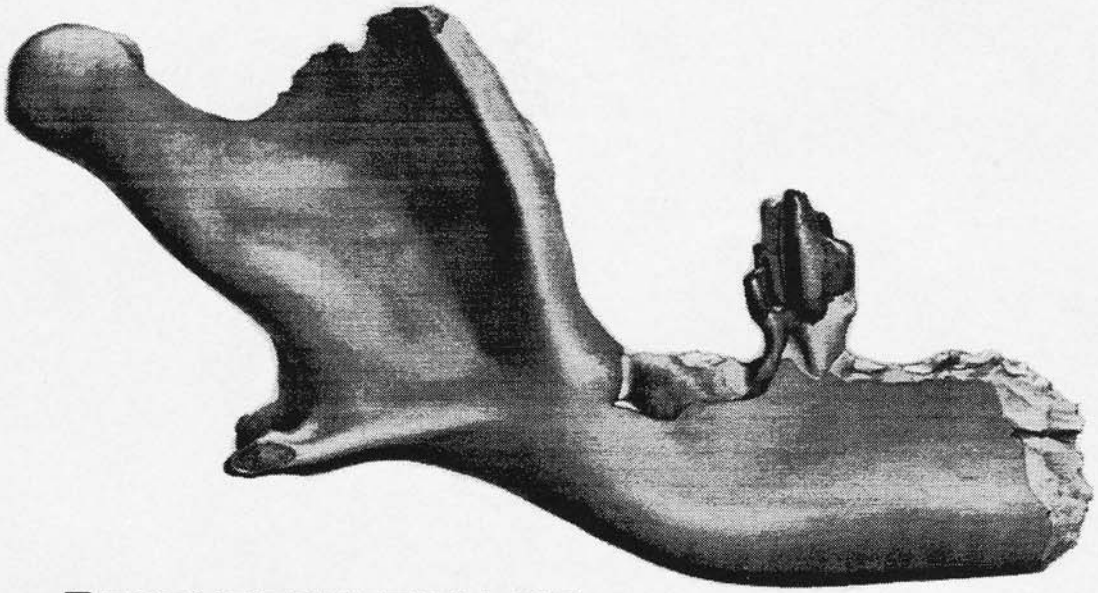
DINOSAUR DREAMING

INVERLOCH • VICTORIA • AUSTRALIA



RECONSTRUCTION OF
EUPANTOTHERE JAW
"TEINOLOPHOS TRUSLERI"

[ART: PETER TRUSLER]

FLAT ROCKS SITE REPORT 1999

CONTRIBUTORS:

