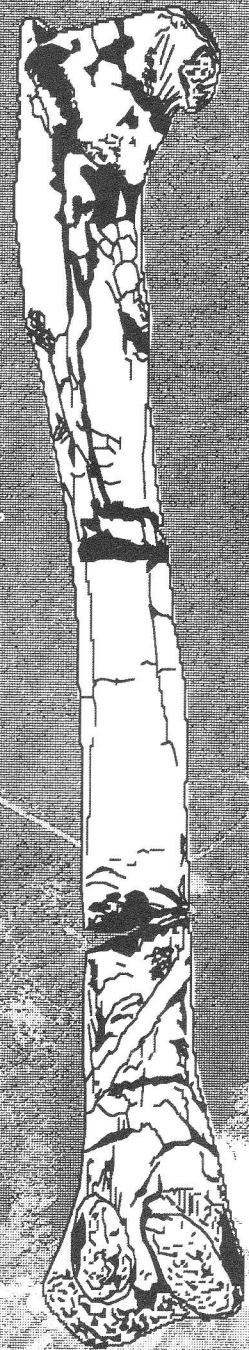


DIG AT DINOSAUR COVE 1990/1991

Limb bone (femur) of small
advanced theraped dinosaur,
x 1/2, found at Dinosaur
Cove, 1991



Dorsal vertebra of small
primitive theraped dinosaur
x 1, found at Dinosaur Cove, 1991

Field Report

Dinosaurs of Darkness Expedition

November 1990-March 1991

Dinosaur Cove is a minor indentation on the rocky Otway coast southwest of Melbourne, Victoria, Australia. It received its official name after the discovery of fossil bones there in 1980 although at the time it was not absolutely certain that the specimens were indeed those of dinosaurs. Subsequent events have amply vindicated the choice.

When the dinosaurs found at Dinosaur Cove were living animals approximately 106 million years ago, Australia was joined to Antarctica. Where Dinosaur Cove now exists was the floor of a rift valley formed as the two continents were just beginning to split apart. At that time, the area was located far to the south of its present position, well inside the Antarctic Circle of the day. However, the biota indicates that the climatic conditions were much milder than found today at similar latitudes. Mild though the conditions may have been, the animals and plants that lived there would have had to put up with prolonged periods of continuous darkness each year. How they adapted to these conditions which are not found in any part of the natural living world today is one of the major research objectives of the Dinosaurs of Darkness project.

The initial plan for the Dinosaurs of Darkness expedition in the 1990/1991 field season called for a two phase operation. In November, 1990, a professional miner from the Western Mining Corporation was to excavate an underground chamber (the "West Chamber", see p. 8) at the Slippery Rock site in Dinosaur Cove where work the previous summer suggested that fossils might be found. During that period also, the 21st Construction Squadron of the Australian Army was to build a concrete pillar close by at the same site. The purpose of this concrete pillar was to support the roof of the tunnels near their entrances in order that a rock pillar left behind to support the roof could be collected (the "First Pillar", see p. 8). Around the base of the rock pillar, fossils had been found on all sides including the partial skeleton that is the holotype of the hypsilophodontid dinosaur Leaellynasaura amicagraphica. At this time it is the most promising area in southeastern Australia for the discovery of additional articulated dinosaur remains.

During the January-March 1991 period, the plan was in three parts. First, to excavate the floor of the chamber exposed by the professional miner from Western Mining and collect the fossils preserved. Second to excavate the rock pillar next to the concrete pillar constructed by the Australian Army. Third, to excavate fossils at Dinosaur Cove East (see p. 9), the original discovery site in Dinosaur Cove and about 50 metres northwest of

the Slippery Rock site.

A fortnight before the work was to begin at Dinosaur Cove, the Australian Army decided that they could not participate. No explicit reason was given for their withdrawal although funding for the project had never been assured. The work with Western Mining, however, went ahead.

The weather and sea conditions during November were vicious, seriously impeding the work. On one occasion, the sea was running so high that a 20 tonne boulder was rolled over and slid along the shore platform where the work was to be carried out. When those sorts of conditions prevailed, no one was on site. Fortunately, none of the equipment was damaged despite such high seas.

