



LANDSCOPE EXPEDITIONS



in association with



UWA EXTENSION
THE UNIVERSITY OF WESTERN
AUSTRALIA

ROCK POOLS AND RUGGED RANGES—
WILDLIFE OF THE NULLAGINE RIVER AND RIPON HILLS 2001
LANDSCOPE EXPEDITIONS REPORT NO. 41

From the Expedition Leaders

On behalf of the Department of Conservation and Land Management and UWA Extension, we would like to thank all expedition members for their enthusiasm, stamina and splendid good humour during our Meentheena expedition. Despite cool weather and recent fires in the reserve, we managed to collect valuable information on the fauna and flora of this remote and remarkable area. The expedition provided some firsts for the leaders, including exploring in the Ripon Hills and finding *Ctenotus nigrilineatus* (only the second known location for this species). We all enjoyed your company and diverse talents and experience. *LANDSCOPE* Expeditions are nothing if not varied and splendid things.

The expedition leaders extend their thanks to Jeff Richardson and Diana MacCallum for cooking such large and wonderful meals for tired and hungry expeditioners. To all of you expeditioners, we give the greatest thanks of all; without you we would never have got this expedition off the ground. We all hope you will return to work with us in the Pilbara, either again at Meentheena, or on some other *LANDSCOPE* Expedition.

Peter Kendrick, Stephen van Leeuwen, Bob Bromilow and Michael Hughes



Members of the Rock Pools and Rugged Ranges (Pilbara) *LANDSCOPE* Expedition 2001

Back row (L-R) Jim McGeough, Bill Scutchings, Geoff Kirkman, Peter Kendrick, Jon Hall, Bill Hawthorn,
Susan Worley, Michael Hughes, Bob Bromilow.

Front row (L-R) Stephen van Leeuwen, Martin Callaway, John Tucker, Rob Barbour.

PARTICIPANTS' DIARY

Monday May 21 At the crack of dawn, the Department of Conservation and Land Management's Karratha compound was a hive of activity, with mountains of gear being packed and people arriving in varying states of readiness. Stephen van Leeuwen seemed to be the dominant male, standing on top of a pile of luggage on the back of the truck. He had an array of people passing and packing things in a carefully determined arrangement. We were finally really under way.

Lovely drive to Marble Bar, which doesn't seem half so remote when you start from Karratha. Then beautiful evening light on the spinifex and fabulous vistas on the last leg to Meentheena. The official team leaders swooped about, setting up camp as the light faded. Lovely river frontage for most of the swag sites. As a priority, the kitchen took shape and while we waited for dinner, we introduced ourselves. Lots of interesting and amiable people - a good start.

Tuesday May 22 Awoke 5.30 am - stars bright through my 'tropiscreen' after a good night's sleep right next door to the Nullagine River. Fish were jumping throughout the night. Woken by spine-tingling call - loud and close by - uncertain - mammal, bird, frog?? Deep moaning calls. Later informed it was a bush stone curlew.

Dawn chorus loud - crows sounding very mournful and tired. Half asleep. Decided to try the waters and went for a dip. Cool and gentle water. Clear, light green water.

Peter Kendrick (PK), Stephen and crew put on an acrobatic display putting up tarpaulin after we had finished breakfast. Peter then addressed us about the day - setting up pits and putting out the Elliott traps. We left camp at 9.30 am and spent two and a half hours driving and trap-setting before stopping at Meentheena Homestead ruins. Martin found a nice dragon lizard which we photographed. Meentheena ruins not inspiring. Arrived back for lunch and set off again at 1.30 pm to do further trapping. Michael's vehicle went south and set up bilby traps. Traps put in a variety of landscapes - very harsh, stony slopes and river flats. Arrived home 5.00 pm.

Tried my hand at fishing. Five small perch and two small catfish prior to losing lure in tree.

Wednesday May 23 Set off at 7.30 am or so in search of our first haul of mammals. Michael and Stephen headed south and we had our first tick at Site 17 with a trio of big-boned (OK, fat) donkeys. The rest of the morning was spent emptying pit traps and Elliott traps and stopping en route to investigate a fair-sized fire (heading away from camp) and a painted finch's nest on top of a spinifex clump.

Back at camp we had a respectable collection of mammals for our first night. Stripe-faced dunnart; spinifex hopping mice; sandy inland, delicate and pebble-mound mice; little red kaluta; Pilbara ningau and a couple of unidentified Pseudantechinus species.

We processed the mammals and reptiles while Stephen nobly offered chunks of his flesh to various Dasyurids to provide photo opportunities.

After lunch Peter and Michael headed off to release our captures while the rest of us went to take a look at Pelican Pool - a flood plain to the west of camp. A few good birds were knocking around there and a dingo crossed the road in front of us on the way home.

Michael, meanwhile, had been busy looking for signs of bilby and had discovered a few burrows so some spotlighting is beckoning tonight - provided, of course, it doesn't rain. If it rains, I'll be spending an hour cursing my foolishness in pitching camp so far from the tarpaulin and wondering whether I really can be bothered to move everything down or perhaps just lie in my swag shrouded in groundsheet and repeating the mantra 'It is just a shower'. We shall see.....

Thursday May 24 Never-Never Land. The day started early - like 2.00 am!! - when the soft pitter-patter of rain drifted down on to our net igloos. Panic! Small lights appearing and people trying to take late evasive action. 2.01 am - the good news - rain stopped.

After customary brekkie, we set out to clear traps but it was a disappointing haul of few specimens, in contrast to the previous day's excellent harvest. The most dramatic specimens were two pythons that Peter heard?? the previous evening up a tree which he then clambered up and drew from a hollow. These he returned to their hole this evening (which an unlucky lizard had just entered 30 seconds before). After trap-check, the northern group and others gathered the lunch and went to the river and met up with the southern group for lunch.

After lunch we visited a site where two drovers were interred about the WWI era (complete with engraved tombstones and railings). We then climbed Baroona Hill, a prominent peak a few hundred feet high on the river edge that gave 360° panoramic views of the surrounding hills.

After Baroona Hill we went to the site of the Blair homestead; the resident pastoral family of the 1930/40s. The story goes that one evening they heard a large body of water moving on the river and quickly vacated the house before it was swept away. A lot of remnants remain scattered about, including the engine and body parts of an old VG motor vehicle. An old boomerang was found which Michael was able to make return after a few practice throws.

Later, some larger animal traps were set. Your author of the day had a refreshing swim and a good day was had by all.

Friday May 25 Another day with *LANDSCOPE* Expeditions, camped beside the Nullagine River on Meentheena; starts with the blue-winged kookaburra's early morning calls; soon followed by the corellas, butcher birds and the whole early morning chorus. Peter's plans for the day are heard and everybody departs in differing directions to check the many lines of Elliott traps and pit traps.

For me, this is my second visit to Meentheena, as I just had to return after last year's wet, wet, wet trip. The country, the landscape, is just so different. Last year so wet and green. This year, so much drier and a large area around the camp and old station buildings has been burnt. No swimming or wading across the river this year - just drive across and not even get the tyres wet.

Trap sites near the camp on burnt ground; sites north of camp and the Ripon Hills Road on unburnt ground; and the sites to the south on unburnt ground; and a continual smoke plume rising to the east each day as more spinifex country is slowly burning. Gradually before lunch the various crews return from the allocated trap lines with the catch of the day to be checked, weighed, named and inspected by Peter and co-workers.

Lunch is prepared by Di and Jeff and everyone eats before heading south over the river to an unnamed rock hole, with only the graffiti of the Blairs - previous station owners in the 40s - to provide it with a common name of Blair's Rock Hole. The rock hole, with rock walls on three sides and large river redgums on the sandy overflow side, had large amounts of ancient Aboriginal petroglyphs engraved on the rock face.

Most people had a long cool swim and some wandered along the running spring-fed inflow. A really beautiful place. Places like this rock hole and some of the pools along the Nullagine River are a very cool and watery relief from the harsh and rocky arid landscape that is Meentheena. One day I will return and see these hills in another different mood; a new colour; another year.

I have enjoyed my second stay at Meentheena, the company has been good; the CALM guys as good as ever; the weather as good as perfect; THANKS everyone for a great trip.

Saturday May 26 Today began at 6.00 am with a gorgeous pink sunrise and the whoosh of birds (a flock of little black cormorants) down the Nullagine. First morning light gives way to the noise of distant voices preparing the fires and the crunching of feet on the stones under the tarpaulin. Most people are quiet at breakfast, eating slowly and talking little, staring sleepily ahead.

At 7.30 am, Peter reminds us that we close down the pit traps, seal the lids gently, and cover with soil. All the Elliott traps are collected after emptying and the pink flagging tape removed. It brings back day two when we carefully placed them all out. By now we are becoming blasé about the rodents and small marsupial carnivores. We proceed at a brisk pace, rapidly pulling up the flywire, rolling and storing it in the pits, capping and covering with soil.

Back at camp by 10.30 am, I decide to go fishing. The spangled perch bite strongly and repetitively and I've caught six or so within 15 minutes. The perch are too small to eat so I decided to sacrifice one and use it as whole bait, tying my line to a log. After lunch we are setting off to the King Rock Hole when I note the line is

taut and pull in a small catfish which has swallowed the perch head first and the tail is just protruding from the catfish's mouth - slit like with barbs. Peter is hurrying me on and so I dump the catfish with Diana and leap aboard the truck.

King Rock Hole is found after a beautiful walk along creek beds and over sweeping fields of spinifex under the lording presence of a spectacular breakaway. King Rock Hole is smaller and the water less clear than Blair's Pool, and we decline a swim. The creek line above the rock hole is long, winding and pretty. I watch water boatmen which look like swimming cockroaches amongst the algae.

