

**Forest Check Invertebrates
Report For 2001-2002**

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Introduction

Our objective was to sample invertebrate biodiversity for the Forestcheck sites in a manner that employed efficient use of available time and resources, effective coverage of habitats and thus potential diversity, and minimal specimen processing time. Two main capture techniques were employed. (1) Passive capture techniques used both light and pit-fall traps. (2) Active techniques involved beating with a beating tray, sweeping with a net and habitat searches for set periods of time. Employing a wide range of habitats and sampling techniques maximised our chances of intercepting a wide range of species that may be limited by a single capture method. In addition known pest species (gum leaf skeletonizer, jarrah leaf miner and bullseye borer) were recorded for each site.

Specimens from active and passive captures were sorted in the laboratory as this was considered the most efficient and accurate means of dealing with samples. Specimens were sorted to order and a morphospecies number assigned to differentiate between species. A reference collection was therefore established and a morphospecies master-list erected (Appendix 1) where Indicator Species (K) and those species with Gondwanan affinities (GA) and Gondwanan Relict (GR) species were assigned.

Sampling Issues

In our initial active sampling methods, habitat sampling was partitioned into: litter, coarse woody debris (CWD), ash beds, moss swards, tree boles and bark, and bare ground. However it very quickly became apparent that separation of habitats such as ash beds from CWD, and moss swards from litter and CWD was difficult, and in many cases sampling for each habitat was repetitive. In addition the yield from tree boles and bark was limited and therefore not time efficient. Therefore active habitat searches were reduced to 1 hr each for litter and CWD.

Beating and sweeping were initially partitioned into morning and afternoon sessions for each technique (1 hr each). This meant that for each site, beating and sweeping took 4 hrs. However morning sweeping often yielded little, if nothing; and afternoon beating results could also be lean since insects were more active and difficult to catch (this was particularly evident in spring, with cool mornings and warm afternoons). Therefore beating was done in the morning and sweeping was confined to late morning or afternoon, taking a total of 2 hrs. Alternatively, we used 2 people for beating done in the afternoon to maximise insect capture. This allowed more than one plot to be done in a day and also allowed more flexibility to accommodate bad weather.

The passive capture techniques were also adjusted to more practical methods. Pit-fall traps were initially to be left open for 24 hrs after which the contents would be bulked and collected for sorting. Due to low apparent capture levels during this period, we decided to open the Pit-fall traps for a 10 day period at all sites simultaneously. This

expanded our capture window, made allowances for adverse weather and allowed more flexibility in trap setting and closure.

Although the total effective light trap period of three nights remained unchanged, it initially involved a rotation cycle through the sites such that not all sites were trapped simultaneously. This was initially done to save on purchase of batteries, however, this method relied on more nights during the 3 week trapping period during which lights were operating and thus less opportunity for selecting good trapping nights or repeating a trapping session should there be light failure. It also required more site visits to clear traps. Also this method meant greater variability across sites as not all sites were trapped on the same night. The difficult weather during spring 2001 was in some ways fortunate as it gave us an example of a bad case sampling scenario at the outset of the project. This therefore forced us to reconsider our sampling regime to build flexibility into our system. Light traps are therefore set for 3 night periods simultaneously at each site within the 3 week sampling period. This allows us to adjust our trapping to accommodate lunar phases and weather extremes whilst maintaining continuity across sites. A longer period, for example a continuous trapping regime for 1 week across all sites, was considered inappropriate, as it would generate too large a sample for efficient sorting.

Specimen processing

During the initial sorting it quickly became apparent a size threshold was required to restrict capture size to manageable levels, this was set at 10 mm with the exception of Gondwanan Relict (GR) and Affinity (GA) species (as identified in operating plan) and in some cases some Indicator species. Our initial interpretation of Indicator species were those invertebrates which were overtly distinctive, such that they are immediately recognisable and significantly notable. An attempt was also made to assign Indicator species to each major habitat (eg capture technique), endemism was also considered (see also discussion on Indicator species in operating plan). With exception of the Pit-fall samples all samples were sorted and identified within the 3 week sampling period. An additional week was required after the sample sort and data basing to examine the reference collection, check morphospecies assignment and determine Indicator species.

Sorting of the Pit-fall samples was done separate from the other sample captures and this resulted in some confusion in assigning morphospecies and where duplication of species occurred in the different data sets. In addition, it is a misconception that not recording abundance of species is time efficient. Sorting to morphospecies requires inspection of the whole capture for that individual sample. Due to the low sample sizes, including a count of the abundance of each morphospecies does not save time, since each individual needs to be checked. Time indeed would be saved in counting abundance if captures of certain singular and frequently occurring species exceeded 15 - 20 but for our samples this rarely occurred.

Data base establishment

It was to be inevitable that in the initial morphospecies assignment some specimens would be assigned a different species number when in fact they are the same. This presented the main problem in data base establishment. In addition the Pit-fall trap

samples were numbered using a different system. Thus some species can have 2 or more numbers, one of which can be from a different numbering system. Consequently we have 3 morphospecies names for each specimen, its original number, its pit-fall trap number where appropriate, and its database working number. This makes data base manipulation awkward.

Preliminary Results

We assigned 588 morpho species (Table 1), 24 were recognised as potential Gondwanan relicts, 33 with Gondwanan affinity and 203 were relegated as Indicator species. Of the morphospecies sampled Lepidoptera (209) and Coleoptera (111) were the most abundant and diverse orders, as would be expected (Table 1).

