.1 Austrostipa echinata

Thirteen specimens were collected and forwarded to the WA Herbarium for identification, of which five were determined to be *A. echinata* and eight as *A. flavescens* (Table 1).

All five records of *A. echinata* were from within the survey area. Two were located near the original collection site, with a further three within the area of the extended survey. These appear to group into three sub-populations (Fig. 2), although more intensive sampling would be necessary to determine whether and to what extent these might be contiguous.

Table 1: Species determination and collection location for thirteen specimens of *Austrostipa* lodged with the WA Herbarium.

Specimen	Determination	No. plants	Collection Location
KRM 918	*A. flavescens*	10	33° 49’ 47” S, 121° 31’ 32” E
KRM 922	*A. flavescens*	10	33° 49’ 32” S, 121° 30’ 44” E
KRM 924	*A. echinata*	1	33° 49’ 15” S, 121° 31’ 34” E
KRM 925	*A. flavescens*	10	33° 49’ 14” S, 121° 31’ 35” E
KRM 928	*A. flavescens*	16	33° 49’ 11” S, 121° 31’ 35” E
KRM 929	*A. echinata*	6	33° 49’ 06” S, 121° 31’ 47” E
KRM 930	*A. flavescens*	20	33° 48’ 49” S, 121° 32’ 08” E
KRM 931	*A. flavescens*	10	33° 48’ 37” S, 121° 32’ 27” E
KRM 934	*A. flavescens*	5	33° 49’ 15” S, 121° 31’ 31” E
KRM 936	*A. flavescens*	5	33° 49’ 14” S, 121° 31’ 32” E
KRM 942	*A. echinata*	20	33° 49’ 05” S, 121° 31’ 45” E
KRM 943	*A. echinata*	2	33° 49’ 10” S, 121° 31’ 43” E
KRM 944	*A. echinata*	8	33° 49’ 15” S, 121° 31’ 31” E

NOTE: *The column ‘No. plants’ refers to the estimated number of plants within an area of 100 square metres centred on location of the specimen. Due to the difficulties in separating the two species in the field, it cannot be presumed that all such plants were conspecific with the specimen.*

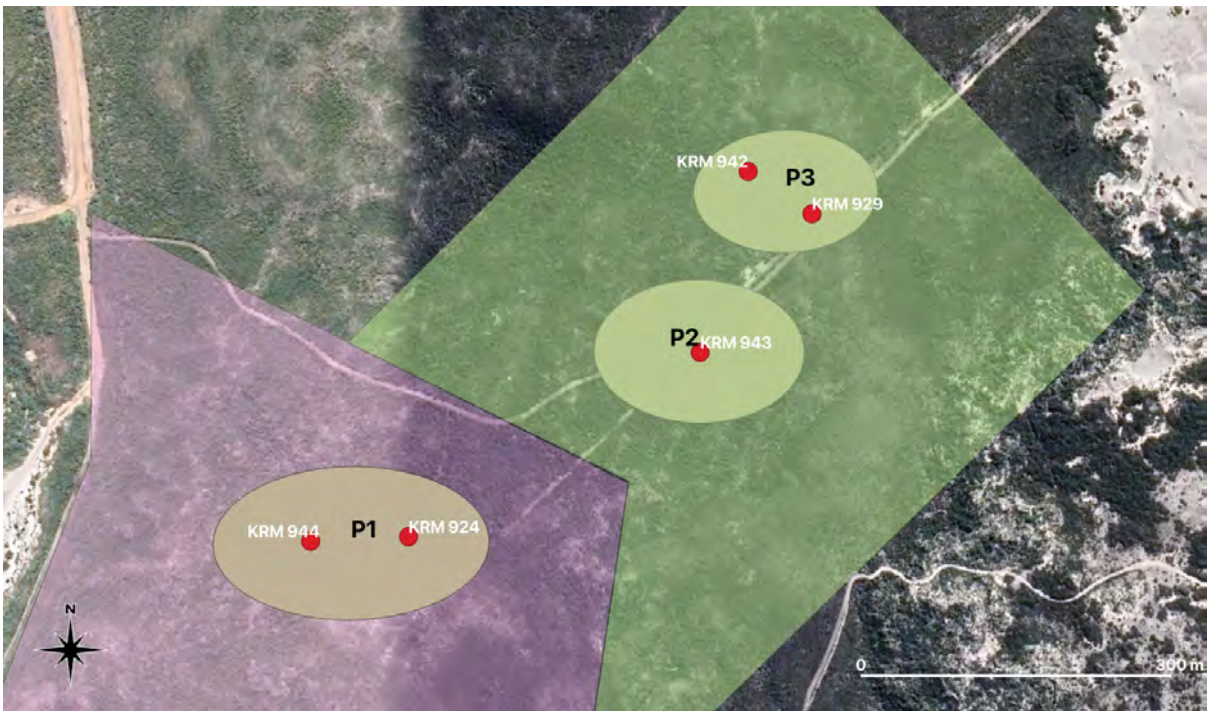

Figure 2: Collection location of *Austrostipa echinata* specimens showing possible grouping into sub-populations (P1-P3).

The specimens of *A. flavescens* collected were more widely distributed, reflecting its relative abundance throughout the site (Fig. 3).

