

ANTS COLLECTED DURING THE SCIENTIFIC EXPEDITION GROUP SURVEY BS638, ARKAROOLA WILDLIFE SANCTUARY, CAMP ‘ARK’, SEPTEMBER 2011.

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INTRODUCTION:

This survey in 2011, after a two-year wet, was the second biological survey by the Scientific Expedition Group (SEG), in the Arkaroola Wilderness Sanctuary. The first survey was in 2009 after a nine-year drought.

During the survey, 25 genera of ants were collected opportunistically from macro-pits and from 159 of the 160 micro-pits; 19 genera were collected in 2009. The genus *Tetraponera* (collected with honey bait) is not common in South Australia and has been found only twice before in the Flinders Ranges (Shattuck 1999). Other invertebrates were collected in all 160 micro-pits at the 16 sites.

LOCATION:

Camp ‘ARK’, Arkaroola Wilderness Sanctuary, is in the northern part of the Flinders Ranges, approximately 600 km north of Adelaide, South Australia. The base camp was at the Old Arkaroola Homestead, 4 km south of the Arkaroola Village ($30^{\circ} 18.692' S$, $139^{\circ} 20.134' E$). The survey was conducted around the Village; north (along the Ridge-top Track 20 km), south, east and west of the Arkaroola Village.

Arkaroola Wildlife Sanctuary covers 610 square km of spinifex-covered hillsides and red rocky peaks. The area was proclaimed a reserve in 1968 to protect the integrity of this internationally significant area. Some of the region’s most unique species, such as the Flinders Ranges Purple-spotted Gudgeon and the Spidery Wattle, are found nowhere else in the world (Vincent 2011).

ARKAROOLA LAND SYSTEM:

This region has outstanding geological features, many of which are unique to science and of international significance, especially within the Arkaroola Gorge, Mount Gee, Mount Painter and the Armchair areas (Vincent 2011).

LATEST HISTORY:

The 2009 survey was organized because there had not been a biodiversity survey at this location. Scientific data was needed as evidence to preserve Arkaroola as a Wildlife Sanctuary safe from mining activities. Thanks to many people, the Arkaroola Wildlife Sanctuary is now under “Protective Legislation” which went through the South Australian Parliament in April 2012.

CLIMATE:

The mean annual rainfall is 249 mm (over 72 years). Arkaroola has more fine days than wet ones. The last good rains were in 2010 with 426.5 mm and in 2011 with 517.4 mm (From the ARK, Newsletter number 15). Between the years 2001–2009 the average yearly rainfall was 175 mm (Sprigg 2011). Thus two very wet years occurred just before this survey.

The temperature in September can vary from 5–25° C with low humidity. It is hot in summer. The mean summer temperature is 33.4° C and winters are mild with a mean temperature of 17.4° C. The mean summer rainfall is 30.9 mm (over 72 years) and the mean winter rainfall is 14.6 mm (BOM).

METHOD:

Micro-pitfalls, macro-pitfalls, opportunistic and honey bait collecting:

Sixteen sites were surveyed. The methods for the macro-pits and micro-pits were the same as in 2009. At each site, 10 micro-pits were placed 10 m apart, parallel to the line of macro-pits (see Vincent 2011). The micro-pits used during **Week 1**, were set up at sites ARK 009 02–ARK 016 02, from 19–23 September 2011, and during **Week 2** at sites ARK 001 02–ARK 008 02, from 24–28 September 2011. They were left open for 4 nights.

The opportunistic and honey bait collecting were both done on opposite weeks to the micro-pit collecting. The ants were identified and counted into genera at the South Australian Museum and verified by John Weyland, using Shattuck (1999) as a reference.

RESULTS:

Ant numbers and genera:

The sites were the same as in the previous survey in 2009 (Vincent 2011). The 80 micro-pits put out during **Week 1** at sites ARK 009 02–016 02 collected 7,607 ants, (one micro-pit had 5,915 small *Iridomyrmex* specimens). During **Week 2**, sites ARK 001 02–008 02 had 3,147 ants. A total of 10,754 ants were collected from the micro-pits during the two weeks (**Tables 1 and 2**).