By the end of the month, with the aid of the professional miner from Western Mining, two-thirds of the planned West Chamber at the Slippery Rock site was excavated. The excavation was carried out by a cycle of drilling in rock well above the fossil layer, setting explosives in the holes thus excavated, blasting, mucking out the debris and then repeating the processes over again. In this manner, air space was earned above the fossiliferous layer so that subsequently, it would be possible to excavate downward to it by the more gentle means used in a conventional fossil site above ground.

As the professional miner from Western Mining could not remain any longer than he did, it was decided that what had by then been excavated would in the January-March, 1991, period be assessed as to the extent and position of the fossil layer within the chamber and further plans for excavation would be made on the basis of those results. In the end, this saved much work for only along the southern margin of the chamber was much fossiliferous rock subsequently discovered.

The only serious injury for the entire dig occurred in November when one of the staff members, Mr. Graham King, broke his leg after a fall of only 70 centimetres when climbing on the cliffs. Fortunately, it was a simple fracture and he was out of the cast in little over one month.

With the New Year, work began on the first and third phases of the plan for 1991. Lowering the floor of the chamber excavated by Western Mining in November required all of January. Jack hammers were used to break up the rock and a scraper driven by a airpowered winch motor was then employed to drag the rock out of the chamber and tunnels.

Once the scraper could no longer be used because the winch motor failed so completely as to be beyond repair during the field season, attention was turned to construction of the concrete

pillar that the Army was to have built the previous November. Initially, it was planned to carry on both the completion of the West Chamber excavation and the construction of the concrete pillar simultaneously. However, construction of the concrete pillar was such a labour intensive procedure that all personnel previously on the chamber excavation project were added to those initially building the concrete pillar. With almost the entire crew devoted to construction of the concrete pillar, more than a month was required to complete it, the final pouring taking place at 11:52 p.m. on the night of 2 March 1991.

Pouring of the concrete was a arduous, labour-intensive procedure. Owing to the problems of access to the Slippery Rock site at Dinosaur Cove, it was necessary to handle each hessian [=burlap] bag of sand and screenings nine times between when it was shoveled into a sack and when it was finally poured. A small, electrically powered concrete mixer was taken underground and the concrete mixed close to where it was poured. To reach the mixing site, after initial bagging, the sand, screenings, and cement had to be loaded on to a trailer, taken to a point about 80 metres from the top of a flying fox, transported to the flying fox by a minerature tractor, loaded onto the flying fox, sent down the 305 metre long flying fox cable, unloaded on the shore platform and carried into the tunnels of the Slippery Rock site. There it was stacked underground in the cramped space available until called for by the crew operating the cement mixer. Initially, the cement could be poured directly from the mixer into the form work. However, for the last one-third of the wall just beneath the roof, a further step was necessary, to pour the wet concrete into a bucket which was then lifted upwards by hand and poured into the form work and packed against the roof it is ultimately to support. In this manner, approximately 50 tonnes of concrete were poured.

With completion of the concrete pillar, there was only three weeks remaining in the field season so the decision was then taken not to excavate in 1991 the rock pillar (the First Pillar) alongside the newly poured concrete one. As plans currently stand, the collection of fossils from that rock pillar will be a principal objective of the next excavation at Dinosaur Cove.

For the balance of the time remaining, the efforts at the Slippery Rock site were devoted to completing excavation of the floor of the West Chamber started by Western Mining. Although the "skeleton rock", the rock type characteristic of where the two partial dinosaur skeletons previously encountered at the Slippery Rock site, was found in the chamber, it was disappointly thin and discontinuous in its distribution. Along the southern margin of the chamber the skeleton rock was thick enough to warrant further excavation in that direction in 1993. As was previously the case, fossils in the skeleton rock were few and far between but those found were often exquisitely preserved. Unfortunately, in 1991 no

paritial skeletons turned up.

Concurrently with the work at the Slippery Rock site, work was going on at a smaller scale at the Dinosaur Cove East site about 50 metres to the northwest. There in January, two detonations of explosives had removed the overburden above about six square metres of fossiliferous rock contiguous with that which produced the first dinosaur bones at Dinosaur Cove.