Bill is keeping us all amused with his stories about early land speculators and crazy moneymaking schemes and I really enjoy walking with him. After exploring the creek line, I decide to cool my feet on a rock ledge just above the water line. All of us are relaxing around the rock hole and I'm chatting to Stephen. The walk back is gentle and Susan takes my photo under a coolibah tree - just for the record. Back to base camp. It feels like home now. Ah, 5.00 pm, beer and conversation around the campfire. I understand why the drovers loved the evenings.

Sunday May 27 There was action in the camp a bit earlier than normal today. We were to travel to the Ripon Hills and continue our research in this area. The sink-hole there had been mentioned many times by PK and we were looking forward to seeing it.

First job for me was to check the bilby traps so Michael, Jon and I set off in anticipation of a catch. They had been set in the same general area that was successful last year - around the sheds and near the creek past the old Blitz. Michael had found several holes and some scratching marks but they were not fresh and our chances were not great. The ten cage traps yielded no catches and we were disappointed.

We only took a bare minimum of camping gear to travel light. So, travelling east over the fairly new Ripon Hills Road we were away. At a point where there was a road construction camp we turned north and the topography was quite flat. A great number of kangaroos was the main feature of this part of the trip. We joined the old Woodie Woodie Road (a road I had used several times - Marble Bar to Carrawine Gorge and Rudall River to Marble Bar). At the ruins of Braeside Station was the grave of Dr Ed Vines, killed in 1899. Further east was the Oakover River Crossing, one of the crossings that gave heavy transport so much trouble. Geoff Kirkman tried in vain to contact 'Macca' on ABC radio. We backtracked towards the west then south over flat spinifex country towards the Ripon Hills. The track became rough and overgrown as we headed up into the hills.

The mining history of this area was very evident and it was hard to believe that men lived and mined manganese ore in this rugged, hot, isolated place. Their camp-workshop area had been burnt in a fire that recently consumed a lot of the east Ripon Hills. An unusual feature of this camp was the fountain in a water garden setting. (completed 29 December 1971)

just in time for New Year). Further up the rough track was the crushing site where the ore was processed and stockpiled. The black manganese ore must have made the place almost unbearable as it retained heat day after day. Stephen gave the old bucket excavator a workout and made a lot of noise when he imagined that the old girl was running backwards down the hill. A gecko (*Oedura marmorata*) was found inside the derelict machine.

We were now quite high and could see east over the plain where the 'roos had been earlier in the trip. The terrain was rocky and covered with low vegetation, *Acacia hilliana* and snappy gum being prevalent.

It was only a few kilometres now to the sink-hole and our anticipation heightened. We stopped the vehicles on the flat top of a ridge - PK led us to the sink-hole. To our amazement there was a huge hole the size of a small football oval and about 40 to 50 metres deep. The rock debris in the bottom had once been the roof of the huge cavern before it had collapsed. There was still a cavern going way back under the un-collapsed rock. We expected to capture bats, mammals and hoped to capture quolls and even possums.

PK, Jon Hall and I set 50 Elliott traps down a promising rocky creek line. The other members set 49 Elliott traps and about six cage traps inside the sink-hole. The cold wind blowing across our campsite did not stop the group from enjoying this exposed but spectacular campsite. Bill Hawthorn kept us amused with his recollections of army life (40 000 rounds to achieve three hits on dummy targets).

So ended a long day - changing camps, travelling over flat then rugged terrain and a unique landform. I enjoyed it as I had been looking forward to seeing the Ripon Hills as part of our expedition. Hoping to see you all again one day.

Monday May 28 Today we awoke on top of one of the highest points in the Ripon Hills. It was cool, but a friendly fire soon had us gathered around for a hot drink and breakfast as we admired a 360° panoramic view of distant hills in every direction. We were on a stony plateau about 300 metres east of the enormous sink-hole which has to be experienced to be believed. After breakfast we split into two groups, one with Stephen which headed off in a couple of vehicles to search for some caves, an abandoned mine and sink-holes. The other group went with Peter to check out the Elliott traps - 49 set in the sink-hole and another 50 set down a dry creek bed in a ravine, which would have had a sizable waterfall if water had been flowing down. A group of us clambered down into the sink-hole to inspect the traps. We only caught one rock rat but two traps had gone off and been knocked around - what could it be? We then inspected the other 50 traps but caught no specimens. Disappointed, we continued to explore down a labyrinth of dry creek beds, limestone rock outcrops, breakaway caves and other geological features.

Eventually we returned to the campsite, had lunch and were joined by the other party who returned with

two bats, which Stephen had caught with Bill Scutchings' Landscape hat. The bats were identified as *Taphozous hillii*, by the width of their teeth. After lunch, the vehicles took off, heading in a southerly direction along a track and then across country - the roughest, most difficult country you would wish to encounter. We were looking for a possible water hole in a ravine with caves and possibly more bats. Finally we arrived at a precipice and descended to a dry creek bed which we explored. Suddenly we found a small water hole with water, then further down another larger body of water but, pressing on, Susan and I discovered a large body of deep cool green water overhung by a cliff-cum-cave, with fairy martin nests on the rock face. Two flat tyres had to be replaced, giving an idea of just how rough it was.

Tuesday May 29 Transit Ripon Hills to Meentheena Station. Breaking camp at the large sink-hole that had served as a rudimentary camp away from the comforts of the main base at Meentheena Station we departed on our return journey, back-tracking the same way we had come on 18 May. We had hoped to pioneer an alternative and more direct route homeward, however, our attempts yesterday to identify and follow a published trail had failed. Before our departure, we checked traps at the bottom of the sink-hole and found our first and only quoll for the entire expedition. A feisty creature which would no doubt sink its teeth into a less than careful handler.

During our return to base camp we dropped into another abandoned mining site - rusting metal and faded memories; a reminder of former times. A reminder also of poor policy-making of former times in the many dangerous mine shafts and machinery still lying around - a disregard for future land usage.

Later that afternoon with our journey complete, a return to Meentheena and to the relative comforts of camping by the Nullagine River, we had many stories to share.

Wednesday May 30 The balance of this trip has been perfect. First a week or so establishing the Meentheena routine of morning trappings, afternoon outings and gourmet evening meals and, before it gets too comfortable, a splendid adventure off to the Ripon Hills for drama, excitement and discoveries. Then a last day of packing up and a long journey home with just enough sparkling moments - the ideal closure.

Having bonded into a strongly cohesive unit by now, all members of the party are keen to contribute usefully to the packing-up ritual of the last morning. So everyone is up early, quickly washed and done with personal packing and ready to help with the tough stuff. Wisely, the kitchen is given a wide berth and left in the capable hands of Jeff and Di - who know where everything goes. And while everyone longs to help pack the vehicles, again we need the expert guidance of Stephen to make sure everything goes in just the right place. So other little jobs are found. Bill and Bill bravely undertake dismantling the toilet. A cast of

thousands turns up to fold the big tarpaulin to Stephen's rigorous standards. Vehicles get refueled. All sorts of things are piled up to go on the truck - this is the part where you notice all the things we might have done without.

Robin, Geoff and Jim go back early with Michael to be in time for the afternoon plane, and with less hands on deck things really start happening. Soon it's day one all over again with Stephen on top of the truck directing, and willing hands flinging boxes, crates, toilet seat, steel posts, tools, swags and bags and enough food to keep us going for several more days into position. Surplus people just sit and watch.

Time to go. Declaring unity for smokers Jon squeezes into Bob's truck with a big black bag containing rubbish and Martin's discarded socks and towel. Jeff takes off with Bill and Martin - they want to see the 'Bar'. After much handshaking Bill and John head off via Nullagine for the drive back to Toodyay. The very clean Peter and Di trail. I go with Stephen and not far down the track we fall about laughing to see the big black bag stuffed in a roadside bin. To recover we need to detour to Marble Bar for a sensational morning tea of iced coffee and kit kat. Just before Port Hedland Peter and Bob pop in to get some explosives while the rest of us wait casually by the road. Except for Jeff's lot - they have to go and find the rock shop for Martin who doesn't seem to have collected quite enough rocks.

Back at the depot in Karratha the unloading is deferred until the next day, final farewells and everyone is despatched to homes and accommodation. Thank you Michael, Bob, Stephen, Peter, Di and Jeff. Your efforts and expertise were greatly appreciated by everyone. It was a great trip. The last day comes too soon for me.

APPENDIX to Meentheena diary

Transcript (ABC Radio North West WA) Drive program 28 May 2001, 4.25 Kate Sieper, compere, interviewing Bill Scutchings, LANDSCOPE Expeditions volunteer

Kate Sieper: The right guide can add so much to an experience. Seeing the landscape through their knowledgeable eyes can add the dimension of history, or even of science, and things you would never normally see can suddenly be brought to life.
I guess that's just one of the attractions to becoming a Landscape Volunteer, working just for the fun of it, for the good environmental buzz of it, with the Department of Conservation and Land Management on a variety of projects. And it is an amazing opportunity.
Bill Scutchings has travelled from

South Australia and is one of the nine volunteers at Meentheena near Marble Bar - a property that is slowly returning to its natural state. Bill joins me by the wonder of satellite phone.

Bill Scutchings: Well, we're on top of a ridgeline, in the Ripon Hills on the eastern side of Meentheena, where we're doing a vegetation and fauna survey for CALM. It's very, very rocky, arid desert ridgelines, we're in land that has been burnt perhaps four or five years ago and is now coming back with a great multitude of different species and we can see various ridgelines around the place - it's low undulating hills with intersecting gullies.
So the purpose of this expedition is to establish what is here in the way of fauna and flora, and because CALM have recently acquired this former cattle property, determine what is here in the way of mammals, vegetation, so forth.

Kate Sieper: And what have you found so far?

Bill Scutchings: In a previous location, we were camped on the Nullagine River, which intersects Meentheena - there was a lot more sandy country there, and we were trapping, in pitfall traps, quite a few species of small mammal, mice, hopping mice, Pilbara Ningauai - which are very small carnivorous mammals.