Fewer ants, a total of 434 ants from 14 sites ranging from 5–77 per site, were collected from the **macro-pits**. No ants were collected from the macro-pits at sites ARK 008 02 and ARK 014 02. Ants collected opportunistically (**Tables 3 & 4**) totalled 552 ants and those collected with **honey bait** 446, included the rare *Tetraponera* genus.

Weather:

Week 1: The daily maximum temperature ranged from 23.1–30.0° C, while the average maximum was 26.3° C. The minimum ranged from 5.5–12.0° C. The relative humidity ranged from 18–55% at 9 a.m. and 14–34% at 3 p.m.

Week 2: The maximum daily temperature ranged from 19.1–32.7° C, while the average maximum was 26.8° C. The minimum ranged from 6.2–9.4° C. The relative humidity ranged from 15–51%, at 9 a.m. and 12–25% at 3 p.m.

The maximum temperature had a larger range in the second week with lower relative humidity, while the average daily maximum only varied by 0.5° C.

Vegetation:

Everywhere was green. There had been a tremendous growth with the presence of many native grasses, ephemeral and herbaceous plants and seedlings, along with many shrubs in flower or fruiting. (See pen and ink drawings of the sites on pp. 50–51.)

ARK 001 02: *Triodia irritans* (Spinifex) grassland on rocky knoll, with *Ptilotus exaltatus* (Mulla Mulla) and *Acacia tetragonophylla* (Dead Finish) with emergent *Eucalyptus intertexta* (Gum-barked Coolibah).

TABLE 1: Summary of ant genera collected in micro-pits at Sites 9–16 during Week 1.

Genera	Site:	9	10	11	12	13	14	15	16	Total	Sites
<i>Calomyrmex</i>										-	-
<i>Camponotus</i>						2	6	1		9	3
<i>Cardiocondyla</i>				17						17	1
<i>Cerapachys*</i>						1				1	1
<i>Crematogaster</i>								11		11	1
<i>Doleromyrma</i>			1						2	3	2
<i>Hypoponera</i>										-	-
<i>Iridomyrmex</i>		148	48	259	225	112	5961	279	151	7183	8
<i>Leptogenys</i>								2		2	1
<i>Melophorus</i>		6		2	1	1	6	6	8	30	7
<i>Meranoplus</i>		1							2	3	2
<i>Monomorium</i>		57	22	48	30	1		21	35	214	7
<i>Ochetellus</i>						1				1	1
<i>Pachycondyla</i>										-	-
<i>Pheidole</i>				7				5	4	16	3
<i>Rhytidoponera</i>		10	9		7	5	2	7	9	49	7
<i>Solenopsis*</i>							1			1	1
<i>Stigmacros</i>										-	-
<i>Tapinoma*</i>							1			1	1
<i>Tetramorium</i>		18	1					25	22	66	4
No. of Ants/Site		240	81	333	263	123	5977	357	233	7607	
No. of Genera/Site		6	5	5	4	7	6	9	8	16	

* = only found in micro-pits during Week 1. Micro-pits open 4 nights 19–23 September, 2011.

TABLE 2: Summary of ant genera collected in micro-pits at Sites 1–8 during Week 2.