Light trapping resulted in the most abundant and diverse captures (Table 2), followed by Pit-fall trapping, sweep netting and beating (respectively). Species diversity and abundance were greatest in spring for all capture methods with the exception of coarse woody debris searches, where morpho species numbers were comparatively similar between the two seasons and specimen abundance was greater in autumn.

Site M9 showed the greatest spring diversity for active capture techniques, M7 for Light trapping and M1 for Pit-fall (Table 3). During autumn site M7 and M10 were most diverse for active capture techniques, M4 for light trapping and M2 for Pit-fall (Table 3).

Spring specimen abundance was greatest at M9 for active capture techniques and M7 for light trapping (Table 4). Autumn abundance followed diversity with greatest abundance at M7 and M10 for active capture techniques and M4 for light trapping (Table 4).

The forest pest jarrah leafminer was present at all sites and abundant at M1, M2 and M4 (Table 5). Evidence of Bullseye borer attack was present at all sites except M8. No evidence of gumleaf skeletoniser was found at any site.

Comparison of sampling methods used

Table 6 outlines capture efficiency and Table 7 summarises advantages and disadvantages of techniques.

Future Tasks

All samples have been processed and data entered. However, due to the misunderstanding regarding abundance in the pit-fall data it would be useful if the specimens for this data could be revisited and abundance recorded.

The data base structure and problems with the morphospecies assignment mentioned earlier needs to be refined with the help of a data base expert.

The morphospecies master list will need to be continually updated and revised as new information is gathered, particularly in respect to collection at new sampling sites.

Revision of Operating Plan
See accompanying document.

July 02

Table 1 Number of morphospecies collected using active and passive capture techniques in spring-autumn 2001-2002, showing allocation of Gondwanan Relicts (GR), species with Gondwanan affinity (GA) and indicator species (K).

Order	No of Spec	GR	GA	K
Amphipoda	1	1		
Annelida	1			
Araneae	7			1
Araneomorphae	7			2
Blattodea	26			15
Chilopoda	10			
Coleoptera	111	3	6	28
Dermaptera	8			5
Diplopoda	2			1
Diptera	46		12	7
Hemiptera	42			15
Hymenoptera	51		13	10
Isopoda	4	1		
Lepidoptera	209		2	99
Mantodea	3			1
Mecoptera	3	3		
Mygalomorphae	6	6		
Neuroptera	5	5		
Odonata	1	1		
Orthoptera	35			16
Phasmatodea	2			
Platyhelminthes	1			
Scorpionida	3			3
Trichoptera	4	4		
Total	588	24	33	203

Table 2 Number of morphospecies and specimen abundance in spring and autumn for each capture method (CWD = coarse woody debris search; na = not available).

Capture Method	No of Morpho Species		Abundance	
	Spring	Autumn	Spring	Autumn
Light	168	144	1511	1264
Pitfall	84	45	na	na
Sweep	78	27	150	60
Beat	77	18	119	59
CWD	24	29	50	78
Litter	36	24	72	32

Table 3 Number of morpho species (diversity) captured at each site for active light and pit fall capture techniques in spring and autumn.

Site	Treatment	<u>Active capture</u>		<u>Light trap</u>		<u>Pit fall</u>	
		Spring	Autumn	Spring	Autumn	Spring	Autumn
M1	Control	13	8	59	54	30	9
M2	Gap	12	14	56	55	25	15
M3	Shelter	25	16	43	74	16	11
M4	Buffer	9	15	62	77	11	9
M5	Control	47	17	71	40	11	9
M6	Gap	29	17	66	52	15	8
M7	Buffer	27	23	84	57	23	5
M8	Gap	44	12	49	40	15	10
M9	Buffer	50	18	51	58	11	7
M10	Control	43	23	52	24	15	9

Table 4 Specimen abundance at each site for active and light capture techniques in spring and autumn.

Site	Treatment	<u>Active capture</u>		<u>Light trap</u>	
		Spring	Autumn	Spring	Autumn
M1	Control	17	9	120	92
M2	Gap	14	18	121	92
M3	Shelter	41	30	83	202
M4	Buffer	10	20	138	194
M5	Control	58	19	208	90
M6	Gap	40	22	175	150
M7	Buffer	37	30	211	154
M8	Gap	50	25	136	81
M9	Buffer	79	24	108	168
M10	Control	58	32	135	41

Table 5 Pest presence and abundance assessment at each site (JLM = jarrah leafminer; GLS = gumleaf skeletoniser; BEB = bullseye borer; 0 = absent, 1 = present, 2 = abundant).

Site	JLM	GLS	BEB
M1	2	0	1
M2	2	0	1
M3	1	0	1
M4	2	0	1
M5	1	0	1
M6	1	0	1
M7	1	0	1
M8	1	0	0
M9	1	0	1
M10	1	0	1

Table 6 Comparison of collection methods using collection efficiencies.