Figure 3: Collection location of *Austrostipa flavescens* specimens within and beyond the survey site.

No species of *Austrostipa* were found in either burnt or unburnt sections of the coastal area at Shelly Beach.

3.2 Austrostipa mundula

During the original survey, *A. mundula* was found to be sparsely distributed throughout the exposed limestone areas on the eastern part of the site. Despite extensive searching, no plants could be found in this area during this survey. However, four different new populations were located, one of which was within the area of the extended survey and three were well outside the survey area (Fig. 4, Table 2). In three of the four locations, it co-occurred with *A. flavescens* (Table 2).

Table 2: Abundance of *Austrostipa mundula* and *A. flavescens* within quadrats

Specimen	**Number of plants within 10m x 10m quadrat**		**Quadrat location**
	Austrostipa mundula	***Austrostipa flavescens***	
KRM 921	5	-	33° 49’ 26” S, 121° 31’ 08” E
KRM 917	26	10	33° 49’ 47” S, 121° 31’ 31” E
KRM 920	6	17	33° 49’ 20” S, 121° 31’ 40” E
KRM 923	48	3	33° 49’ 52” S, 121° 31’ 04” E

Figure 4: Collection location of *Austrostipa mundula* specimens within and beyond the survey site.

4 Discussion

4.1 Austrostipa echinata

The presence of *Austrostipa echinata* in additional parts of the survey site was confirmed. All specimens collected were from plants growing in areas where limestone was overlain by relatively deep sand. Searches outside the survey area did not locate any further occurrences of this species.

Austrostipa echinata is difficult to separate in the field from the often morphologically similar *A. flavescens*, rendering precise enumeration of the number of individuals present problematic. Detailed examination of every individual and collection of possibly hundreds of samples for further study would be extremely time consuming, and was beyond the scope of the current survey.

Plants in the observed sub-populations were bearing fruit, suggesting that further recruitment may occur. It is unclear whether *A. echinata* is a new arrival to the area, or whether it has always been present in small numbers. The 2016 fire dramatically altered the environment of the survey area, reducing the dense Acacia shrubland to bare ground and providing a window of opportunity for the establishment of other species. It is possible that *A. echinata* was either present in the seed bank or else occurred in occasional open spaces. The area concerned is unlikely to have been the subject of detailed botanical scrutiny in the past, and its similarity to *A. flavescens* would have meant that *A. echinata* would easily be overlooked by any visiting collectors.

Further elaboration of the status of the species within and beyond the survey area is likely to require further intensive fieldwork and collection of voucher specimens.

4.2 Austrostipa mundula

This species was found to be restricted to areas of low heath growing on areas of exposed limestone. While the initial survey found it to be sparsely distributed across this substrate, its abundance had decreased by the time of this supplementary survey, so that it was rare within the survey area. However, it was found to be relatively common in several other locations outside the survey area, including within the nature reserve located immediately to the west. The limestone substrate extends to the west beyond the area actually searched, and it is likely that additional populations occur in association with this geology.

5 References

Esperance Wildflower Society (2017) Flora Survey Report: Mining lease M63/602 East of Quallilup Lake, Dalyup. Unpublished Report.

Everett J, Jacobs S, Nairn L (2009) Austrostipa. In 'Flora of Australia. (ABRS/CSIRO Australia: Melbourne).

Jessop J, Dashorst GRM, James FM (2006) 'Grasses of South Australia.' (Wakefield Press: Kent Town S.A.).

APPENDIX A

National Parks and Wildlife Act 1972—1.7.2015
Schedule 9—Rare species

Common name	Species
	GLEICHENIACEAE
coral fern	*Gleichenia microphylla*
	GOODENIACEAE
	Dampiera roycei
	Goodenia anfracta
Bentham's goodenia	*Goodenia benthamiana*
	Goodenia brunnea
	Goodenia chambersii
	Goodenia glandulosa
spreading goodenia	*Goodenia heteromera*
Flinders Range goodenia	*Goodenia saccata*
myrtle fanflower	*Scaevola myrtifolia*
	Velleia cycnopotamica
	GRAMINEAE
pointed swamp wallaby-grass	*Amphibromus archeri*
long-nosed swamp wallaby-grass	*Amphibromus macrorhinus*
dark swamp wallaby-grass	*Amphibromus recurvatus*
	Aristida arida
	Aristida australis
smooth wallaby-grass	*Austrodanthonia laevis*
short-awn wallaby-grass	*Austrodanthonia tenuior*
cane spear-grass	*Austrostipa breviglumis*
foxtail spear-grass	*Austrostipa densiflora*
spiny spear-grass	*Austrostipa echinata*
	Austrostipa gibbosa
	Austrostipa multispiculis
Flinders Range spear-grass	*Austrostipa petraea*
	Austrostipa plumigera
	Austrostipa tenuifolia
Tucker's spear-grass	*Austrostipa tuckeri*
Vickery's spear-grass	*Austrostipa vickeryana*
red-leg grass	*Bothriochloa macra*
heath bent-grass	*Deyeuxia densa*
rough-bearded grass	*Echinopogon ovatus*
barren cane-grass	*Eragrostis infecunda*