Genera	Site:	1	2	3	4	5	6	7	8	Total	Sites
<i>Calomyrmex*</i>			5						1	6	2
<i>Camponotus</i>		2				1	2	3		8	4
<i>Cardiocondyla</i>		42				2			11	55	3
<i>Cerapachys</i>										-	-
<i>Crematogaster</i>		90					3		4	97	3
<i>Doleromyrma</i>		1						1		2	2
<i>Hypoponera*</i>						1			1	2	2
<i>Iridomyrmex</i>		446	81	77	80	1137	189	119	420	2549	8
<i>Leptogenys</i>					1					1	1
<i>Melophorus</i>		9			7	20	3	5	7	51	6
<i>Meranoplus</i>		1	2					4		7	3
<i>Monomorium</i>		22		31	34	48	33	79	5	252	7
<i>Ochetellus</i>				1						1	1
<i>Pachycondyla*</i>						12				12	1
<i>Pheidole</i>		2	5	14	3	3	4			31	6
<i>Rhytidoponera</i>		22	10	7	5	1		10	5	60	7
<i>Solenopsis</i>										-	-
<i>Stigmacros*</i>		1		1					1	3	3
<i>Tapinoma</i>										-	-
<i>Tetramorium</i>		3	1			1		4	1	10	5
No. of Ants/Site		641	104	131	130	1226	234	225	456	3147	
No. of Genera/Site		12	6	6	6	10	6	8	10	17	

* = only found in micro-pits during Week 2. Micro-pits open 4 nights 24–28 September, 2011.

TABLE 3: Summary of ant genera collected opportunistically at Sites 1–8 during Week 1.

Genera	Site:	1	2	3	4	5	6	7	8	Total	Sites
<i>Calomyrmex</i>					8					8	1
<i>Camponotus</i>				1		7		2		10	3
<i>Cardiocondyla</i>										-	-
<i>Crematogaster</i> *		1			8			28		37	3
<i>Hypoponera</i> *						1				1	1
<i>Iridomyrmex</i>		26	6	18	18		10	12	12	102	7
<i>Leptogenys</i> *									6	6	1
<i>Melophorus</i>										-	-
<i>Monomorium</i>						10	6			16	2
<i>Opisthopsis</i>										-	-
<i>Pheidole</i>										-	-
<i>Podomyrma</i>						3				3	1
<i>Rhytidoponera</i>		1				2				3	2
<i>Tetramorium</i>										-	-
No. of Ants/Site		28	6	19	39	18	16	42	12	180	
No. of Genera/Site		3	1	2	5	3	2	3	1	8	

* = the genera *Crematogaster*, *Hypoponera* and *Leptogenys* were only found opportunistically during Week 1.The genus *Tetramorium* was only captured with honey bait at Site 6.

Opportunistic collecting from 19–23 September 2011.

TABLE 4: Summary of ant genera collected opportunistically at Sites 9–16 during Week 2.

Genera	Site:	9	10	11	12	13	14	15	16	Total	Sites
<i>Calomyrmex</i>			17					1		18	2
<i>Camponotus</i>							2	1	1	4	3
<i>Cardiocondyla</i> *					1				1	2	2
<i>Crematogaster</i>										-	-
<i>Hypoponera</i>										-	-
<i>Iridomyrmex</i>		60	39	38	23	4	63	21	46	294	8
<i>Leptogenys</i>										-	-
<i>Melophorus</i> *					1	1		2		4	3
<i>Monomorium</i>					5	4	4			13	3
<i>Opisthopsis</i> *								1	1	2	2
<i>Pheidole</i> *									8	8	1
<i>Podomyrma</i>				4		1				5	2
<i>Rhytidoponera</i>		8	1						1	6	4
<i>Tetramorium</i> *									4	4	1
No. of Ants/Site		68	62	47	29	5	67	25	73	372	
No. of Genera/Site		2	4	4	4	2	3	5	8	12	

*The genera *Cardiocondyla*, *Melophorus*, *Opisthopsis*, *Pheidole* and *Tetramorium* were only found opportunistically during Week 2.

Opportunistic collecting from 24–28 September 2011.

ARK 002 02: Sparse shrubland of *Acacia tetragonophylla* and *Senna artemisioides* ssp. (Cassia) over *Ptilotus obovatus* (Silver Mulla Mulla) and *Portulaca oleracea* (Common Purslane).