Kate Sieper: Did you say pit trap? How do you build a pit trap for a mouse?

Bill Scutchings: A pit trap is a 60 cm length of 150 mm PVC waterpipe buried flush with the top of the ground and there's two pits about six metres apart and between these pits runs a length of 30 centimetre high flywire. Animal at nighttime bumps into the flywire and goes along it and falls into the pits, and we pick them up in the morning.

Kate Sieper: And is it very successful?

Bill Scutchings: Very successful way to catch nocturnal animals. The only way, really, out in that country. Because it's mainly spinifex and the animals are sheltering in that during the day, and come out to feed at night, and fall down our little pitfall

traps. They're not hurt in any way, and we return them to the capture site later that afternoon when we've identified them, weighed them and so forth.

Kate Sieper: And how long do you spend out there?

Bill Scutchings: We left Karratha last Sunday, and we'll return there on Wednesday. So we spent five or six, or about five days on the Nullagine River and now we'll spend about two days out here in the Ripon Hills. Then we go back to Karratha.

Kate Sieper: And what do you get out of it, Bill?

Bill Scutchings: I get a chance to see a vast range of native fauna and flora in a place that I would have no chance of getting to without being on an expedition like this - in arid land, in inaccessible places, and with a well-equipped, well-staffed expedition. So we just can't, individuals just can't get here on their own, so I can see, see animals and flora that it's just not possible to see elsewhere or on your own.

Kate Sieper: And so you'll do another trip, do you think?

Bill Scutchings: I think so. I'd like to get out in the Gibson Desert again. I enjoyed that the other time - I enjoyed being there and I enjoyed what they were doing, and that was surveying cat, dingo and fox numbers.

Kate Sieper: Are you learning a lot?

Bill Scutchings: Yeah. I'm working from a fairly wide but not very deep knowledge of our fauna and flora, so you're learning a bit about everything. Because our staff members are expert in their fields, they're passing their knowledge on, but you can't take it all in, of course, because there's so much coming in...

So much fauna you have to look at. It seems very diverse, Kate, we've had, the vegetation on the Nullagine River, which is melaleucas and redgums and various other eucalypts. Out here where we are now, there are numerous hakeas and grevilleas, a great multitude of acacias and other things whose names escape me...

Kate Sieper: [Laughs]

Bill Scutchings: ...because they're just coming so thick and fast.

Kate Sieper: Bill, thanks very much for speaking with me. Have a great trip.

Bill Scutchings: Thanks, Kate. I've enjoyed it.

Kate Sieper: Bill Scutchings, one of the Landscape volunteers speaking to me not from the other side of the planet, or from a completely other planet, as it might have sounded, but from Meentheena, which is a station that is being looked after by CALM, and being returned to its natural state. Sort of between, or near, Marble Bar and Nullagine.

End

BACKGROUND TO THE SURVEY

The Meentheena 2001 expeditioners followed partly in the footsteps of the *LANDSCOPE* Expeditions 2000 team. Both *LANDSCOPE* Expeditions benefited from the hard work of the Pilbara Green Corps 2000 crew, who installed 200 pit traps at 20 sites around Meentheena. We are all grateful for their efforts, as they used over 200 sticks of explosive to dig holes in that rocky ground.

The pit trap sites were chosen to ensure that most of the major landscape surface types of the Meentheena area were represented. Meentheena landscapes vary from low-relief plains and rolling hills through to ragged gorges and breakaways. Generally, to the west the low relief plains are of stony clay soils or colluvial deposits, with granites protruding in some areas. Along the Nullagine River lie small areas of orange sandplain, but more usually rugged and ancient sedimentary ranges. The rocky ridges and hills are almost all ancient sandstones and mudstones, often heavily silicified. Some were formed by some of the most ancient living things on earth, the stromatolites. The stromatolites of Meentheena are well known all over the world, and attract a small but steady trickle of overseas researchers.

More detailed information on the geology can be obtained from maps and explanatory notes of the 1:250 000 Geological Series Nullagine Sheet (Hickman 1978; see References).

TRAPPING SITES

Twenty trapping sites were located on Meentheena, along the Ripon Hills road or near old station access tracks. Because we changed our format this year, to allow for time to visit the Ripon Hills sink-hole, we did not attempt to open and run all of the trapping sites available to us. This meant that 6 of the 20 sites (1 to 5, and 12; indicated by * in the table below) were not activated during our visit. However, for completeness, their locations are given in the table below.

Table 1. List of all trapping sites at Meentheena

Site Number	Habitat Type	Location
1*	Stony ridge above colluvial plain	South of Ripon Hills Road
2*	Drainage wash, colluvial plain	South of Ripon Hills Road
3*	Spinifex flat, colluvial plain	South of Ripon Hills Road
4*	Granite rockpile, base of basalt hills	North of Ripon Hills Road
5*	Crest of basalt hills	North of Ripon Hills Road
6	Shale flat near basalt hills	North of Ripon Hills Road
7	Basalt slope with spinifex	North of Ripon Hills Road
8	Spinifex colluvial flat	North of Ripon Hills Road
9	Spinifex colluvial flat	Entry track, near camp
10	Red sandplain near river	West side of river, near camp
11	Rocky carbonate hills, near camp	West side of river, near camp
12*	Stony colluvial slope	West of camp
13	Red sandplain near river	East of river, near old homestead
14	Stony colluvial flat	Close to airstrip
15	Low stony hills	North-east of airstrip
16	Stony basalt ridge	South of old homestead
17	Clayey drainage flat	South of old homestead
18	Stony low basalt hills	South-west of old homestead
19	Rocky carbonate hills	South-west of old homestead
20	Stony colluvial flat	Near rock-wallaby turnoff

RESULTS.

All told, we trapped just 88 mammals (19 species) and 37 reptiles (23 species). We saw evidence of other species, such as echidna, but did not actually see any animals. Of the 125 animals trapped, we retained a total of 21 (7 reptiles and 14 mammals) as specimens for the WA Museum. These were creatures that were significant in some way, were required for ongoing research (such as the planigales, bilbies and rare species of reptile), or for which specimens were needed to confirm identifications.

MAMMALS

Despite the small number of individuals captured, we saw most of the small mammal species that are known from Meentheena. The table below shows where all the species we trapped came from. The annotated list gives additional information, as well as listing those species that we saw but did not actually catch.

TACHYGLOSSIDAE
Tachyglossus aculeata
Near Nullagine River.

Signs were sometimes observed in hilly and rocky areas, usually as diggings or scats. No animals were seen, but they are often shy and in any case, they look a lot like a spinifex clump.

MONOTREMES
Echidna

DASYURIDAE

Dasykaluta rosamondae

CARNIVOROUS MARSUPIALS

Little red antechinus

(alias Little red finger-biter)

Sites 14, 15 .

2 males (mean 24 g, n = 2); 3 females (mean 27.5 g, n = 3). These gutsy little predators seemed to prefer sites with good spinifex cover, rather than rocks or other shelter. This species is intermediate in size between the tiny *Ningau* and the larger *Pseudantechinus*. It is widespread and common throughout the Pilbara. The males of this species never live long enough to see (or eat!) their offspring. Soon after mating, all the males suffer a simultaneous and catastrophic collapse of their immune systems, leading to a lingering and seemingly unpleasant death.

Dasyurus hallucatus

Ripon Hills sink-hole.

1 male, 700 g.

The northern quoll, while smaller than its southern cousin, is the largest marsupial carnivore in the Pilbara. They are unlikely to be trapped in pit traps (indeed they seem to learn that pit traps contain take-away snacks very quickly), but cage traps seem to work well. Removing them from traps can be a perilous exercise. The cliffs and boulder piles of the Ripon Hills are ideal for these creatures, particularly as this site also contains rock rats (*Zygomys argurus*), a favourite prey item. The tough little male we caught may be the fellow responsible for trashing our line of Elliott traps deep within the sink-hole.

Northern quoll

Ningauai timealeyi Pilbara Ningauai

Sites 7, 13, 14, 15, 17, 18, 19, 20.

3 males (mean 4.3 g, n = 3); 12 females (mean 4.1 g, n = 10).

These tiny creatures were not particularly common, but they were found in a wide range of habitats (from sandplain to rocky hills and ridges) with good spinifex cover. They are fearless predators, and will tackle a grasshopper or similar creature twice their size. They are, however, relatively placid, and despite fearsome teeth they will sit quietly in your hand.

***Planigale* sp.** Planigale

Sites 16, 18, 19.

2 males (mean 6 g, n = 2); 1 female (7 g).

The planigales are one of the scientific mysteries of the north-west. The taxonomy of these tiny carnivores is still poorly known, and a recent review of the genus indicates that the Pilbara Planigale is new to science. Their very flattened heads and bodies appear to be especially adapted to pushing into cracks and crevices, and this could be why they were found on sites with lots of rockpiles.

Pseudantechinus roryi Rory's antechinus

Sites 11, 19.

2 males (mean 35.25 g, n = 2).

These animals belong to a species that WA Museum staff have only scientifically described in 2000. It is known only from the Pilbara, and is usually found in rocky sites. These are intermediate sized predators, and are not generally very common.

Sminthopsis macroura Stripe-faced dunnart

Site 13.

1 female (9 g).

The stripe-faced dunnart is a widely distributed species, which is common in the west Pilbara. These too are ferocious carnivores, and will tackle prey larger than themselves. Along with the other small marsupials, the dunnarts breed in the spring, so no evidence of reproductive activity was seen or expected in this animal. This species does not appear to be common on Meentheena.

MACROPODIDAE KANGAROOS AND WALLABIES

Macropus rufus Red kangaroo

'Big reds' were often seen in open country and plains on Meentheena, particularly in the late afternoon or evening. We often saw them on the plains on the western part of the station, and in the large open areas along the river to the south. They are common elsewhere and widespread.