Collection method	Number of individuals collected	Trap or collection time (hours)	Process time excluding database and analysis (person hours)	Trap efficiency (individuals per collection hour)	Process efficiency (individuals per person hour)
Spring					
Light	1511 ¹	360	About 60 for trap tending About 90 for sample sort	4.2	10.1
Pitfall	84 ²	240	16 hours trap tending 150 hours sample sort	0.35	0.56
Sweep	150 ¹	10	Active searches disrupted by rain.	15.0	Active searches disrupted by rain
Beat	119 ¹	10	See as for Sweep above	11.9	See as for sweep above
CWD	50 ¹	10	See above	5.0	See above
Litter	72 ¹	10	See above	7.2	See above
Autumn					
Light	1264	360	About 90 for sample sort About 60 for trap tending	3.5	8.4
Pitfall	45 ² 24 ^{2,3}	240	16 hours trap tending 120 hours sample sort	0.19 0.1 ³	0.38
Sweep	60	10	About 150 for field collection of combined active search samples. About 90 for sample sort of combined active search samples.	6.0	0.95 combined active search methods
Beat	59	10	See for sweep above	5.9	See above
CWD	78	10	See above	7.8	See above
Litter	32	10	See above	3.2	See above

Notes: 1 Includes some individuals smaller than acceptable size.

2. Number of species.

3. New species

Table 7 Summary of collection method comparisons.

Collection method	Disadvantages of collection method	Advantages of collection method
Light	Collects only light attracted fauna. Faunal fidelity to survey site is unknown?	Abundant individuals collected: implies higher probabilities of collecting rare species. High process efficiency (small effort needed and overall costs are low per unit of information gathered).
Pitfall	Bias towards sampling most active species of ground fauna. Low capture and process efficiency	High faunal fidelity to survey site. Ability to capture species otherwise not captured with other methods
Sweep	Capture efficiency vulnerable to poor air temperature conditions (too hot or too cold for flying insects). Extremely low process efficiency due to small sample sizes (catch effort carries time penalty of travel between sites). Faunal fidelity to survey site is unknown?	Good catch efficiency in suitable conditions (acceptable samples can be gathered relatively quickly).
Beat	Extremely low process efficiency due to small sample sizes (catch effort carries time penalty of travel between sites). Upper canopy not sampled.	Good catch efficiency (acceptable samples can be gathered relatively quickly). Less affected by air temperature and rain than sweep. High faunal fidelity to survey site.
CWD	Extremely low process efficiency due to small sample sizes (catch effort carries time penalty of travel between sites). Only a superficial sample of CWD fauna.	Good catch efficiency (acceptable samples can be gathered relatively quickly). Relatively unaffected by air temperature and rain. High faunal fidelity to survey site.
Litter	Extremely low process efficiency due to small sample sizes (catch effort carries relatively large penalty of unproductive time in travel between sites). Duplication of pitfall sampling?	Good catch efficiency (acceptable samples can be gathered relatively quickly) Relatively unaffected by air temperature and rain. High faunal fidelity to survey site.

Appendix 1 Morphospecies list for invertebrates

Spec #	Order	Family	Tax 3	Genus	Species	GR/
1	Lepidoptera	Carthaeidae	Oenochrominae	Carthaea	saturnioides	K
2	Lepidoptera	Geometridae		Arhodia	sp	K
3	Lepidoptera	Thaumetopoeidae		Epicoma	melanosticta	K
4	Lepidoptera	Notodontidae		Destolmia	lineata	K
5	Lepidoptera					
6	Lepidoptera	Arctiidae				K
7	Lepidoptera	Thaumetopoeidae		Ochrogaster	sp 1	K
8	Lepidoptera	Thaumetopoeidae		Ochrogaster	sp 2	K
9	Lepidoptera	Thaumetopoeidae		Ochrogaster	sp 3	K
10	Lepidoptera	Thaumetopoeidae		Ochrogaster	lunifer	K
11	Lepidoptera	Thaumetopoeidae		Ochrogaster	sp 4	K
12	Lepidoptera	Geometridae				K
13	Coleoptera	Dytiscidae			447	
14	Coleoptera	Hydrophilidae				
15	Coleoptera	Elateridae				
16	Diptera	Tipulidae				K
17	Coleoptera	Scarabeidae		Onthophagus	ferox	K
18	Lepidoptera	Noctuidae		Agrotis	munda	K
19	Lepidoptera	Geometridae		Chlorocoma	dicloraria	K
20	Lepidoptera					
21	Lepidoptera					
22	Lepidoptera	Geometridae		Chlorocoma	sp	K
23	Lepidoptera	Geometridae				K
24	Lepidoptera	Geometridae				K
25	Lepidoptera					
26	Coleoptera	Elateridae				
27	Blattodea	Blaberidae		Cololampra	sp	K
28	Coleoptera	Melolonthinae		Heteronyx	sp 1	
29	Coleoptera	Melolonthinae		Heteronyx	sp 2	
30	Lepidoptera	Noctuidae		Dasypodia	selenophora	
31	Lepidoptera	Geometridae		Parepisparis	excusata	K
32	Lepidoptera	Thaumetopoeidae				K
33	Lepidoptera					
34	Lepidoptera	Lymantriidae		Teia	athlophora	K
35	Lepidoptera	Thaumetopoeidae		Ochrogaster	sp 5	K
36	Lepidoptera	Thaumetopoeidae		Ochrogaster	sp 6	K
37	Lepidoptera					K
38	Lepidoptera					
39	Lepidoptera	Noctuidae				K
40	Lepidoptera	Noctuidae		Persectania	sp	K
41	Lepidoptera	Geometridae				K
42	Lepidoptera	Geometridae		Gastrina	cristaria	K
43	Lepidoptera	Pyalidae ?				K
6	Lepidoptera	Arctiidae				K
45	Lepidoptera	Zygaenidae		Pollanisus	viridipulverulenta	K
46	Lepidoptera	Geometridae				
47	Lepidoptera	Geometridae				

