



BIOLOGICAL SURVEY OF VACANT CROWN LAND SOUTH OF COOLCALALAYA:  
PRELIMINARY REPORT

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INTRODUCTION

The only previous biological survey work in the area south of Coolcalalaya appears to be that of Beard (1976b) and two CALM surveys (Mell 1981; A.H. Burbidge 1988).

Beard's (1976b) study consisted of vegetation mapping at a scale of 1:250 000. Three main vegetation units were mapped: scrub heath on yellow sandplain (mainly in the western part of the vacant Crown land), *Acacia-Allocasuarina* thicket on red sands (mainly in the central area) and *Acacia ramulosa-Eucalyptus* spp.-*Callitris columellaris* shrubland with scattered trees (mainly in the east). Beard (1980) drew the boundary between the Eremaean Botanical Province (Carnarvon Botanical District) and South-west Botanical Province (Irwin Botanical District) in a north-west to south-east direction through the study area.

Mell's (1981) study consisted of an examination of the vegetation at 25 sites, from which he listed about 100 of the dominant plant species. Opportunistic observations were made on mammals (five species), birds (45 species) and reptiles (six species). He recommended that the area be vested as a nature reserve.

In October 1988 I made a brief inspection of this area (A.H. Burbidge 1988) and compared it with the Wandana Nature Reserve, the then proposed Toolonga Nature Reserve and Kalbarri National Park (see file 020696F3103 ff. 111-130). The vacant Crown land was shown to be different, particularly in terms of its plant communities, from the other areas inspected.

Vegetation has been mapped at 1: 1 000 000 for Toolonga Nature Reserve by Beard (1976c), at 1:250 000 for Kalbarri National Park by Beard (1976b) and Wandana Nature Reserve by Beard (1976a). General biological survey work has been carried out at Toolonga by A.A. Burbidge *et al.* (1980) and at Wandana Nature Reserve by A.A. Burbidge *et al.* (1978).

The present survey was conducted in order to provide an objective assessment of the floristic variation in the vacant Crown land south of Coolcalalaya, within a regional context provided by comparable data from Kalbarri National Park and Toolonga and Wandana Nature Reserves. Together with opportunistic data collected on vertebrates, these data were to be used to provide an assessment of the conservation value of the area.

## METHODS

Data from all sites sampled in 1988 were also used in the present study. An additional 28 sites (1 at Toolonga, 6 at Kalbarri and 21 south of Coolcalalaya) were sampled in 1990, with the resultant distribution of sites as shown in Table 1 and Fig. 1. All sites were on Holocene/Pleistocene surface types. All except one were on eolian and residual sands (Playford *et al.* 1970; Hocking *et al.* 1982; van der Graaff *et al.* 1983), varying from mostly yellow quartz sands in the south and west to red-brown quartz sands in the east and north. The exception was site 22 which was on colluvium in a broad shallow depression. Much of the area south of Coolcalalaya showed signs of relatively recent wildfires, but all sample sites were long unburnt sites, so as to avoid, as far as possible, spurious results due to fire effects.

Each site consisted of a 30 x 30 m quadrat which was permanently marked with a steel post. Each site was sampled as exhaustively as possible for vascular plant species, and vegetation described using Muir's (1977) system. Measurements of soil pH and degree of soil compaction were made for each quadrat, for future analysis. Observations on vertebrate animals were made opportunistically.

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Table 1: Distribution of sampling sites amongst areas.  
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Area	No. of sites
Toolonga NR	6
VCL, Coolcalalaya	27
Kalbarri NP	6
Wandana NR	4
Total	43

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Plant species were identified and the resultant matrix of 43 sites by 454 plant species was subjected to classification, ordination and minimum spanning tree analyses (PATN; see Belbin *et al.* 1984; Belbin 1989) to provide objective comparisons between sites. Analyses were also run without singletons (species recorded at a single site only - 191 species) and it is these analyses that are reported here as the singletons contributed little to the patterning and their removal made interpretation easier. For site classifications the Bray-Curtis association measure was used, while the two-step association measure was used for the species classifications. Dendrograms were constructed using the flexible UPGMA option with beta = -0.1. Ordination was by multi-dimensional scaling (using the SSH module within PATN).  
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## RESULTS

### Vegetation and Floristics

Vegetation at the sample sites varied from species rich heaths on pale yellow sands (especially in Kalbarri) to *Acacia* woodlands, usually with *Allocasuarina acutivalvis* or *Eucalyptus* sp(p). and *Callitris columellaris* on red sands. Descriptions of sites are given in Appendix 1 and a list of plant species is given in Appendix 2. A subjective analysis of variation in vegetation types is given in A.H. Burbidge (1988) (file 020696F3103 ff. 126-128).

Approximately 450 plant taxa were recorded from the four study areas. In the vacant Crown land south of Coolcalalaya, we recorded 318 species of plants from 57 families.

Species richness varied from 18 species at site 19 to 58 species at sites 12 and 15. These latter two sites were sampled in two years, and in the 1988 sampling session an area slightly greater than the standard quadrat size was used. Amongst the classification groups, the mean number of species per site (Table 2) varied from 23 for group 4 to 48 for group 2. Group 2 had a high number of species per site because these sites were rich in annuals. Kalbarri sites (group 6) had a mean of 45 species per site.

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Table 2: Mean number of species per site for each group recognized in the classification analysis.  
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Group	n	mean no. of spp.
1	6	34
2	10	48
3	11	34
4	4	23
5	6	32
6	6	45

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### Classification of Sites

The dendrogram resulting from the classification of the 43 sites in terms of plant species presence was truncated at the six group level (Figs. 1, 2). The primary division in the dendrogram separated sites which were primarily woodland, open mallee or shrubland sites from heath sites on deep yellowish sands.

There were four groups on the woodland/mallee/shrubland side of this primary division. The six Group 1 sites were the six open woodland sites on reddish sands at Toolonga. They contained a suite of species including *Rhyncharrhena linearis* and *Stenopetalum filifolium* which were absent in all other groups apart from a few species which also occurred sporadically in Group 2 sites. Group 2 (10 sites) consisted of sites dominated by woodlands of *Acacia* species, usually with

*Eucalyptus* sp(p)., on reddish sands. Eight of these sites were south of Coolcalalaya and the remaining two on Wandana. Group 3 (11 sites) were woodlands to shrublands or heaths with prominent woodland elements. Ten of these sites were south of Coolcalalaya with the remaining one on Wandana. Group 4 consisted of four sites south of Coolcalalaya. These were shrublands or thickets with floristic composition intermediate between the heaths and woodlands.

The heaths were distributed among two groups. Group 6 consisted of the six species rich sites in Kalbarri National Park. Group 5 consisted of six sites, one at Wandana with the remainder south of Coolcalalaya, with emergent *Actinostrobilus arenarius* and/or *Eucalyptus* sp(p)., on deep yellow sands. These sites contained many of the species found in Kalbarri, but one suite of typical south western species, including *Calytrix* sp. 4, *Mesomelaena pseudostygia* and *Stylidium macrocarpum*, was found only in Group 6 sites. In addition, the Group 5 sites contained a few species, such as *Poranthera microphylla*, which were absent from Kalbarri sites but found at a few of the woodland and shrubland sites.

Ordination and minimum spanning tree analyses of the sites confirmed the groupings from the classification analyses with only minor differences. In addition, the ordination analysis showed that Groups 1 and 6 are the two most dissimilar groups within the data set. Furthermore, Groups 3 and 4 appeared on the ordination plot in positions intermediate between Groups 1 and 2 on the one hand and Groups 5 and 6 on the other, suggesting that Groups 3 and 4 are intermediate in floristic composition compared with the other groups.

#### Records of Vertebrates

Appendix 3 contains a list of the vertebrate species known from the study area. After combining the results of Mell's observations with those made in the current surveys, totals of 16 reptile, 71 bird and seven mammal (four native) species are known from the vacant Crown land south of Coolcalalaya.