ARK 003 02: Dense shrubland of *Melaleuca glomerata* (Inland Paperbark) over sandy creek bed with emergent *Eucalyptus camaldulensis* var. *obtusa* (Northern River Red Gum) and very sparse understorey with *Cassinia laevis* (Curry Bush).

ARK 004 02: *Callitris glaucophylla* (Northern Cypress-pine) woodland over *Acacia tetragonophylla*, *Eremophila alternifolia* (Narrow-leaved Emu Bush) and *Ptilotus obovatus*.

ARK 005 02: *Triodia irritans* grassland with emergent *Eucalyptus intertexta*, *Acacia tetragonophylla* and *A. confluens* (Arkaroola Wattle).

ARK 006 02: *Acacia confluens* and *Dodonaea viscosa* ssp. *angustissima* (Narrow-leaved Hop-bush) shrubland with emergent *Eucalyptus intertexta*.

ARK 007 02: *Eremophila alternifolia*, *E. freelingii* (Rock Emu Bush) and *Acacia confluens* shrubland with emergent *Eucalyptus intertexta*, over *Triodia irritans*.

ARK 008 02: Low open woodland of *Eucalyptus intertexta*, over *Eremophila freelingii* and *Senna artemisioides* ssp.

ARK 009 02: *Acacia aneura* (Mulga), *A. tetragonophylla* (Dead Finish), *Eremophila freelingii* (Rock Emu Bush) shrubland over Chenopod understorey and a few *Capparis mitchellii* (Native Orange).

ARK 010 02: *Xanthorrhoea quadrangulata* (Yakka) grassland with emergent *Callitris glaucophylla* over *Cassinia laevis* (Curry Bush) and *Ptilotus obovatus* (Silver Mulla Mulla).

ARK 011 02: *Melaleuca glomerata* (Inland Paperbark) shrubland with emergent *Callitris glaucophylla* and *Eucalyptus camaldulensis* var. *obtusa* (Northern River Red Gum) and *Triodia irritans* (Spinifex).

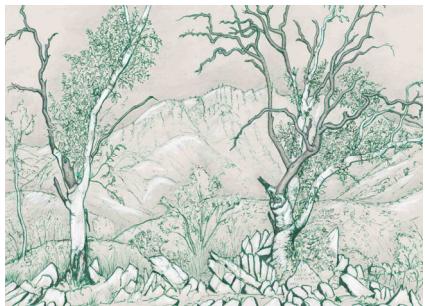
ARK 012 02: *Eucalyptus gillii* (Curly Mallee) low open woodland, over *Acacia tetragonophylla*, *Eremophila freelingii* and *Senna artemisioides* ssp. (Cassia) with *Exocarpos apollinaris* (Leafless Cherry).

ARK 013 02: *Eucalyptus camaldulensis* var. *obtusa*, over *Melaleuca glomerata*, *Senna artemisioides* ssp. and *Enchytraea tomentosa* (Ruby Saltbush).

ARK 014 02: *Eucalyptus gillii* and *Acacia araneosa* (Spidery Wattle) over *Triodia irritans* grassland with Chenopod understorey including *Salsola kali* (Buckbush).

ARK 015 02: *Eucalyptus gillii* with emergent *Callitris glaucophylla*, over *Eremophila freelingii*, *Triodia irritans* and Chenopod understorey.

ARK 016 02: *Acacia rivalis* (Silver Wattle) over sparse Chenopod shrubland with emergent (but senescent) *Acacia aneura* (Mulga), and *Eucalyptus intertexta* (Gum-barked Coolibah).



