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University of Technology
Perth Western Australia

School of Biology

WORK EXPERIENCE REPORT

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31391-5-89

SCHOOL OF BIOLOGY

WORK EXPERIENCE REPORT

"Data collation on granite outcrop flora"

Student: Leigh Sage

Employer: The Department of Conservation
and Land Management
Woodvale Research Centre

Duration: December, 1989

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1.0 INTRODUCTION

The Western Australian country side is pocketed with numerous granite outcrops. Good examples being Boulder Rock, Sullivan Rock and Hyden Rock. The outcrops are found to contain certain flora usually found in far-away different habitats and areas. The rocks tend to collect and hold water quite readily, enabling the "alien" flora to be supported. Thus the outcrops are considered to be "flora islands", often enabling orchids only found closer to the coast, to survive in the more arid areas. Research scientists from the Department of Conservation and Land Management have been conducting flora surveys of these outcrops with the orchids (Orchidaceae) being of considerable interest. Generally these surveys are to establish and class "rare" flora, determine the range of certain species and thus to determine worthwhile conservation areas. And also to establish specifically which granite outcrops are worth preserving and how many.

Dr. Steve Hopper (Senior Research Scientist with CALM) and Andrew Brown (Technical Officer with CALM) have been conducting these flora surveys for a number of years now, with projects such as the Banksia and Orchid atlas being set up by them in the last few years. Other areas of work by them have included rare flora bills, taxonanic and herbdrium work.

Generally my job at the Woodvale Research Centre has been to set up three data bases on certain granite outcrops and their flora. The first data base was based on the Ornduff granite outcrops (so named after Bob Ornduff, who surveyed them a few years ago), starting initially on the orchids of these rocks and then expanding the data base to include all flora surveyed. This first data base was a "tester" to see if the expected patterns would result in the forthcoming data bases. The second data base consisted of a general east/west transect of rocks surveyed across southern W.A., including about 43 outcrops. And like the Ornduff data

base, orchids were "put in" first, then expanding later to include all flora found. The third and final data base was to include virtually all the granite outcrops surveyed in W.A., but to be on **only** the orchids found on these

2.0 WORK EXPERIENCE DIARY

Monday 27th November

- met Dr. Steve Hopper (Senior Principal Research Officer) who I'm working for.
- met Andrew Brown (Technical Officer)
- they discussed the data base with me and what will be required.
- met Norm McKenzie, he showed me what format the data was required to be in to enter into PATN, the specially developed statistical package.
- started editing the "Caladen dec", which is a file of all orchid taxa in W.A., which we copied from DWIII to Word (ASCII).
- the data has to be processed by the specially designed PATN program, by mutli-variate data analysis, producing dendograms and two-way tables.

Tuesday 28th November

- continued editing the "Caladen dec"
- set up the DBASE file for the **Ornduff** granite outcrops (nine in all)
- searched for data from Andrew's and Dr. Hopper's field notes.

Wednesday 29th November

- entered data from field notes onto word file in 123456789 form, on orchids **only** at the moment, other plants will be entered later.
- then started just reading through Dr. Hopper's field notes (there are 25 full books in all!)
- had a tour of the entire research centre

Thursday 30th November

- continued searching Dr. Hopper's notes, just placing markers in the places where granite rocks were visited.

Friday 1st December

- continued searching the field notes for most of the day.

Monday 4th December

- halted the search of Dr. Hopper's notes
- started adding the eight new rocks onto the data base and word file (the start of the "Transect" data base)
- searched for the rocks in the field notes.

Tuesday 5th december

- was given the full **nearly** set of transect rocks by Dr. Hopper.
- started producing a map of W.A. from photocopies at 1:10000 000 which covers 115°E - 124°E and 35°S - 29°S and inserting the rocks onto it from Steve's map.

Wednesday 6th December

- finished the map
- continued IDing the rocks, etc.
- completed the orchid version of the Ornduff data base and put into PATN

Thursday 7th December

- identifying the transect rocks and describing
- cleaned up and filed everything

Friday 8th december

- identifying the transect rocks and describing
- put same on data base

Monday 11th December

- nearly completed all situation descriptions for transect rocks (33 new ones!) and entered into a base.
- started entering data on "tran.doc" for "PATN" ("tran.doc" is the word processor file which will hold all the data).

Tuesday 12th December

- finished off description of most of the rocks
- started data entry on second base (Transect)
- saw an Antarctica slide show

Wednesday 13th December

- continued data entry and checking the species names.
  (wrote them down, ticked them off as entered and checked any ones needed to)

Thursday 14th December

- continuing data entry
- search of field notes

Friday 15th December

- continuing data entry
- search of field notes

Monday 18th December

- continuing data entry
-

Tuesday 19th December

- continuing data entry
-

Wednesday 20th December

- first attempt at the PATN analysis of the second data base
- re-assessment of data by Dr. Hopper.
- corrections done on the data base.

Thursday 21st December

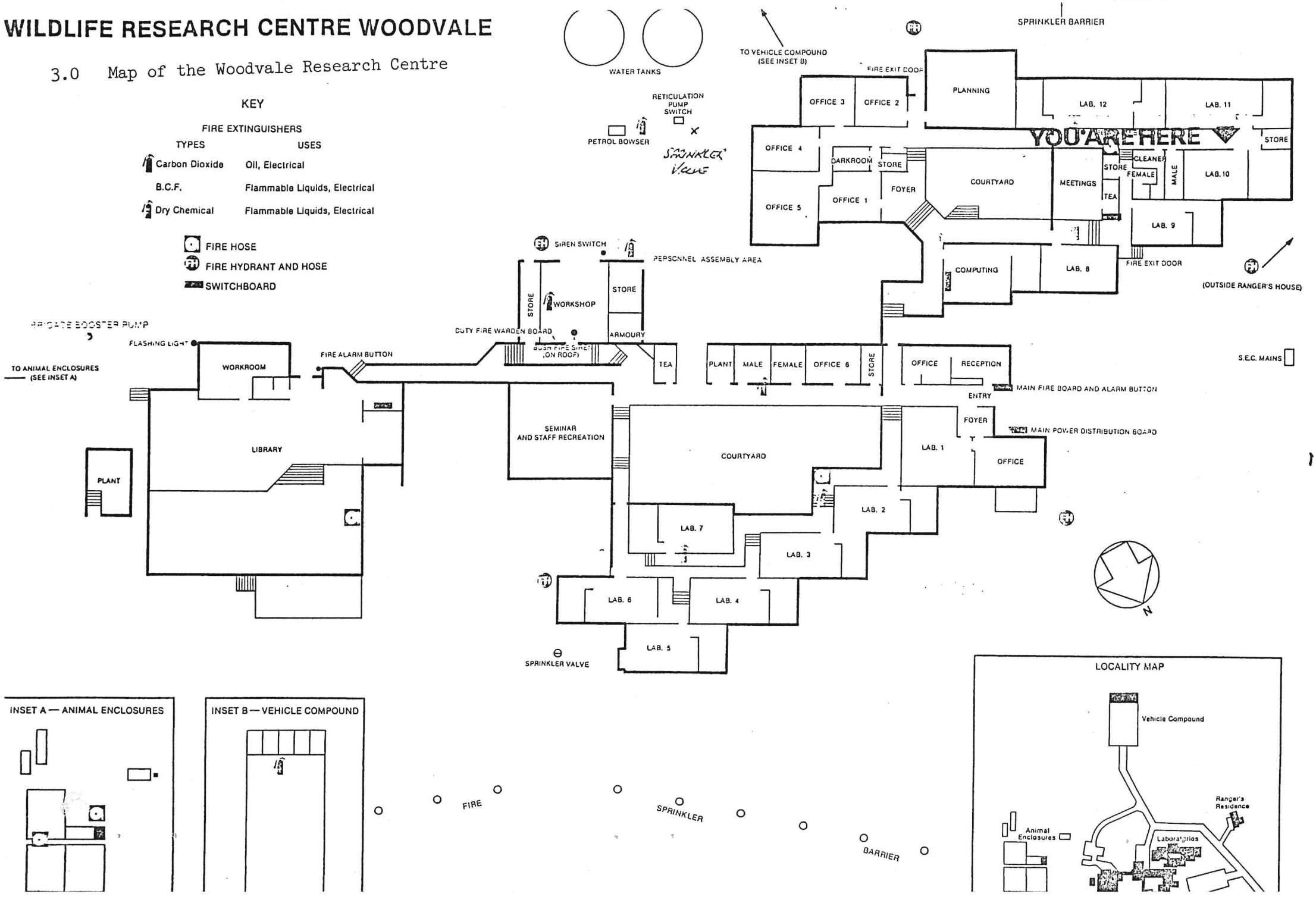
- second attempt at the PATN analysis
-

Friday 22nd December

- - final update of data by Andrew
- obtained information for my report
- finished off the dendogram and two-way analysis and printouts
- started the third data base (Andrew will finish)

WILDLIFE RESEARCH CENTRE WOODVALE

3.0 Map of the Woodvale Research Centre



4.0 INTRODUCTION

Dr. Bob Ornduff in 1986/87 conducted an intensive floral survey on a series of nine granite outcrops in the southwest of W.A. Including a number of outcrops in the Darling Scarp, in the vicinity of the Albany Highway and stretching out to Hyden the semi and /arid area about 500 km east of Perth. These rocks have since been also surveyed by researchers from CALM with all orchid species present taking specific interest.