#### DISCUSSION

The most important finding of this study is that the vegetation south of Coolcalalaya is intermediate between, but distinctly different from, that at Kalbarri and Toolonga. It is more similar to that at Wandana, but is more variable and contains some vegetation types not known from Wandana. These conclusions support Beard's (1980) opinion that the area lies on the boundary between the South-west Botanical Province (with vegetation such as that in Kalbarri) and the Eremaean Botanical Province (with vegetation such as that at Toolonga). Careful examination of the two relevant maps by Beard (1978b, 1980) shows that the area is indeed a mixture or mosaic of inland and coastal vegetation types. Although it is clear that the area is a transition zone between two very different vegetation types, it is difficult to assign a convincing boundary between the two Provinces. The present study confirms

that the area is a transitional one and suggests that the major dichotomy is between the heaths on deep yellow sands and the remaining vegetation types (mostly woodlands, sometimes over heaths or shrublands). This suggests that the boundary between the two Provinces may be a little further to the west than shown by Beard (1980), but further sampling would be needed to confirm this. In any case, it is clear that the area south of Coolcalalaya is of considerable interest in the context of the study of phytogeographic boundaries in south-western Australia.

This interest is also reflected in the fact that a number of plant species found south of Coolcalalaya during the present survey are at the inland limits of their distribution at this latitude. While much further effort is needed to know how many species are involved, preliminary investigations show that the following species are known to be at or near the limit of their distribution in this area:

*Caladenia amplexans*  
*Caladenia* sp. nov. aff. *denticulata*  
*Caladenia flava*  
*Caladenia roei*  
*Lamarchea hakeifolia*  
*Stylidium limbatum*  
*Thelymitra sargentii*  
*Tricoryne* sp. nov.

Many more species are likely to be involved. Furthermore, the area includes the only known localities of:

*Stylidium* sp. nov. - a scale-leaved species, not previously recorded in extensive surveys of this group by D.J. Coates (pers. comm.), and

*Chamelaucium* sp. nov. - a species with small white flowers, most closely related to an un-named pink flowered species from the Nerren Nerren dunes, but not previously recorded in extensive surveys of the genus by G.J. Keighery and N.G. Marchant (pers. comm.).

Similarly, the area is an overlap zone with respect to vertebrate species. Amongst the reptiles, *Ctenophorus maculatus* (recorded by Mell 1981) is at its easternmost limit at this latitude and our record of *Lerista connivens* is a south-easterly extension of known range. The bird fauna is a mixture of south-western and Eremaean species, with the Western Yellow Robin being at its inland limit at this latitude and the Bourke Parrot being at its western limit at this latitude. Also, we recorded both south-western (*Rhipidura fuliginosa preissii*) and inland (*R.f. albicauda*) subspecies of the Grey Fantail. The area supports both inland (Red) and south-western (Western Grey) species of kangaroo. Further observations and a systematic trapping program would increase the list of biogeographically interesting occurrences, especially for the reptiles.

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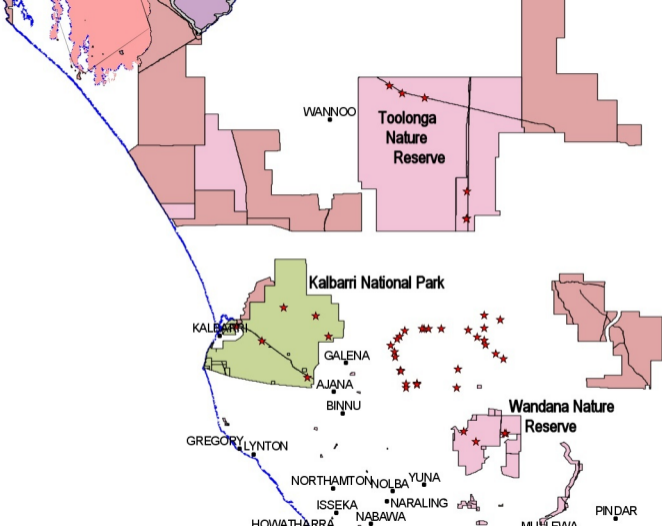
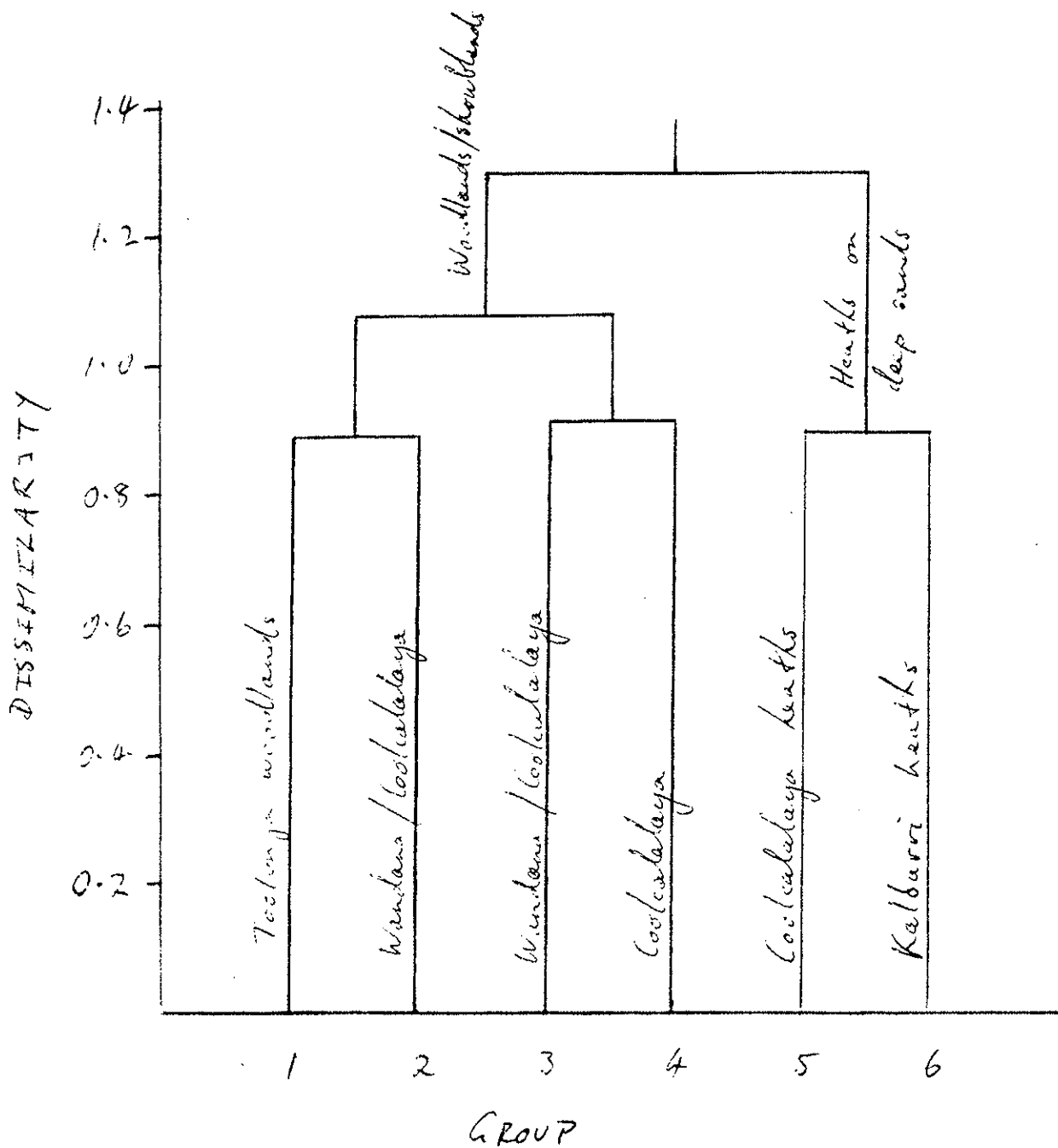




Figure 2: Classification of the 43 sites according to plant species presence.