Lesley Kool - field report

Nick van Klaveren - excavation report

Doris Seegets-Villiers - taphonomic report

Tom Rich - research progress report

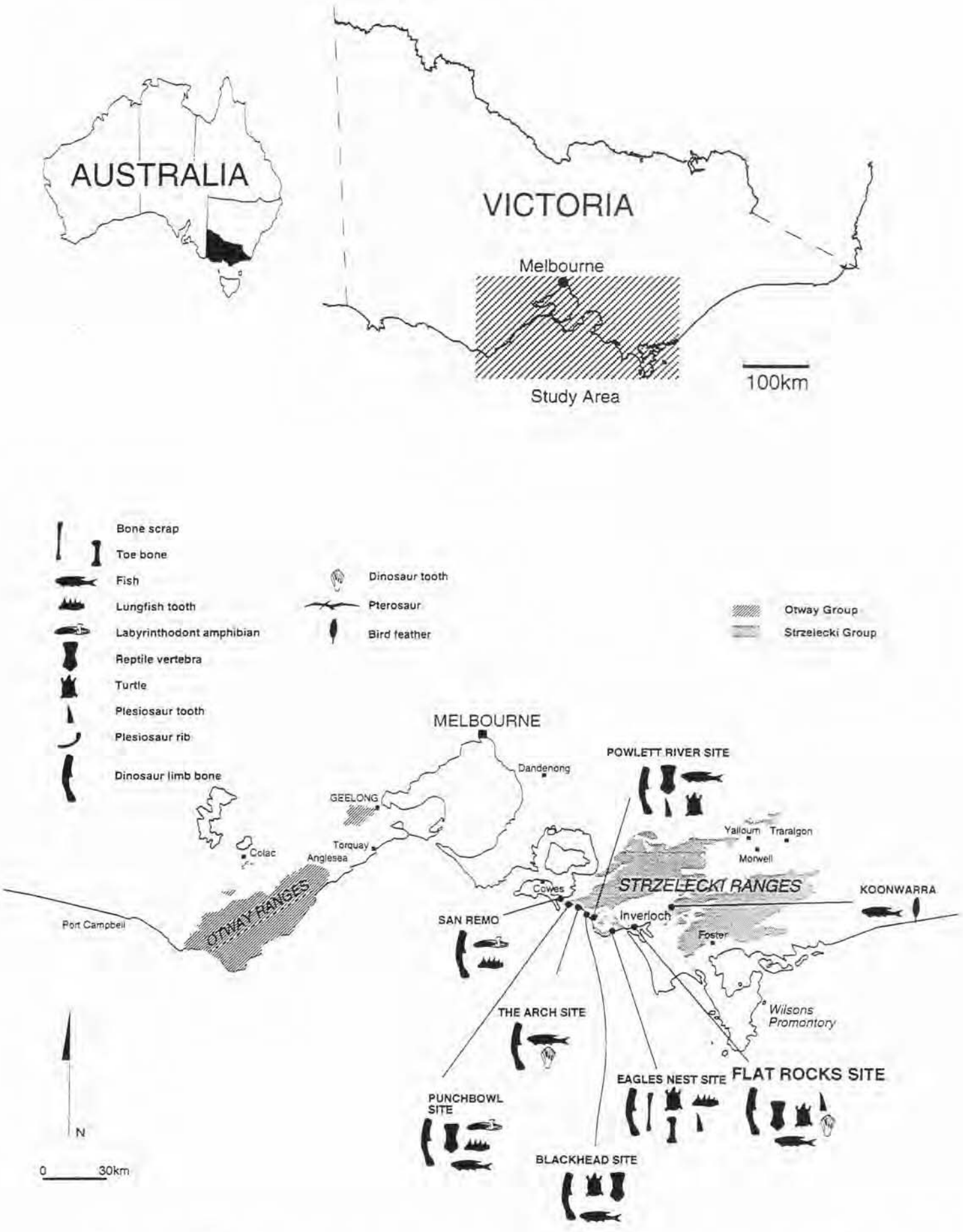
DINOSAUR DREAMING 1999
ANNUAL REPORT

Field Report by Lesley Kool:

Overall, the 1999 Dinosaur Dreaming field season was an unqualified success. After the frustrations experienced in the 1998 field season, this year's excavations developed very smoothly. The modified construction, introduced in 1998, took less than a week to install, compared to more than three weeks the previous field season. Once installed, it prevented at least 75% of the sand re-entering the excavations during high tides, saving at least two hours of digging wet sand each day. Doris Seegets-Villiers continued collecting data for her research into the taphonomy of the site. She was greatly assisted by a laser level system, designed by Nick van Klaveren which, despite a few teething problems, resulted in speeding up the data collection process. Doris was also able to collect valuable data on a number of fossil bones found *in situ* which will eventually help her to build a three-dimensional computer model of the site.

The Flat Rocks site was discovered in 1991 as part of a prospecting program whereby the Strzelecki coastal shore-platform, from San Remo to Inverloch, was systematically searched at low tide, looking for exposed bones. The prospecting programme began in 1988 and since that time many exposed bones have been collected. Large areas of the shore-platform are often covered by sand, but as luck would have it, on the day the area west of Inverloch was prospected, the sand had been swept from the rocks by strong winds and high seas. Consequently, more than 20 small bones were discovered in an exposed fossil layer, approximately four metres wide, stretching up the beach and into the cliff. This represented the largest concentration of fossil bones found anywhere along the Victorian coastline, and after a preliminary excavation the following year, extensive excavations began in 1994.