METHODS AND MATERIALS

The surveying methods used by A. Brown and Dr. Hopper were either by randomly noting plants seen on the outcrops or intensively surveying an area or the whole area of the rock. If orchids were the main plants concerned then they would have been specifically searched for until all were considered found. The plants' scientific names were then noted in field note books, along with specific details such as date, a diary of how to get to the outcrop rock name and any other relevant information.

The information collected during field trips was later transferred onto a computer data base using a word processing package. Whereby the orchid species were listed vertically, and individual granite outcrops, represented by an abbreviated number, listed horizontally across the top. A binary system was used where the specific orchid (Y) had been found at the specific rock (X) then the number "1" was placed at that position, and if it was absent then an "0" was placed there instead. This binary system of "presence" or "absence" enables direct comparisons to be made between different rocks and between different species of plants. The rocks can be linked in relation to the species that they have in common, and the species can be linked according to the rocks they have in common. This was all done by the computer statistical package "PATN" using multivariat analysis. It was used to create the dendrograms and two-way tables showing the groupings and linkages between rocks/orchids.

DISCUSSION

Generally the two-way table and dendogram shows up 2 or 3 groupings of the nine rocks. With the Darling Range rocks of Sullivan, Nettleton, Blue, Boulder and 10.3 being one group. The Humps and Hyden rock being another grouping. Boyagin and 10.9 rocks showing up as "in-between" rocks, possessing orchids found in both the other groups (Boyagin more so). Thus the data seems to have confirmed the desired and expected results of distinct groupings out in the desert to the east and in the Darling Range area, with a middle "mixed" area. The middle grouping is of special conservation importance, as this grouping generally contains orchids found in both the other areas and would more likely be considered to be reserved if only a certain number of rocks were to be reserved.

The results also show that there are a number of orchids that occur throughout the range of the Ornduff granite outcrops.

5.0 THE DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

The Department of Conservation and Land Management was formed in 1984, along with the Lands and Forests Commission, the National Parks and Nature Conservation Authority and the Forest Production Council. Generally CALM manages the State forests, Nature, marine nature and timber reserves, the national parks and marine parks. CALM specifically carries out research on land management and flora and fauna conservation/protection, assists the statutory bodies, enables the development of forest production and advises the responsible minister on reserving Crown land.

There are approximately sixteen hundred people employed by the department. Made up of field workers, field staff, clerical staff, tradespersons and professional (and specialists) staff. The field workers generally carry out labouring work such as fire control, nursery duties, burning and constructing facilities for visitors. The field staff is made up of Forest officers (supervision and administration in the State forest areas), wildlife officers (wildlife legislation enforcement) and National Park rangers (National Park management). To become a field staff member means joining the Cadetship Programme, which is over two years, or becoming a Trainee Ranger for two years. The professional staff (possessing a tertiary degree) include botanists, biologists, agricultural scientists, geographers, soil scientists, accountants, foresters, and landscape architects. Other specialist persons employed include graphic artists, economists, computer programmers and cartographers. Tradespersons such as mechanics, carpenters, technicians and welders are also employed.

6.0 WOODVALE RESEARCH CENTRE

At the Woodvale Research Centre, areas of conservation and land management such as fire ecology, biogeography and flora conservation are studied and assessed. There being approximately sixty-five people employed by CALM in research, and forty-five of them working at Woodvale.

The Biogeography unit at Woodvale conducts floral surveys of National parks and reserves and possible reserves. National Parks such as the Leeuwin Naturliste N.P. are quite extensively surveyed and closely managed because of the high intake of visitors per year. Projects such as the Banksia Atlas and Orchid Atlas have been set up by research at Woodvale to tap the large reserve of amateur botanists and naturalists. These atlas' are where any member of the public using an identification and "how to" booklet, can fill out site forms on any species of Banksia/Orchid they come across. These forms are then sent into the Woodvale research centre and entered onto a data base, whereby computer generated atlas' or maps are produced of where a certain species has been found.

The Biogeography unit also research poorly known and rare flora. A poorly known plant is first checked in the herbarium (Como), then surveyed and then carefully mapped. Rare flora require a rare flora site report form to be filled out if found, people such as land owners are notified and the rare flora legislation updated if needed.

Taxonomic work is also carried out at Woodvale. A plant group such as Orchidaceae may be checked if an updating is considered to be needed. Firstly a check on those already named is made, (species or genus) a literature search is then made, which is then followed by a herbarium search (worldwide). And if it is found that the specimen has not been named (or

needs to be re-named/re-described), then a new description is written and a name given. Often the plant is named after a special feature, possibly a striking flower or colour. The description of the plant includes site, general description, a comparison to another similar species and a latin description. The description should then be published in a journal which has a wide distribution so as many people as possible are aware of the new species or name change.

6.1

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT
RARE FLORA FIELD REPORT FORM

Rare flora report

TAXON: Lalaechia sp (salt lakes) S.D. Hopper 4162. **POPULATION No.:** 9

File No. Head Office: 023077F3702 **File No. District:**

DRF ☑ **Proposed DRF** ☐ **Priority Species No.** ☐ **Geog. Restr.** ☐

New Population ☐ **Routine Inspection** ☐ **Re-survey** ☑ **Opportunistic Survey** ☐

FROM: S.D. Hopper via A. Kelly **TITLE:** Research scientist **SURVEY DATE:** 25.9.84

REGION: Wheatbelt **DISTRICT:** Merredin **SHIRE:** Goomalling

District Site Ref.: **MAP REF.:**

LAND STATUS:

Nature Res. ☐	Water Res. ☐	Gravel Res. MRD ☐	Gravel Res. Shire ☐
National Park ☐	Railway Res. ☐	Rd. Verge MRD ☐	Rd. Verge Shire ☐
State Forest ☐	Private ☑	VCL ☐	Shire Reserve ☐
Other ☐	State:		

LOCALITY:

LATITUDE: **LONGITUDE:** **ALTITUDE:** **ASPECT:**

LANDFORM:

Hilltop ☐	Flat ☑	Drainageline ☐	Swamp ☐	Ridge ☐
Outcrop ☐	Breakaway ☐	Slope ☐	Gully ☐	Valley ☐
Riverbank ☐	Lake Edge ☐	Low Plain ☐	Sand Dune ☐	Cliff ☐
Firebreak ☐	Other:			

ROCK TYPE: Laterite ☐ Granite ☐ Dolerite ☐ Limestone ☐ Other:

ROCK FORM: Sheet ☐ Boulder ☐ Fluviatile Gravel ☐ Concretionary gravel ☐

SOIL TYPE: Sandy ☑ Loamy ☐ Clayey ☑ Peaty ☐

SOIL COLOUR: Red ☐ Brown ☐ Yellow ☐ White ☐ Grey ☐

SOIL CONDITION: Perm. wet ☐ Moist ☐ Dry ☐ Saline ☐ Other:

sandy alluvial area

VEGETATION CLASSIFICATION (Muir's): Actinostrobus - Jacksonia sp open low scrub over mallee

ASSOCIATED SPECIES: Actinostrobus sp. Jacksonia sp. Banksia prionotes Eucalyptus tetraptera

No. OF PLANTS:

Estimated ☐ Actual ☑ Mature: 2 Seedlings: Dead: Area Occupied:

REPRODUCTIVE STATE: in bud ☐ flower ☑ immature fruit ☑ dehisced ☐ vegetative ☐

POLLINATORS: Native bees ☐ honey bees ☐ mammals ☐ birds ☐ insects ☐

Other observations:

CONDITIONS OF POPULATION: Recently burnt ☐ diseased ☐ disturbed ☐ undisturbed ☐

Other ☐ State:

POTENTIAL THREATS: Firebreaks ☐ mining ☐ recreational activities ☐ disease ☐ weeds ☐

grazing ☐ clearing ☐ prescribed burning ☐ Other ☐ State

FIRE HISTORY: Not known ☑ Burnt in 19 Summer ☐ Autumn ☐ Winter ☐ Spring ☐

Next control burn: Year: Month:

VOUCHER SPECIMEN: Retained ☐ W.A. Herb. ☑ Other ☐ State: DH 462

ATTACHED: Map ☑ Mudmap ☐ Illustration ☐ Photo ☐ Field Notes ☑

ACTION: Taken:

Required: by District ☐ S.O.H.G. ☐

FENCING REQUIREMENT:

OTHER COMMENTS: Exact location difficult to determine from field notes.