No. of sites: 6 10 11 4 6 6

APPENDIX 1: Description of vegetation (Muir 1977) at each of the detailed sites on the Toolonga Nature Reserve, vacant Crown land south of Coolcalalaya, Wandana Nature Reserve and Kalbarri National Park.

Toolonga Nature Reserve

Site 1.

Scrub to 3.5 m, consisting of mostly *Acacia* sp. 1, *Acacia* sp. 2 and *Thriptomene* sp. 1 with emergents of *Callitris columellaris* and (rarely) *Bursaria occidentalis* over Low Scrub of mostly *Grevillea stenostachya* and Lamiaceae sp. (sp. no. 14) over Very Open Herbs (including *Ptilotus schwartzii*, *P. polystachyus*, *Podolepis canescens* and *Schoenia cassiniana*) and Very Open Low Grass (mostly *Monochather paradoxa*) on red sand.

Site 2.

Emergents of *Brachychiton gregorii* and *Bursaria occidentalis* with scattered *Eucalyptus* aff. *mannensis* in Scrub of mostly *Acacia* sp. 1 with *Gyrostemon ramulosus* and *Thriptomene* sp. 1 over Low Scrub including *Eremophila* sp. 2 (common), *Rhagodia latifolia*, *Grevillea stenostachya* and *Acacia* sp. 4 over Very Open Herbs (including *Ptilotus schwartzii*, *P. polystachyus* and *Podolepis canescens*) and Very Open Low Grass (mostly *Monochather paradoxa*) on red sand.

Site 3.

Emergent *Callitris columellaris* in Scrub of mostly *Acacia* sp. 1 and *Thriptomene* sp. 1 over Open Low Scrub including *Eremophila* sp. 1, *Acacia* sp. 2 and *Rhagodia latifolia* over Open Dwarf Scrub D of *Psammomoya ephedroides* over Very Open Herbs (including *Ptilotus schwartzii*, *Myriocephalus guerinae* and *Podolepis canescens*) and Very Open Low Grass (*Stipa ?tuckeri* and *Monochather paradoxa*) on red sand.

Site 4.

Emergent *Callitris columellaris*, *Eucalyptus ?kochii*, *E.* aff. *mannensis* and *E. oldfieldii* s.l. over Scrub to about 3.5 m of mostly *Acacia* sp. 6 (?*ramulosa*) and *Acacia* sp. 4 over Low Scrub including *Eremophila* sp. 1, *Eremophila* sp. 2, *Eremophila* sp. 3, *Acacia* sp. 6 (?*ramulosa*) and *Rhagodia latifolia* over Very Open Herbs (including *Ptilotus polystachyus*, *Schoenia cassiniana*, *Calandrinia polyandra*, *Stenopetalum filifolium*, *Dianella revoluta*, *Lobelia* cf. *gibbosa*, *Waitzia citrina*, and *W. sauveolens*) and Very Open Low Grass (*Stipa elegantissima* and *Monochather paradoxa*) on pale red sand.

Site 5.

Emergent *Callitris columellaris*, *Eucalyptus eudesmioides* s.l. and *E.* aff. *jucunda* s.l. over Scrub to about 3.5 m of mostly *Acacia* sp. 6 (?*ramulosa*), *Acacia* c.f. sp. 4 and

*Allocasuarina acutivalvis* over Low Scrub including *Eremophila* sp. 1 and *Rhagodia latifolia* over Very Open Herbs (including *Ptilotus schwartzii*, *P. gaudichaudii*, *Podolepis canescens* and *Brachycome ciliaris*) and Very Open Low Grass (mostly *Monochather paradoxa*) on yellow-orange sand.

Site 27

Emergents of *Callitris columellaris* and *Eucalyptus* species in Scrub of *Acacia ?ramulosa* of 3-4 m over scattered shrubs of *Grevillea stenostachya* and *Eremophila* sp. over scattered Herbs and grasses.

Vacant Crown Land South of Coolcalalaya

Site 6

Very Open Tree Mallee to about 5 m, consisting of *Eucalyptus obtusiflora*, *E. eudesmioides* s.l., *E. ?kochii* and *E. aff. mannensis* with scattered *Callitris columellaris* over Scrub to 3.5 m of mostly *Acacia* sp. 6 (*?ramulosa*) and *Allocasuarina acutivalvis* over Open Low/Dwarf Scrub of mixed species including *Pileanthus peduncularis* and *Olearia axillaris* var. *eremicola* over Very Open Herbs (including *Ptilotus polystachyus* and *P. gaudichaudii*) and Very Open Low Grass (including *Pentaschistus airoides*, *Monochather paradoxa*, *Plectrachne ?drummondii*, *Stipa elegantissima* and *S. tenuifolia*) on yellow-red sand.

Site 7.

Thicket of mostly *Acacia* sp. 11 with some *Acacia* sp. 10 and scarce emergent *Eucalyptus eudesmioides* s.l. over Very Open Low Sedges (*Ecdeiocolea monostachya*) over patchy Very Open Herbs (including *Lobelia winfridae*, *Calocephalus* sp. 1, *Podolepis canescens* and *Waitzia citrina*) and sparse grasses (*Monochather paradoxa*) on reddish-yellow sand in a depression.

Site 8.

Very Open Tree Mallee to about 9 m, consisting of *Eucalyptus eudesmioides* s.l., *E. jucunda* s.l. and *E. oldfieldii* s.l. with scattered *Callitris columellaris* and *Bursaria occidentalis* over Scrub to 3.5 m of mostly *Acacia* sp. 6 (*?ramulosa*), and *Acacia* sp. 4 over (Open) Low Scrub of mixed species including *Olearia axillaris* var. *eremicola*, *Rhagodia latifolia*, *Grevillea stenostachya* and *Chamelaucium* sp. nov. over patches of Open Low Grass (*Plectrachne ?drummondii*, *Stipa elegantissima* and *S. tenuifolia*) over Very Open Herbs (including *Ptilotus polystachyus*, *P. gaudichaudii*, *Podolepis canescens* and *Waitzia acuminata*) on red sand.

Site 9.

Scrub of mostly *Acacia* sp. 13 to about 3.5 m with scattered *Allocasuarina acutivalvis* and *Callitris columellaris* over

scattered shrubs to about 2 m of *Melaleuca* sp. 1 and *Eremophila* sp. 6 with *Eremophila* sp. 7 to about 1 m over Very Open Herbs (including *Ptilotus gomphrenoides*, *P. obovatus*, *P. gaudichaudii*, *P. polystachyus* and *Erodium cygnorum*) and Very Open Low Grass (*Monochather paradoxa* common and *Pentaschistus airoides* abundant with *Stipa elegantissima* being rare) on yellow-red sand.

#### Site 10.

Scattered emergents of *Eucalyptus eudesmioides* s.l., *Allocasuarina acutivalvis*, *Brachychiton gregorii* and *Callitris columellaris* over patches of Open Low Scrub of mostly *Grevillea eriostachya* and *G. candelabroides* over patches of Dwarf Scrub C (including shrubs from various families) over Hummock Grass of *Triodia* sp. (?irritans), Very Open Herbs (including *Podotrochea gnaphalioides*, *Cassytha* sp., *Tricoryne* sp. nov. and *Dianella revoluta*) and Very Open Low Sedges (*Ecdeiocolea monostachya*).

#### Site 11.

Open Tree Mallee of *Eucalyptus obtusiflora* over (Open) Scrub of mostly *Acacia* sp. 12, *Dodonaea viscosa* and *Exocarpos aphyllus* over scattered shrubs to about 1 m of these same species over Open Herbs (especially *Ptilotus obovatus*; *P. exaltatus*, *P. polystachyus*, *P. gaudichaudii* and *Erodium cygnorum* also present) over Very Open Low Grass (mostly *Stipa elegantissima*) on yellow-red sand.