The primary motivation for this work at Dinosaur Cove East was that based on femora, there are three different hypsilophodontid dinosaurs at Dinosaur Cove. However, only two have been named thus far because only two types of teeth have been recognised. Dinosaur Cove East has all three femoral types and the thought is that with enough work, the third hypsilophodontid dental type might be found, providing the basis for the formal recognition of this additional hypsilophodontid in the assemblage from Dinosaur Cove.

No such new hypsilophodontid teeth were recognised at Dinosaur Cove during the season. The results, however, were far from unsatisfactory. A variety of small theropods, carnivorous dinosaurs, were found. It was fortunate that near the close of the season, Dr. Philip J. Currie of the Royal Tyrrell Museum of Palaeontology, not only had the opportunity to visit Dinosaur Cove and participate in the work there, but was able to examine a number of specimens collected earlier in the year. An expert on small theropods, he made a preliminary assessment of the material and recognised at a minimum, two different families of these dinosaurs and perhaps as many as four among the small sample of isolated bones recently discovered and prepared.

Because of this tantalising outcome at Dinosaur Cove East, cores were taken in an attempt to determine the shape and extent of the remaining fossiliferous rock body. On this basis, towards the end of the expedition overburden was removed over a ten square metre area of shore platform to a depth of 1.2 metres on average utilising explosives. Exploitation of the now accessible fossiliferous rock immediately below the area excavated will be a priority programme during the next expedition to Dinosaur Cove.

Explosives were also used to expose fossiliferous rock at Dinosaur Cove West, a site last worked in 1985. At that time, all overburden was removed by means of plugs-and-feathers, a system of wedges which is quite effective at splitting rock but which required an undue amount of labour in the circumstances at that site. Abandoned in 1985 because of the great effort required to continue there and the low returns in terms of the quality and quantity of fossil specimens that such work yielded, with the availability of explosives, it is thought that further excavations which are now feasible will likely yield a justifiable return in

1993.

Colleagues whose work is contributing directly to the reconstruction of the biotic community that existed in southeastern Australia during the early Cretaceous made significant progress in their work during the past year.

Lesley Kool and Michael Cleeland, both of Monash University, prospected and collected a number of fossil vertebrates in the early Cretaceous Strzelecki Group to the southeast of Melbourne. Their efforts during the past year have substantially augmented the collection of fossil vertebrates from this rock unit, particularly specimens of labyrinthodont amphibians, dozens of which are now known. The quantity and preservation of the labyrinthodont remains together with their position within the Strzelecki Group far from any possible source they might have been reworked from, establishes their age as by far the youngest specimens of this major amphibian group beyond reasonable doubt.

The dinosaur record from the Strzelecki Group was also enhanced. Besides several additional hypsilophodontid bones which will serve to refine the taxonomy of that group, ankylosaurs were added to the list of dinosaurs known from Victoria. Recorded from Queensland on the basis of two skeletons of Minmi, ankylosaurs were unknown in southeastern Australia until the discovery a bone fragment bearing the unique cross section of a rib of that group of dinosaurs. In addition, a partial femur collected earlier from the Strzelecki Group also appears to belong to these animals. Again, an expert on the group in question just happened to be in residence at the right time: Dr. Ralph Molnar of the Queensland Museum who described Minmi, was visiting Melbourne when the diagnostic rib was collected.

Because of these successes in the Strzelecki Group, one month will be devoted to test excavations in those rocks early in 1992 at a number of promising sites. The objective of this work will be to determine whether or not enough material can be recovered from them by systematic excavation to warrant that approach rather than solely relying on collecting specimens exposed at the surface through natural erosion, the only technique utilised there to date.

A pilot investigation of the early Cretaceous flora for the purpose of understanding the climatic conditions that then prevailed was made by Robert Spicer, Oxford University, and Judith Totman Parrish, University of Arizona. They were taken to fossil plant localities in both the Strzelecki and Otway Ranges by Jack Douglas, now retired from the Geological Survey of Victoria, who published the first monographs on the early Cretaceous flora of Victoria. Spicer and Parrish in their three weeks of fieldwork were able to detect substantial differences between the polar Cretaceous floras from the North Slope of Alaska where they have

spent several seasons, and those of Victoria, suggesting different adaptive strategies were employed to cope with the conditions imposed at high latitudes in the two hemispheres. Based on the results of their laboratory analysis of the specimens collected in the next six months, they plan to design a more extensive field programme to refine the preliminary conclusions this brief visit will warrant.