48	Lepidoptera					
49	Hemiptera	Cicadidae		Cicadetta	sp	
50	Lepidoptera	Geometridae				K
51	Diptera	Muscoidea				
52	Hymenoptera	Apidae		Apis	melifera	K
53	Diptera	Calliphoridae		Calliphora		
54	Diptera	Syrphidae				
55	Coleoptera	Dytiscidae				
56	Coleoptera	Chrysomelidae				
57	Lepidoptera	Notodontidae		Danima	banksiae	K
58	Lepidoptera	Notodontidae				K
59	Lepidoptera	Geometridae				K
60	Lepidoptera					
61	Lepidoptera					
62	Lepidoptera					K
63	Lepidoptera					
64	Lepidoptera	Oecophoridae				K
65	Lepidoptera					
66	Lepidoptera	Geometridae				
67	Lepidoptera					
68	Diptera	?				
69	Trichoptera					GR
70	Coleoptera	Melolonthinae		Heteronyx	sp 3	
71	Lepidoptera					
72	Lepidoptera	Geometridae				
73	Lepidoptera					
74	Lepidoptera	Noctuidae				
75	Lepidoptera	Noctuidae				
76	Lepidoptera					
77	Lepidoptera					
78	Lepidoptera	Zygaenidae		Pollanisus	viridipulverulenta	K
79	Lepidoptera	Geometridae	Oenochrominae	Arhodia	sp	K
80	Lepidoptera					K
81	Lepidoptera	Limacodidae		Doratifera	sp	K
82	Lepidoptera	Geometridae				
83	Lepidoptera	Geometridae				
84	Lepidoptera	Pyalidae		Uresiphita	ornithopteralis	K
85	Lepidoptera	Geometridae				
86	Lepidoptera	Geometridae				
87	Hymenoptera	Ichneumonidae		Ophion	sp	GA
88	Diptera	Pyrgotidae				K
89	Mecoptera	Meropeidae		Austromerope	poultoni	GR
90	Lepidoptera	Limacodidae				K
91	Lepidoptera	Anthelidae		Chenuala	sp	K
92	Lepidoptera	Tortricidae ?				
93	Coleoptera	Carabidae				
94	Coleoptera	Melolonthinae		Heteronyx	sp 4	
95	Lepidoptera	Geometridae				
96	Lepidoptera	Geometridae				
97	Lepidoptera	Geometridae				
98	Coleoptera	Curculionidae	Gonipterinae	Oxyops	sp	

99	Coleoptera	Lycidae		Metriorrhynchus	sp	K
100	Coleoptera	Curculionoidea	Belidae			GR
101	Coleoptera	Chrysomelidae				
102	Coleoptera	Curculionidae				
103	Coleoptera	Curculionidae				
104	Lepidoptera					
105	Hemiptera	Pentatomidae				K
106	Orthoptera	Tettigoniidae				K
107	Hemiptera					
108	Hemiptera	Membracidae				K
109	Hemiptera					
110	Hemiptera					
111	Lepidoptera					
112	Coleoptera	Chrysomelidae	Paropsinae			
113	Coleoptera	Curculionidae				
114	Coleoptera	Curculionidae				
115	Coleoptera	Chrysomelidae				
116	Coleoptera	?				
117	Hemiptera	Pentatomidae				
118	Orthoptera	Tettigoniidae				
119	Blattodea	Blaberidae		Calolampra	sp 1	K
120	Blattodea	Blatellidae		Neotemnapteryx	sp	K
121	Blattodea	Blatellidae		Platyzosteria	sp 1	K
122	Blattodea	Blatellidae		Platyzosteria	sp 2	K
123	Dermaptera					K
124	Coleoptera	Curculionidae	Gonipterinae			
125	Diptera	Drosophilidae				
126	Diptera	Tabanidae				
127	Diptera	?				
128	Diptera	Muscoidea				
129	Diptera	Syrphidae				
130	Diptera	Syrphidae				
131	Neuroptera	Hemerobeidae				GR
132	Mantodea					
133	Lepidoptera	Noctuidae				
134	Diptera	Muscoidea				
135	Coleoptera	Elateridae				
136	Diptera	Tachinidae				K
137	Lepidoptera	Noctuidae				
138	Lepidoptera					
139	Lepidoptera	Noctuidae				
140	Lepidoptera	Noctuidae				
141	Lepidoptera	Tineidae		Moerarchis	australasiella	K
142	Diptera	Therevidae				K
143	Diptera	Syrphidae				
144	Trichoptera					GR
145	Trichoptera					GR
145	Trichoptera					GR
147	Blattodea	Blaberidae		Calolampra	sp 2	
148	Blattodea	Blaberidae				
149	Orthoptera	Tettigoniidae				K