#### Site 16

Rare emergent *Callitris columellaris* and *Eucalyptus eudesmioides* in Open Scrub of *Acacia* sp. 11 with a few *Acacia* sp. 10 over Open Dwarf Scrub D of *Thriptomene* sp. 3 and *Thriptomene* sp. 8 over Open Low Sedges of *Ecdeiocolea monostachya* with scattered Herbs, specially "Waitzia minute" in a slight depression.

#### Site 17

Emergents of mostly *Eucalyptus jucunda* with occasional *E. oldfieldii* and *Bursaria occidentalis* (and with *E. eudesmioides* and *E. aff. mannensis* nearby) over Scrub of mainly *Acacia* sp. 4 over Dwarf Scrub C of mainly *Thriptomene* sp. 4 over scattered *Amphipogon strictus* and other Herbs, mainly daisies.

#### Site 18

Open Dwarf Scrub C of mostly *Thriptomene* sp. 5 and Open Low Sedges of *Ecdeiocolea monostachya* with rare emergent *Eucalyptus eudesmioides* and *E. oldfieldii* to about 5 m and *Actinostrobos arenarius* and *Acacia* sp. 23.

Site 19

Emergents of *Eucalyptus oldfieldii* in Open Scrub of *Hakea bucculenta* and *Acacia* sp. 24 (1.5-2 m) over Open Low Grass of *Plectrachne drummondii*.

Site 20

Very Open Tree Mallee of *Eucalyptus oldfieldii* to about 5 m with scattered *Callitris columellaris* over Open Scrub of *Eremophila* sp. 7 (2.5 m) over Open Dwarf Scrub C of mostly *Calytrix* sp. 1 with scattered Herbs, mostly *Amphipogon strictus*.

Site 21

Thicket of *Allocasuarina acutivalvis* and *Acacia acuminata* to ca. 2.5 m over Dwarf Scrub C of mostly *Baeckea/Micromyrtus* and *Mirbelia ramulosa*.

Site 22

Scattered emergents of *Eucalyptus* species including *E. eudesmioides* in Low Heath C of *Acacia* sp. 23 over Dwarf Scrub D of ?*Kunzea* sp. 1 with scattered emergent *Acacia* sp..

Site 23

Scrub of *Acacia ?ramulosa* and *Allocasuarina acutivalvis* to ca. 4 m with scattered *Ac. acuminata* and *Melaleuca* sp. 6 over very sparse shrubs including *Grevillea stenostachya* to ca. 1 m over scattered *Amphipogon strictus* and a species rich herb layer of mostly Asteraceae varying from bare patches (to several square metres) to Dense Herbs, overall being perhaps mid-dense. Scattered emergents of *Eucalyptus* species including *E. eudesmioides* occur outside of the quadrat.

Site 24

Scrub of *Acacia ?ramulosa* with some *Allocasuarina acutivalvis*, *Acacia acuminata* and *Melaleuca* sp. 6 to ca. 4 m over very sparse shrubs including *Lamarchea hakeifolia* to ca. 1 m with Herbs to Dense Herbs of mostly Asteraceae. A few emergent eucalypts occur nearby.

Site 25

Open Low Scrub A of *Actinostrobos arenarius* over Open Dwarf Scrub C of *Conospermum stoechadis* and *Allocasuarina campestris* over Open Dwarf Scrub D of various myrtaceous species with Very Open Tall Sedges of *Ecdeiocolea monostachya* and Very Open Low Sedges and scattered Herbs.

Site 26

Low Woodland B of *Actinostrobos arenarius* with occasional emergent *Eucalyptus jucunda* over Open Dwarf Scrub C of

mostly myrtaceous species over scattered shrubs (mostly myrtaceous) less than 0.5 m with scattered *Ecdeiocolea monostachya* and ?*Lepidobolus* sp.

#### Site 28

Emergents of *Actinostrobos arenarius* in Open Low Scrub B of *Allocasuarina campestris* and *Grevillea candelabroides* over Open Dwarf Scrub C of *Conospermum stoechadis* and *Thriptomene* sp. over Open Dwarf Scrub D of myrtaceous spp.

#### Site 29

Emergents of *Banksia sceptrum* to 3 m over Open Low Scrub A of mostly *Allocasuarina campestris* and *Actinostrobos arenarius* over Open Dwarf Scrub C of myrtaceous species over Open Dwarf Scrub D of myrtaceous species.

#### Site 30

Very Open Shrub Mallee to 3 m of *Eucalyptus oldfieldii* and Open Low Woodland B of *Actinostrobos arenarius* to 3 m over scattered shrubs, mostly *Lamarchea hakeifolia*, to 2 m over Open Dwarf Scrub C of *Calothamnus ?quadrifidus* and other myrtaceous species, over scattered *Ecdeiocolea monostachya*, *Plectrachne ?drummondii* and ?*Lepidobolus* sp.

#### Site 31

Scattered *Eucalyptus rigidula* and *E. eudesmioides* to 4 m over scattered *Allocasuarina campestris* to 2 m over Dwarf Scrub C of *Melaleuca* sp. 4, *Conospermum stoechadis*, *Allocasuarina campestris* and *Calothamnus* sp. 3 over Very Open Tall Sedges of *Ecdeiocolea monostachya*.

#### Site 32

Emergent *Eucalyptus oldfieldii* over Scrub of *Acacia* spp., mostly *Acacia* sp. ?28, over Open Dwarf Scrub C/D of mostly myrtaceous species over scattered annuals, mostly daisies.

#### Site 33

Emergents of *Callitris columellaris* in Very Open Tree Mallee to 7 m of mostly *Eucalyptus sheathiana* with occasional *E. eudesmioides* (and *E. aff. mannensis* nearby) over Open Scrub of *Acacia* sp. 3 and *Acacia* sp. 12 with some *Allocasuarina acutivalvis* over Open Low Scrub A of *Eremophila* sp. 1A over scattered shrubs of *Olearia axillaris* and scattered grasses and Herbs.

#### Site 34

Emergents of *Eucalyptus eudesmioides* and *E. jucunda* over Scrub to 3-4 m of *Allocasuarina acutivalvis* and *Acacia* spp. over Open Low Scrub B of *Labichea ?eremaea* and *Micromyrtus* sp. 1 with scattered *Calytrix* sp. to ca. 0.5 m.

Site 35

Very Open Shrub Mallee to ca. 5 m of mostly *Eucalyptus oldfieldii* over Very Open Tall Sedges of *Ecdeiocolea monostachya*.

Site 36

Open Low Woodland A of *Eucalyptus loxophleba* over Open Scrub of *Acacia* sp. 2, *A.* sp. 12, *Melaleuca* spp. and *Eremophila* sp. 1A with some regrowth of *M. uncinata* to 1.5 m, scattered shrubs to 0.5 m of mostly *Scaevola spinescens* and *Ptilotus obovatus* and scattered Herbs of mostly *Maireana ?villosa* and Asteraceae.

Site 37

Very Open Tree Mallee to 4 m of mostly *Eucalyptus obtusiflora* over scattered shrubs of *Acacia* sp. (23 and 28 ?) to 2 m and *Baekkea* sp. 3 to 1.5 m over Very Open Tall Sedges of *Ecdeiocolea monostachya* and scattered grasses *Plectrachne ?drummondii*.

Wandana Nature Reserve

Site 12.

Very Open Shrub Mallee of mostly *Eucalyptus jucunda* with some *E. oldfieldii* s.l. to about 4 m over occasional shrubs of *Hakea bucculenta*, *Grevillea eriostachya* and *G. candelabroides* over Low Heath of various species including *Pileanthus peduncularis*, *Calytrix* sp. 2, *Petrophile* sp. and *Melaleuca* spp. over Open Hummock Grass of *Plectrachne ?drummondii*, Open Low Sedges (*Ecdeiocolea monostachya* and *?Lepidobolus* sp.) and Very Open Herbs of various species including *Helipterum cotula* and *Waitzia acuminata* on deep pale yellow sand.

