Forestcheck Cryptogams Progress Report 2002

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Introduction

Ten Forestcheck plots were visited during May 2002 and cryptogams (lichens, mosses and liverworts LBH) were sampled. Samples collected at each plot had extensive records prepared for individual species, which recorded macro and micro habitats along with species occurrence and frequency for all plots. At each plot the biodiversity of LBH was measured using 10cm X 10cm grids over a 100m transect.

Sampling

The initial sampling was carried out as a series of 4 X 100m transects around the edge of the Forestcheck grid within the 300x300m area. Two collectors sampled 2m either side of the 100m transects collecting all LBH's independently. These site collections were sorted in the laboratory on the same day and any replicate samples combined. Species descriptions were prepared and notes made as to which substrate samples were found on and an estimate of frequency and occurrence for each substrate and site. The position occupied by each species within the stratal layers was also estimated.

Using established 100m ($1x1M^2$) vegetation transects for each site the presence or absence of the LBH groups within a grid $10x10cm^2$ every 10m laterally spaced at 1m and 2m was mapped. A result of this aspect was to look at LML diversity at each site and to establish the relevance of nominated indicator species. It soon became apparent that this aspect was a waste of time and effort as the results were too inconsistent and were impacted upon by other external factors. Several transects resulted in zero records, which did not reflect the results obtained by the above method from the same sites. Another problem encountered was that of LBH's above 1m from ground level as these had to be ignored due to difficulty of scoring.

The sampling time appears to be on target with a window of opportunity covering many months that may improve the quality of some samples collected. The prospect of conducting an end of season re-sampling was considered but may be of little benefit as the expected species increase is low and best left to future monitoring programs.

Specimen Processing

At this stage the processing of specimens is on target with all identifications completed with the exceptions on taxonomic problem species, which I have phrase named to assist in listing and data entry. All lichen samples have been processed and are ready to send to PERTH. Moss and liverwort samples that require the additional step of washing and redrying is taking a bit longer with completion expected before the start of next set of sites. Data base entry and label generation is in hand and most samples will be ready to send to the Herbarium for future reference. Once completed problem species can be

sent to experts within Australia or externally. As this will take time I consider this to be an on going aspect of Forestcheck cryptogams and list can be updated from Herbarium data records as required.

Number of samples collected including repeats for all sites = 498

*Number of lichens samples = 266
*Number of moss samples = 58
*Number of Liverworts samples = 33

* Excluding repeat samples

159 individual cryptogam species have been recognised from 10 sites

NB: 20 extra samples of algae and fungi were also sampled and placed into the Herbarium but identified as Genus sp. (fungi or algae).

Database Establishment

The entry protocols have been developed and data entry has been undertaken. The removal of the taxa diversity database as no longer required appears to be a good move. Re adjustment of the data recorded in collecting book and the ranking of appropriate fields has meant that the 10 x10 cm grid data can be obtained and the species diversity rated.

Preliminary Results

Table 1

ForestCheck Cryptogam Site Data

Sites		M1	M5	M10	M4	M7	M9	M2	M6	M8	M3
Type of site		C	C	C	B	B	B	G	G	G	S
	Number of samples	82	53	50	76	49	47	31	33	15	62
Groups		Number of taxa									
L	Lichen	45	28	36	45	25	22	13	20	8	28
B	Mosses	8	9	8	5	7	5	4	2	6	4
H	Liverworts	3	3	4	3	3	6	6	3	1	1
		Number of species									
Habitats											
	1Wood	18	14	27	21	10	10	5	8	5	18
	2Bark	16	9	10	9	11	8	2	3	1	4
	3Ant Hill	1	0	2	5	2	1	1	0	0	2
	4Soil	6	12	5	5	4	9	12	8	4	7
	5Stone	6	7	0	6	4	2	2	4	3	2
	6Organic Material	13	5	7	10	5	8	2	4	2	3
	7Charcoal	3	2	0	4	1	2	2	1	1	3
Stratal Position											
	10-30cm	36	25	19	33	24	20	22	19	11	24
	231cm-3m	24	17	36	31	17	14	2	10	6	15
	33.1m+	4	4	4	1	2	3	0	1	0	1
Habitat Frequency											
	171%+	0	0	0	0	0	0	0	0	0	0
	250-70%	15	10	11	22	9	11	6	5	5	10
	310-49%	20	22	23	16	15	13	12	16	3	13
	40-9%	21	6	14	15	11	9	5	3	7	11
Site Frequency											
	150%+	0	0	0	0	0	0	0	0	0	0
	215-49%	1	1	0	2	0	1	2	0	0	2
	33-14%	19	17	15	18	14	10	6	9	4	9
	41-2%	36	22	34	33	21	21	15	15	11	23
Indicator species		21	15	14	17	15	15	9	10	9	14

C = control, B = buffer, G = gap, S = Shelter wood timber harvest treatments.