When first discovered, the fossil layer was exposed level with the surrounding rocky shore platform. Excavation of this fossil layer during the first four field trips resulted in a wedge-shaped hole reaching a depth of up to 60 cms below the level of the shore platform. Deepening the hole brought logistical problems with the amount of sand that was dumped during each high tide. By the end of the 1997 field season it was taking up to two hours to remove the sand in the hole and expose the fossil layer at the base. It was this problem that prompted Nick van Klaveren, the site excavation manager, to design a unique system, which we hoped, would prevent much of the sand filling the hole. During the 1998 field season the new system was put to the test with mixed results. What we had hoped would take a matter of days to set up, ended up taking more than three valuable weeks. However, much was learned during this frustrating period and modifications to the original plans were put into operation for the 1999 excavations.



Locality map of Southern Coast of Victoria showing Strzelecki Early Cretaceous sites

Of course the main objective for the fieldwork is to collect fossil bones and this year proved our most successful to date. Not only were 630 fossil bones and teeth catalogued in the field, but included in that number were three tiny mammal jaws. When the first mammal jaw was discovered during the 1997 field season, we hoped that it would not prove to be the only evidence of this exciting group of animals. Fortunately, this was not the case as three more jaws were found in 1998 during a re-examination of unprepared specimens collected during earlier field seasons. Dr. Tom Rich compared the three new jaws with the original jaw of *Ausktribosphenos nyktos,* and concluded that at least one of them represented a new group of mammals called eupantotheres. This group is thought to be ancestral to the modern mammals.They have previously been found in Jurassic and/or Cretaceous rocks on all other continents except Antarctica. But they are only associated with placental mammals at one other place, the Early Cretaceous site at Khovboor, Mongolia. A second paper was published in Records of the Queen Victoria Museum Launceston in January 1999. Entitled *Early Cretaceous Mammals from Flat Rocks, Victoria, Australia* by Thomas H. Rich *et al,* it describes the first four mammal jaws discovered and officially names the eupantothere jaw as *Teinolophos trusleri,* honouring the artist Peter Trusler for his accurate portrayals of many of the fossil animals discovered in the Early Cretaceous rocks of Victoria.

The discovery of three more mammal jaws during the 1999 field season was gratifying, as a concerted effort has been made to improve our chances of recognising these tiny specimens. The training program for the 1999 new volunteers was expanded to include an evening training session, held at Monash University, as well as a one-day field trip to the Flat Rocks site before the field season commenced. Each volunteer was given a number of small bone fragments in matrix, circled with a red texta. They were asked to study each bone fragment carefully, noting bone texture, colour and shape. Once they felt confident they knew what the fossil bone looked like, they were then given a number of unmarked bone fragments in matrix, which they had to identify. This process is not as easy as it sounds, as the rocky matrix from the Flat Rocks site contains many other inclusions such as fossilised wood and mud clasts that can easily be mistaken for bone. To reinforce this training program, the new volunteers were expected to identify more unmarked bone fragments before they were allowed to start breaking rock during the field season.

Two of the three new mammal jaws found this season have been prepared. One of these is clearly in the same genus, if not species, as the first mammal discovered at Flat Rocks. The second may be, but this is more doubtful. However, the fact that seven lower jaws have been recognised in only two years suggests that these tiny animals were more abundant than we ever imagined, and it should only be a matter of time before an upper jaw or skull of this enigmatic group is discovered.

A number of other bones recovered during the 1999 field season have also been prepared. A large limb was exposed in cross-section which, once prepared, has been identified as the largest hypsilophodontid femur yet recovered from the Flat Rocks site. It measures 21cms long and is one of seven hypsilophodontid femora prepared so far from the latest dig. A number of isolated teeth were also recovered during the 1999 field season. So far 11 hypsilophodontid teeth and 4 theropod teeth

have been prepared, as well as a number of teeth which have yet to be identified. One tooth is of particular interest as, although it is only a partial tooth, it looks very much like a small mammalian incisor tooth. If so, it would be the first such incisor from the Early Cretaceous of Victoria, but as yet it is unidentified. See Dr. Tom Rich's report for more details.