Site 13.

Emergent mallees of *Eucalyptus eudesmioides* s.l. and *E. jucunda* s.l. over scrub of mostly *Acacia* sp. 17 to about 3 m over Dwarf Scrub D of mostly myrtaceous shrubs including *Pileanthus peduncularis*, *Calytrix* sp. 2, *Calothamnus* sp. 1 and *Baekkea ?grandiflora* over (Open) Sedges (*Ecdeiocolea monostachya*) on yellow sand in a swale.

Site 14.

Very Open Tree Mallee of *Eucalyptus loxophleba* to about 7 m with scattered *Callitris columellaris* over Scrub of mostly *Acacia* sp. 6 (?ramulosa) and *Acacia* sp. 20 over Open Low/Dwarf Scrub of mostly *Rhagodia latifolia* and *Acacia* sp. 12 over Very Open Herbs (especially *Ptilotus obovatus*, *P. gaudichaudii*, *Zygophyllum eremaum*, *Z. fruticulosum* and *Waitzia acuminata*) over Very Open Grass (*Stipa elegantissima*) on slightly clayey red sand.

Site 15.

Open Tree Mallee of mostly *Eucalyptus obtusiflora* up to 5 m over Open Low Scrub A of mostly *Bursaria occidentalis* and *Acacia* sp. 15 over Dwarf Scrub D of myrtaceous shrubs, *Rhagodia latifolia* and *Rhagodia* sp. over Open Hummock Grass of *Plectrachne ?drummondii* and scattered Herbs including *Calandrinia* spp. on red sand on a low crest.

Kalbarri National Park

Site 38

Scattered emergent *Xylomelum angustifolium* to 4 m with scattered shrubs of *Banksia ashbyi*, *Grevillea candelabroides* and *Acacia* sp. to 2 m over Low Heath C of various species including *Allocasuarina campestris*, *Daviesia nudiflora* and *Conospermum stoechadis* over Open Dwarf Scrub D of various species including *Calytrix* sp. and *Cryptandra* sp. 2 over Very Open Tall Sedges of *Ecdeiocolea monostachya* and scattered Herbs including *Schoenus clandestinus* and *Stylidium repens*.

Site 39

Emergents of *Grevillea leucopteris* with foliage to 1.5 m and inflorescence to 2.5 m and *Banksia attenuata* to 1.5 m over Low Heath D of about 0.5 m, of mostly *Eremaea ebracteata* and *Petrophile ericifolia* over scattered Herbs and sedges.

Site 40

Dwarf Scrub C of *Melaleuca* sp. 11, *Calytrix* sp. 4 and *Banksia attenuata* over Open Dwarf Scrub D of various species including *Eremaea ebracteata* over Very Open Tall Sedges of *Ecdeiocolea monostachya* and scattered Herbs. Rare emergent *Banksia ?prionotes* and *Acacia* sp. nearby.

Site 41

Scattered *Baekkea ?robusta* ca. 1.5-2 m over Dwarf Scrub C of mainly myrtaceous species over scattered *Ecdeiocolea monostachya*, *Mesomelaena pseudostygia* and other Herbs in a slight depression.

Site 42

Emergent *Eucalyptus jucunda* (to 3.5 m) and *Actinostrobus arenarius* with a few *E. gittinsii* and *Banksia sceptrum* to 3 m over Open Low Scrub B of myrtaceous species over Open Dwarf Scrub D of mainly myrtaceous species with scattered *Ecdeiocolea monostachya*.



Site 43

Scattered *Banksia sceptrum* and *Xylomelum angustifolium* to 3.5 m with scattered *Baekkea ?robusta* and *Calothamnus* cf. *homalophyllus* to ca. 2 m over Open Low Scrub B of mostly *Melaleuca* sp. 10 over Open Dwarf Scrub C of *Conospermum stoechadis* and myrtaceous species over Open Dwarf Scrub D of various proteaceous and myrtaceous species over scattered *Ecdeiocolea monostachya*, *Mesomelaena pseudostygia* and other Herbs.

APPENDIX 1: List of plant species recorded from the coastal lowland south of Coolcalalaya. At the time of writing, only about 55% of specimens had been checked at the State Herbarium. Nomenclature is based on Green (1985).

Code            Species (or field name)

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## 7 ADIANTACEAE

1,2 c Cheilanthes austrotenuifolia H.Quirk & T.C.Chambers

## 18 CUPRESSACEAE

3     Actinostrobus arenarius C. Gardner  
 -     Callitriche columellaris F. Muell.

## 31 POACEAE

13    c Amphicodon strictus R.Br.  
 8     c Bromus arenarius Labill.  
 9,10c Bromus aff. arenarius  
 6,7 c Danthonia caespitosa Gaudich (AHB 4244, 4245)  
 16    c Monachather paradoxa Steudel (AHB 4243)  
 4     c\*Pentstemonis airoides (Nees) Staaf  
 21    c Phalaris sp. 1  
 22    c Plectrarchne drummondii C.E. Hubb. (AHB 4238, 4240, 4241)  
 -,25,26 c Stipa elegantissima Labill.  
 25    c Stipa tenuifolia Steudel (AHB 4239)  
 27     Stipa aff. nitida Summerh.  
 29     Triodia sp. (?irritans) (AHB 4237)

## 32 CYPERACEAE

39     Chrysitrix distriomatosa C.B.Clarke  
 40     Mesomelaena preisii Nees  
 44    c Schoenus clandestinus S.T.Blake  
 46     Schoenus sp. 2 (minute) (s.30)  
 -     Schoenus sp. 5 (minute) (nr s23)

## 39 RESTIACEAE

-     c Ecdeiocolea monostachya F. Muell. (AHB 4242)  
 49     ?Leiodobolus sp (cf Ecdeiocolea: low, twisted)  
 50     twisted inflorescence (25)  
 51     fine curly restio (28)

## 54C DASYPOGONACEAE

53    c Acaothocarpus ?preisii Lehm.

## 54E PHORMIACEAE

-     Dianella revoluta R.Br.

54F ANTHERICACEAE

- 57 c Thysanotus manlesianus (?patersonii)
- c Tricoryne sp. ?nov. (AHB 4234)
- 60 ?Tricoryne sp. 1 (26,30)
- 61 ?Tricoryne sp. 2 (12,13,37,43)

54J COLCHICACEAE

- 63 Wurmbea tenella (Endl.) Benth.

55 HAEMODORACEAE

- 64 Conostylis stylidioides F.Muell.
- 69 ? Haemodorum sp. 1 "strap"

66 ORCHIDACEAE

- Caladenia amplexans A.S. George
- Caladenia sp. aff. denticulate
- Caladenia flava R.Br.
- Caladenia roei Benth.
- Pterostylis nana R.Br. s.l.
- Thelymitra sargentii R.S. Rogers

70 CASUARINACEAE

- Allocasuarina acutivalvis (F.Muell.) L.Johnson

90 PROTEACEAE

- 75 Banksia ashbyi E.G.Baker
- 76 Banksia sceptrum Meissner
- c Conospermum stoechadis Endl.
- 87 Grevillea annulifera F.Muell.
- 80 c Grevillea candelabroides C.Gardner
- 86 Grevillea commutata F.Muell.
- 81 c Grevillea dielsiana C. Gardner
- 82 c Grevillea eriostachya Lindley
- 84 c Grevillea integrifolia (Endl.) Meissner
- 85,88 c Grevillea stenostachya C. Gardner
- 92 c Hakea bucculenta C. Gardner
- 93 Hakea orthorrhyncha F.Muell.
- 98 c Persoonia angustifolia Benth.
- 99 c Persoonia striata R.Br.
- 97,100 c Petrophile semifurcata F.Muell.