150	Hemiptera	Reduviidae					K
151	Trichoptera						GR
6	Lepidoptera	Arctiidae			6		K
153	Hemiptera	Pentatomidae					
154	Coleoptera	Melolonthinae		Liparetrus	sp		
155	Coleoptera	Chrysomelidae					
156	Coleoptera	Curculionidae					
157	Coleoptera	Curculionidae	Rhadinosominae	Rhadinosomus	sp		K
158	Coleoptera	?					
159	Coleoptera	?					
160	Coleoptera	Curculionidae	Gonipterinae	Gonipterus	sp		
161	Coleoptera	Curculionidae	Gonipterinae	Oxyops	fasciata		K
162	Coleoptera	Scarabaeidae	Melolonthinae	Liparetrus	jenkinsi		
163	Hemiptera	Reduviidae					
164	Hemiptera						
165	Diptera	Asilidae					GA
166	Hemiptera						
167	Orthoptera	Tettigoniidae					
168	Coleoptera	Belidae		Belus	suturalis		GR
169	Coleoptera	Curculionidae					
170	Hemiptera						
171	Coleoptera	Scarabaeidae	Melolonthinae	Liparetrus	sp		
172	Coleoptera	Scarabaeidae	Melolonthinae	Heteronyx	sp		
173	Coleoptera	?					
174	Orthoptera						
175	Coleoptera	Chrysomelidae	Paropsinae				
176	Hemiptera	Pentatomidae					
177	Hemiptera						
178	Diptera	Tabanidae					GA
179	Diptera	Drosophilidae					
180	Orthoptera	Grillidae					K
181	Coleoptera	Curculionidae	Gonipterinae	Oxyops	sp		
182	Coleoptera	Chrysomelidae					
183	Hymenoptera	Colletidae					K
184	Hymenoptera	Doryctinae					
185	Lepidoptera	Noctuidae		Periscepta	polystieta		K
186	Hymenoptera	Colletidae					K
187	Hemiptera						
188	Hemiptera						
189	Coleoptera	Scarabeidae	Dynastinae	Cryptodus	sp		K
190	Blattodea	Blattidae					K
191	Coleoptera	Phycosecidae	Phycosecis				
192	Coleoptera	Tenebrionidae	Lagriinae	Lagria	aneouiobcea		GA
193	Coleoptera	Coccinellidae		Coccinella	repanda		
194	Coleoptera	?					
195	Diptera	?					
196	Hemiptera	Reduviidae					
197	Lepidoptera						
198	Coleoptera	Lycidae					
199	Coleoptera	Curculionidae					
200	Hemiptera						

201	Coleoptera	Belidae					GR
202	Orthoptera	Tettigoniidae					
203	Hymenoptera	Colletidae					
204	Diptera	Asilidae					GA
205	Diptera	Muscoidea					
206	Diptera	Syrphidae					
207	Hemiptera	Cicadidae		Cicadetta	sp		K
208	Coleoptera	Lycidae		Metriorrhynchus	sp		K
209	Coleoptera	Curculionidae					K
210	Coleoptera	Curculionidae					
153	Hemiptera	Pentatomidae					
212	Coleoptera	Scarabeidae	Melolonthinae	Liparetrus	sp		
163	Hemiptera	Reduviidae					
214	Coleoptera	Curculionidae					
215	Coleoptera	?					
216	Orthoptera	Gryllidae					
217	Diptera	Asilidae					GA
218	Orthoptera	Tetigoniidae					K
219	Blattodea	Blattidae		Platyzosteria			K
220	Coleoptera	Elateridae					
221	Hemiptera	Pentatomidae					
222	Hymenoptera	Formicidae		Myrmecia	sp 2		
223	Chilopoda						
224	Chilopoda						
225	Chilopoda						
226	Chilopoda						
227	Chilopoda						
228	Chilopoda						
229	Chilopoda						
230	Hemiptera	Pseudococcidae					
231	Orthoptera	Acrididae					K
232	Orthoptera	Acrididae					K
233	Orthoptera	Acrididae		Goniaea	sp		K
174	Orthoptera	Acrididae					K
235	Orthoptera	Acrididae					K
236	Lepidoptera						
237	Odonata	Zygoptera					GR
238	Lepidoptera						
239	Hemiptera						
240	Hemiptera	Pentatomidae					K
241	Hemiptera						
242	Diptera	Syrphidae					
243	Hymenoptera	Evaniidae					
244	Coleoptera	Curculionidae					K
245	Diptera	Bombyliidae					K
246	Orthoptera	Tetigoniidae					K
247	Coleoptera	Curculionidae					
248	Coleoptera	Chrysomelidae	Paropsinae				
249	Hemiptera						
250	Mecoptera	Bittacidae		Harpobittacus	sp		GR
251	Hemiptera	Pentatomidae					