Andrew Constantine, Monash University, compared and contrasted in detail the sedimentary regimes of the various fossil vertebrate sites in the Strzelecki and Otway groups. Differences in the faunas between these two rock units may in part be owing to differences in the mode of cutting and filling of the channels that prevailed in the two areas. In addition the faunas in the two units are from different parts of their respective rift valleys, those from the Otway Group were buried in flood plain deposits, those from the Strzelecki Group, in alluvial fans.

In the months to come, the rock units he has recognised in outcrop will be dated and palaeoecologically evaluated by Barbara Wagstaff and Jennifer McEwan-Mason, both of Monash University, using palynological techniques, a continuation of their long term effort to provide age control on the early Cretaceous fossil vertebrate sites of Victoria.

The following people participated in the Dinosaurs of Darkness expedition.

Carl Adams	David Hird	Helen Poole
Andrew Anastasis	Dawn Hird	Ian Poole
Rob Anderson	Graeme Hird	Rosalinde Poole
Charis Atlas	Robert Hodge	Allison Ramsden
Kevin Aulenback	William Hopkins	Patricia Vickers-Rich
Darren Bellingham	Gerry Hubregtse	Thomas Rich
Alaistair Blaikie	Roger Jaensch	Judith Rutherford
Ray Blandford	Ian Jesser	Pauline Schokman
Michael Cleeland	Julia Kayser	Herm Siebert
Peggy Cole	Ben Kefford	Steven Siebert
Michelle Colwell	Graham King	Gordon Spark
Andrew Constantine	Jennifer King	Robert Spicer
Ian Cook	John King	Frank Steuart
Louisa Cook	Amanda Kool	Ian Stewart
Sally Cowan	Lesley Kool	Volker Stix
Philip Currie	Andrew Kos	Darren Tanke
Jane Danis	David MacMahon	Nicholas van Klavern
Donald Davidson	Lois McMillan	Ronald Vanderwal
James Dunaway	Donald Manning	Peter Vunovich
Louise Dunaway	Helen Mitchell	April Whitelaw
Allison Gentry	Richard O'Shields	Thomas Whitelaw
Ralph Granner	Judith Parrish	Helen Wilson
Lucinda Hann	Barry Poole	John Wilson
John Herman	David Poole	Phares Woods