Macropus robustus Euro or Hill kangaroo

Euros occur throughout the Meentheena area, but particularly near hills and rocky outcrops where they can shelter in small caves and overhangs during the day. Many euros are killed along the Ripon Hills road each year in this area, as they often feed along the road verge at night. They are common and widespread.

Petrogale rothschildi Rothschild's rock-wallaby

Nullagine River and Ripon Hills.

We saw rock wallabies on cliffs near the Nullagine River, and in the vicinity of the Ripon Hills sink-hole. This species of rock wallaby is common and widespread in the Pilbara. Its secure status is in strong contrast to that of many other rock wallaby species, many of which are threatened with local extinction.

PERAMELIDAE

Macrotis lagotis

BANDICOOTS

Rabbit-eared bandicoot, or greater bilby

Old Homestead.

Recently-active bilby burrows were found at various locations close to camp, near the old station dump. Unfortunately, none were captured on this occasion, although we have been successful in the past. Bilbies are known to regularly shift their place of abode, reconditioning old burrows or digging new ones. It appeared that the burrows we were trapping on had recently been vacated.

EMBALLONURIDAE

Taphozous georgianus

SHEATH-TAIL BATS

Common sheath-tail bat

King Rockhole, Ripon Hills.

7 females (mean 27.8 g, n = 7).

Common sheath-tails are one of the most common bats in the Pilbara. While many bats live in tree hollows or under loose bark, the sheath-tails always roost in caves. The small caves near King Rockhole are ideal for this species, as are the caves and overhangs found throughout the Ripon Hills. They are distinguished from their very similar relative, *T. hilli*, by having a relatively wider jaw. Our measurements confirmed this.

Taphozous hilli

Hill's sheath-tail bat

Ripon Hills.

1 male (18 g), 1 female (24 g).

A species that is much less common than the common sheath-tail, Hill's sheath-tail is another species found roosting only within caves during the day. The two individuals caught had a narrow upper jaw (only 3.2 mm across the canines, compared with 4.2 mm for the Common sheath-tails), so they were kept as our first records of this species from the Meentheena area.

MOLOSSIDAE

Mormopterus beccarii

FREE-TAIL BAT

Beccari's free-tail bat

Nullagine River.

1 male (13.5 g).

A single male was mist-netted near the Nullagine River, close to our camp. This species ranges across most of the northern half of the continent, and usually roosts in tree hollows.

Table 2. Mammals recorded at trapping sites

Sites	6	7	8	9	10	11	13	14	15	16	17	18	19	20	other
<i>Dasykaluta rosamondae</i>								+	+						
Little red antechinus															
<i>Dasyurus hallucatus</i>															+
Northern quoll															
<i>Ningauai timealeyi</i>		+					+	+	+		+	+	+	+	
Pilbara Ningauai															
<i>Planigale</i> sp										+		+	+		
Planigale															
<i>Pseudantechinus roryi</i>						+								+	
Rory's antechinus															
<i>Sminthopsis macroura</i>							+								
Stripe-faced dunnart															
<i>Petrogale rothschildi</i>														+	
Rothschild's rock wallaby															
<i>Mus musculus</i>						+									+
House mouse															
<i>Pseudomys chapmani</i>	+								+						
Northern pebble-mound mouse															
<i>Pseudomys delicatulus</i>					+										
Delicate mouse															
<i>Pseudomys desertor</i>	+	+					+	+	+		+		+	+	
Desert mouse															
<i>Pseudomys hermannsburgensis</i>			+	+											
Sandy inland mouse															
<i>Notomys alexis</i>			+		+		+								
Northern hopping-mouse															
<i>Zyzomys argurus</i>															+
Common rock rat															
<i>Nyctophilus geoffroyi</i>															+
Lesser long-eared bat															
<i>Mormopterus beccarii</i>															+
Beccari's free-tail bat															
<i>Scotorepens greyii</i>															+
Little broad-nosed bat															
<i>Taphozous georgianus</i>															+
Common Sheath-tail bat															
<i>Taphozous hilli</i>															+
Hill's Sheath-tail bat															

VESPERTILIONIDAE

Nyctophilus geoffroyi

Nullagine River.

1 male (9 g).

A single male of this species was mist-netted near the Nullagine River, close to our camp. Lesser long-eared bats are a very widespread species, ranging over most of the continent.

Scotorepens greyii

Nullagine River.

1 male.

A single male of this species was mist-netted near the Nullagine River, close to our camp. Again, this is a very widely distributed species in the northern half of Australia. It also roosts mainly in tree hollows.

MURIDAE

Pseudomys chapmani

Sites 6, 9, 15,

1 male (11 g).

Pebble mound mice are not common at Meentheena. We saw only a few active mounds (at Sites 6, 9 and 15), although dead mounds were more common. However, the animal we captured was from the sort of place where you would expect them: somewhere with enough pebbles to form mounds. While we are not sure which mounds our mouse came from, it is likely that they range over quite large distances each night. Meentheena is close to the edge of this species' range in the Pilbara, as it is not found in the sandy deserts.

Pseudomys delicatulus

Site 10.

3 males (mean 5.2 g, n = 3); 2 females (mean 8.5 g, n = 2).

These are probably the cutest of our Pilbara native mice. The Meentheena *P. delicatulus* are close to the inland limits of their range. They like sandplain sites where digging burrows is easy. Their presence on the recently burnt Site 10 indicates that their burrows provide enough protection for them to survive, despite the lack of spinifex clumps for shelter.

Pseudomys desertor

Sites 6, 7, 13, 14, 15, 17, 19, 20.

8 males (mean 17 g, n = 7); 7 females (mean 20.5 g, n = 5).

Until recently, the desert mouse was not known from the Pilbara. However, in the last few years, it has been found at many locations in the east and central Pilbara. Meentheena was one of the first of these. These mice were our most common mammal, and were widely distributed across most habitats. Their absence from some sites appears to be more to do with the vagaries of sampling rather than an unsuitability of habitat.

EVENING BATS

Lesser long-eared bat

Pseudomys

hermannsburgensis

Sites 8, 9.

3 males (mean 10 g, n = 3).

This is a species with an enormous geographical range, occurring throughout the arid zone and deserts across Australia. They can occur at high densities following good seasons, and are often the most abundant native mammal trapped. At Meentheena, however, they are totally eclipsed by *P. desertor*. Perhaps the absence of *P. desertor* from sites 8 and 9 meant that *P. hermannsburgensis* were more abundant there.

Notomys alexis

Sites 8, 10, 13.

4 male (mean 28 g, n = 4); 12 females (mean 31.1 g, n = 11).

Northern hopping mice were very common, but only on sites with sandy substrates. Our captures of *Notomys* conformed with their well known preference for sandy habitats.

Zyzomys argurus

Ripon Hills sink-hole.

No surprises that we caught rock rats from the rocky hills and rock piles of the Ripon Hills. The absence of rock rats from other rocky sites is a bit mystifying, but with the generally low rates of captures, perhaps it is to be expected. Rock rats appear to be a favourite food of Northern Quolls, and they would certainly be found along the rock wallaby cliffs. With quolls in residence, they would be very wary rats.

MURIDAE

Mus musculus

Sites 11, 20.

1 male (mean 10 g); 2 females (mean 11.25 g, n = 2).

The humble house mouse is one of the most successful invaders of our continent. It now lives in all parts of Australia, including the deserts. However, in the arid areas, it is often found to concentrate on those areas in the landscape where productivity is highest. It is no surprise that they are most common around people and houses. We could expect house mice anywhere in the Meentheena area, although it is a surprise to find *Mus* on the high rocky hills of Site 11.

CANIDAE

Canis lupus dingo

Australia's native wolf is common in the remote parts of the Pilbara, although it is difficult to know how much domestic dogs have contaminated the genetic integrity of the dingo. Dingos have been in Australia about 4000 years, originally coming from Asia. We saw tracks at many locations, particularly along the river, and a few dogs here and there. We also occasionally heard them howling at night.

Sandy inland mouse

Spinifex Hopping-mouse

Common rock rat

'NEW' RATS AND MICE

House mouse

DOGS

Dingo

FELIDAE

Felis catus

Again, a very successful invader. Cats now live throughout the continent, and are not dependent upon free water to survive. We saw their tracks and scats, but otherwise saw none.

CATS

Cat

disturbingly, there were a number of quite important reptile families entirely absent from our sampling. This can be attributed to the fact that we only had the pit traps open for a relatively short period, and that the cool weather stopped many species from moving around.

EQUIDAE

Equus caballus

A small group of horses were living just up the river from our camp. They are station horses, and were reclaimed for stock work during the final muster on Meentheena, in late 2001. Brumbies (wild horses) are a destructive pest, and are generally not useful working horses after they lose their breeding.

HORSE AND DONKEY

Horse***Equus asinus***

Donkeys are present throughout Meentheena, although we saw more tracks than animals. They are subject to intensive shooting, and numbers are much lower now than they have been in past years. Again, wild donkey are a pest. Aerial shooting is the only economical means of controlling their numbers. The Department of Conservation and Land Management is cooperating with the Department of Agriculture by assisting with funding a 'Judas collar' program to control donkey. A radio-transmitting collar is fitted to a female donkey, which is released and used to locate herds for up to a year. There should be very few donkey left on Meentheena by the end of 2001.

Donkey

CAMELIDAE

Camelus dromedarius

Camels are very common in the deserts to the north and east of Meentheena. However, contrary to popular belief, camels can happily live in more rugged country, and are widespread in the Pilbara. We saw tracks on roads in the south of the station, and on the flat plains to the west. A large group of camel can drink a tank dry, and bulls have been known to destroy tanks, fences and even windmills. They are consequently destroyed as vermin. Their impacts on natural values are not so great in country like Meentheena, but in the desert large numbers have a very bad impact on natural waters.