252	Hymenoptera	Formicidae		Myrmecia	sp 1	
253	Coleoptera	Carabidae				
254	Blattodea	Blattidae		Platyzosteria	sp	
232	Orthoptera	Acrididae		Goniaea	sp	K
235	Orthoptera	Acrididae				K
257	Dermaptera					K
258	Dermaptera					K
259	Diplopoda					
260	Diplopoda					K
261	Amphipoda					GR
262	Isopoda					GR
258	Dermaptera					K
264	Coleoptera	Carabidae	Harpalinae	?Cenogmus	sp	GA
265	Coleoptera	Carabidae	Esydrinae			GA
266	Blattodea	Blattidae		Platyzosteria		K
267	Chilopoda					
268	Orthoptera	Tettigoniidae				
269	Blattodea					
270	Hemiptera	Reduviidae				
271	Araneae					
235	Orthoptera	Acrididae				K
235	Orthoptera	Acrididae				K
235	Orthoptera	Acrididae				K
275	Hymenoptera	Formicidae		Iridomyrmex	sp 3	
276	Orthoptera					
277	Chilopoda					
278	Orthoptera					
279	Hymenoptera	Formicidae		Myrmecia	sp 4	
280	Coleoptera	Carabidae		Carenum	sp	GA
281	Hymenoptera	Formicidae		Myrmecia	sp 3	
282	Blattodea	Blattidae		Platyzosteria	sp	K
283	Mygalomorp					GR
284	Hemiptera	Reduviidae				K
285	Araneae					
286	Araneae	Araneomorphae	Sparassidae			
287	Coleoptera	Scarabeidae				
288	Coleoptera	Carabidae		Chlaenius		GA
289	Coleoptera	Scarabeidae	Melolonthinae	Heteronyx	sp	
290	Coleoptera	Curculionidae				K
291	Coleoptera	Curculionidae	Molytinae	Tranes	sp	K
292	Blattodea	Blaberidae		Laxta		K
293	Orthoptera	Acrididae		Phaulacridium	vitatum	K
294	Orthoptera	?				
295	Hymenoptera	Pompilidae				
296	Lepidoptera	Lycinidae				K
52	Hymenoptera	Apidae		Apis	melifera	K
297	Lepidoptera	Nymphalidae	Heteronympha	Merope	duboulayi	K
299	Coleoptera	Buprestidae				K
300	Coleoptera	Curculionidae	Amycterinae			K
301	Hemiptera	Membracidae				K
302	Hemiptera	Membracidae				K

303	Phasmatodea					
304	Orthoptera	Acrididae		Goniae		K
305	Neuroptera	Mermelontidae				GR
306	Lepidoptera	Nymphalidae		Geitoneura	klugit	K
307	Coleoptera	Chrysomelidae	Paropsinae			K
308	Coleoptera	Chrysomelidae	Paropsinae			K
309	Mantodea					
310	Orthoptera					
311	Hemiptera	Reduviidae				K
312	Diptera	Asilidae				GA
312	Diptera	Asilidae				GA
314	Orthoptera					
315	Lepidoptera					
316	Lepidoptera					
317	Lepidoptera	Geometridae				
318	Lepidoptera	Geometridae				
319	Lepidoptera	Tineidae		Moerarchis	clathrella	K
320	Lepidoptera	Geometridae		Arhodia	sp	K
321	Lepidoptera	Geometridae				K
322	Lepidoptera	Limacodidae		Doratifera	quadriguttata	K
323	Lepidoptera	Geometridae				
324	Lepidoptera	Tineidae		Moerarchis	sp	K
325	Lepidoptera	Psychidae		Iphierga	euphragma	K
326	Lepidoptera	Geometridae				
327	Lepidoptera	Geometridae				
328	Lepidoptera	Saturnidae		Opodiphthera	helena	K
329	Lepidoptera	Noctuidae				K
330	Lepidoptera	Geometridae		Crypsiphora	ocultaria	K
331	Lepidoptera	Oecophoridae		Wingia	aurata	K
332	Lepidoptera	Lymacodidae		Doratifera	sp	K
333	Lepidoptera	Pyalidae				
334	Lepidoptera	Geometridae		Gastrina	cristarina	K
89	Mecoptera	Meropidae		Austromerope	poultoni (male)	GR
336	Lepidoptera	Noctuidae		Chrysodeixis	argenteifera	K
337	Lepidoptera					
338	Lepidoptera	Geometridae				
339	Lepidoptera	Geometridae				
340	Coleoptera	Carabidae	Chlaeniinae			
341	Lepidoptera	Pyalidae				
342	Lepidoptera	Pyalidae				
343	Hymenoptera	Formicidae		Myrmecia	sp 5	
344	Lepidoptera	Noctuidae				K
345	Lepidoptera					K
346	Lepidoptera	Noctuidae				K
347	Coleoptera	Scarabidae	Melolonthinae	Heteronyx		
340	Coleoptera	Carabidae	Chlaeniinae			
349	Coleoptera	Curculionidae				K
350	Lepidoptera					
351	Coleoptera	Cerambycidae		Uracantha	triangularis	K
352	Lepidoptera	Anthelidae		Anthela	sp	K
353	Coleoptera	Scarabidae		Colpochila	sp	K

354	Coleoptera	Scarabeidae		Cryptodus	dynastinae	K
355	Lepidoptera	Geometridae				
356	Lepidoptera	Pyrilidae				
357	Lepidoptera	Geometridae		Eucyclodes	buprestaria	K
358	Lepidoptera	Geometridae				
359	Coleoptera	Scarabeidae	Melolonthinae	Heteronyx		
360	Neuroptera	Hemerobiidae				GR
361	Neuroptera	Chrysopidae		Chrysopa		GR
362	Lepidoptera					
363	Coleoptera	Scarabeidae	Melolonthinae	Heteronyx		
364	Lepidoptera	Noctuidae				
365	Lepidoptera	Pyrilidae				
366	Lepidoptera					
367	Lepidoptera					
368	Coleoptera	Curculionidae	Amycterinae			K
369	Lepidoptera					
370	Lepidoptera	Notodontidae		Hylaeora	dilucida	K
371	Lepidoptera	Lasiocampidae		Entometa	fervens	K
372	Lepidoptera	Hepialidae		Abantiades	hydrographis	GA
373	Lepidoptera	Hepialidae		Abantiades	ocellatus	GA
374	Lepidoptera	Notodontidae				K
375	Lepidoptera	Geometridae				K
376	Lepidoptera					
377	Lepidoptera	Geometridae		Phallaria	ophiusaria	K
373	Lepidoptera	Hepialidae		Abantiades	ocellatus	GA
379	Lepidoptera	Noctuidae		Peripyra	sanguinipuncta	K
380	Lepidoptera					
381	Lepidoptera	Anthelidae				K
382	Lepidoptera					
383	Lepidoptera					
384	Lepidoptera	Geometridae		Pholodes	sp 1	K
385	Lepidoptera	Geometridae		Pholodes	sp 2	K
386	Lepidoptera	Noctuidae				
387	Lepidoptera					
388	Lepidoptera	Noctuidae		Pantidia	sp	
389	Lepidoptera	Geometridae				K
390	Lepidoptera	Notodontidae				K
391	Lepidoptera	Noctuidae				
392	Lepidoptera	Geometridae				K
393	Lepidoptera	Geometridae				K
394	Lepidoptera					
395	Lepidoptera	Geometridae				
396	Lepidoptera	Oecophoridae				
397	Lepidoptera	Pyrilidae				
398	Lepidoptera	Limacodidae		Doratifera	sp	K
399	Lepidoptera					
400	Neuroptera	Myremeleontidae				GR
401	Lepidoptera	Pyrilidae				
402	Lepidoptera	Geometridae				
403	Lepidoptera	Geometridae				K
404	Lepidoptera	Thaumetopoeidae		Oenosandra	sp	K