Table 2

Combined Number of Cryptogam Groups Located on Different Substrates and Strata's

	Habitats (Substrates)							Stratal levels		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**Ground**	**Shrub**	**Tree**
Sites										
M1	18	16	1	6	6	13	3	36	24	4
M2	5	2	1	12	2	2	2	22	2	0
M3	18	4	2	7	2	3	3	24	15	1
M4	21	9	5	5	6	10	4	33	31	1
M5	14	9	0	12	7	5	2	25	17	4
M6	8	3	0	8	4	4	1	19	10	1
M7	10	11	2	4	4	5	1	24	17	2
M8	5	1	0	4	3	2	1	11	6	0
M9	10	8	1	9	2	8	2	20	14	3
M10	27	10	2	5	0	7	0	19	36	4

In table 2 I looked at the cryptogam groups (LML) and at the number of species that occurred on each available microhabitat substrate. The second section of this table looks at the number of species occurring at the various habitat levels. It should be noted that in several instances individual species of LML could be located on several habitats or several stratal levels.

Table 3

Forest Check Cryptogam Habitat and Stratal Levels Usage
[Showing Number of Species in all 3 Groups: Lichens (L), Mosses (B) and Liverworts (H)]

		Habitats							Stratal Levels		
Sites	**Groups**	Wood	Bark	Ant Hill	Soil	Stone	Organic	Charcoal	0-30cm	31cm-3m	3.1m+
M1	L	18	16	1	0	5	7	3	25	2	4
	B	0	0	0	5	1	4	0	8	0	0
	H	0	0	0	1	0	2	0	3	0	0
M5	L	13	9	0	3	5	5	1	13	14	2
	B	0	0	0	7	2	1	1	6	1	0
	H	1	0	0	3	0	0	0	2	1	0
M10	L	22	8	2	1	0	5	0	10	29	4
	B	3	1	0	3	0	2	0	6	4	0
	H	2	1	0	1	0	0	0	4	2	0
M4	L	18	9	5	1	7	8	3	25	28	1
	B	1	0	0	3	0	2	1	5	1	0
	H	2	0	0	1	0	1	0	3	2	0
M7	L	6	9	0	2	3	5	1	15	14	2
	B	3	1	2	1	1	0	0	7	1	0
	H	1	1	0	1	0	0	0	2	2	0
M9	L	10	8	1	0	2	4	1	10	13	3
	B	0	0	0	4	0	4	0	5	0	0
	H	1	0	0	5	0	0	1	4	2	0
M2	L	5	2	1	3	2	2	0	12	1	0
	B	0	0	0	4	0	0	1	4	0	0
	H	0	0	0	5	0	0	1	6	1	0
M6	L	8	3	0	3	4	4	1	14	10	1
	B	0	0	0	2	0	1	0	2	0	0
	H	0	0	0	3	0	0	0	3	0	0
M8	L	3	1	0	0	2	1	1	5	4	0
	B	2	0	0	3	1	1	0	5	2	0
	H	0	0	0	1	0	0	0	1	0	0
M3	L	15	4	2	3	2	3	3	18	15	1
	B	2	0	0	3	0	0	0	4	0	0
	H	1	0	0	1	0	0	0	2	0	0

M1, M2 &M10 control sites
M4, M7 & M9 buffer sites
M2, M6 & M8 gap sites
M3 shelter wood site

In table 3 I looked at the number of individual LML species and their occurrence on both the various habitat type available and the stratal levels.