CAMEL

One-humped camel

In contrast to the previous year, the only frog we recorded was the Desert tree frog, *Litoria rubella*. These are very widespread, and are present around any permanent water source throughout the arid zone. Other species present at Meentheena are burrowing frogs, and only emerge after heavy rain.

Our survey failed entirely to record any of the blind snakes (*Ramphotyphlops*), which are usually caught in pit traps. Even more surprising, we found no legless lizards (family Pygopodidae). However, reptiles can be a difficult group to comprehensively survey. They often hide away out of sight, and many species occur at low densities, which means we encounter them only occasionally. Such species may be detected only after many repeated survey efforts. This is by no means a failure - it is a feature of the reptile fauna of the Australian arid zone. This is why surveys are repeated over a period of years, in different seasons. The example of the frogs is a good one - as we experienced dry weather, our survey did not detect them. During the 2000 LANDSCOPE Expedition, we were lucky, and caught nearly 200 frogs after heavy rain. The down side of this was that the river came up, and made our stay cold and uncomfortable.

Several reptile species of particular interest were recorded. *Ctenotus nigrilineatus* is known from only one other location in the Pilbara. This black and white striped skink was described from Woodstock, south of Port Hedland. The examples we caught at Meentheena are only the second population ever recorded.

The Pilbara death adders (*Acanthophis wellsi*) collected during this survey are also of interest, in that they may be hybridising with the closely related desert death adders (*A. pyrrhus*). These two species do hybridise near Cane River (as we discovered on a previous LANDSCOPE Expedition), and the specimens we collect from Meentheena may demonstrate that this hybridisation is not an isolated feature of the Cane River populations. Desert death adders are common in the sandy desert areas to the east of Meentheena, and also around Port Hedland.

BOVIDAE

Bos taurus

Meentheena was an operating cattle station until a year before our expedition, and stock are still on the property. We didn't see a lot of them, but we could see where they had been. Once stock are removed by the past owners, the Department of Conservation and Land Management will try to keep the area free of cattle if possible.

CATTLE

Cattle

AMPHIBIANS AND REPTILES

Only 21 reptile species, and one amphibian, were recorded during this survey period (See table 3). This is a small proportion of the number of herpetofauna species known to occur in the Meentheena area. More



Dr Geoff Kirkman with an eel-tailed catfish, Nullagine River.

Photo: S. van Leeuwen

Bill Hawthorn surveying the Nullagine River.
Photo: P. Kendrick



Breakfast at the Nullagine River basecamp.

Photo: S. van Leeuwen

An unnamed rockhole in the Ripon Hills east of the sinkhole.

Photo: S. van Leeuwen



Ripon Hills sinkhole.

Photo: S. van Leeuwen

Jim McGeough,
Michael Hughes, and
Bill Hawthorn
inspecting the lonely
grave of James Spinney.
Photo: P. Kendrick



Table 3. Amphibians and reptiles recorded at trapping sites.

	6	7	8	9	10	11	13	14	15	16	17	18	19	20	other
AMPHIBIA															
HYLIDAE															
<i>Litoria rubella</i>															+
REPTILIA															
GEKKONIDAE - Geckos															
<i>Diplodactylus savagei</i>		+													
<i>Gehyra punctata</i>															+
<i>Gehyra variegata</i>															+
<i>Heteronotia binoei</i>														+	+
<i>Oedura marmorata</i>															+
AGAMIDAE - Dragon lizards															
<i>Ctenophorus caudicinctus</i>									+	+					
<i>Lophognathus longirostris</i>															+
SCINCIDAE - Skink lizards															
<i>Carlia munda</i>															+
<i>Ctenotus grandis</i>			+				+				+				
<i>Ctenotus nasutus</i>				+											
<i>Ctenotus nigrilineatus</i>				+											
<i>Ctenotus pantherinus</i>								+	+		+			+	
<i>Ctenotus saxatilis</i>			+									+		+	+
<i>Lerista bipes</i>				+											
<i>Menetia greyii</i>		+													
<i>Morethia ruficauda</i>															+
<i>Tiliqua multifasciata</i>															+
VARANIDAE - Monitor lizards															
<i>Varanus acanthurus</i>															+
<i>Varanus eremius</i>															+
BOIDAE - Pythons															
<i>Antaresia stimsoni</i>															+
ELAPIDAE - Front fanged venomous snakes															
<i>Acanthophis wellsi</i>															+
<i>Furina ornata</i>								+							

BIRDS

During our stay at Meentheena, we kept an approximate tally of bird species seen during the trip. The list given below is far from comprehensive. Serious birding would need to be done early each morning, about when we were clearing our pit traps. Even so, the list is not a bad one.

Emu
Brown quail
Black swan
Black duck
Grey teal
Australasian grebe
Darter
Little black cormorant
Little pied cormorant
Australian pelican
White necked heron
White-faced heron
Nankeen night heron
Great egret
Black bittern
Straw-necked ibis
Yellow billed spoon-bill
Jabiru
Black shouldered kite
Black breasted buzzard
Black kite
Whistling kite
Spotted harrier
Wedge-tailed eagle
Little eagle
Little falcon
Brown falcon
Nankeen kestrel
Buff-banded rail
Australian bustard
Little button quail
Bush stone-curlew
Black-fronted dotterel
Crested pigeon
Spinifex pigeon
Diamond dove
Peaceful dove
Galah
Little corella
Cockatiel
Australian ringneck
Budgerigar
Horsfield's bronze cuckoo
Pheasant coucal
Barking owl
Barn owl
Southern boobook
Tawny frogmouth
Spotted nightjar
Australian owl-nightjar
Blue winged kookaburra
Red-backed kingfisher
Sacred kingfisher
Rainbow bee-eater
Black-tailed tree-creeper
Variegated fairy-wren
White-winged fairy-wren
Rufous-crowned emu-wren
Yellow-rumped thornbill
Yellow-throated miner
White-plumed honeyeater
Golden-backed honeyeater

Grey-headed honey-eater
Brown honeyeater
Singing honeyeater
Crimson chat
Grey-crowned babbler
Rufous whistler
Grey shrike-thrush
Magpie lark
Willy wagtail
Black-faced cuckoo-shrike
White-winged triller
Little woodswallow
Pied butcherbird
Australian magpie
Torresian crow
Richard's Pippit
Zebra finch
Crimson firetail finch
Mistletoe bird
Welcome swallow
Tree martin
Fairy martin
Spinifex bird

FLORA OF THE MEENTHEENA CONSERVATION PARK

The Meentheena Conservation Park is located in the Pilbara Biogeographical Region of northern Western Australia. The bioregion conforms to the boundaries of Beard's (1975) Fortescue Botanical District. This natural region is characterised by extensive plains and mountainous rugged ranges with generally shallow, skeletal stony soils which support vegetation dominated by tree and shrub communities that chiefly comprise emergent eucalypts and acacias over spinifex (*Triodia*) grasses. The distribution of the flora and vegetation in the region is strongly determined by climatic influences, in particular rainfall, together with geological and edaphic (soil) considerations. These influences promote a diverse landscape mosaic of vegetation types and a surprisingly species-rich flora for such an arid area. Another strong selective force influencing floristic distribution and the arrangement of vegetation across the landscape is fire, particularly in relation to the burn history of an area.

The flora of the Meentheena Conservation Park was poorly known prior to the governmental acquisition of the pastoral lease in April 1999. At the time of acquisition only 89 plant species were recorded from the station. Most of these species had been collected in the 1990s by staff in the Rangeland Survey team from the Department of Agriculture or by well-known volunteers Daphne Edinger and Gilbert Marsh. The flora list for the Park was augmented during the May 2000 Meentheena *LANDSCOPE* Expedition by the addition of 197 species culminating in a flora of 286 species. This number is somewhat below expectations for such an area given florist richness estimates for other localities in northern arid Western Australia (Table 1). Using simple regression analysis procedures a flora in the vicinity of 430-460 species would be within expectations for an area the size of Meentheena.

Clearly, additional survey work is required in the Park to increase our botanical knowledge and

Table 1 Known plant species richness of various study areas within the Pilbara.

Locality	Area (km ²)	No. of species	Species/km ²	Authority
Mining Area C - Hamersley Range	560	422	753.6	<i>ecologia</i> 1997
Barlee Range Nature Reserve	1045	515	492.8	van Leeuwen, unpublished
Kennedy Range National Park	1416	314	221.8	Keighery <i>et al.</i> 2000
Cape Range Peninsula	2185	630	288.3	Keighery and Gibson 1993
Meentheena Cons. Park (2001)	2387	331	138.7	van Leeuwen, unpublished
Meentheena Cons. Park (pre 2001)	2387	286	119.8	van Leeuwen, unpublished
Karijini National Park	6274	800	127.5	Trudgen and Casson 1998
Kintyre Study area	7500	409	54.5	Hart, Simpson & Associates 1993
Southern Carnarvon Basin	75000	2133	28.4	Keighery <i>et al.</i> 2000
Pilbara Biogeographical Region	179305	1900	10.6	van Leeuwen, unpublished

appreciation of the flora. Similarly, it is apparent that the flora occurring within large areas of the Park had not been documented, as previous survey efforts had primarily been confined to the alluvial plain of the Nullagine River towards the centre of the Park and the associated rough basaltic, doleritic and sandstone terrain slightly to the west of this imposing drainage line (Figure 1). Some collecting has also occurred along the Ripon Hills Road and limited botanical collecting has occurred to the north-west and on the south-eastern side of the Park, which are characterised by granitic plains. Similarly, no botanical surveys have been undertaken to the north-east, which harbours extensive highly dissected basaltic, silcrete and doleritic plateaux and plains.