405	Lepidoptera	Noctuidae					
406	Lepidoptera						
407	Lepidoptera						
408	Hymenoptera						
409	Hymenoptera	Formicidae					
410	Blattodea	Blaberidae					K
411	Lepidoptera						
412	Lepidoptera	Noctuidae					K
413	Lepidoptera						
414	Lepidoptera						
415	Lepidoptera	Geometridae					K
416	Coleoptera	Scarabeidae	Melolonthinae	Heteronyx	sp		
417	Lepidoptera	Geometridae		Gastrina	sp		K
418	Coleoptera	Scarabeidae	Melolonthinae	Heteronyx	sp		
419	Lepidoptera						
420	Lepidoptera						
421	Lepidoptera						
422	Lepidoptera						
423	Hymenoptera	Formicidae	Dolichoderinae	Iridomyrex	sp 2		K
424	Lepidoptera	Geometridae					K
425	Lepidoptera	Geometridae					K
426	Lepidoptera	Lasiocampidae		Entometa	sp		K
427	Coleoptera	Scarabeidae	Melolonthinae	Heteronyx			
428	Lepidoptera						
429	Lepidoptera						
430	Lepidoptera						
431	Lepidoptera						
432	Lepidoptera	Pyalidae					K
433	Mantodea	Mantidae		Archimantis	sp		K
434	Lepidoptera						
435	Lepidoptera	Noctuidae					K
436	Lepidoptera	Geometridae					K
437	Coleoptera	Lucanidae		Syndesus	sp		K
438	Lepidoptera						
439	Coleoptera	Carabidae	Carabinae				GA
440	Coleoptera	Dytiscidae					
441	Lepidoptera						
442	Lepidoptera						
443	Lepidoptera						
444	Coleoptera	Elateridae					
445	Lepidoptera	Artctiidae	Arctiinae	Spilosoma	sp		K
446	Lepidoptera						K
13	Coleoptera	Dytiscidae					
368	Coleoptera	Curculionidae	Amycterinae				K
449	Lepidoptera	Noctuidae					K
450	Lepidoptera	Geometridae		Thalaina	clara		K
451	Lepidoptera	Geometridae					K
452	Lepidoptera						K
453	Lepidoptera						
454	Lepidoptera						
455	Lepidoptera	Geometridae		Gastrina	cristaria		

456	Lepidoptera						
457	Lepidoptera	Anthelidae					K
458	Phasmatodea						
459	Lepidoptera						
460	Lepidoptera						
437	Coleoptera	Lucanidae		Syndesus	sp		K
462	Coleoptera	Curculionidae	Gonipterinae	Oxyops			
463	Coleoptera	Chrysomelidae	Paropsinae				K
464	Diptera	Tachinidae					K
465	Coleoptera	Chrysomelidae	Paropsinae				K
466	Diptera	Tabanidae					
467	Diptera	Tabanidae					GA
468	Araneae						K
469	Scorpionida				Scorpion sp2		K
470	Coleoptera	Curculionidae	Gonipterinae	Oxyops			
471	Coleoptera	Chrysomelidae	Paropsinae	Chrysophtharta			
472	Araneae						
473	Diptera	Tabanidae					
52	Hymenoptera	Apidae		Apis	melifera		K
475	Hemiptera	Pentatomidae					K
476	Coleoptera	Cerambycidae	Laminae				
477	Hymenoptera	Formicidae		Myrmecia	callima		K
478	Hymenoptera	Formicidae		Myrmecia	sp 7		K
479	Blattodea	Blaberidae					
480	Diptera	Calliphoridae		Calliphora			
481	Hymenoptera	Pompilidae					GA
482	Hemiptera	Reduviidae					K
483	Blattodea	Blaberidae					
484	Dermaptera						K
485	Orthoptera						
486	Hymenoptera	Formicidae		Myrmecia	sp1		
487	Hymenoptera	Formicidae		Myrmecia	sp 6		
488	Coleoptera	Curculionidae	Gonipterinae	Gonipterus			
489	Hemiptera						K
490	Blattodea						
491	Dermaptera						
492	Dermaptera						
493	Hymenoptera	Braconinae					K
494	Hymenoptera	Pompilidae					
495	Diptera	Tabanidae					
496	Coleoptera	Curculionidae	Amycterinae				K
497	Araneae						
498	Diptera	Muscoidea					
52	Hymenoptera	Apidae		Apis	melifera		K
500	Hymenoptera	Evaniidae					K
501	Orthoptera	Acrididae					K
502	Araneae						
503	Hemiptera	Eurymelidae		Pogonoscopus	sp		K
504	Hymenoptera						
505	Hymenoptera	Sphecidae					K
506	Diptera	Bombylidae					K