A second theropod dinosaur claw or ungual also turned up recently. Although we now have more than 40 isolated theropod teeth, the theropod bones are very rare in the fossil assemblage. The first theropod claw was found in 1996, but was so badly smashed that it was difficult to assign it to a dinosaur group. Finally, Dr. Ralph Molnar tentatively identified it belonging to the ornithomimid or "bird mimic" group of dinosaurs. The second claw, although smaller than the first, is much better preserved and casts of it will be sent to other institutions for comparison.

The Dinosaur Dreaming Project encompasses not only the excavation work at the Flat Rocks site, but all aspects of research into the Early Cretaceous of Victoria. So, when we were contacted towards the end of 1998 by John Lambrecht of Tara Valley Farm regarding some possible dinosaur footprints, we were naturally very interested. John, who is a keen naturalist, noticed some unusual depressions in a large boulder on his farm in South Gippsland. Tara Valley farm is situated within the Strzelecki Group, the same group that includes the Flat Rocks site and is therefore approximately the same age. We visited John and made a silicon rubber mould of the depressions, which looked suspiciously like dinosaur footprints. The most obvious imprint was approximately 23 cms long and appeared to represent three splayed toes, similar to footprints made by a medium sized theropod dinosaur. We sent casts of the depressions to Dr. Tony Thulborn, a dinosaur trackway expert, and eagerly awaited his verification. Unfortunately Tony felt that the prints did not possess the definitive features of dinosaur footprints, and therefore, he could not verify their authenticity. We were all very disappointed, especially John, who thought he might have the first dinosaur footprints from the Strzelecki Group. Previously, dinosaur footprints have been found at Knowledge Creek and Skenes Creek, both sites in the Otway Group, which is also Early Cretaceous, but approximately ten million years younger.

Although we have not been able to verify the impressions as dinosaur footprints, it has given us another area in the Strzelecki Group to continue our search, with the help of enthusiastic people like John Lambrecht.

Excavation Report by Nicholas van Klaveren

The Flat Rocks fossil locality was excavated for a period of six weeks, from the beginning of February to mid March 1999. All material was collected under permit 1000024 of the Department of Natural Resources and Environment, Victoria. By the end of the 1997 field season all easily removable fossil matrix had been excavated and in the last two field seasons a construction has been built to help exclude sand from the working area.

Excavation Methods:

The excavation method this year continued with the use of large iron wedges and sledgehammers to remove the bulk of the fossil layer from the targeted area. Exposed specimens were removed with a diamond saw blade equipped Stihl TS460 Cutquik. The technique of removal used last year was continued with wedges driven into the semi-continuous coal layer at the base of the Middle Sandstone Unit, then a second level was extracted with the wedges driven into the Lower Sandstone Unit.

The unfossiliferous, overlying sandstone overburden was removed chiefly with the two Cobra petrol driven jackhammers and with the assistance, at the start of the dig, of a compressed air driven Tex 22 jackhammer, which proved to be considerably more powerful than the former. Once the majority of the overburden was removed the method was then switched to sledge hammers and wedges so as to provide greater control to protect the underlying fossil layer from damage.

Technical Innovations and Working Solutions:

The Flat Rocks fossil locality, due to its location at the bottom of a cliff in the inter- tidal zone facing Bass Strait, presents a number of difficulties with regard to the difference in elevation and large waves at high tide.

Last year a construction consisting of packing material, plastic tarpaulins, steel mesh, rock bolts and iron beams was built to help exclude sand and thereby increase access time to the fossiliferous units.

A number of innovations were tried this year to improve the system introduced last year.

Drums.

This year one hundred and eighty drums of twenty to twenty five litre volume capacity replaced the plastic PET bottles in bags and were overall far more successful. The drawback to the use of drums is that some filled with water between tides and became quite heavy. Another problem was just getting the shear number of them down and up the cliff at the start and end of the dig and the storage between digs.

To get the drums down this year a flying fox, consisting of forty metres of thin nylon rope, was used to send them down individually by their handles. Reducing the tension in the line as they descended controlled the rate of descent. To get them back up at the end of the season a derrick was constructed out of a four metre wooden beam hinged on a base plate and stabilised by rope guys. This contraption successfully lifted two thirds of the drums in groups of eight until the cheap hinge twisted due to metal fatigue.