COPY SENT TO: Regional Office ☐ District Office ☐ Other ☐ State:

SOHG TO SEND COPY TO: Regional Office ☑ District Office ☑ Other ☐ State: Inform private landowners of population. Re-survey of site required.

Signed: Kelly Date: 18/12/89

NOTE: More than one box in any section may be ticked.

RECORDS: PLEASE FORWARD TO SENIOR CLERK FLORA, WILDLIFE AND LAND ADMINISTRATION

7.0 ORCHIDS

7.1 Orchidaceae

Orchids are found in the Orchidaceae family of plants, and generally possess quite distinctive floral attributes which distinguish them from other plant groups. Along with groups such as grasses and palms, orchids are monocotyledons (as opposed to dicotyledons), and make up 10 per cent of the world's flowering plants (20-35000 spp.) (D.L. Jones : 1988). Generally in the orchids, the perianth is in three segments. The three segments being alike or unlike, distinguishing the orchid. Also a Cabellum is produced by the forward petal. Another conspicuous part of the flower is the arrangement of the male and female organs into the column, being the central part of the flower (D.J. Jones : 1988) (D. Clyne : 1972). Basically Australia is not as rich in orchids as other parts of the world, though most of our orchids are endemic to here (D. Jones : 1988). Most are found in fringe areas of Australia (where most of the population is), becoming generally less common the further inland you go, with some being found in higher altitudes of up to 2000 metres (D.L. Jones : 1988). Most of the Australian orchids are epiphytes, being found mostly in tropical and semi-tropical areas of W.A., Northern Territory and Queensland and in northern N.S.W. With our South West possessing the biggest amount of terrestrial orchids in Australia. (A. Brown and M. Hoffman 1984).

7.2 All Orchid taxa known from W.A. granite outcrops

ALL ORCHID TAXA KNOWN FROM GRANITE OUTCROPS IN W.A
A. BROWN - 29TH NOVEMBER 1989

Species underlined are declared rare

1. Caladenia applanta
2. Caladenia attingens subsp. attingens
3. Caladenia attingens subsp. gracillima
4. Caladenia borealis
5. Caladenia brevisura
6. Caladenia brownii
7. Caladenia caesarea subsp. maritima
8. Caladenia caesarea subsp. transiens
9. Caladenia cairnsiana
10. Caladenia chapmanii
11. Caladenia citrina
12. Caladenia decora
13. Caladenia denticulata subsp. denticulata
14. Caladenia denticulata subsp. amplior
15. Caladenia doutchiae
16. Caladenia exstans
17. Caladenia falcata
18. Caladenia filifera
19. Caladenia flava subsp. flava
20. Caladenia flava subsp. maculata
21. Caladenia flava subsp. sylvestris
22. Caladenia footeana
23. Caladenia gardneri
24. Caladenia graminifolia
25. Caladenia granitora
26. Caladenia harringtoniae
27. Caladenia heberleana
28. Caladenia hiemalis
29. Caladenia hirta subsp. rosea
30. Caladenia hoffmanii
31. Caladenia incensa
32. Caladenia incrassata
33. Caladenia infundibularis
34. Caladenia integra
35. Caladenia latifolia
36. Caladenia lobata
37. Caladenia longicauda subsp. longicauda
38. Caladenia longicauda subsp. clivicola
39. Caladenia longicauda subsp. eminens
40. Caladenia longicauda subsp. rigidula
41. Caladenia longiclavata
42. Caladenia marginata
43. Caladenia microchila
44. Caladenia multiclavia
45. Caladenia nana subsp. unita
46. Caladenia nivalis
47. Caladenia pachychila
48. Caladenia patulens
49. Caladenia pectinata
50. Caladenia pholcoidea
51. Caladenia polychroma subsp. dimidia
52. Caladenia polychroma subsp. horistes
53. Caladenia plicata
54. Caladenia pulchra subsp. pulchra

55. Caladenia radialis
56. Caladenia remota
57. Caladenia reptans
58. Caladenia rhomboidiformis
59. Caladenia roei
60. Caladenia saccharata
61. Caladenia sigmoidea
62. Caladenia validinervia
63. Calochilus aff. campestris
64. Cryptosylis ovata
65. Cyanicula amplexans
67. Cyanicula caerulea subsp. apertala
68. Cyanicula deformis
69. Cyanicula fragrans
70. Cyanicula gemmata
71. Cyanicula ashbyi
72. Cyanicula sericea
73. Cyrtostylis huegelii
74. Cyrtostylis robusta
75. Diuris aff. corymbosa
76. Diuris laxiflora
77. Diuris longifolia
78. Diuris picta
79. Drakonorchis barbarossa
80. Drakonorchis mesocera
81. Elythranthera brunonis
82. Elythranthera emarginata
83. Eriochilus dilatatus subsp. dilatatus
84 Eriochilus dilatatus subsp. multiflorus
85. Eriochilus helonomos
86. Eriochilus scaber
87. Fitzgeraldia forrestii
88. Fitzgeraldia nigricans
89. Leporella fimbriata
90. Leptoceras menziesii
91. Lyperanthus serratus
92. Microtis atrata
93. Microtis orbicularis
94. Microtis parviflora
95. Microtis unifolia
96. Monadenia bracteata
97. Paracaleana dixonii
98. Paracaleana nigrita
99. Prasophyllum ringens
100. Prasophyllum parvifolium
101. Pterostylis allantoidea
102. Pterostylis barbata
103. Pterostylis hamiltonii
104. Pterostylis aff. hamiltonii
105. Pterostylis mutica
106. Pterostylis aff. nana
107. Pterostylis aff. plumosa
108. Pterostylis recurva
109. Pterostylis aff. rufa
110. Pterostylis sargentii
111. Pterostylis scabra
112. Pterostylis aff. vittata
113. Spiculaea. ciliata subsp. ciliata
114. Thelymitra antennifera
115. Thelymitra benthamiana

116. Thelymitra crinita
117. Thelymitra cucullata
118. Thelymitra flexuosa
119. Thelymitra fuscolutea
120. Thelymitra aff. fuscolutea
121. Thelymitra longifolia
122. Thelymitra aff. nuda
123. Thelymitra pauciflora
124. Thelymitra aff. pauciflora
125 Thelymitra spiralis
126. Thelymitra villosa

WRCAPB:CALADENIA

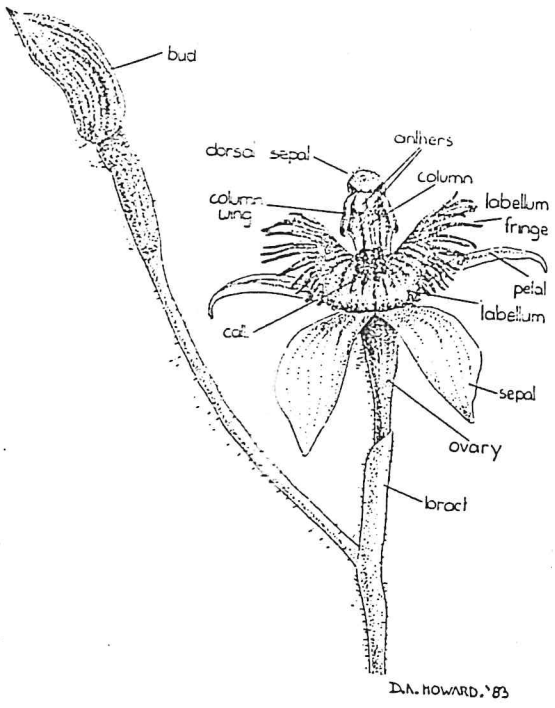
7.3 Caladenia - The Spider Orchids

Western Australia, specifically the South West, possess about fifty species (and varieties) of this orchid genus. Holding more than any other state in Australia (out of 80) and forming the largest orchid genus in this state. (A. Brown and N. Hoffman 1984).