507	Blattodea					
508	Blattodea					K
509	Blattodea					
510	Hymenoptera	Formicidae				
511	Coleoptera	Scarabeidae		Onthophagus		
512	Hemiptera	Reduviidae				K
513	Hemiptera	Pentatomidae				K
514	Coleoptera	Curculionidae				
515	Hymenoptera	Ichneumonidae				GA
516	Hymenoptera	Pompilidae				
517	Lepidoptera	Geometridae				
518	Lepidoptera	Noctuidae				
519	Isopoda	collective sp				
520	Annelida	collective sp				
521	Platyhelminth					
522	Dermaptera					
525	Blattodea	Blattidae				K
526	Orthoptera	Stenopelmatidae		Onosandrus	sp	K
527	Hemiptera	Gelastocoridae		Nerthra	sp	
528	Coleoptera	Carabidae				K
529	Coleoptera	Carabidae				K
530	Diptera	Anthomyiidae				
531	Diptera	Tabanidae				GA
532	Diptera	Asilidae				GA
533	Hymenoptera	Ichneumonidae	Branchinae	Australoglypta	sp	
534	Hymenoptera	Mutillidae				
535	Hymenoptera	Formicidae	Dolichoderinae	Iridomyrmex	sp1	
536	Araneomorph	Corinnidae		Supunna	albopunctata	K
537	Araneomorph	Corinnidae		Supunna	picta sp1	K
538	Mygalomorph	Nemesiidae			juvenile	GR
539	Isopoda					
540	Isopoda					
541	Diptera	Asilidae				GA
542	Hymenoptera	Formicidae	Ponerinae	Prionopella	sp	
543	Hymenoptera	Formicidae	Poneri	Rhytidoponera	sp	
544	Hymenoptera	Colletidae				
545	Hymenoptera	Colletidae				
546	Hymenoptera	Colletidae				
547	Blattodea	Blaberidae		Laxta	sp2	K
548	Orthoptera	Acrididae				
550	Coleoptera	Scarabaeidae	Melolonthinae			
552	Hymenoptera	Formicidae	Myrmeciinae	Myrmecia	sp1	
553	Araneomorph	Ctenidae				
554	Araneomorph	Lycosidae				
555	Orthoptera	Gryllidae				
557	Coleoptera	Carabidae				K
558	Coleoptera	Carabidae	Pentagonicinae	Scapodes	boops	
560	Araneomorph	Gnaphosidae				
562	Coleoptera	Scarabaeidae	Melololonthinae	Heteronyx	sp	
564	Diptera	Asilidae				GA
565	Diptera	Syrphidae				
567	Mygalomorph	Nemesiidae		Chenistonia	sp1	GR

568	Scorpionida			Scorpion sp1	K
570	Blattodea	Blaberidae		sp4	K
571	Coleoptera	Elateridae			
573	Hemiptera	Reduviidae			
576	Orthoptera	Acrididae	Cedarinia	sp2	
577	Diptera	Tipulidae			
579	Diptera	Sarcophagidae			
580	Hymenoptera	Mutillidae			
581	Mygalomorp	Nemesiidae	Chenistonia	sp2	GR
584	Hymenoptera	Tiphiidae			GA
585	Mygalomorp	Nemesiidae		juvenile	GR
587	Coleoptera	Carabidae			K
588	Diptera	Tipulidae			
589	Lepidoptera	Noctuidae			
590	Mygalomorp		Nemesiidae	juvenile	GR
591	Blattodea	Blatellidae	Neotemnapteryx	sp	
592	Blattodea	Blattidae	Polyzosteria	sp	
593	Lepidoptera	Hesperiidae	Hesperilla	chrysotricha	K
594	Lepidoptera	Nymphalidae	Vanessa	kershawi	K
596	Hymenoptera	Colletidae			
597	Araneomorph	Miturgidae	genus2	sp1	
598	Lepidoptera	Noctuidae			
603	Diptera	Tabanidae			GA
604	Hymenoptera	Tiphiidae			GA
607	Hymenoptera	Pompilidae			GA
608	Orthoptera	Gryllidae			
609	Orthoptera	Gryllidae			
611	Hymenoptera	Pompilidae			GA
612	Hymenoptera	Pompilidae			GA
613	Orthoptera	Acrididae			
614	Hymenoptera	Tiphiidae			GA
616	Hymenoptera	Pompilidae			GA
617	Hymenoptera	Pompilidae			GA
618	Orthoptera	Gryllidae			
619	Hymenoptera	Pompilidae			GA
620	Araneomorph	Trochanteridae	Rebilus	sp	
621	Coleoptera	Elateridae			
622	Hymenoptera	Pompilidae	Cryptocheilus	fabricolor	GA
623	Chilopoda				
628	Coleoptera	Staphylinidae			K
629	Scorpionida			Scorpion sp3	K