Table 4

Frequency of Cryptogam Taxa Located on Each Site

Taxa	Sites M1	M2	M3	M4	M5	M6	M7	M8	M9	M10
Mosses (B)										
Barbula calycina	*	*	*	*	*		*	*	*	*
Barbula sp.	*									
Campylopus bicolor					*					
Campylopus introflexus	*	*	*	*	*	*	*	*	*	*
Campylopus sp RJC 18080								*		
Ceratodon purpureus					*	*	*		*	
Dicranoloma diaphanoneum					*					*
Dicranoloma sp.		*					*	*		*
Fissidens tenellus	*					*	*		*	*
Fissidens sp.				*						
Funaria hygrometrica	*	*	*	*	*		*	*		*
Hypnum cupressiforme	*				*					
Racopilum cuspidigerum var. convolutaceus					*					*
Sematophyllum contiguum	*		*		*		*	*		*
Genus sp. RJC 17806				*						
Genus sp. (Emerald Moss)									*	
Liverworts (H)										
Anthoceros laevis	*	*			*	*			*	
Cephaloziella exiliflora	*	*	*	*	*	*	*		*	*
Chiloscyphus semiteres	*		*	*			*			*
Fossombronia sp. (leafy)		*		*				*	*	
Fossombronia sp. (lettuce)		*			*	*			*	
Fossombronia sp. (purple lipped clam)		*								
Fossombronia sp. (salvinia)		*					*		*	*
Frullania sp.										*
Genus sp. RJC 18121									*	
Lichens (L)										
Buellia stellulata	*				*		*		*	
Calicium glaucellum	*			*						*
Calcium salicinum	*									
Calcium victorianum subsp. Victorianum	*									
Caloplaca ferruginea	*			*						
?Chaenotheca chlorella			*							
Cladia aggregata	*	*	*	*	*	*	*	*	*	*
Cladia schizopora	*		*	*	*	*	*	*	*	*

Cladonia cervicornis var. verticellata	*			*	*		*		*	
Cladonia ?chlorophaea	*			*						*
Cladonia crispata var. cetrariiformis				*		*				
Cladonia humilis var. humilis			*							
Cladonia kremplehuberi	*		*	*	*	*	*		*	*
Cladonia macilenta	*									
Cladonia aff. Ochrochlora										*
Cladonia ochrochlora										*
Cladonia ?praetermissa			*							
Cladonia ramulosa	*								*	*
Cladonia rigida	*		*	*	*	*				*
Cladonia aff. Rigida										
Cladonia scabriuscula	*			*			*			
Cladonia ?southlandica				*						*
Cladonia sulcata		*	*	*	*		*			*
Cladonia tessellata	*				*	*	*		*	
Cladonia sp.	*									
Cladonia sp. RJC 17704			*							
Cladonia sp. RJC 18155										*
Cladonia sp. (fine)										*
Cladonia sp. (pipes)			*							
Diploschistes sp. (ant hill)		*								*
Diploschistes sp.		*								
Fuscidea cyathoides				*						
Graphis sp. (black beans)				*						
Graphis sp. (blackrays)	*		*	*		*	*		*	
Graphis sp. (black tram lines)								*		*
Graphis sp, (brown lips)				*	*					
Hypocenomyce australis	*			*	*					
Hypocenomyce foveata	*			*						
Hypocenomyce scalaris							*			
Hypocenomyce sp. (lead grey)	*						*			
Hypogymnia pulchrilobata										*
Hypogymnia pulverata					*					
Hypogymnia subphysodes var. austerodioides	*		*	*	*					
Hypogymnia subphysodes var. subphysodes	*		*	*	*		*		*	
Imshaigia aleurites					*					
?Lecidea sp. (black dots)			*	*						
?Lepraria sp.										*
Menegazzia platytrema	*						*		*	*
Neuropogon ?antarcticus	*			*						
Neuropogon ?subcapillaris									*	
Ochrolechia sp. GS (Kantavilas 306/92)	*	*	*	*	*	*	*		*	*
Ochrolechia sp. (buff doughnuts)										*
Ochrolechia sp. (cream doughnuts)								*		
Ochrolechia sp. (white pustules)	*									
Ochrolechia sp. (tan doughnuts)										*