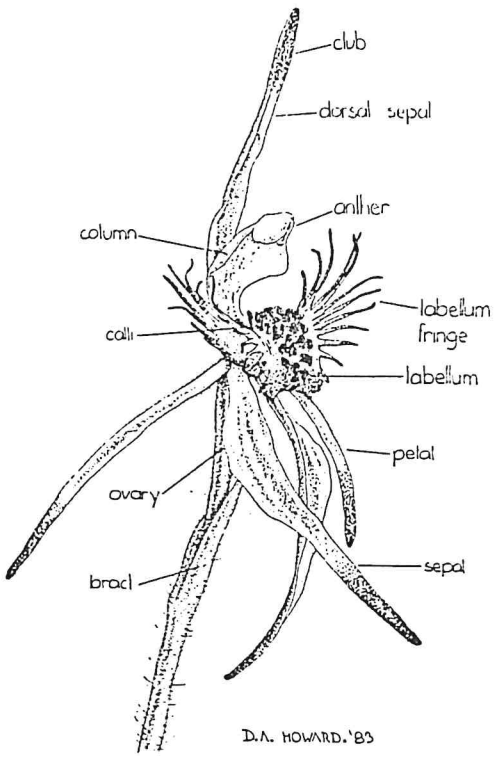
Generally Caladenia possess a solitary (not including bracts) hairy leaf arising from a hairy stem. With a labellum possessing calli and which is fringes (A. Brown and N. Hoffman : 1984) (Blackall and Grieve : 1981). The Calli give a number of different formations on the labellum, giving distinctiveness to some species (Brown and Hoffman : 1984).

Flowering for the Caladenia ranges from April to January, with most flowering in spring (September to October) (Brown and Hoffman : 1984).

Caladenia discoidea



Caladenia corynephora



Brown, Hoffman: 1984

8.0 REFERENCES

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W.E. Blackall and B.J. Grieve 1981 — How to Know Western Australian Wildflowers - Parts I, II, UWA Press Perth, 4th Ed.

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1989 — Career Information Booklet, CALM, Perth

9.0 Appendix

9.1 Orchids of Ornduff outcrops

ALL ORCHIDS KNOWN FROM THE ORNDUFF GRANITE OUTCROPS IN W.A
S. HOPPER & A. BROWN - 6TH DECEMBER 1989

Key to the Ornduff Outcrops :
1. Nettleton Rock
2. 10.3km Rock
3. 10.9km Rock
4. Blue Rock
5. Boulder Rock
6. Sullivan Rock
7. Boyagin Rock
8. Hyden Rock
9. The Humps

1. Caladenia dimidia
2. Caladenia falcata
3. Caladenia flava subsp. flava
4. Caladenia hirta subsp. rosea
5. Caladenia incrassata
6. Caladenia longicauda subsp. eminens
7. Caladenia longiclavata
8. Caladenia marginata
9. Caladenia pachychila
10. Caladenia radialis
11. Caladenia reptans
12. Caladenia roei
13. Caladenia saccharata
14. Caladenia serotina
15. Cyanicula deformis
16. Cyanicula ashbyae
17. Cyanicula sericea
18. Cyrtostylis huegelii
19. Diuris aff. corymbosa (early scarp)
20. Diuris aff. corymbosa (late scarp)
21. Diuris aff. corymbosa (S wheatbelt)
22. Diuris longifolia
23. Diuris picta
24. Drakonorchis mesocera
25. Elythranthera brunonis
26. Elythranthera emarginata
27. Eriochilus dilatatus subsp. multiflorus
28. Eriochilus helonomos
29. Fitzgeraldia nigricans
30. Leporella fimbriata
31. Leptoceras menziesii
32. Microtis atrata
33. Microtis rara
34. Microtis unifolia
35. Monadenia bracteata1
36. Paracaleana dixonii
37. Prasophllum brownii
38. Prasophyllum ringens
39. Prasophyllum parvifolium
40. Pterostylis barbata
41. Pterostylis aff. nana(hairy)

42. Pterosytlis aff. nana(glaborous)
43. Pterostylis recurva
44. Pterostylis sargentii
45. Pterostylis scabra
46. Pterostylis aff. vittata
47. Spiculaea. ciliata subsp. ciliata
48. Thelymitra antennifera
49. Thelymitra crinita
50. Thelymitra flexuosa
51. Thelymitra aff. fuscolutea
52. Thelymitra longifolia
53. Thelymitra aff. nuda
54. Thelymitra pauciflora
55. Thelymitra aff. pauciflora

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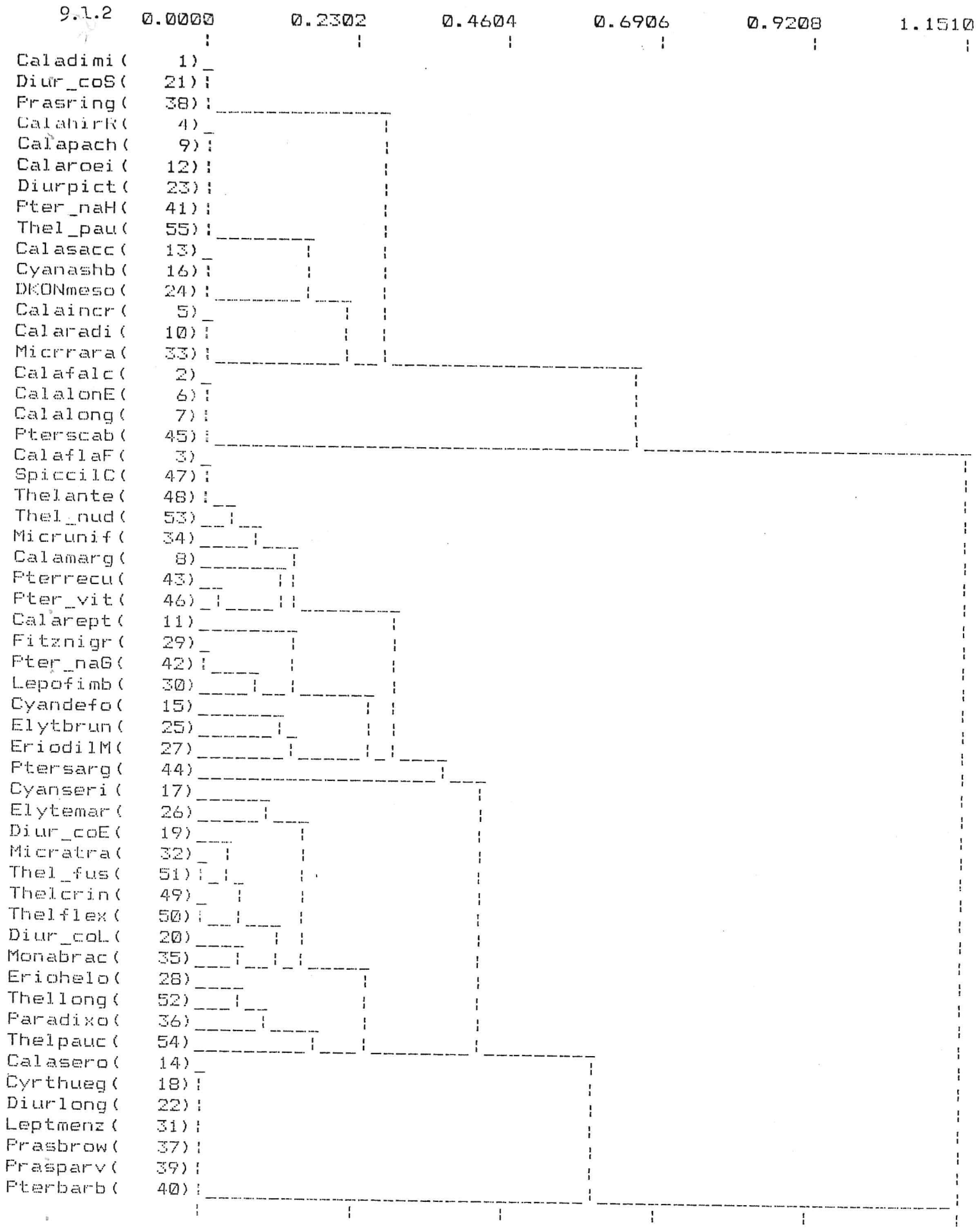
        NB1BS.1.B.HH
        el0ou.0.o.yu
        tu_ul._.y.dm
        te3ll.9.a.ep
        lRRdi.R.g.ns
        e  ev. .i.R
        R  ra. .n.
           RR. .R.

