Tiny Animals, Titan Trees

Canopy Sticky Trapping & Branch Mapping In *Eucalyptus obliqua*

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Special thanks to
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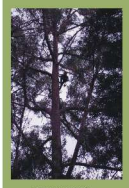
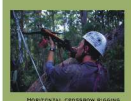
& all field volunteers!

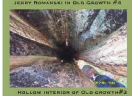

100 yr old tree #2


Horizontal crossbow rigging

Sue Baker descending #4

Middle live trunk traps

Jerry Romanek in old growth #4


Hollow interior of old growth #2

Brendan Kayes at #3

Damien catchpole descending #4

Upside down treetop #2

Rigging crossbow with reel

Empty wound collar in #4

Branch wound in #3

Gene Miller rigging #4

Mike Sumner in #2

Joe Henderson in #3

Trunk and Branch Sticky Traps

Large side branch in #3

B. Kayes descending #3

Looking down 100yr old tree #1

Branch wound in #4

Introduction:

Despite its widespread coverage of the continent and its status as the iconic Australian tree, research on the canopy invertebrate fauna of *Eucalyptus* is still at an early stage. Biodiversity investigations utilising canopy fogging and branch clipping have looked at a portion of the *Eucalyptus* canopy arthropods in Western Australia (Abbott, 2002; Majer *et al* 2000, 2002), New South Wales (Bell 1985; Lowman and Heatwole 1992; Recher *et al* 1996), mallee Victoria (Yen 1989), subalpine Australian Capital Territory (Burdon 1974; Ohmart 1981) and Tasmania (Grove *et al* 1992). These studies tend to concentrate on comparisons between regional locales and between *Eucalyptus* species. There is a scarcity of information on comparisons within an individual tree.

In the tall wet sclerophyll forests of Victoria, research on the vertebrate fauna has found certain elements of mammalian biodiversity to be dependent on the large older trees that are being depleted by the process of forestry plantation establishment (Lindenmayer *et al* 2002). This project aims to compare the biodiversity of the canopy invertebrate fauna of young (100 year olds) and old specimens of *Eucalyptus obliqua* in Southern Tasmania and to investigate the links between structural attributes and biodiversity. Other primary research goals are to learn about the ontogeny and allometry of *Eucalyptus obliqua* and to develop tools to share these data with the general public.

Rope access techniques were used to visit the treetops of selected safe study trees. Using surveying techniques derived from branch mapping work in the coniferous forests of western North America (Sillett and Van Pelt 2000; Van Pelt 2002), anatomically correct empirical models of individual trees were generated (Figure 1). Within each tree crown, eight sticky traps were used to collect animals and compare different trap placements within the trees. As only two young and two old trees were studied in this pilot study, this poster presents the data from within tree comparisons. Future work in the upcoming summer will investigate young-old comparisons.

<=Figure 2. Warra Locale

Figure 3.=> Study site

Methods:

The upper canopies of four *Eucalyptus obliqua* trees at Warra Long Term Research Area in the Huon Valley of Tasmania, Australia were visited in a pilot study during summer 2003. The study site is in an area burnt in 1898, with trees approximately 10 km west of the Tahune Airwalk tourist attraction (Figure 2, map from www.warra.com website). Safe trees were selected in pairs of 100 year old trees and old-growth trees in close proximity to each other (Figure 3). After initial rigging with a crossbow bolt trailed by fishing line, climbing ropes were used to access the treetops.

Structural measurements on every accessible branch within the tree (including slope, azimuth, length, starting girth and estimate of foliage volume) were processed using computer drafting software to form a 3-dimensional tree map, or "arborograph." This measurement strategy was based on a method developed by Sillett and Van Pelt (2000).

At various places within each tree crown, eight sticky traps were utilized to sample a portion of the arthropod fauna. The traps were made of glossy cardboard squares 15x15 cm stapled to the bark of the tree. They were placed according to a study design comparing upper branches with lower branches, live branches with dead branches, and horizontal branch surface placements with vertical trunk placements. These traps were active for 5 weeks beginning in March 2003. Other trap designs were tested and are being modified to suit the difficulties of installment and maintenance in this environment. Sticky traps have the advantages of low cost and portability and are well suited to comparing specific points in the canopy. (Basset *et al* 1997)

Beetles were pinned, sorted to morphospecies, and sorted generally to family . All other animals were counted and sorted, generally to order. The composition and abundance of this collection forms the dependent response data set to the independent predictor tree structural maps..