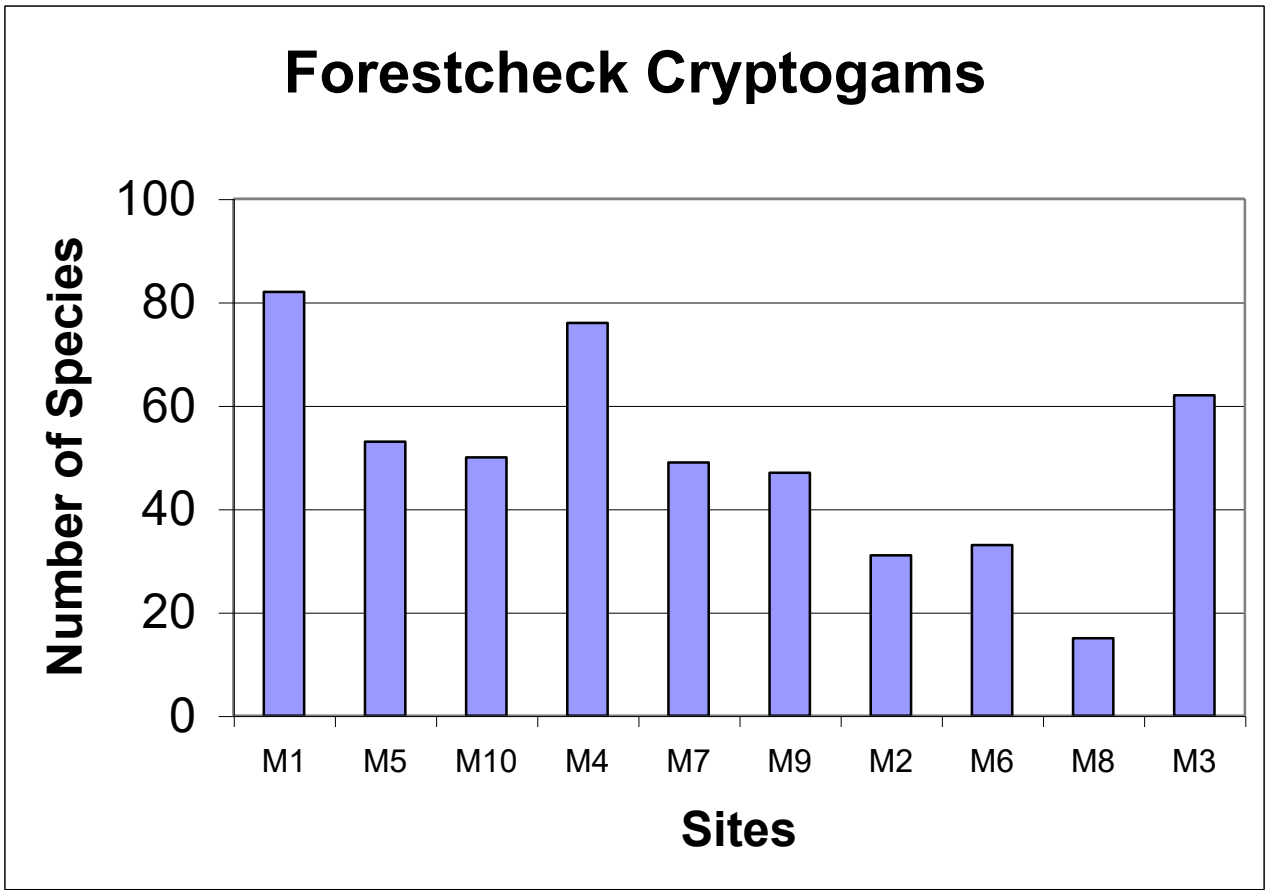
Ochrolechia sp. (twiggy)	*			*	*				*	*
Ochrolechia sp. RJC 18056							*			
Pannaria sp. (grey flakes)				*						
Pannoparmelia wilsonii	*		*	*	*		*		*	*
Paraporpidia glauca	*			*	*	*	*	*	*	
Parmotrema cooperi				*						
Parmotrema praesorediosum	*									
Parmotrema tinctorum			*							
Peltigera didactyla		*								
Pertusaria ?pertusa			*							
Ramboldia stuartii	*		*	*	*	*	*	*	*	*
Rhizocarpon sp. (grey)	*			*			*	*		
Tephromelia atra	*			*	*					*
Thelotrema lepadinum	*									
Thysanothecium hookeri				*						*
Thysanothecium scutellatum	*		*	*	*	*	*	*	*	*
Trapeliopsis sp. (green grey chunks)			*							
Usnea inermis		*	*	*	*	*			*	*
Usnea oncodeoides			*	*					*	
Usnea pulvinata					*					*
Usnea aff. Rubicunda	*									
Usnea scabrida subsp. Scabrida	*									
Usnea ?subalpina				*						
Usnea subeciliata	*				*		*			
Xanthoparmelia sp.	*									
Xanthoparmelia sp. RJC 17992					*					
Xylographa sp. (eye slits)				*						
Genus sp. (black chelsea buns)						*				
Genus sp. (black dots)							*			
Genus sp. (black freckels)					*	*				
Genus sp. (black ganglia)				*						
Genus sp. (black & tan dots)				*						
Genus sp. (black hairy stepping stones)				*					*	
Genus sp. (brown freckles)										
Genus sp. (brown papillae)				*						
Genus sp. (brown warts)	*						*			
Genus sp. (brown waxy dots)			*							
Genus sp. (green algae-like)				*						
Genus sp. (green flecks)			*	*		*				
Genus sp. (green powder)										*
Genus sp. (grey green)					*	*	*			
Genus sp. (green flecks ant hill)									*	
Genus sp. (grey flecks)						*				
Genus sp. (grey frosting)				*						
Genus sp. (grey powder)					*					*
Genus sp. (grey slick)	*									
Genus sp. (lead grey)									*	