Caladimi        . .*.**
Diur_coS        . .*.**
Prasring        . .*.**
CalahirR        . . .**
Calapach        . . .**
Calaroei        . . .**
Diurpict        . . .**
Pter_naH        . . .**
Thel_pau        . . .**
Calasacc        . . .*
Cyanashb        . . .*
DKONmeso        . . .*
Calaincr        . . . *
Calaradi        . . . *
Micrrara        . . . *
           ............
Calafalc        . .*.
CalalonE        . .*.
Calalong        . .*.
Pterscab        . .*.
           ............
CalaflaF  *****.*.*.**
SpiccilC  *****.*.*.**
Thelante  *****.*.*.**
Thel_nud  * ***.*.*.**
Micrunif  ** **. .*.**
Calamarg  *****.*.*.
Pterrecu   ****. .*.*
Pter_vit  ** **. .*.*
Calarept     * . .*.
Fitznigr     **. .*.
Pter_naG     **. .*.
Lepofimb  *  **. .*.
Cyandefo     * . .*.*
Elytbrun     **. .*.*
EriodilM     * . .*.**
Ptersarg      *. . . *
           ............
Cyanseri     **. . .
Elytemar   * * . . .
Diur_coE   ****. . .
Micratra  ** **. . .
Thel_fus  ** **. . .
Thelcrin  *****. . .

