

## Table of Contents

<u>Page</u>	<u>Section</u>
5	<b>Statement of Originality</b>
6	<b>Abstract:</b>
7	<b>Acknowledgments</b>
11	<b>1) Introduction:</b>
11	1.1 Biodiversity and forest structure
17	1.2 Research questions
	1) What are the structural differences between 100 year old and old-growth <i>E. obliqua</i> , and how can they be measured and displayed?
	2) How is the canopy arthropod biodiversity different in 100 year old and old-growth <i>E. obliqua</i> ?
	3) In what ways does crown structure influence arthropod biodiversity in <i>E. obliqua</i> ?
18	1.3 Limitations of the present study
19	<b>2) Aims and Background</b>
19	2.1 Addressing the research questions
24	2.2 Background Research
48	2.3 Synthesis of previous research
49	<b>3) Study Design and Site</b>
49	3.1 Study Subject and Site
55	3.3 Study design
64	<b>4) Crown Structure – Methods</b>
64	4.1 Definition of tree elements
75	4.2 Structural data collection
84	4.3 Field Recordings
90	4.4 Vector derived variable generation
93	4.5 Tree Structural Descriptor Generation
95	4.6 Analysis of structural descriptors
96	4.7 Arborograph generation and analysis
98	4.8 Image file size analysis
101	4.9 Structural features
103	<b>5) Crown Structure – Results</b>
105	5.1 Total numbers
105	5.2 Summary and range of structural descriptors.
106	5.3 Univariate T-tests
117	5.4 Multivariate classifications
119	5.5 File Size comparison
120	5.6 Structural features
134	5.7 Other untabulated features
137	<b>6) Crown Structure – Discussion</b>
137	6.1 Distinctness of crowns
151	6.2 Variability in tree crowns
155	6.3 Incidence of structural features
157	6.4 More complexity of information

## Table of Contents

<u>Page</u>	<u>Section</u>
<b>161</b> .....	<b>7) Canopy Arthropods - Methods</b>
161 .....	7.1 Trap design types
172 .....	7.2 Trap processing
173 .....	7.3 Data Analysis
175 .....	7.4 Analysis Approaches
176 .....	7.5 Biodiversity aspects
182 .....	7.6 Scaling of results
<b>190</b> .....	<b>8) Canopy Arthropods –Results</b>
190 .....	8.1 Trap survival
192 .....	8.2 Total collection overview
192 .....	8.3 Trap type comparison
194 .....	8.4 Abundance results
199 .....	8.5 Richness results
204 .....	8.6 Community structure results
206 .....	8.7 Diversity results
211 .....	8.8 Species accumulation and estimated richness results
214 .....	8.9 Distinctness results
234 .....	8.10 RTU level morphospecific results
<b>236</b> .....	<b>9) Canopy Arthropods – Discussion</b>
236 .....	9.1 Abundance of faunal activity
238 .....	9.2 Richness of fauna
242 .....	9.3 Diversity of fauna
245 .....	9.4 Distinctness of fauna
<b>250</b> .....	<b>10) Correlation – Methods</b>
250 .....	10.1 Exploring correlations between structure and arthropod biodiversity
251 .....	10.2 Bivariate Correlations
254 .....	10.3 Multivariate correlations
<b>255</b> .....	<b>11) Correlation – Results</b>
255 .....	11.1 Bivariate results
264 .....	11.2 Multivariate Correlation results
<b>268</b> .....	<b>12) Correlation – Discussion</b>
268 .....	12.1 The influence of crown structure on canopy arthropods of <i>E. obliqua</i>
269 .....	12.2 Bivariate
271 .....	12.3 Multivariate compositional predictors
272 .....	12.4 Surrogate measures
272 .....	12.5 Applicability

## Table of Contents

<u>Page</u>	<u>Section</u>
274 .....	<b>13) Conclusions</b>
274 .....	13.1 Mapping Aim 1: Quantitatively assess the differences in crown structure and size between 100yr and old E. obliqua
275 .....	13.2 Mapping Aim 2: Investigate the presence of structural features in the crowns of 100yr and old E. obliqua
276 .....	13.3 Mapping Aim 3: Modify the conifer mapping technique of Van Pelt et al. (2004b) for Eucalyptus trees
278 .....	13.4 Mapping Aim 4: Develop a technique for displaying crown structure of forest trees using computer models based on 3-dimensional spherical coordinates
279 .....	13.5 Mapping Aim 5: Expand Jacobs 1955 theory of intra-branch competition in Eucalyptus saplings to mature and old-growth E. obliqua
280 .....	13.6 Mapping Aim 6: Generate a predictor data set to explore the influence of crown structure on canopy arthropods
280 .....	13.7 Trapping Aim 1: Determine what differences exist in arthropod biodiversity between 100 year old and old growth Eucalyptus obliqua
281 .....	13.8 Trapping Aim 2: Contribute to the knowledge of Eucalyptus canopy arthropods
281 .....	13.9 Trapping Aim 3: Develop robust, inexpensive trap designs suitable for transport to and use in E. obliqua
282 .....	13.10 Trapping Aim 4: Generate a response data set to explore the influence of crown structure on canopy arthropods
283 .....	13.11 Conclusions: Answering the Research Questions 1) What are the structural differences between 100 year old and old-growth E. obliqua, and how can they be measured and displayed? 2) How is the canopy arthropod biodiversity different in 100 year old and old-growth E. obliqua? 3) In what ways does crown structure influence arthropod biodiversity in E. obliqua?
285 .....	13.12 Future directions
287 .....	<b>14) References</b>
(311) .....	<b>15) Appendix 1. Arborograph Line Up</b>
(312) .....	<b>16) Appendix 2 Arborograph CAD Script Generation</b>
(313) .....	<b>17) Appendix 3. Sample Arborograph Script</b>
(353) .....	<b>18) Appendix 4. Blank Data Sheet</b>
(354) .....	<b>19) Appendix 5. Sample Data Sheet</b>
(355) .....	<b>20) Appendix 6. RTU listing</b>
(359) .....	<b>21) Appendix 7. A Review of Canopy Arthropod Biodiversity Research in Australian Eucalyptus</b>
(389) .....	<b>22) Appendix 8. Additional Spider Taxonomy</b>
(391) .....	<b>23) Appendix 9. Arthropod Voucher Photograph Collection</b>

*Please note that PDF computer files are electronically bookmarked*