Results:

A total of 32 sticky trap divided between two young and two old trees were analyzed for within tree differences in beetle morphospecies richness and ordinal arthropod abundance.

Descriptive statistics comparing upper and lower branches live and dead branches, and trunk and branch placements are shown in Figure 4. Significant ($p<0.05$) differences as detected by one-way ANOVA are highlighted.

3220 animals were collected. 89% of all animals collected were flies (Figure 5). The data on abundances for "all arthropods" are therefore confounded with Dipteran abundance.

Beetle morphospecies richness was found to be significantly higher in upper branches than lower branches. 111 beetle individuals (20 morphospecies in 15 families) were collected (Figure 6). Throscidae: *Aulonothroscus* sp. beetles were the most widespread and abundant non-Dipterans detected.

Dipteran abundances were found to be significantly higher on the branches than on the tree trunks, while both spiders and Hemiperans were found to be significantly more abundant on the trunk.

The ordinal abundances in traps placed in an old *Eucalyptus obliqua* are presented in their proper locations in Figure 1.

Comparison of arthropods collected by sticky traps in crowns of *Eucalyptus obliqua*, Southern Tasmania, Summer 2003	Coleoptera Morphospecies Richness		All Arthropods		Diptera		Hymenoptera		Coleoptera		Hemiptera		Arachnid		Other	
	Mean # Morphospecies per trap	S.D.	Mean Abundance per trap	S.D.	Mean Abundance per trap	S.D.	Mean Abundance per trap	S.D.	Mean Abundance per trap	S.D.	Mean Abundance per trap	S.D.	Mean Abundance per trap	S.D.	Mean Abundance per trap	S.D.
Upper branch (n=16)	2.25	1.53	123.1	100.1	112.2	101.7	4.4	3.35	3.81	2.97	0.63	0.81	0.44	0.73	1.94	1.9
Lower branch (n=16)	1.38	0.96	77.75	77.23	67.6	72.3	4.5	4.2	3.69	4.27	0.44	0.89	0.81	0.31	0.63	1.15
Significant? (ANOVA)	p=0.029														p=0.024	
Live branch (n=16)	1.69	1.2	128.5	116.3	117.75	113.6	4.81	3.45	3.75	2.59	0.56	0.83	0.56	0.81	1.19	1.42
Dead branch (n=16)	1.94	1.52	72.3	41.8	62	41.3	4.13	4.06	3.94	3.4	0.5	0.82	0.69	0.87	1.38	1.83
Significant? (ANOVA)																
Trunk placement (n=16)	1.94	1.29	57.25	48.12	46.75	44.36	3.69	2.68	3.5	2.39	0.88	1.02	1	0.82	1.75	2.02
Branch placement (n=16)	1.69	1.91	143.56	106.82	133	102.3	5.25	4.43	4.19	4.07	0.19	0.4	0.25	0.68	0.81	1.19
Significant? (ANOVA)			p=0.006		p=0.009						p=0.016		p=0.008			

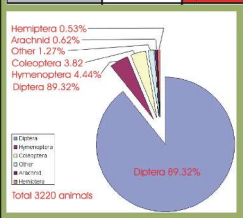


Figure 4. Descriptive Statistics

<= Figure 5. Ordinal Pie

Figure 6.=> Beetle Taxa

Order	Superfamily	Family	Subfamily/Genus	Morphospecies	# collected	%
Coleoptera	Elateroidae	Throscidae	Aulonothroscus	1	69	62.2
Coleoptera	Chrysomeloidea	Chrysomelidae	Halticinae	1	6	5.4
Coleoptera	Tenebrionoidae	Salpingidae	Neosalpingus	1	6	5.4
Coleoptera	Curculioidea	Phalacridae		1	5	4.5
Coleoptera	Curculioidea	Cryptorhagidae		3	4	3.6
Coleoptera	Curculioidea	Coccinellidae	Rhizobius	1	3	2.7
Coleoptera	Bostrychoidea	Anobiidae		1	3	2.7
Coleoptera	Curculioidea	Coccinellidae	Scymnus	1	2	1.8
Coleoptera	Curculioidea	Cryptorhagidae		1	2	1.8
Coleoptera	Scirtoidea	Scirtidae		1	2	1.8
Coleoptera	Curculioidea	Nitidulidae		2	1	0.9
Coleoptera	Caraboidea	Carabidae	Lebiini	1	1	0.9
Coleoptera	Curculioidea	Phloeostichidae	Mimakola	1	1	0.9
Coleoptera	Tenebrionoidae	Melandryidae	Orchesia	1	1	0.9
Coleoptera	Curculioidea	Nitidulidae	Thalycrodes	1	1	0.9
Coleoptera	Curculioidea	Cryptorhagidae		2	1	0.9
Coleoptera	Curculionoidea	Curculionidae		1	1	0.9
Coleoptera	Curculioidea	Langurdiidae		1	1	0.9
Coleoptera	Curculionoidea	Scolytidae		1	1	0.9
Total beetles	8 Superfamilies	15 Families		20 morphospecies	111 individuals	100%