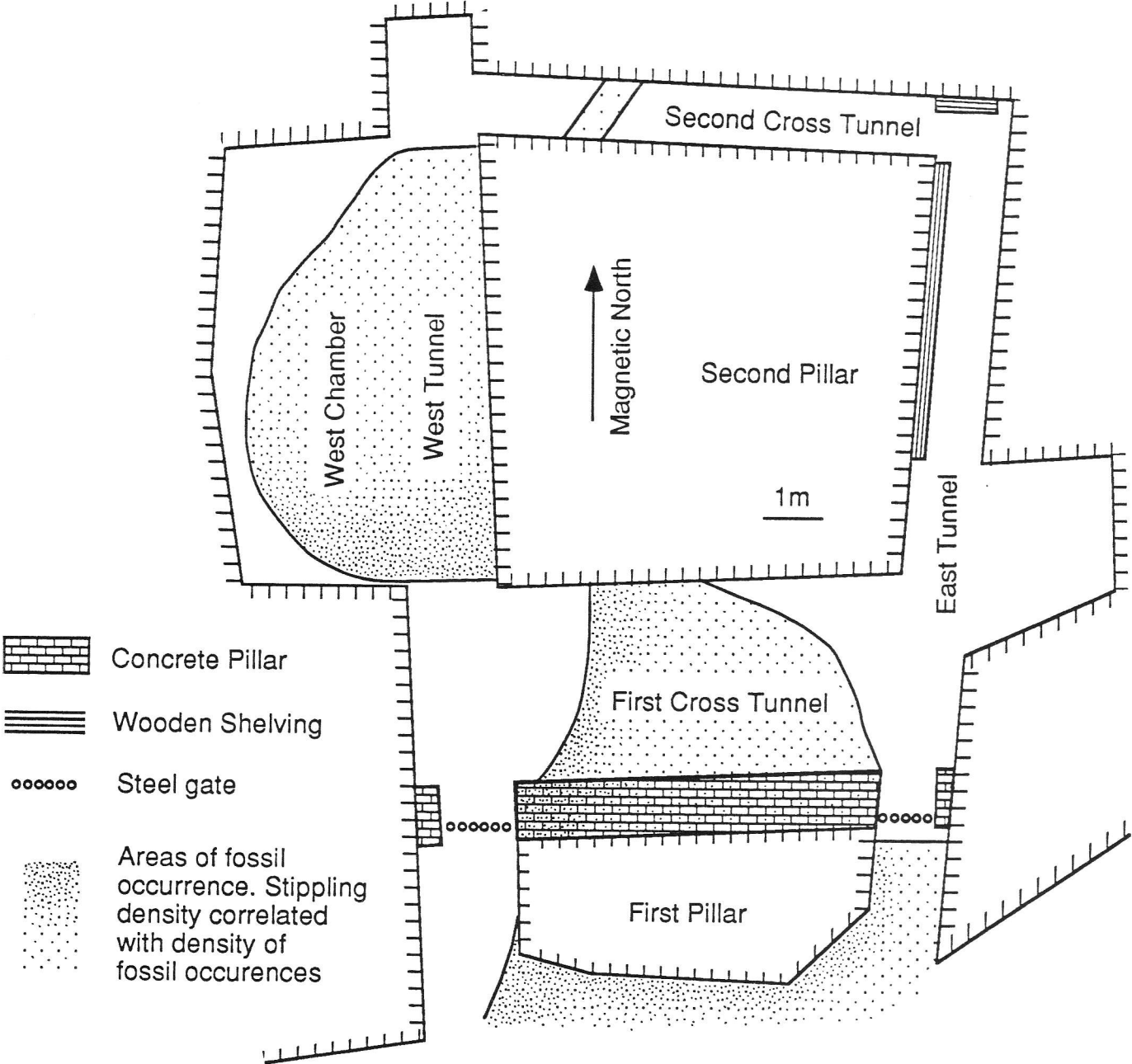
There were a number of people whom, although not volunteers on site, contributed substantially to the success of the work.