92 SANTALACEAE

- ,105 Exocarpos aphyllus R.Br.
- Santalum acuminatum (R.Br.) A.DC.
- Santalum spicatum (R.Br.) A.DC.

105 CHENOPODIACEAE

- 110,111 Atriplex semilunaris Aellen
- 112 c Atriplex aff. vesicaria Heward ex Benth.
- c "Chenopodium desertorum" (J.Black) J.Black
- ,118,?129 Enchylaena tomentosa R.Br.

- 1256 Maireana georgei (Diels) Paul G. Wilson  
 126 c Maireana trichoptera (J.Black) Paul G. Wilson  
 1256 Maireana villosa (Lindley) Paul G. Wilson  
 116 Rhagodia latifolia (Benth.) Paul G. Wilson ssp. latifolia  
 130 c Rhagodia aff. latifolia  
 117 Rhagodia sp.  
 131 Salsola kali L.  
 132 c Sclerolaena discantha (Nees) Benth.

#### 106 AMARANTHACEAE

- 136 Ptilotus exaltatus Nees  
 137 c Ptilotus gaudichaudii (Steudel) J.Black var. gaudichaudii  
 141 c Ptilotus gomphrenoides F.Muell. var. gomphrenoides  
 138 c Ptilotus grandiflorus (F.Muell.) F.Muell. var. grandiflorus  
 139 c Ptilotus obovatus (Gaudich.) F.Muell.  
 - 143 c Ptilotus polystachyus (Gaudich.) F.Muell.  
 140 c Ptilotus schwartzii F.Muell.

#### 108 GYROSTEMONACEAE

- Codonocarpus cotinifolius (Desf.) F.Muell.

#### 110 AIZOACEAE

- c Tetraoonia diptera F.Muell.

#### 111 PORTULACACEAE

- 144 c Calandrinia polyandra Benth.  
 165 Calandrinia pumila (Benth.) F.Muell.  
 - c Calandrinia sp. 1 (pointed petals)  
 145 ?? Calandrinia sp. 4 (grey)  
 - ?gen. ?nov. ?sp. (AHB 4232)

#### 131 LAURACEAE

- 148 Cassytha sp. 1 (17,39)  
 149 Cassytha sp. 2 (superfine) (14,23)  
 150 Cassytha sp. 3 (21,38,40)

#### 138 BRASSICACEAE

- 151 \* Brassica tournefortii Gouan  
 508 Menkea sp. (33)  
 155,156 c Stenopetalum filifolium Benth.

#### 143 DROSERACEAE

- 159 c Drosera stolonifera Endl. ssp. humilis  
 160 Drosera macrantha Endl.  
 161 Drosera sp. 2 (small) (24)

#### 149 CRASSULACEAE

- 164 Crassula colorata (Nees) Ostenf.  
 164 Crassula exserta (Reader) Ostenf.

152 PITTOSPORACEAE

- c Bursaria occidentalis E.M.Bennett

160 SURIANACEAE

- c Stylobasium spathulatum Desf.

163 MIMOSACEAE

- 196 c Acacia acuminata Benth.  
201 c Acacia sp. 1 (upright ph., rough bark, oblong infl.)  
202 c Acacia sp. 2 (scruffy; globul. infl.)  
204 c Acacia sp. 4 (terete pungent; s. 2, 8)  
206 c Acacia sp. 6 ?ramulosa (stripev pod)  
208 - Acacia sp. 8 (see sp. 28)  
209 c Acacia sp. 10 (phyl. squarish) (site 7)  
210 c Acacia sp. 11 (grey phyl) (site 7)  
211 c Acacia sp. 12 (gorse like; s. 8, 14, 44, 45)  
212 c Acacia sp. cf 12 (larger) (site 11, 14)  
213 c Acacia sp. 13 (red pod) (site 9)  
214 c Acacia sp. 14 (site 9)  
215 c Acacia sp. 15 (site 10, 12)  
223 c Acacia sp. 23 (lanc. phyl; obl. infl; s. 18, 32)  
224 c Acacia sp. 24 (pentagon; s. 19, 32; = sp. 10??)  
225 c Acacia sp. 25 aff. cyperophylla (22)  
(red branches, glob. infl.)  
226 c Acacia sp. 26 (terete; oblong infl; s. 25)  
227 c Acacia sp. 27 (reddish branchlets; s. 31)  
228 c Acacia sp. 28 (cf Cas., pungent; obl. infl)  
(= sp. 8; ?= sp. 26?; site 10)

164 CAESALPINIACEAE

- c Cassia nemophila Cunn. ex Vogel

195 Labiichea Peremaea

165 PAPILIONACEAE

- 179a Chorizema aff. ericifolium Meissner  
170 Daviesia aff. hakeoides Meissner  
184 Isotropis cuneifolia (Smith) Benth.  
504 Jacksonia sp. 3 (28)  
181 Mirbelia aff. depressa E.Pritzl  
176 c Mirbelia ramulosa (Benth.) C.Gardner  
179c Mirbelia spinosa Benth.

167 GERANIACEAE

- 244 c Erodium cygnorum Nees

173 ZYGOPHYLLACEAE

- 249 c Zygophyllum fruticulosum DC  
250 c Zygophyllum iodocarpum F.Muell.

## 175 RUTACEAE

- 252 c Eriostemon sp.1 (grey) (6,6)
- 253 c Eriostemon sp. 2 (green; 17,32)
- 259 Eriostemon sp. 3 (s. 26; white)
- 257 c Phebalium sp. (site 32)
- 255 c yellow flowers (10,39)

## 183 POLYGALACEAE

- 260,168 c Comesperma integerrimum Endl.
- 261 c Comesperma scoparium Steetz
- 262 c Comesperma sp. 1 (climber; pale green fl purple tip)
- 263 ?Comesperma sp. 2 (43)

## 185 EUPHORBIACEAE

- 493 c Bertya sp. (25,38,42,43)
- 264 Euphorbia "drummondii" (11)
- 266 c Monotaxis luteiflora F.Muell.
- 267 Monotaxis sp. 1 (10)
- 268 c Poranthera microphylla Brongn.
- 269 Poranthera sp. 1 (minute,30; ?microphylla)
- 270 small white flower (9)

## 207 SAPINDACEAE

- Dodonaea viscosa Jacq.

## 215 RHAMNACEAE

- 275 c Cryptandra sp. 1 (site 8,15)
- 276 c Rhamnaceae sp. 1 (rusty fruit; 26,38)
- 277 Rhamnaceae sp. 2 (40)

## 221 MALVACEAE

- 278 c Hibiscus sp. (10)
- 280 c Sida sp.1 (1,14,23)

## 223 STERCULIACEAE

- 284 c Keraudrenia hermanniifolia Gey (10)
- 285 c burgundy buds (16)
- 286 purple flowers brown tips (35)

## 226 DILLENIAEAE

- 287 c Hibbertia "aucea" (6,18 19,26,28,29)
- 288 Hibbertia sp. 1 (22)

## 263 THYMELAEACEAE

- c Pimelea microcephala R.Br.