As already mentioned, fire is a significant force that influences the distribution of plants and vegetation types

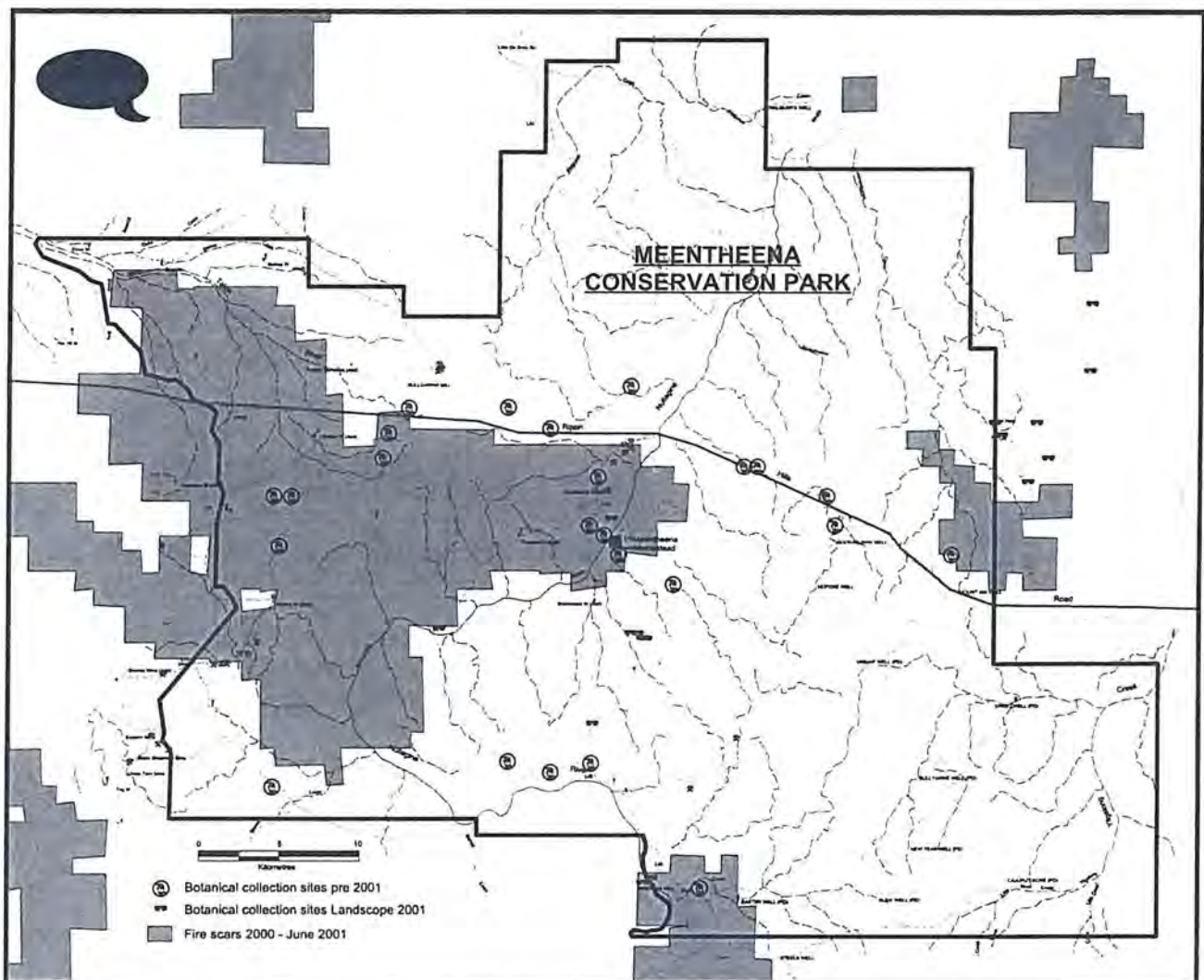


Figure 1 Location of botanical collecting sites and 2000-2001 burn scars in the Meentheena Conservation Park.

across the Pilbara. It is well documented in many arid zones that plants respond differently to fire depending on various life history strategies (e.g. seeders vs resprouters). A fire ephemeral life history is one such strategy that has important implications when documenting the flora of an area like Meentheena. This strategy describes plants, primarily annuals or short-lived perennials, which thrive in the post-burn environment (or after similar disturbances) and persist for a few years thereafter gradually disappearing from the regenerating vegetation community as seral progression towards a climax community occurs. Explanations for the proliferation of such plants are associated with reduced competition for light and nutrient resources along with physiological considerations such as seed dormancy mechanisms. Obviously, such life history strategies and responses to fire must be considered before the process of developing a comprehensive flora list can be deemed complete. A great opportunity therefore exists to document the fire ephemeral flora of the Meentheena Conservation Park as a consequence of large fires which raised over 51 960 ha (22%) of the Park during the 2000-2001 fire season.

Consequently, the botanical aim of the 2001 Meentheena LANDSCOPE Expedition was to augment the flora list for the Park. This was to be accomplished by three strategies, namely through:

- Revisiting sites which had been sampled in 2000 to document any new plants, particularly ephemeral species that may have responded to wet season rainfall;
- Sampling burnt habitats to document fire responsive ephemeral plants; and
- Visiting new areas of the Park, such as the Ripon Hills, to document previously unrecorded species in the Park.

Methods

During the Expedition, plant species present on Meentheena were recorded using an opportunistic sampling regime. Indeed, flora sampling was entirely opportunistic and comprised expeditioners and leaders collecting samples as they visited fauna sampling grids and explored the Park. Specimens were processed in the field and pressed in conventional herbarium plant presses for drying under ambient conditions. Details of habit, abundance, locality, habitat, vegetation type and associated species were recorded for each collected specimen. Sufficient material was collected from each sample to facilitate the lodgement of voucher specimens in the Western Australian Herbarium (PERTH), Pilbara Regional Herbarium (KARR) and the Australian National Herbarium (CANB). Upon return to the office, specimens were identified, databased and mounted ready for incorporation into the appropriate collections. Specimen identification was performed with reference to standard published floras applicable to the Pilbara (e.g. Jessop 1981; Wheeler *et al.* 1992), generic taxonomic treatments (e.g. Halford 1996; Grimes 1997) or through liaison with taxonomists at the PERTH and Eastern States' herbaria.

The classification of plants presented in this report conforms to that currently employed by the Western Australian Herbarium as portrayed in Paczkowska and Chapman (2000).

Results and Discussion

Fulfilment of the botanical aim of the 2001 Expedition was somewhat hindered by a lack of rainfall during the 2000/01 wet season. The rainfall at Marble Bar, the closest recording station to Meentheena, during the 2000/01 wet season was approximately 130 mm below the average of 360 mm, while that recorded over the first six months of 2001 was approximately 75 per cent below average. Clearly the ability to detect and record annual and ephemeral taxa, including fire ephemerals was severely impeded by this lack of rainfall.

Nevertheless, 128 specimens were collected during the expedition from 17 localities around the Meentheena Conservation Park. Excluding collections from outside the Park, which were all made in the Ripon Hills, a total of 72 species were represented by the 128 specimens. These 72 species represented 32 families and 52 genera. Forty-eight of the plants collected during the expedition were new records for the Park (Table 2).

Combining the new records obtained during the 2001 Expedition with records obtained during the previous 2000 Landscape Expedition (197 species) and historical records obtained from the Western Australian Herbarium and Agriculture WA, 330 species are now known to occur in the Park (Table 2). These species represent 133 genera from 53 families. The 2001 Expedition has resulted in the inclusion of plants from an additional 15 genera and six families to the flora list for the Park.

Table 2. Plants recorded from the Meentheena Conservation Park. Names in bold and underlined are new records for the Park recorded during the May 2001 Landscape Expedition (* = non-native species, P2 = conservation status).