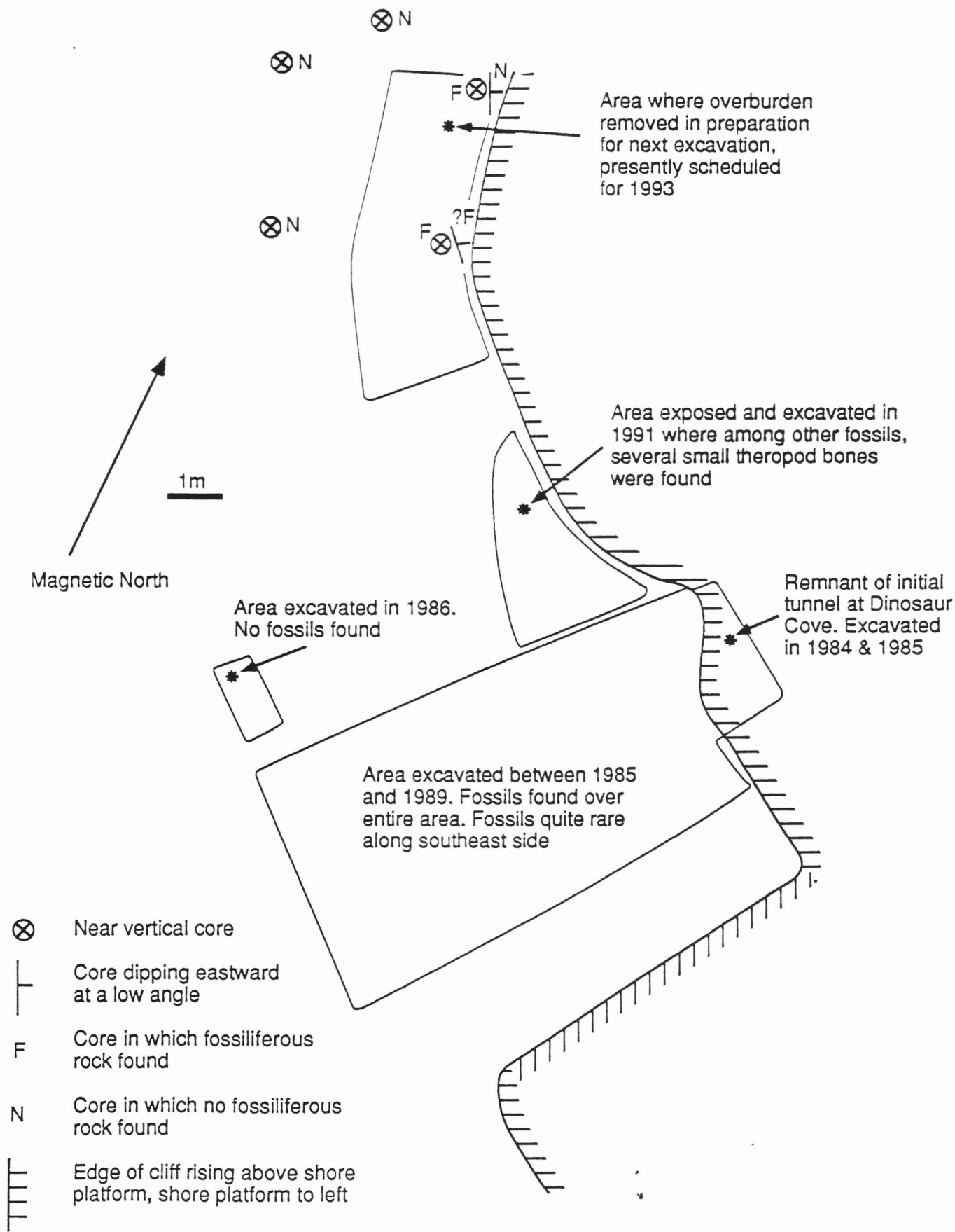
John Angel	Spencer Herd	Rebecca Norton
Arja Byrne	Warrick Herman	Patrick O'Hanlon
Debbie Byrne	Robert Jones	Patrick O'Neill
Rodney Brain	John Landy	Max Parker
Ronald Clarkson	Harold Lepp	Illio Perin
David Denney	Ian Lilley	Glenn Reynolds
Gregory Denney	William Loads	Philip Ryan
Winsome Denney	Jack Mackenzie	David Sheffield
Mick Foley	Michael Marmach	Robert Tranter
Rick Gore	Neil Melville	Chris Wilkinson
Arnis Heislars	Jim Milne	Joy Wilkinson
Drew Henry	Sandor Mokos	Noel Watkins
	Les Molnar	Eric West

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Museum of Victoria
Melbourne
Victoria
Australia

10 May 1991





DINOSAUR'S IMPRINT OF A COLD GONDWANA

Wrought by roughage, tonnes of monosyllabic grunts,
In a frigid latitude of winter lushness,
Reptilia swoon under dimmed light from the moon,
By chance and chance alone immortalised in stone.

Death before decay; time fails in this stream channel.
You who are all hen-sized, lain waste of littered bones.
Only to die in a scurry; these green leaves cleft -
Such was the maturity of lives being reft.

You now remain but phantoms of necessity,
Brought about by unclear rocks entrenched underfoot.
Astonishment not disguised in human faces,
But let loose by the mere fact of your existence.

Stretch you horrid beast; stretch through our imaginings,
And wrench our seeking, searching brains from eons past.
This benign modesty you hide can't be mistook -
T'is human curiosity that drives our will.

Finding irony in impressions made by death,
And find we give the gift of immortality.
Or have we - the tomb thieves - uncovered unawares,
The mystery that reveals our own preclusion.

Andre A. Coffa, 1991, volunteer at DC