ARK 001 02 "Granite Knoll"



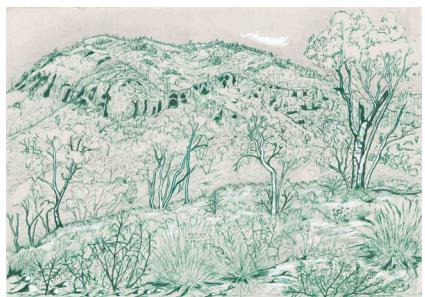
ARK 002 02 "*Acacia tetragonophylla*"



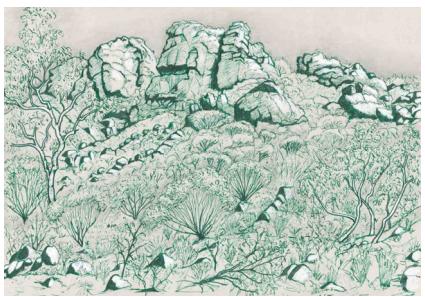
ARK 003 02 "Radium Creek"



ARK 004 02 "South side Mt. Gee"



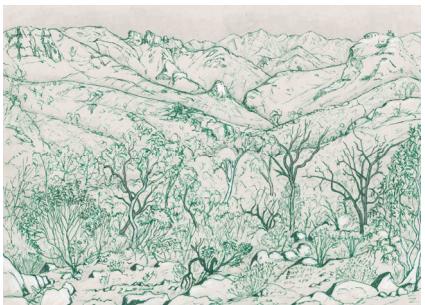
ARK 005 02 "*Triodia* Mt. Painter"



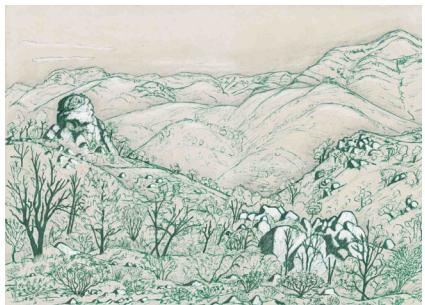
ARK 006 02 "Split Rock"



ARK 007 02 "Loose Granite"



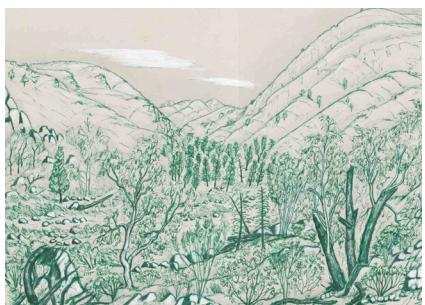
ARK 008 02 "Armchair Mt."



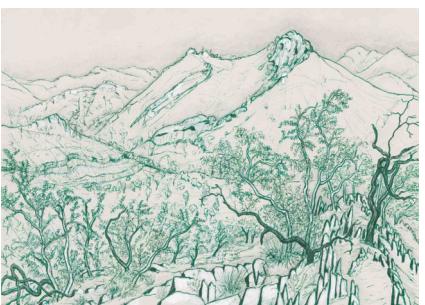
ARK 009 02 "Jasper Rocks"



ARK 010 02 "Xanthorrhoea"



ARK 011 02 "Near Stubbs Waterhole"



ARK 012 02 "Curly Mallee"



ARK 013 02 "Dry Creek Bed"



ARK 014 02 "Spidery Wattle"



ARK 015 02 "The Pinnacles"



ARK 016 02 "Silver Wattle"

DISCUSSION:

Ant Abundance: (See Tables 1, 2, 3 & 4).

The high rainfall over the two years previous to this study has resulted in the rejuvenation of the vegetation and a vast increase in invertebrate food supply. Putting in the micro-pits was a lot easier as the ground was softer; (I still used an ice axe to make the holes). This would also make it a lot easier for the ants to expand their tunnels, making more space for the colony to expand. The growth of vegetation from the last two wet seasons and the resulting increase of food supply enabled the ant colonies to expand, as more (10,754) were out foraging and captured in the micro-pits compared with the 2009 (956) survey.