Thelflex  *****. . .
Diur_coL  *  * .*. .
Monabrac  ** * . . .
Eriohelo  *    *. . .
Thellong   *   *. . .
Paradixo       *. . .
Thelpauc  ***  . . .
           ............
Calasero       * . . .
Cyrthueg       * . . .
Diurlong       * . . .
Leptmenz       * . . .
Prasbrow       * . . .
Prasparv       * . . .
Pterbarb       * . . .
```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Calapach(9)
Calaroei(12)
Diurpict(23)
Pter_naH(41)
Thel_pau(55)
Calasacc(13)
Cyanashb(16)
DKONmeso(24)
Calaincr(5)
Calaradi(10)
Micrrara(33)
Calafalc(2)
CalalonE(6)
Calalong(7)
Pterscab(45)
CalaflaF(3)
SpiccilC(47)
Thelante(48)
Thel_nud(53)
Micrunif(34)
Calamarg(8)
Pterrecu(43)
Pter_vit(46)
Calarept(11)
Fitznigr(29)
Pter_naG(42)
Lepofimb(30)
Cyandefo(15)
Elytbrun(25)
EriodilM(27)
Ptersarg(44)
Cyanseri(17)
Elytemar(26)
Diur_coE(19)
Micratra(32)
Thel_fus(51)
Thelcrin(49)
Thelflex(50)
Diur_coL(20)
Monabrac(35)
Eriohelo(28)
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Calasero(14)
Cyrthueg(18)
Diurlong(22)
Leptmenz(31)
Prasbrow(37)
Prasparv(39)
Pterbarb(40)
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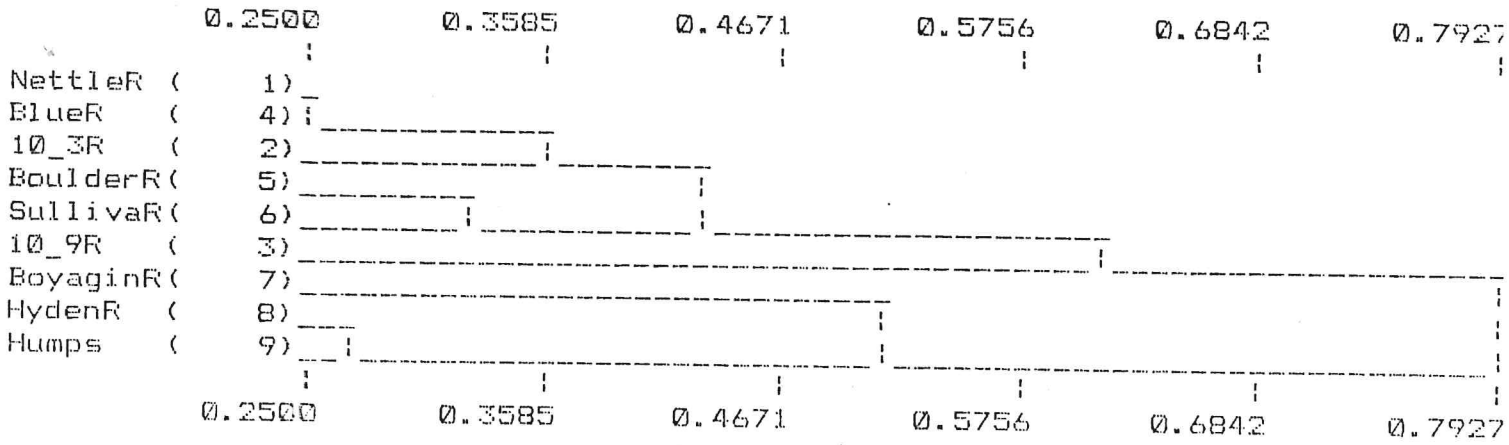

9.2 Data table of all orchid taxa from the east/west transect

ALL ORCHIDS KNOWN FROM AN EAST/WEST TRANSECT OF GRANITE OUTCROPS IN W.A
S. HOPPER & A. BROWN - 11TH DECEMBER 1989

KEY TO THE OUTCROPS :

1.	Nettleton Rock	NettleR
2.	10.3km Rock	10_3R
3.	10.9km Rock	10_9R
4.	Blue Rock	BlueR
5.	Boulder Rock	BoulderR
6.	Sullivan Rock	SullivaR
7.	Boyagin Rock	BoyaginR
8.	Hyden Rock	HydenR
9.	The Humps	Humps
10.	Afgan Rock	AfganR
11.	Yadadmia Rock	Yadadmia
12.	Coragina Rock	Coragina
13.	Ponier Rock	PonierR
14.	Mt Coobaninya	MtCooban