ADIANTACEAE	<i>Cheilanthes sieberi</i>	<i>Bulbostylis burbridgeae</i>
	<i>Cheilanthes brownii</i>	<i>Cyperus cunninghamii</i>
TYPHACEAE	<u><i>Typha domingensis</i></u>	<i>Cyperus vaginatus</i>
POACEAE		<i>Cyperus</i> sp. (SVL 4511)
	<i>Amphipogon strictus</i>	<i>Cyperus</i> sp. (SVL 4575)
	<i>Aristida contorta</i>	<i>Cyperus</i> sp. (SVL 4564)
	<i>Aristida holathera</i>	<i>Cyperus</i> sp. (SVL 4782)
	<i>Aristida</i> sp. (SVL 4533)	<i>Cyperus</i> sp. (SVL 4784)
	* <i>Cenchrus ciliaris</i>	<i>Cyperus</i> sp. (SVL 4790)
	* <i>Cenchrus setigerus</i>	<i>Eleocharis</i> sp. (SVL 4789)
	<i>Chrysopogon fallax</i>	COMMELINACEAE
	<i>Cymbopogon ambiguus</i>	<u><i>Commelina ensifolia</i></u>
	<i>Dactyloctenium radulans</i>	MORACEAE
	<u><i>Dicanthium</i> sp. (SVL 4820)</u>	<i>Ficus opposita</i> var. <i>indecora</i>
	<i>Digitaria</i> sp.	<i>Ficus brachypoda</i>
	<i>Enneapogon caerulescens</i>	PROTEACEAE
	<i>Enneapogon polyphyllus</i>	<i>Grevillea pyramidalis</i>
	<i>Enneapogon</i> sp.	<i>Grevillea wickhamii</i> subsp. <i>aprica</i>
	<i>Eragrostis cumingii</i>	<i>Hakea lorea</i>
	<i>Eragrostis pergracilis</i>	SANTALACEAE
	<i>Eragrostis setifolia</i>	<i>Santalum lanceolatum</i>
	<i>Eragrostis tenellula</i>	CHENOPODIACEAE
	<i>Eragrostis</i> sp.	<i>Dysphania kalpari</i>
	<i>Eriachne aristidea</i>	<i>Dysphania rhadinostachya</i>
	<i>Eriachne benthamii</i>	<i>Enchylaena tomentosa</i>
	<i>Eriachne helmsii</i>	<i>Salsola tragus</i>
	<i>Eriachne ovata</i>	<i>Sclerolaena</i> sp. (SVL 4569)
	<i>Eriachne pulchella</i> subsp. <i>dominii</i>	AMARANTHACEAE
	<i>Eriachne</i> sp. (SVL 4484)	<u><i>Achyranthes aspera</i></u>
	<i>Eriachne</i> sp. (SVL 4580)	* <i>Aerva javanica</i>
	<i>Iseilema membranaceum</i>	<i>Alternanthera nana</i>
	<i>Paspalidium rarum</i>	<i>Alternanthera nodiflora</i>
	<i>Perotis rara</i>	<i>Amaranthus mitchellii</i>
	<u><i>Setaria dielsii</i></u>	<i>Gomphrena affinis</i>
	<i>Sorghum</i> sp. (SVL 4528a)	<i>Gomphrena canescens</i>
	<u><i>Sorghum</i> sp. (SVL 4817)</u>	<i>Gomphrena cunninghamii</i>
	<i>Sporobolus australasicus</i>	<i>Ptilotus aevroides</i>
	<i>Themeda triandra</i>	<i>Ptilotus appendiculatus</i>
	<i>Themeda</i> sp. (SVL 4536)	<i>Ptilotus astrolasius</i>
	<i>Triodia angusta</i>	<i>Ptilotus auriculifolius</i>
	<i>Triodia epactia</i>	<i>Ptilotus axillaris</i>
	<i>Triodia lanigera</i>	<i>Ptilotus calostachyus</i>
	<i>Triodia longiceps</i>	<i>Ptilotus carinatus</i>
	<i>Triodia pungens</i>	<i>Ptilotus exaltatus</i>
	<i>Triodia wiseana</i>	<i>Ptilotus fusiformis</i>
	<i>Yakirra australiensis</i>	<i>Ptilotus helipteroides</i>
	Genus sp. (SVL 4504)	<u><i>Ptilotus mollis</i></u> P2
	Genus sp. (SVL 4507)	<i>Ptilotus</i> sp. (SVL 4542)
	Genus sp. (SVL 4567)	NYCTAGINACEAE
	Genus sp. (SVL 4571)	<i>Boerhavia coccinea</i>
	<u>Genus</u> sp. (SVL 4766)	<i>Boerhavia gardneri</i>
	<u>Genus</u> sp. (SVL 4779)	<i>Boerhavia schomburgkiana</i>
	<u>Genus</u> sp. (SVL 4820)	AIZOACEAE
		<i>Trianthema cussackiana</i>
		<i>Trianthema glossostigma</i>
		<i>Trianthema oxycalyptra</i>
		<i>Trianthema pilosa</i>
		<i>Trianthema portulacastrum</i>
		<i>Trianthema turgidifolia</i>

Trianthema sp.

MOLLUGINACEAE

Glinus oppositifolius*Mollugo molluginis*

PORTULACACEAE

Calandrinia* sp. (SVL 4780)Portulaca oleracea*

CARYOPHYLLACEAE

*Polycarpaea breviflora**Polycarpaea corymbosa**Polycarpaea holtzei**Polycarpaea longiflora*

MENISPERMACACEAE

Tinospora smilacina

PAPAVERACEAE

**Argemone ochroleuca*

CAPPARACEAE

Cleome viscosa

DROSERACEAE

Drosera indica

MIMOSACEAE

*Acacia ampliceps**Acacia ancistrocarpa**Acacia arida**Acacia bivenosa**Acacia coriacea* subsp. *pendens**Acacia cowleana**Acacia eriopoda**Acacia exilis**Acacia farnesiana**Acacia gregorii****Acacia hilliana****Acacia inaequilatera**Acacia maitlandii**Acacia ptychophylla**Acacia pyrifolia**Acacia retivenia* subsp. *clandestina**Acacia spondylophylla**Acacia sclerosperma**Acacia tetragonophylla**Acacia trachycarpa**Acacia tumida**Acacia victoriae**Dichrostachys spicata*

CAESALPINIACEAE

*Petalostylis labicheoides**Senna artemisioides* subsp. *helmsii**Senna artemisioides* subsp. *oligophylla**Senna glutinosa* subsp. *glutinosa**Senna glutinosa* subsp. *x luerssenii**Senna glutinosa* subsp. *pruinosa**Senna notabilis****Senna symonii******Senna venusta***

PAPILIONACEAE

*Alysicarpus rugosus**Cajanus pubescens**Crotalaria crispata**Crotalaria cunninghamii**Crotalaria medicaginea**Cullen leucochaites**Cullen leucanthum**Cullen martinii**Cullen pogonocarpum**Cullen stipulaceum**Cullen* sp.*Desmodium filiforme**Glycine tabacina****Glycine* sp. (SVL 4806)***Indigofera colutea**Indigofera limifolia**Indigofera linmaei**Indigofera monophylla**Indigofera rugosa**Indigofera trita**Lotus australis**Rhynchosia minima**Sesbania cannabina**Sesbania formosa**Swainsona decurrens**Swainsona formosa**Swainsona kingii**Swainsona pterostylis**Swainsona stenodonta**Templetonia egena**Tephrosia bidwillii**Tephrosia* sp. Bungaroo Creek (Met 11601)*Tephrosia* sp. 1*Tephrosia* sp. 2***Tephrosia* sp. (SVL 4799)*****Tephrosia* sp. (SVL 4846)***Vigna lanceolata**Zornia albiflora*

ZYGOPHYLLACEAE

*Tribulus hirsutus**Tribulus macrocarpus**Tribulus occidentalis**Tribulus platypterus**Tribulus suberosus*

POLYGALACEAE

Polygala isingii

EUPHORBIACEAE

*Euphorbia australis**Euphorbia coghlanii****Euphorbia drummondii******Flueggea virosa* subsp. *melahtesoides****Leptopus decaisnei**Phyllanthus lacunellus**Phyllanthus maderaspatensis*

STACKHOUSIACEAE

***Stackhousia* sp. (SVL 4837)**

SAPINDACEAE

Atalaya hemiglauca

TILIACEAE

*Corchorus aestuans**Corchorus fascicularis**Corchorus laniflorus**Corchorus tridens**Corchorus walcottii**Corchorus* sp. (SVL 4512)*Corchorus* sp. (SVL 4525)*Corchorus* sp. (SVL 4537)

Triumfetta appendiculata

Triumfetta chaetocarpa
Triumfetta maconochieana
Triumfetta plumigera
Triumfetta propinqua

Triumfetta sp. (SVL 4830)

Triumfetta sp. (SVL 4841a)

Triumfetta sp. (SVL 4841b)

MALVACEAE

Abutilon fraseri

Abutilon lepidum

Abutilon sp. (SVL 4829)

Gossypium australe

Hibiscus brachychlaenus

Hibiscus burtonii

Hibiscus coatesii

Hibiscus leptocladus

Hibiscus panduriformis

Hibiscus sturtii

Sida echinocarpa

Sida rohlena

Sida sp. (SVL 4502)

Sida sp. (SVL 4517)

Sida sp. (SVL 4518)

Sida sp. (SVL 4520)

Sida sp. (SVL 4545)

Sida sp. (SVL 4550)

Sida sp. (SVL 4835)

STERCULIACEAE

Waltheria indica

Waltheria virgata

LYTHRACEAE

Ammannia baccifera

COMBRETACEAE

Terminalia canescens

MYRTACEAE

Corymbia candida subsp. *dipsodes*

Corymbia ferritcola

Corymbia hamersleyana

Eucalyptus camaldulensis

Eucalyptus gamophylla

Eucalyptus leucophloia

Eucalyptus odontocarpa

Eucalyptus victrix

Melaleuca argentea

Melaleuca glomerata

HALORAGACEAE

Myriophyllum verrucosum

APIACEAE

Trachymene oleracea

OLEACEAE

Jasminum didymum

APOCYNACEAE

Carissa lanceolata

ASCLEPIADACEAE

Cynanchum floribundum

CONVOLVULACEAE

Bonamia pannosa

Bonamia rosea

Convolvulus erubescens

Evolvulus alsinoides

Jacquemontia pannosa

Ipomoea lonchophylla

Ipomoea muelleri

Ipomoea sp. (SVL 4811)

Polymeria calycina

Polymeria sp. (SVL 4491)

Polymeria sp. (SVL 4560)

BORAGINACEAE

Heliotropium aff. crispatum

Heliotropium heteranthum

Heliotropium inexplicitum

Heliotropium murinum

Heliotropium ovalifolium

Heliotropium sp. (SVL 4833)

Trichodesma zeylanicum

VERBENACEAE

Clerodendrum floribundum

SOLANACEAE

**Datura leichhardtii*

Nicotiana benthamiana

Nicotiana occidentalis

Nicotiana rosulata

**Physalis minima*

Solanum diversiflorum

Solanum horridum

Solanum lasiophyllum

Solanum sp. (SVL 4568)

SCROPHULARIACEAE

Peplidium sp. (SVL 4572)

Peplidium sp. (SVL 4816)

Stemodia grossa

Stemodia viscosa

Striga squamigera

BIGNONIACEAE

Genus sp. (SVL 4538)

PEDALIACEAE

Josephinia sp. Mt Edgar Stn (NT Burbidge 1194)

MYOPORACEAE

Eremophila latrobei

Eremophila longifolia

Eremophila sp.