Pumps:

In 1998 only two pumps were used, a petrol driven impeller pump and a small electric vortex sump pump. Before the 1999 field season commenced, a larger electric sump pump was purchased and a second petrol driven pump was procured. Both the electric pumps had problems with their float switches but the problem was rectified by having them converted to manual control by bypassing the wiring to the float switches. They were then operated by turning them on and off at the switch. The larger of the two electric pumps procured last year had a pumping rate as good as the petrol pumps, without the problems of priming and clogged impellers, so was used almost exclusively by the end of this season. The petrol pumps this year were as hard

to prime as ever despite the addition of foot valves (which were jammed open by the smallest piece of seaweed) and by the end of the season were little used.

Survey Equipment:

Improvements in the method of surveying for taphonomic, geologic and engineering data were trialled with the construction of a laser level. The laser level was built from a photographic tripod and pen laser. However, it was found that the laser was weak in full sunlight and the tripod was difficult to level and keep leveled. Wind and accidental knocking also easily upset it. The survey staff built to be used with the laser was however quite often used in conjunction with a builders line level (the original method), but will need its scale (a dressmakers tape) replaced due to fading by the sun and salt water.

The Construction:

The construction worked well again this year and was operating successfully within a week of the start of the dig. This year the risk of not grouting the rock anchors was taken. They held successfully throughout the field season and all were unscrewed and removed at the end. A number of plastic drums escaped during the first use of the construction. This was found to be caused by a weakness in the pattern of mesh layout. This problem was rectified by adding two further sheets and replacing two damaged ones. The use of lighter beams at the edges to replace the chains and pins and the use of heavier mesh prevented most of the damage that occurred to the lighter mesh last year. The mesh will be usable again next year, although in a somewhat rustier condition.

Overall, the construction worked well but allowed a little more sand into the excavation. This was probably due to the raised height (0.40 m) subjecting it to more force from the waves, the result of which was that the sandbags were more prone to being shifted and the tarpaulins damaged. One benefit was that far less sand was deposited upon the top which, was a major time consuming factor last year in excavating the site.

Excavated areas:

Area 1

The primary area of excavation this year was at and around 196 mE and 101 mN (see progress map). The rock excavated was that left behind and exposed from last year's dig and approximately one third of that which was exposed this year. The total volume of fossiliferous rock excavated was similar to last year indicating the size of the area exposed, and hence the size of the construction is about a third larger than needed.

However, at its present size the construction enables a bit more "elbow room" to swing sledge hammers and a better perspective of the geological layering. Fossilized bones from area 1 were found to be significantly more concentrated in patches with comparatively barren areas between.

The two fossil layers (Upper and Middle Clay Gall Conglomerates) were once again found to be thinning out, especially the upper to the west. The extra thick part of

the Middle Clay Gall Conglomerate at the original sump area (193 mE, 100 mN) still remains to be excavated next year. The overlying units are thought to be quite rich, as when pieces loosened during overburden removal revealed cranial material (probably hypsilophodontid).

Area 2

A new sump area was excavated in the northeast corner of last year's work area. A square hole approximately one metre by one metre was jackhammered into the Lower Sandstone Unit with only a few turtle shell fragments found. This area will become the permanent sump area during future digs and will require no further deepening.

Y2K Excavation Plans

Next year's dig will concentrate on the removal of the remaining fossil matrix exposed during this year's dig as well as the thin veneer of overburden to the west of this year's area.

Some minor improvements are envisaged for next year's dig, including:

- A purpose built heavy canvas tarpaulin to replace the present collection of tattered plastic ones.
- A new, light weight generator to replace the less than portable five KVA one used this year.
- A large diameter pipe to more rapidly facilitate the movement of water from the southeast corner of next year's excavation area to the sump.

In the near future a series of cores will be drilled to investigate the subsurface limits of the fossiliferous horizon to the north of the excavation face. This should allow planning for future excavations into the next millennium.