Genus sp. (orange blobs)			*							
Genus sp. (orange powder)	*									
Genus sp. (pale yellow blobs)							*			
Genus sp. (pebbles)										*
Genus sp. (soot)						*				
Genus sp. (tan apo flake)						*				
Genus sp. (tan jelly caps)	*									
Genus sp. (white powder)										*
Genus sp. (yellow powdery blobs)			*							
Genus sp. RJC 17783				*						
Genus sp. RJC 17824		*								
Genus sp. RJC 17825		*								
Genus sp. RJC 17835										
Genus sp. RJC 17905	*									
Genus sp. RJC 17915	*									
Genus sp. RJC 17955						*				
Genus sp. RJC 18168										*
Genus sp. RJC 18169										*
Genus sp. RJC 18177										*

NB: Names in Bold text are the nominated indicator species

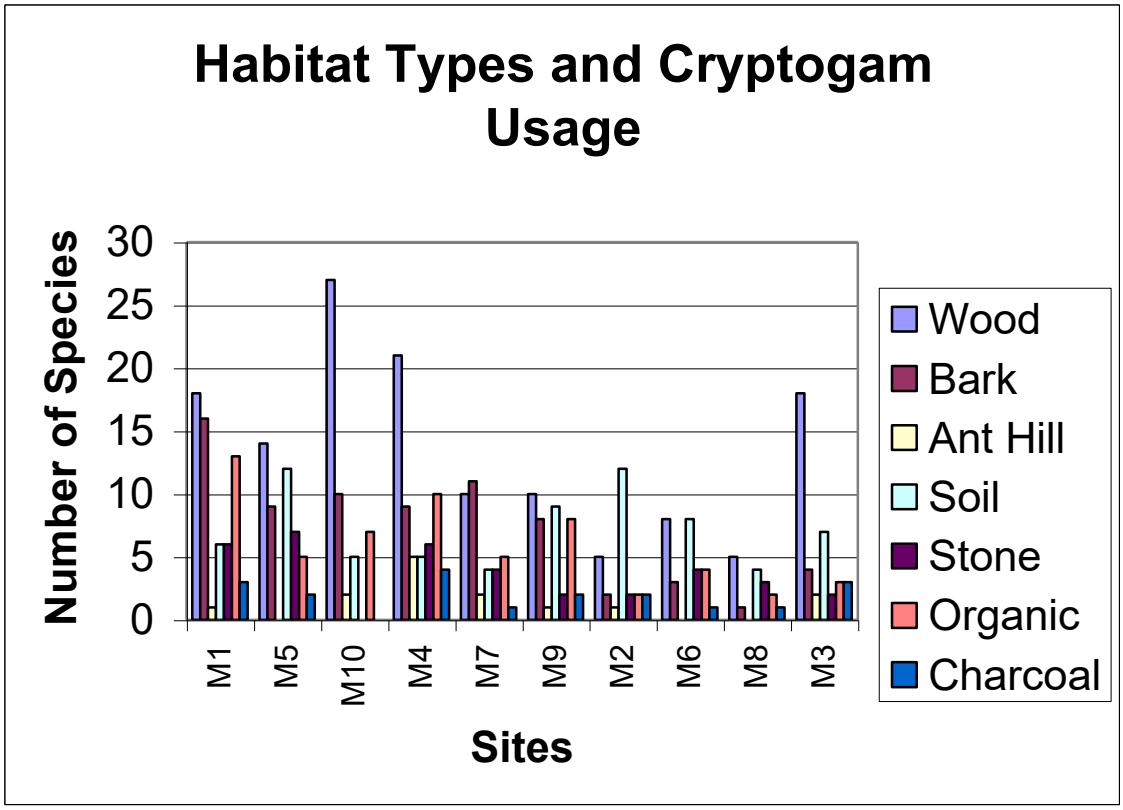
Table 4 lists the species of cryptogam taxa recognised on all of the Forestcheck sites and their presence or absence at each site. The higher percentage of Genus sp. Listed for the lichen section illustrates the degree of uncertainty that exists due to the limited available information.