## 273 MYRTACEAE

- 326 c Baeckea robusta F.Muell.
- 328 c Baeckea sp. 3 (site 37)

- 294 c Beaurortia sp.1 (red anthers) (25)  
 297 c Calothamnus sp. 1 (5 bundles) (10,19)  
 298 c Calothamnus sp. 2 ?quadrifidus (10,19,30)  
 302 c Calytrix sp. 1 (blue fl) (6,8,15)  
 303 c Calytrix sp. 2 (long calyx) (10)  
 304 c ?Calytrix sp. 3 (red wispy) (28)  
 - c Chamelaucium sp. nov. (AHB 4233) (3,33)  
 - Eremaea aff. pauciflora (Endl.) Druce (tree)  
 - c Eucalyptus eudesmioides F.Muell. s.l.  
 - c Eucalyptus jucunda C.Gardner s.l.  
 - c Eucalyptus ?kochii Maiden & Blakely (AHB 4236)  
 - c Eucalyptus leptopoda Benth.  
 - c Eucalyptus aff. mannensis Boomsma  
 - c Eucalyptus obtusiflora DC  
     (E. dongarraensis)  
 - c Eucalyptus oldfieldii F.Muell. s.l.  
 - c Eucalyptus rigidula Maiden  
 - c Eucalyptus sheathiana Maiden  
 - c Eucalyptus aff. socialis F.Muell.  
 - c Eucalyptus striaticalyx W.Fitzg.  
 308 c ?Kunzea sp 1 (yellow) (22)  
 - c Lamarchea hakeifolia Gaudich. var. brevifolia  
 310 c Melaleuca aff. cardiophylla  
 - Melaleuca uncinata R.Br.  
 312 c Melaleuca sp. 1 (9)  
 313 c Melaleuca sp. 4 (13,18,41,42)  
 - c Melaleuca sp. 5 (= sp. 4)  
 314 c Melaleuca sp. 6 (paperbark, 4m: 23)  
 315 c Melaleuca sp. 7 (round leaf; 29)  
 316 c Melaleuca sp. 8 (short leaf; 26,29)  
 317 c Melaleuca sp. 9 (36)  
 306 c Melaleuca sp. 16 (18,41)  
 330 c Micromyrtus sp. 1  
     (?Thriptomene sp.; 13,26,33,34,41)  
 331 c Micromyrtus sp. 2 (site 10,29,32)  
 333 c Micromyrtus sp. 3 (site 9,21)  
     [? gen. ? sp. of sites 9,10,13]  
 328 c winged calyx (?Micromyrtus sp.; 13,22,31)  
 325 c Pileanthus peduncularis Endl.  
 329 c Thriptomene/Micromyrtus sp.1 (site 10)  
 334 c Thriptomene sp. 3 (13,16,21)  
 335 c Thriptomene sp. 4 (site 17)  
 [335 c Thriptomene sp. 5 (? = 334) (18,35)  
 336 c Thriptomene sp. 6 (sites 22-32,35)  
 337 c Thriptomene sp. 7 (13,25,26,28,29,38)  
 339 c Thriptomene tuberculata (near site 23)  
 340 c Micromyrtus sp. 4 (site 17)  
 341 c Thriptomene sp. 8 (16,18,19,21,26,29,35)  
 342 c round leaf myrt. ?Scholtzia  
 343 c Thriptomene sp. 9 (imbricate; 28)  
 346 Myrtaceae sp. 1 (site 25)  
 - c Verticordia etheliana C.Gardner (AHB 4230)  
 521 c Verticordia sp. 3 (28,29)

## 276 HALORAGACEAE

- 351 c Glischrocaryon aureum (Lindley) Orch.  
 108 Haloragis odontocarpa F.Muell.

## 281 APIACEAE

- 352 c Daucus sp. 1
- 503 c Hydrocotyle sp. 1 (site 24)
- 515 c Platysace ?commutata (Turcz) Norman
- c Trachymene cyanopetala (F.Muell.) Benth.
- c Trachymene ornata (Endl.) Druce
- Trachymene pilosa Smith
- c Uldinia ceratocarpa (W.Fitzg.) N.Burb.

## 288 EPACRIDACEAE

- 355 c sp. 1 (oblong lvs, green fruit; 17)
- 356 c sp. 2 (sm.lvs; minute red fls; 20)

## 302 LOGANIACEAE

- 506 ?Logania sp. 2 (31)
- c Mitrasacme paradoxa R.Br.

## 304 APOCYNACEAE

- c Alyxia buxifolia R.Br.

## 305 ASCLEPIADACEAE

- c Rhyncharrhena linearis (Decne.) K.L.Wilson

## 310 BORAGINACEAE

- 360 c Haloania cyanea Lindley
- c Omphalolappula concava (F.Muell.) Branc

## 311A CHLOANTHACEAE

- 361 c Dicrastylis sp. 1
- 362 c Dicrastylis sp. 2
- 364 c Dicrastylis sp. 4 (10)
- c Spartothamnella teucriflora (F.Muell.) Mold.
- 366 c Pityrodia sp. 1 (12,18,26,31)
- 368 c Pityrodia sp. 3 (12)
- 514 Pityrodia sp. 5 (pale green-grey; 18)

## 313 LAMIACEAE

- 369 c Microcorys sp. (10)
- 370 c Prostanthera c.f. baxteri (6)
- 371 ?Prostanthera sp. 1 (site 17.37)

## 315 SOLANACEAE

- 376 c Anthotroche walcottii F.Muell.
- 379 c Solanum lasiophyllum Dunal ex Poiret
- 380 c Solanum ?pumularium S. Moore
- 381 Solanum sp. 1 (brown buds; 8.12)



### 326 MYOPORACEAE

- 382 c Eremophila forrestii F.Muell.
- 383 c Eremophila c.f. glabra (R.Br.) Ostenf.
- 384 c Eremophila oppositifolia R.Br.
- 385 c Eremophila sp. 1 (2,9)
- 386 c Eremophila sp. 1A (?= sp. 5: 2,33)
- 390 c Eremophila sp. 5 (6,20)
- 391 c Eremophila sp. 6
- 392 c Eremophila sp. 7 (9)
- 393 c Eremophila sp. 9 (36)

### 329 PLANTAGINACEAE

- 402 c Plantago varia R.Br.

### 331 RUBIACEAE

- 403 c Opercularia spermacocea Labill.

### 340 LOBELIACEAE

- 404 c Lobelia cf. gibbosa Labill.
- 405 c Lobelia winfridae Diels

### 341 GOODENIACEAE

- c Brunonia australis Smith
- 406 c Dampiera sp. 1 (10)
- 407 c Dampiera sp. 2 (leafless; 18)
- 408 c Dampiera sp. 3 (37)
- 411 c ?Lechenaultia sp. (21)
- 412 c Scaevola oxyclona F.Muell.
- 413 c Scaevola spinescens R.Br.
- 416 c "Goodenia" sp. 1 (9,32)
- 417 c Goodenia sp. 2 (1,23)
- 418 c Goodenia sp. 3
- 419 c Velleia sp. 1 (14,15,24)
- 421 c Velleia sp. 3 (minute; sm lavender fl;22)
- 422 c Goodeniaceae sp.1 (16,17)
- 523 ?Goodeniaceae (23)

### 343 STYLIDIACEAE

- c Stylidium elongatum Benth.
- Stylidium limbatum F.Muell.
- Stylidium repens R.Br.
- Stylidium sp. nov. aff. pilosum Labill.

### 345 ASTERACEAE

- 423 c Anqianthus sp. 1 (6,15,33)
- \*Arctotheca calendula
- 424 c Brachycome ciliaris (Labill.) Less.
- 425 c Brachycome cf. ciliaris (11)
- 426 c Brachycome ?iberidifolia Benth.
- 427 c Brachycome sp. ?nov. aff. iberidifolia  
(AHB 4247; site 10)
- 428 c Brachycome sp. 1 (white; 9,14,45)