RUBIACEAE

Oldenlandia crouchiana

Synaptantha tillaeacea

CUCURBITACEAE

**Cucumis melo*

Cucumis sp. (SVL 4822)

Mukia maderaspatana

CAMPANULACEAE

Wahlenbergia tumidifruca

LOBELIACEAE

Lobelia quadrangularis

GOODENIACEAE

Dampiera candidans

Goodenia heterochila

Goodenia lamprosperma

Goodenia micrantha

Goodenia microptera

Goodenia stobbsiana

Goodenia triodiophila

Scaevola amblyanthera

Scaevola sp.

STYLIDIACEAE

Stylidium desertorum

Stylidium fluminense

ASTERACEAE

*Centipeda minima**Centipeda* sp. (SVL 4559)*Chrysogonum trichodesmoides**Flaveria australasica**Ixioclamys cuneifolia**Ixioclamys* sp. (SVL 4523)*Olearia* sp.*Pentalepis trichodesmoides**Pluchea tetranthera**Pteracaulon serrulatum**Pterocaulon sphacelatum**Senecio* aff. *leucoglossus**Streptoglossa adscendens**Streptoglossa bubakii**Streptoglossa odora*

Genus sp. (SVL 4483)

Genus sp. (SVL 4522)

Genus sp. (SVL 4565)

Most of the plants recorded at Meentheena are typical, ubiquitous species found throughout the Pilbara. The grass family (Poaceae) with 50 species was the richest recorded, a feature typical of most Pilbara study areas. Twenty-two families were represented by only one species. Other common elements of the flora were peas (Papilionaceae), wattles (Mimosaceae), mulla mullas (Amaranthaceae) and daisies (Asteraceae) with 38, 23, 20 and 18 species respectively. By far the most visually conspicuous plants on Meentheena were regenerating spinifex (*Triodia*) and wattles (*Acacia*) which were conspicuous in all habitats with six and 20 species, respectively. Other conspicuous plants were the re-sprouting emergent eucalypts, especially the river red gums (*Eucalyptus camaldulensis*) which fringed the Nullagine River, and the white-barked snappy gums (*Eucalyptus leucophloia*) which stylishly graced the slopes of most hills. The tall majestic paperbarks (*Melaleuca argentea*) bordering most of the pools along the Nullagine River together with the white dragon tree or corkwood (*Sesbania formosa*) were also a conspicuous component of the flora.

Most plants recorded at Meentheena have a ubiquitous distribution throughout the Pilbara and much of the arid inland regions of central Western Australia. However, two of the plants recorded in the Park, one for the first time during this expedition, are of conservation interest. These plants are *Josephinia* sp. 'Mt Edgar Stn.' (N.T. Burbidge 1194) and *Ptilotus mollis*, as described below:

Josephinia sp. 'Mt Edgar Stn.' (N.T. Burbidge 1194): This undescribed species is known from six collections all obtained from the Mt Edgar-Meentheena area. The species is currently not listed on CALM's Priority Flora List. The species was collected from three localities during the expedition. All localities were along the Nullagine River on alluvial wash areas close to the river in areas that had recently been burnt. This species is now known from five localities on Meentheena.

Ptilotus mollis: This species is listed on CALM's Declared Rare and Priority Flora List as a Priority 2 taxon. This designation implies that the species is known from one or a few (<5) populations, at least some of which are not believed to be under immediate threat. The species is under urgent consideration for addition to the Schedule of Declared

Rare Flora but requires further survey to fulfil stringent survey conditions before addition to the schedule can be considered. This species has previously been collected from four localities in the inland Pilbara, from south-east of Marble Bar at the Warrawoona Mining Centre; in the Rudall River area; on the footslopes of Mt Bruce in the Hamersley Range and west of Marble Bar in the Gorge Range. During the expedition this species was collected at the base of a breakaway near the Ripon Hills sink-hole. The species was also recorded from the Ripon Hills Mining Centre, which is outside the Park.

Other plants of botanical interest recorded during the Expedition include:

Triumfetta plumigera: This tall (1.5 m) upright plant with small hairy burr-like fruit was collected from the access track to the Ripon Hills sink-hole. Suggestions made by SVL at the time indicated that this species was possibly new, having not previously been reported in the scientific literature. While these comments proved incorrect the species is a new record for the Pilbara and this collecting locality represents the first for the species outside the Kimberley region in Western Australia. The Ripon Hills population also represents the most southern known for the species, which typically has a distribution across semi-tropical northern Australia. The Ripon Hills population is 370 km south on the next nearest population, which is located in the southern Edgar Ranges. The Ripon Hills population represents a significant disjunct outlier population for this species.

Triumfetta appendiculata: This shrub was collected from the banks of the Nullagine River below Baroona Hill. This population is the most eastern recorded for the species, which has a distribution that is typically centred on the west Pilbara coastline and inland to the Hamersley Ranges.

Templetonia egena: This broom-bush shrub, which grows up to 2 m tall, was collected from the plateau adjacent to the Ripon Hills sink-hole. This population represents a significant north-westerly range extension for the species, which has a sporadic distribution throughout the southern rangelands and desert regions of Western Australia. The Ripon Hills population is the second recorded from the Pilbara Biogeographical Region.

Eucalyptus odontocarpa: The mallee was observed several times along the access track to the Ripon Hills Mining Centre and thereafter collected along the track to the Ripon Hills sink-hole. These populations represent a slight westerly extension of the distributional range of the species, which previously was delimited by the Oakover River, east of Meentheena.

Seven non-native plant species have been recorded on the Meentheena Conservation Park (Table 2). Two of these were added during the 2001 Expedition. These non-native species are buffel grass (*Cenchrus ciliaris*), birdwood grass (*Cenchrus setigerus*), kapok bush (*Aerva javanica*), Mexican poppy (*Argemone ochroleuca*), thornapple (*Datura leichhardtii*), ulcardo melon (*Cucumis melo*) and wild gooseberry (*Physalis minima*). Mexican poppy and the ulcardo melon were recorded during the most recent survey. A few plants with cosmopolitan distributions throughout the Southern Hemisphere were also recorded on Meentheena. These include prickly saltwort (*Salsola tragus*), purslane (*Portulaca oleracea*) and mimosa bush (*Acacia farnesiana*).

Further botanical survey research is required in the Meentheena Conservation Park to comprehensively document the flora. The current flora list of 330 species is still below expectations for an area of this size in north-western Australia (Table 1). Examination of

the flora list for the Park suggests that it is currently depauperate in species representative of the Brassicaceae, Euphorbiaceae, Goodeniaceae, Papilionaceae, Poaceae and Solanaceae. As many of the presumed missing representatives from these families are annual and ephemeral species, planning future botanical surveys after sufficient rainfall and in spring would be a profitable strategy. Similarly, the sampling of burnt habitats after sufficient rainfall should be pursued, as should the documentation of the flora in the northern and western part of the Park as well as in the vicinity of Yilgalong Creek.

Stephen van Leeuwen and Bob Bromilow

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The references listed below will provide further information on the geology, fauna and flora of the north-west of Western Australia. This is by no means exhaustive. However, many of these books were used during our time at Meentheena while identifying animals.

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VOLUNTEER PROFILES

Rob Barbour was attracted by the general activities proposed for this expedition and decided to join as he has not been in this area before. Rob visited the Gibson Desert on one of our expeditions in 1997. He has travelled quite a bit in Australia and overseas and these days devotes a fair amount of his time to several community voluntary groups.

Martin Callaway works for the Australian National University as an engineer and lives and works at Siding Spring Observatory. His previous job has taken him to several desert regions undertaking seismic research. His interests are outback driving, photography, wildlife ecology and star-gazing.

Jon Hall is a government statistician working in Canberra. Jon loves the wilderness and is interested in all aspects of natural history with a particular passion for mammals. He says that trips like this are precisely the reason that he left the UK two years ago.

Bill Hawthorn has been on a number of earlier LANDSCOPE Expeditions including the one to the Great Victoria Desert in 1996. He has not visited the present area before. He feels that more research is needed in terms of flora and fauna and thinks this trip should be exciting and rewarding. Bill is a retired visual arts lecturer and has always had a strong interest in the natural environment, in particular birds and plants.

Geoff Kirkman is a GP living in a semi-rural area (Karragullen WA). He has a lifelong interest in native mammals and conservation, with some experience with practical conservation projects.

Jim McGeough is another one of our faithful expeditioners returning for a trip with us (Jim has been on a number of previous LANDSCOPE Expeditions). A retired civil engineer, Jim has worked on the Woomera Rocket Range, the Tasmanian hydro-electric scheme, in New Guinea, the Snowy Mountains hydro-electric scheme and also in the Pilbara. He has also served as a Town Clerk and on the Keep Australia Beautiful Council, and has been on other expeditions to exotic places including Antarctica, Africa, Borneo, Tanzania, Mt Everest, Silk Road Tibet.

Bill Scutchings is delighted that the project will give him an opportunity to have input into fauna and flora conservation and observation in a region and habitat that he really enjoys. He has travelled through the western deserts and this area twice before. Bill is from South Australia where he has long been a member of the local Naturalists' Club and Birds Australia. He is interested in habitat retention and/or revegetation, clean rivers and a feral-free environment. He has travelled over most parts of Australia and has a general interest in natural history and the environment. He travelled to the Gibson Desert in 1998 with our expedition to that area.

John Tucker took part in the expedition to the Nullagine last year when there was rather more rain than expected but everyone was well looked after and well fed despite the adverse conditions. Of course he hopes that this year there won't be quite so much rain as last year to enable access to more of Meentheena Station. John has been wandering, working and exploring the outback for years. He is not sure which comes first - the remoteness, the beauty, the tranquility or the vastness of the arid interior all of which he finds acts as a magnet for him.

Susan Worley, previously a science teacher, is now a regional manager of the north-west for the Waters and Rivers Commission. She is interested in people, processes and land and water management. She chose this expedition to learn more about Pilbara Rivers.