15.	Breeboorinia Rock	BreebooR
16.	Boingaring Rock	BoingarR
17.	Mt Buraminya	MtBurami
18.	Clyde Hill	ClydeH
19.	Buldania Rocks	Buldania
20.	Peak Charles	PeakChar
21.	Chiddarcooping Hill	Chiddarc
22.	Pingaring Rock	PingarR
23.	McGann Rock	McGannR
24.	Cliff Rock	CliffR
25.	Karroun Hill	KarrounH
26.	Beeringgnurding Hill	BeeringH
27.	Mt Churchman	MtChurch
28.	Corrigin Rock	Corrigin
29.	Mt Caroline	MtCaroli
30.	Cleary Rocks	ClearyR
31.	Mt Collier	MtCollie
32.	Mocardy Hill	MocardyH
33.	Pony Hill	PonyH
34.	Beekeeper Rd Rock	BeekeeRR
35.	Flat Rock	FlatR
36.	Hay Flat	HayFlat
37.	Scarp Rd Rock	ScarpRR
38.	Samson Brook Rock	SamsonBr
39.	Samson Brook SE Rock	SamsonSE
40.	Oakely Dam Rock	OakelyDR
41.	Logue Brook Rock	LogueBR
42.	Twin Rocks	TwinR
43.	Tumlo Hill	TumloH

PRESENCE/ABSENCE					GENUS/SPECIES	CODE
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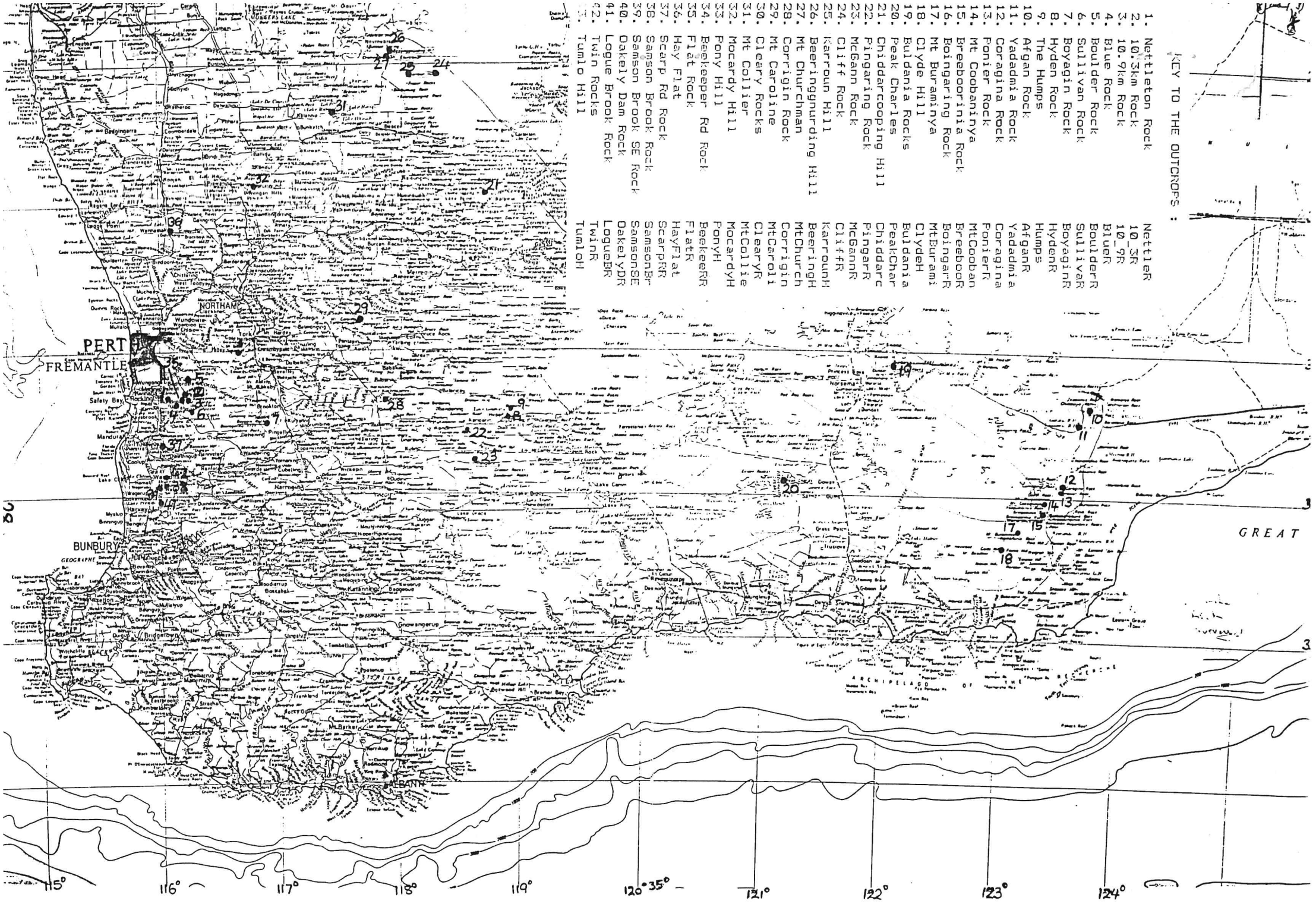
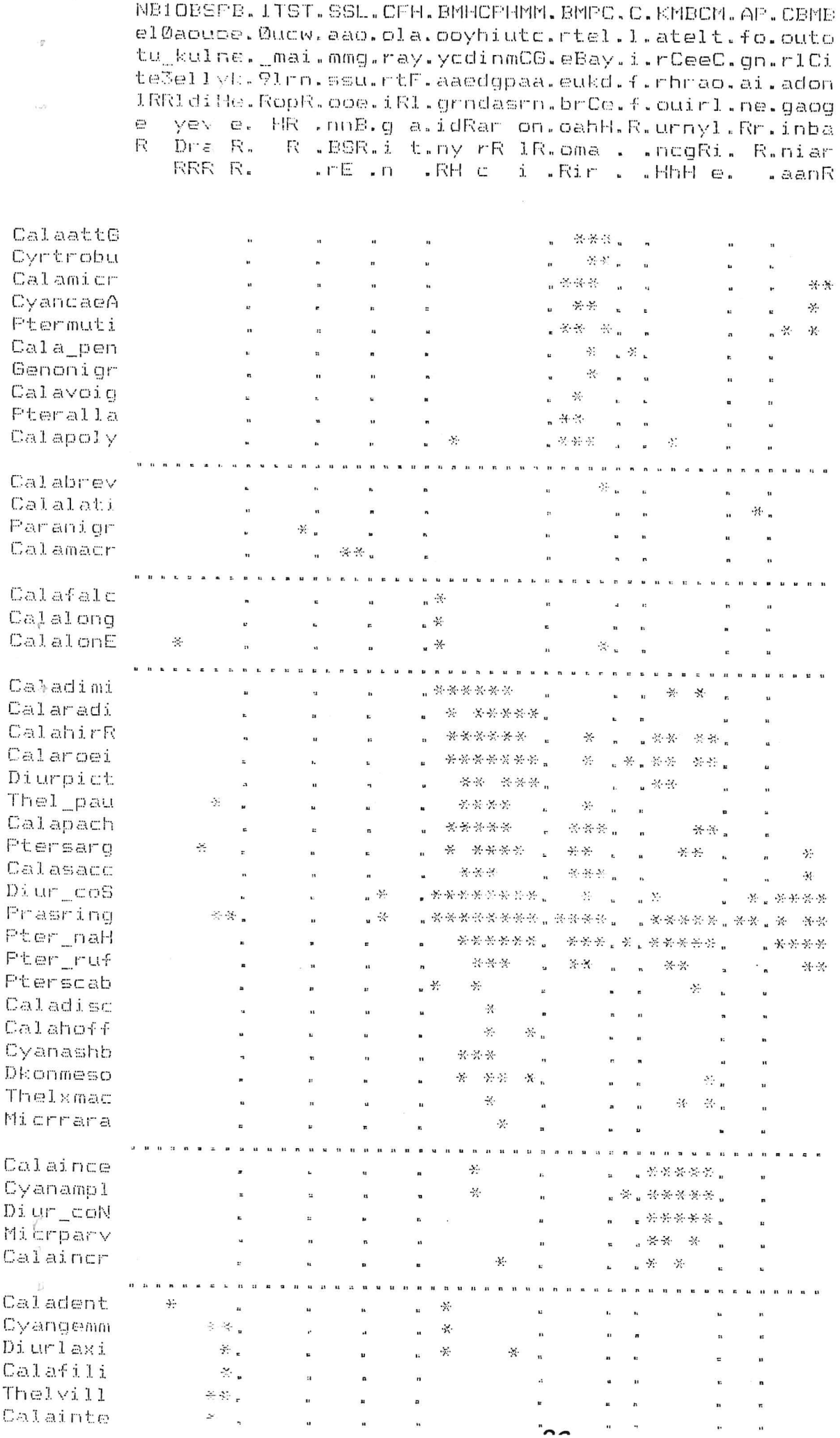
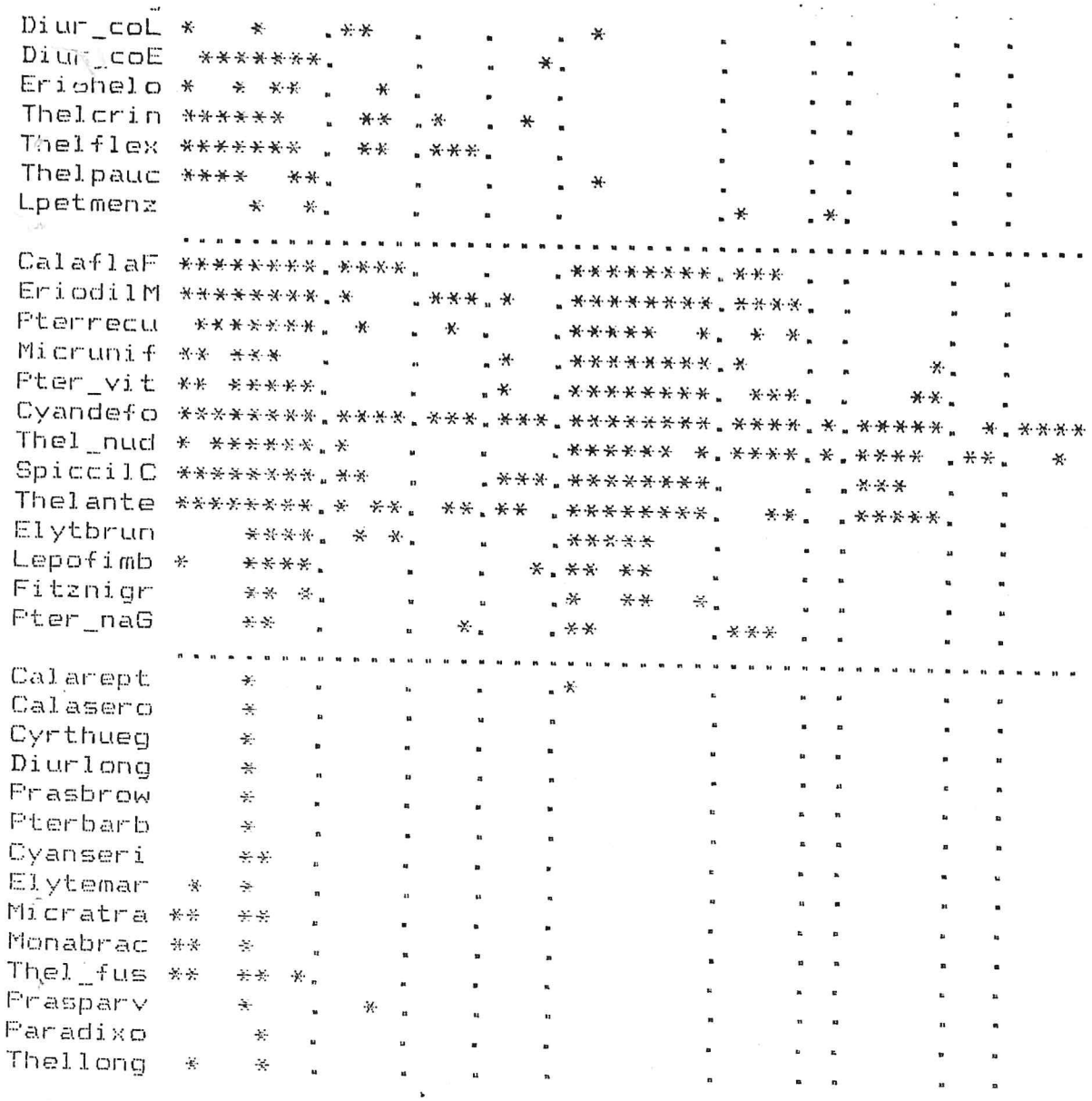

KEY TO THE OUTCROPS :
1. Nettleton Rock
2. 10.3km Rock
3. 10.9km Rock
4. Blue Rock
5. Boulder Rock
6. Sullivan Rock
7. Boyagin Rock
8. Hyden Rock
9. The Humps
10. Afgan Rock
11. Yadadmia Rock
12. Coragina Rock
13. Fonier Rock
14. Mt Coobaninya
15. Breeboorinia Rock
16. Boingaring Rock
17. Mt Buraminya
18. Clyde Hill
19. Buldania Rocks
20. Peak Charles
21. Chiddarcooping Hill
22. Pingaring Rock
23. McGann Rock
24. Cliff Rock
25. Karroun Hill
26. Beeringgnurding Hill
27. Mt Churchman
28. Corrigin Rock
29. Mt Caroline
30. Cleary Rocks
31. Mt Collier
32. Mocardy Hill
33. Pony Hill
34. Beekeeper Rd Rock
35. Flat Rock
36. Hay Flat
37. Scarp Rd Rock
38. Samson Brook Rock
39. Samson Brook SE Rock