Graph1 Combined Cryptogam Groups, Occurrences per Site



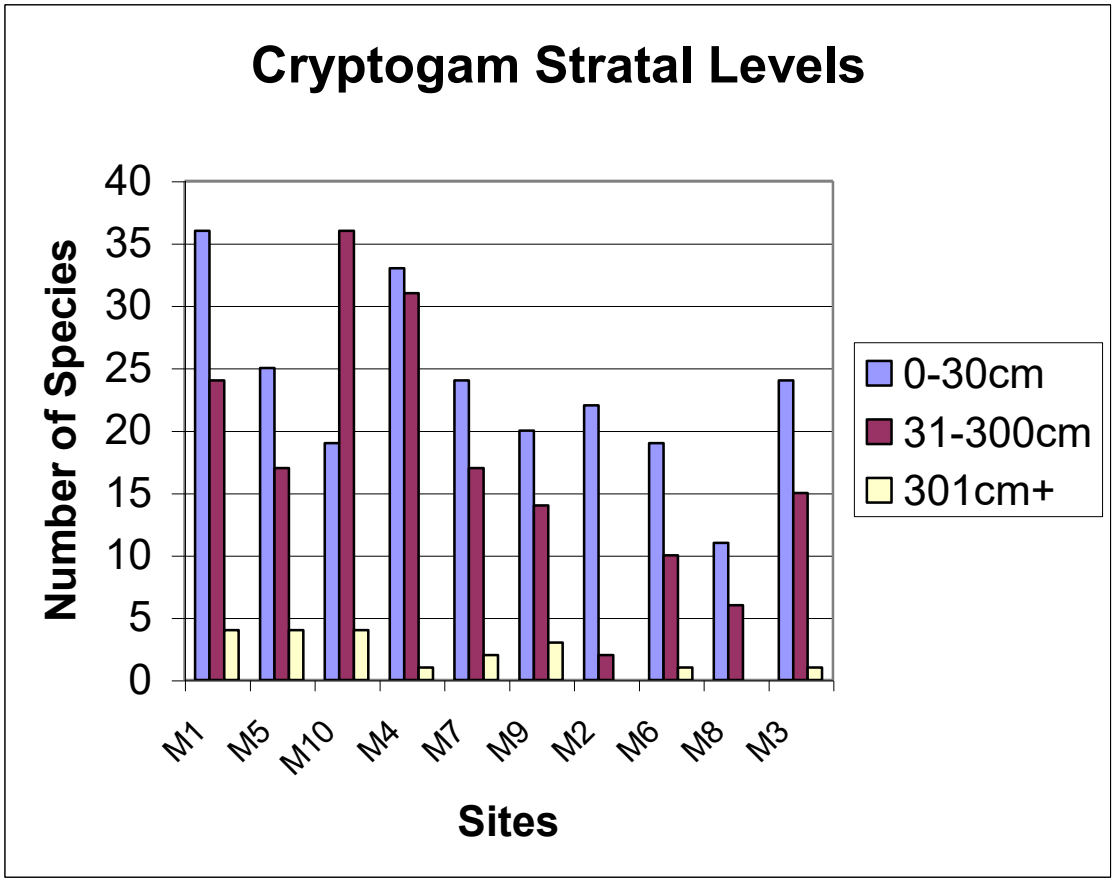
In graph 1 a decline in the number of species is evident with minimal changes between the control (M1, M5, M10) and the buffer (M4, M7,M9) sites. A decline is apparent in the gap sites (M2, M6, M8). The shelterwood site (M3) appears to minimal decline in species and is similar to the buffer sites.
The variations noted in the control sites and also reflected in all the other sites appears to be the result of external influences. The significant decline in species numbers in all of the gap sites would appear to be the direct result of habitat loss or damage.

Graph 2. Available Habitat types (substrates) and the number of cryptogams colonising these substrates.