Conclusion:

The preliminary results appear to indicate that significant differences exist in canopy fauna distribution. As only 4 trees were studied, the veracity of these results will be confirmed or rejected by future data.

Future goals include higher resolution taxonomy on Diptera and Hemiptera, and the recording of more structural attributes such as burls, hollows, and wounds. Inexpensive flight-intercept traps and bark funnel fence traps are being developed from recycled soda pop bottles for use in the upcoming field season. It is expected that a more diverse trapping regime will result in a more diverse fauna detected.

The highest priority for the expansion of the trapping effort to include more trees and address the comparison of young and old *Eucalyptus obliqua* individuals.

Please visit the project web page! Contact details, 3-d models, trapping data, photo galleries, further statistics and all future data can be found at:

www.geog.utas.edu.au/yoav

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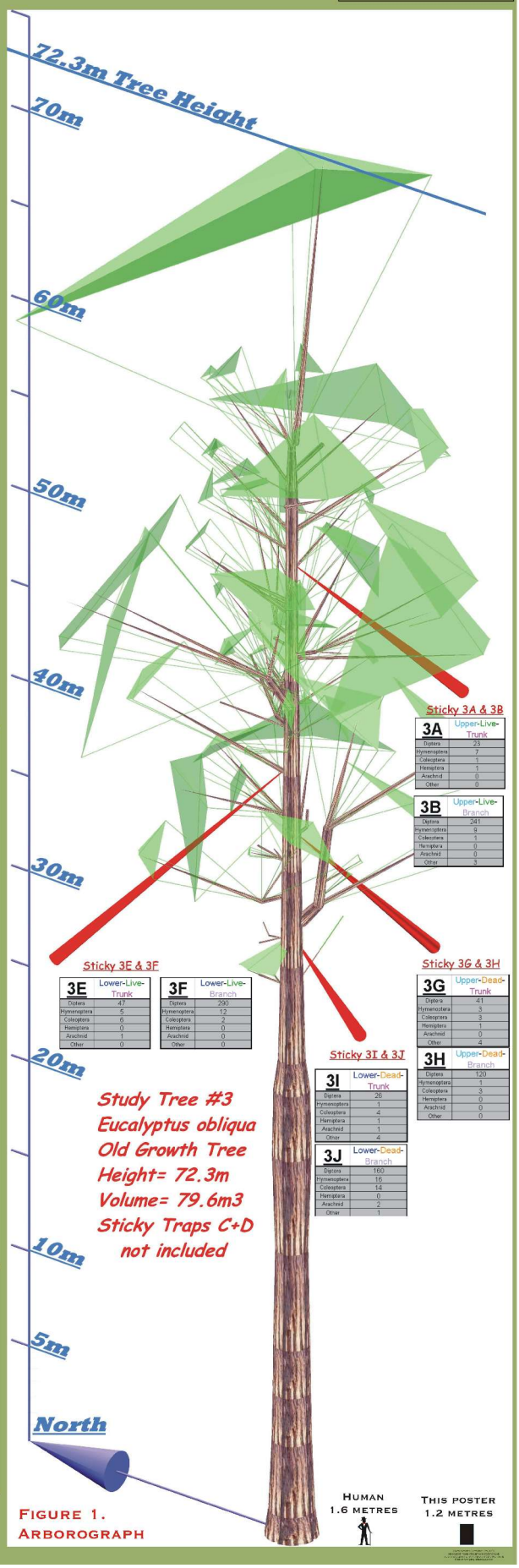

Figure 1. Arborograph

Thank you for your interest!

Comments? Questions? Contact:
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