40. Dakely Dam Rock
41. Logue Brook Rock
42. Twin Rocks
43. Tumlo Hill
NettleR
10_3R
10_9R
BlueR
BoulderR
SullivaR
BoyaginR
HydenR
HumpsR
AfganR
YadadmiaR
CoragiaR
FonierR
MtCoobanR
BreeboorR
BoingarR
MtBuramiR
ClydeH
BuldaniaR
PeakCharR
ChiddarcR
PingarR
McGannR
CliffR
KarrounH
BeeringH
MtChurchR
CorriginR
MtCarroliR
ClearyR
MtCollieR
MocardyH
PonyH
BeekeeRR
FlatR
HayFlat
ScarpRR
SamsonBr
SamsonSE
DakelyDR
LogueBR
TwinR
TumloH
PERTH
FREMANTLE
NORTHAM
BUNBURY
ALBANY
GREAT
115°
116°
117°
118°
119°
120°35'
121°
122°
123°
124°

9.2.1 Two-way table of east/west transect




Diur_coL
Diur_coE
Erioheld
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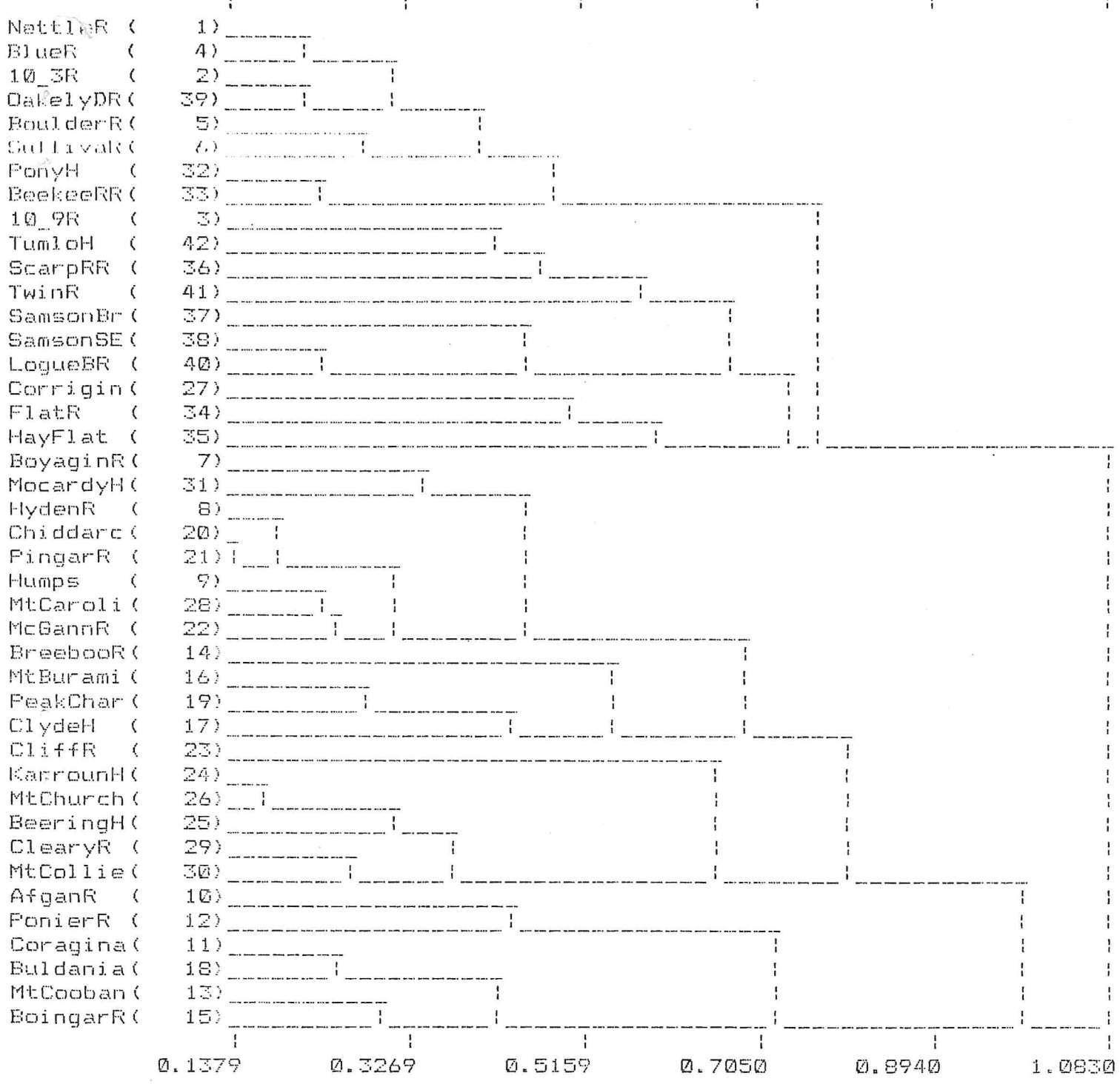
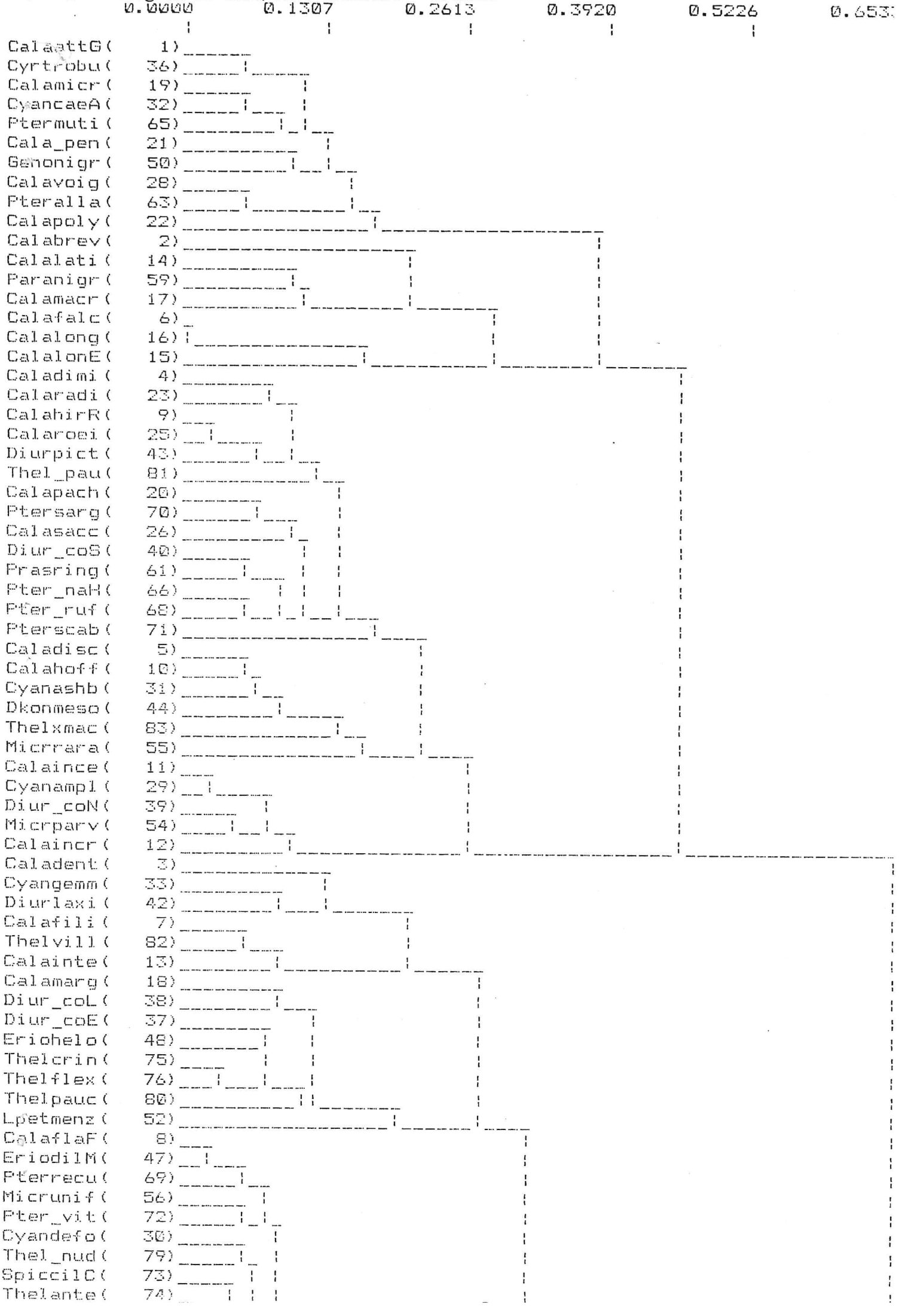
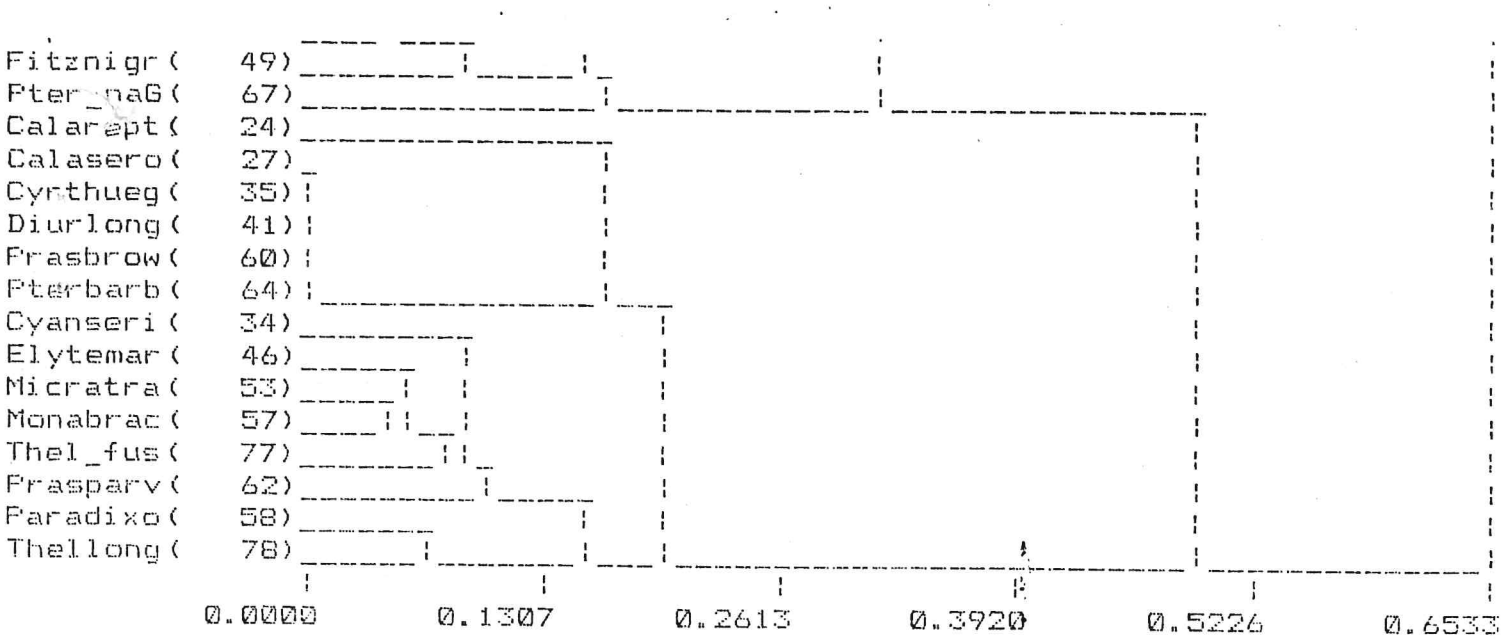
Micrunif
Pter_vit
Cyandefo
Thel_nud
SpiccilC
Thelante
Elytbrun
Lepofimb
Fitznigr
Pter_naG
Calarept
Calasero
Cyrthueg
Diurlong
Prasbrow
Pterbarb
Cyanseri
Elytemar
Micratra
Monabrac
Thel_fus
Prasparv
Paradixo
Thellong

9.2.2 Dendogram of east/west transect - outcrops



9.2.3 Dendogram of east/west transect - orchids

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Pter_naG(67)
Calarept(24)
Calasero(27)
Cynthueg(35)
Diurlong(41)
Prasbrow(60)
Pterbarb(64)
Cyanseri(34)
Elytemar(46)
Micratra(53)
Monabrac(57)
Thel_fus(77)
Prasparv(62)
Paradixo(58)
Thellong(78)
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0.3920
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0.6533

10.0 ACKNOWLEDGEMENTS

I'd like to thank Andrew Brown and Dr. Steve Hopper for enabling me to have this work experience. And for giving me a really good insight into the workings of CALM and especially at Woodvale.