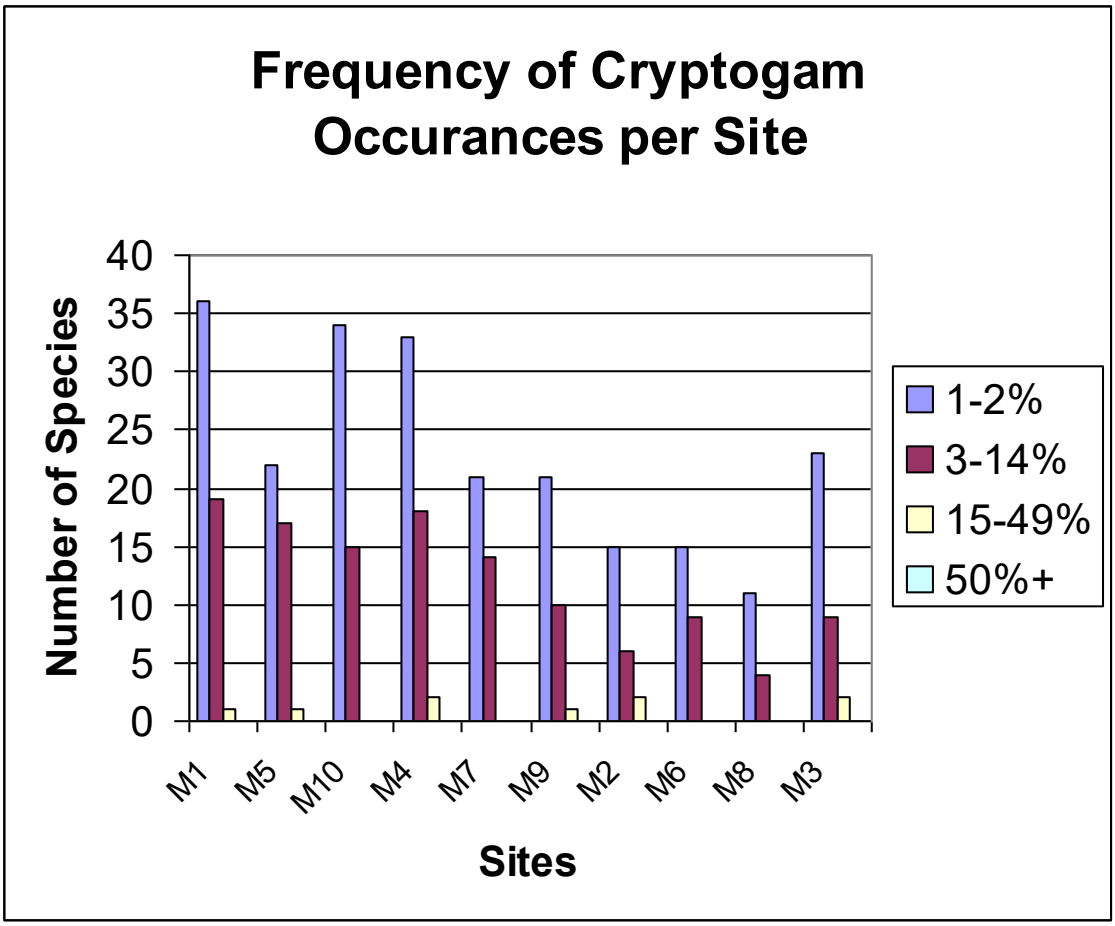
Graph 2 was implemented to depict the usage of the various available substrates (micro habitats) and the number of cryptogam species occupying these habitats. This graph indicates that the preferred habitats used on all sites are 1 wood, 2 barks, 3 soils and 4 old organic materials with other substrates not as readily colonised.

Graph 3 The occurrence of cryptogam groups and the number of species found at each stratal level.