- 431 Brachycome sp. 4 (11)  
 435 c Calocephalus sp. 1 (7)  
 437 c Calocephalus sp. 3 (7)  
 438 c Calocephalus sp. 4 (?=3) (7,10)  
 439 c Calocephalus sp. 5 (grey) (23)  
 - c Calocephalus sp. 6 (26)  
 442 c Calotis ?hispidula (F.Muell.) (F.Muell.)  
 443 c Cephalopterum drummondii A.Gray  
 444 c Ceratogyne obionoides Turcz.  
 445 c Chrysocoryne pusilla (Benth.) Endl.  
 446 c "Chrysocoryne" sp. 1 (36)  
 451 c Chthonocephalus pseudevax Steetz  
 453 c Helipterum strictum (Lindley) Benth.  
 455 Helipterum sp. 2 (2,14,15,37)  
 456 c ?Hypochaeris sp. 1 (23,24)  
 - c Olearia axillaris (DC) F.Muell. var. eremicola  
 458 c ?Olearia sp. (nr 9)  
 - c Podolepis canescens Cunn.  
 459 c Podolepis lessonii (Cass.) Benth.  
 - c Podotheca craphalioides F.A.Graham  
 460 c Podotheca sp. 1 (12; sm. - ?craphalioides)  
 - c Schoenia cassiniana (Gaudich.) Steetz  
 461 c Senecio cf. minimus Poiret  
 462 c Waitzia acuminata Steetz  
 463 c Waitzia citrina (Benth.) Steetz  
 - c Waitzia suaveolens (Benth.) Druce  
 464 c ?Waitzia minute (8,9)  
 465 c ?Waitzia scruffy (36)  
 468 c yellow fl -> red fruit (9)  
 470 c small kali (14,23,)  
 471 c little yellow tubes (24,26)  
 472 c tiny; burundy tipped (16,17)  
 - c hairy minute erect (22)  
 - c ? gen. ? sp. (7)  
 - c ? gen. ? sp. (9)  
 473 c coppery bracts (1,9,14,36)  
 479 c cf Isaetopsis (36)  
 481 yellow buttons 1 (2,3,9)  
 485 sm. pale yellow (36)  
 486 daisy sp. 1 (26)  
 509 c cf Olearia grey lvs, orange stems

APPENDIX 3: List of vertebrate animals recorded on the vacant Crown land south-east of Coolcalalaya. Species marked with an asterisk were recorded by Mell (1981) but not during the present survey. All records from the present survey were made by J.K. Rolfe and A.H. Burbidge.

Common Name	Scientific Name
<u>Reptiles</u>	
	<i>Diplodactylus alboguttatus</i>
	<i>Diplodactylus strophurus</i>
Bynoe's Gecko	<i>Heteronotia binoei</i>
Central Netted Dragon	<i>Ctenophorus inermis</i>
Spotted Dragon	* <i>Ctenophorus maculatus</i>
	<i>Ctenophorus scutullatus</i>
Moloch	* <i>Moloch horridus</i>
Western Bearded Dragon	* <i>Pogona minor</i>
	<i>Tympanocryptis adelaidensis</i>
	<i>Ctenotus schomburgkii</i>
	<i>Lerista connivens</i>
	<i>Lerista macropisthopus</i>
	<i>Lerista muelleri</i>
	<i>Morethia obscura</i>
	* <i>Varanus caudolineatus</i>
Gwarda	* <i>Pseudonaja nuchalis</i>
<u>Birds</u>	
Emu	<i>Dromaius novaehollandiae</i>
Brown Goshawk	<i>Accipiter fasciatus</i>
Little Eagle	<i>Hieraaetus morphnoides</i>
Brown Falcon	<i>Falco berigora</i>
Australian Kestrel	<i>Falco cenchroides</i>
Banded Lapwing	<i>Vanellus tricolor</i>
Common Bronzewing	<i>Phaps chalcoptera</i>
Crested Pigeon	<i>Ocyphaps lophotes</i>
Red-tailed Black-Cockatoo	<i>Calyptorhynchus magnificus</i>
Galah	<i>Cacatua roseicapilla</i>
Little Corella	<i>Cacatua sanguinea</i>
Cockatiel	<i>Nymphicus hollandicus</i>
Budgerigar	* <i>Melopsittacus undulatus</i>
Port Lincoln Ringneck	<i>Barnardius zonarius</i>
Mulga Parrot	<i>Psephotus varius</i>
Bourke's Parrot	<i>Neophema bourkii</i>
Elegant Parrot	<i>Neophema elegans</i>
Pallid Cuckoo	<i>Cuculus pallidus</i>
Horsfield's Bronze-Cuckoo	<i>Chrysococcyx basalis</i>
Shining Bronze-Cuckoo	<i>Chrysococcyx lucidus</i>
Southern Boobook	<i>Ninox novaeseelandiae</i>
Tawny Frogmouth	<i>Podargus strigoides</i>
Australian Owlet-nightjar	<i>Aegotheles cristatus</i>
Spotted Nightjar	<i>Caprimulgus guttatus</i>
Red-backed Kingfisher	* <i>Halcyon pyrrhopygia</i>
Rainbow Bee-eater	<i>Merops ornatus</i>
White-backed Swallow	<i>Cheramoeca leucosternum</i>
Tree Martin	<i>Cecropis nigricans</i>
Richard's Pipit	<i>Anthus novaeseelandiae</i>

Appendix 3 (cont.).

Common Name	Scientific Name
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>
White-winged Triller	* <i>Lalage sueurii</i>
Southern Scrub-robin	<i>Drymodes brunneopygia</i>
Red-capped Robin	<i>Petroica goodenovii</i>
Western Yellow Robin	<i>Eopsaltria griseogularis</i>
Golden Whistler	<i>Pachycephala pectoralis</i>
Rufous Whistler	<i>Pachycephala rufiventris</i>
Grey Shrike-thrush	<i>Colluricincla harmonica</i>
Crested Bellbird	<i>Oreoica gutturalis</i>
Grey Fantail	<i>Rhipidura fuliginosa</i>
Willie Wagtail	<i>Rhipidura leucophrys</i>
White-browed Babbler	<i>Pomatostomus superciliosus</i>
Brown Songlark	* <i>Cinclorhamphus cruralis</i>
Splendid Fairy-wren	<i>Malurus splendens</i>
Variiegated Fairy-wren	<i>Malurus lamberti</i>
White-winged Fairy-wren	* <i>Malurus leucopterus</i>
Redthroat	<i>Sericornis brunneus</i>
Weebill	<i>Smicrornis brevirostris</i>
Western Gerygone	<i>Gerygone fusca</i>
Inland Thornbill	<i>Acanthiza apicalis</i>
Chestnut-rumped Thornbill	<i>Acanthiza uropygialis</i>
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>
Spiny-cheeked Honeyeater	<i>Acanthagenys rufogularis</i>
Yellow-throated Miner	<i>Manorina flavigula</i>
Singing Honeyeater	<i>Lichenostomus virescens</i>
Yellow-plumed Honeyeater	* <i>Lichenostomus ornatus</i>
Grey-fronted Honeyeater	<i>Lichenostomus plumulus</i>
Brown-headed Honeyeater	<i>Melithreptus brevirostris</i>
Brown Honeyeater	<i>Lichmera indistincta</i>
White-fronted Honeyeater	<i>Phylidonyris albifrons</i>
Pied Honeyeater	<i>Certhionyx variegatus</i>
Crimson Chat	<i>Ephthianura tricolor</i>
Mistletoebird	<i>Dicaeum hirundinaceum</i>
Striated Pardalote	<i>Pardalotus striatus</i>
Zebra Finch	<i>Poephila guttata</i>
Masked Woodswallow	<i>Artamus personatus</i>
Black-faced Woodswallow	<i>Artamus cinereus</i>
Grey Butcherbird	<i>Cracticus torquatus</i>
Pied Butcherbird	<i>Cracticus nigrogularis</i>
Australian Magpie	<i>Gymnorhina tibicen</i>
Australian Raven	<i>Corvus coronoides</i>
Little Crow	<i>Corvus bennetti</i>

Mammals

Echidna	<i>Tachyglossus aculeatus</i>
Red Kangaroo	<i>Macropus rufus</i>
Western Grey Kangaroo	<i>Macropus fuliginosus</i>
White-striped Mastiff-bat	<i>Tadarida australis</i>
Rabbit	<i>Oryctolagus cuniculus</i>
Fox	<i>Vulpes vulpes</i>
Feral Cat	<i>Felis catus</i>
Goat (feral)	<i>Capra hircus</i>