The weather during the two weeks was very similar. Most days were relatively calm with one day **Week 1** at 9 a.m. a wind of 24 km/hr that increased to 33 km/hr at 3 p.m. **Week 2** also had a day of gentle wind at 24 km/hr at 9 a.m. and 28 km/hr at 3 p.m. (BOM 2011) These mild days brought more ants out to forage, they would not get blown or washed away, they were curious enough to get captured.

Different species of the genus *Iridomyrmex* 9,732 dominated in numbers, occurring in 158 of the 160 micro-pits.

Monomorium: 497 specimens (a very small ant) were captured at 14 sites, (micro-pits, macro-pits and opportunistically).

Rhytidoponera: 182 (a large loner) and *Melophorus* 101 (a hot weather species) both occurred at 14 sites.

Camponotus: 56 specimens also occurred at 19 sites, but only at 7 sites were they in micro-pits, 6 more sites were in macro-pits and 6 sites by opportunistic collecting.

Calomyrmex: 66 specimens occurred at 11 sites. Only 6 specimens were captured in the micro-pits at 2 sites. They occurred at another 7 sites in the macro-pits, and 2 more sites with the honey bait.

Crematogaster: 399 specimens occurred at 10 sites, occurring in the micro-pits at 4 sites, but at another 6 sites they were captured with the honey bait.

Tetramorium: 80 specimens (a very small ant) occurred at 9 sites in the micro-pits (range 1–25).

Cardiocondyla: 74 specimens occurred at 6 sites; 4 sites from micro-pits and 2 more from opportunistic collecting.

Pheidole: 56 specimens (a very small ant) occurred at 10 sites, 9 of which were in micro-pits and the other site was in a macro-pit.

Meranoplus: 10 specimens occurred only in micro-pits at 5 sites while the very small *Doleromyrma* (5 specimens) were captured in the micro-pits at 4 sites.

Leptogenys 9 specimens and *Stigmacros* 3 specimens, both occurred at 3 sites.

Cerapachys 7, *Hypoponera* 3, *Ochetellus* 2, and *Opisthopsis* 2, all occurred at 2 sites, while *Pachycondyla* 12, *Tetraponera* 9, *Solenopsis* 1, *Notoncus* 1, *Polyrhachis* 1, and *Tapinoma* 1, occurred at only one site.

Genera Richness: (See Tables 1, 2, 3 & 4)

The richness of ant genera in this area was 25; 20 genera from micro-pits, 2 more genera (*Notoncus* and *Polyrhachis*) from macro-pits and another 3 genera (*Opisthopsis*, *Podomyrma* and *Tetraponera*) from opportunistic and honey-bait collecting. The number of genera present seems to depend on the ability of the site to collect and retain moisture, the growth of the vegetation, and the resulting

increase in food supply. The number of genera collected in 2011 was 25; only 19 were collected in 2009.

Week 1: *Doleromyrma* (a small species) was found in micro-pits and opportunistically, but not in macro-pits. *Tapinoma* (also a small species) was found in micro-pits but not in macro-pits or opportunistically.

Week 2: *Calomyrmex* and *Hypoponera* were found in micro-pits and opportunistically. *Pachycondyla* and *Stigmacras* were found only in the micro-pits.

The large-sized genera *Calomyrmex*, *Camponotus*, *Cerapachys*, *Iridomyrmex*, *Melophorus*, *Notoncus*, *Polyrhachis* and *Rhytidoponera* were all found in macro-pits. *Notoncus* and *Polyrhachis*, two medium-sized genera, were only collected in the macro-pits. *Notoncus* comes out in cooler weather; maybe it was too warm during most of the nights the micro-pits were open. *Polyrhachis* is one of the more common groups of ants in Australia and nests in open soil or under rocks and logs. Most species are timid and many species are nocturnal (Shattuck 1999).

Three genera, *Opisthopsis*, *Podomyrma*, and *Tetraponera* were not caught in the micro-pits or macro-pits but only captured opportunistically or with honey bait.

Two years of rain has increased the abundance and richness of ants in the Arkaroola Wildlife Sanctuary.

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