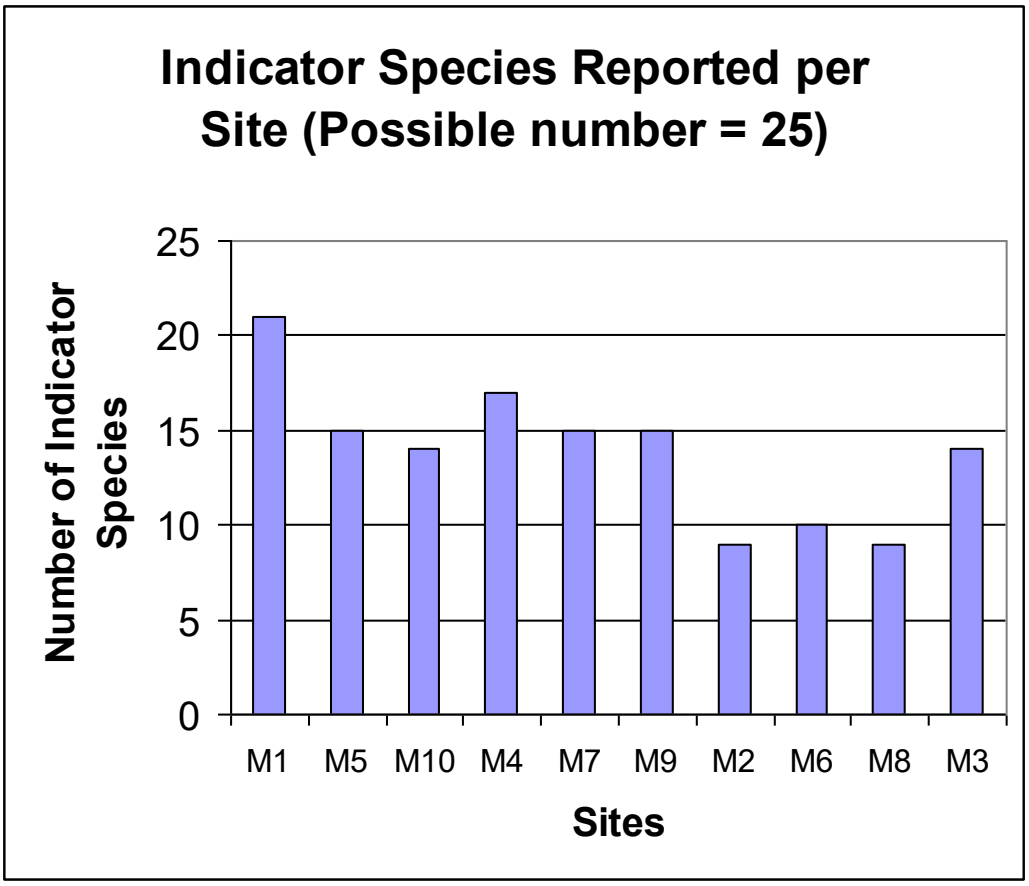
In graph 3 the number of cryptogam species located at the three nominated strata levels is mapped. It would appear from this data that the 0-30 cm level is preferred and that the shrub level 31-300 cm the next preferred level. M10 shows a greater preference to the shrub layer that reflects the observed densities of tree canopies, undergrowth and litter found on this site.

Graph 4. Frequency and number of species of cryptogams occurring at each site (300x300M^2)



Graph 4 looks at the percentage of total area per site occupied by the 3 cryptogam groups and the number of species involved. This is very arbitrary but attempts to show that although large number of species may be involved at each site the actual area occupied is between 1-2% of the total possible area.

Graph 5. The number of Indicator Species located on each site



Indicator Species

As noted in graph 5 the indicator species recommended in 2001 appeared to work well but it must be emphasised that this list of indicator species requires constant review as new site locations are established.

Conclusions

Although the cryptogam groups are difficult to study and interpret in the field as the methodology employed to survey these micro flora is still in flux. Improvements to the techniques used are possible but in an attempt to keep it simple I think that the current methods employed and the level of information gathered is on par.

Future Tasks

Although no backlogs are allowed the limited available information and high degree of complex issues associated with cryptogams will necessitate the development of a long outstanding backlog. It is envisaged that a portion of this backlog material can be passed onto relevant experts for identification but due to the global low number of experts available many samples may not be examined in the near future. To address this problem I have endeavoured to provide phrase names for many of these unknown species that can be linked to a voucher with an exclusive Perth Herbarium identification bar code. This will give constant future access to these samples via interrogation of Perth herbarium databases and capture any name changes resulting from identifications supplied either by experts or from taxonomic revisions. By using phrase names it is possible to designate a specific species that can be cited in reports and publications.

Prepare a field guide to nominated cryptogam indicator species with illustrations and information to help recognise individual species in the field. It would also be desirable to prepare a photographic or scanned record of all cryptogam taxa identified in this initial Forestcheck survey and for any other sites in future surveys.

Revised Operating Plan for 2003

Members Add Karina Knight

Objectives No change

Equipment Nil

Estimated Costs

Team leader (R. Cranfield)		
Vehicle 1300km @ 0.50c/km	$650	to herbarium Perth
Accommodation 1 week in Perth	$720	to herbarium Perth
Assistance (K. Knight)		
Vehicle 1300km @ 0.50c/km	$650	
Accommodation @ $120/day	$480	
Trips to Sites		
10 trips approx 750km	$400	
Materials$350		
Laboratory requirements	$1400	
Data basing		
15days @8hr@$16/hr	$1920	Verna
Total	**$6570**	

Methods
Field
As per 2001 with minor changes

Pt.5 4x100m transects 3 m from 100 x100m^2
Pt.6 delete

Laboratory
As per 2001

Site Images

For sites M1 – M10