Taphonomic Report by Doris Seegets-Villiers

The 1999 Dinosaur Dreaming field trip was the second one undertaken as part of a Ph.D. thesis at Monash University. The main aim of this project is to investigate the fossil site and its surroundings at a small scale mainly in terms of sedimentology and taphonomy.

For the sedimentology section, the deposits are described in terms of grain size, degree of rounding, composition, bed thickness and extent etc. Unusual features found within the sediment beds were recorded as well and will be worked on during the year. Measurements recording the extent of the individual layers were taken using the same method as last year. For those of you who just joined the "Friends of Dinosaur Dreaming" the following is a brief description of how it is done.

> All we need is a compass, a thin rope, spirit level, plumb bob, tape measure and a stick. It is not a highly technical way, but it provides us with enough information to create a 3D map of the excavation area.

All measurements are taken from a fixed orientation point and the horizon. This year we used split pins, whose positions were recorded at the beginning of the dig, as reference points. To measure the position of the boundary of a layer (or for bone orientation and the position of the bone) we would place the stick on the boundary and with the help of the thin rope, plumb bob, level and the tape measure we would measure the distance and depth of the given point from our fixed point. The compass gave us the derivation of that newly measured point from the fixed point.

Five layers of alternating conglomerate and sandstone have been identified at the site. Due to close observation and measuring, we could actually establish that the first conglomerate layer almost thinned out completely in a NW-SE direction and was only 1-2 cm thick, but on both sides became gradually thicker again. This trend is expected to persist and should be noticeable during later digs. The second conglomerate showed a similar, however less distinctive behaviour. This conglomerate does not only thin out over a distance of about 70 cm but also shows a middle section of 15-20 cm which is very sandy and hardly shows any larger particles, making it more a pebbly sand than a conglomerate. Furthermore, there was an area where the first and second conglomerate seemed to almost be fused together, only separated by a very thin layer of sandstone.

During the field work, six palynological samples were taken from the mudstone underneath the fossil bearing layers. Later, during two more trips to the site, a further 24 samples were collected. The later probes were taken around features interpreted as cryoturbations. These are permafrost structures that are associated with seasonal freezing and thawing of soils. They only occur within a certain temperature frame around the 0° Celsius mark. The purpose of investigating these samples is to determine if there are any changes in amount and diversity of pollen and spores in the samples, which might further support the theory of dinosaurs living in cold climates. So far six of the 30 samples have been investigated and a further 13 have been prepared, but not yet examined. All six already probed samples show a high amount of spores and pollen but low diversity. One of the samples has yielded a zone indicator (this is a grain that tells you the approximate age of the sediments). This shows that the deposits are Aptian in age, which is a time zone in the Early Cretaceous. These samples however, have not yet shown any significant differences in diversity.

A further attempt to get more information on the climate at the time was undertaken by taking a small sample of a fossilized tree trunk. A halt or slowing in growth can be established via the difference in thickness of summer and winter growth rings. A thin section revealed a clear distinction between lighter coloured, wider summer and darker but much thinner winter growth rings. The next step now will be getting a larger section of the trunk by coring and closely examining the differences between seasonal growth rings and at the same time trying to find out what kind of trees we actually find at the site.

This year we were able to obtain more orientation measurements on bones than last year. The following data was measured and recorded:

- The orientation with respect to North
- The dip angle
- The depth from a fixed point
- The distance thereof
- The layer it was found in
- The kind of bone (if that was possible to determine)
- Which side of the bone was up and which end - the proximal or distal end

This year we furthermore introduced a system that enabled us to get more, however quite rough measurements on bones not found *in situ* in the hole. Before work was resumed every morning chalk arrows, which pointed North were drawn onto the rock surface, moreover symbols for up (⊙) and down (⊗) were introduced as well. The measurements gained are not extremely precise, however they should not be more than 10° out, which means we still get a good general idea of the bearings of the bone. In this case, however, it was impossible to measure a dip and the position of the bone and sometimes it was also quite difficult to determine the layer from which the bone was excavated.

This year all the "shoulder bones" were kept. Shoulder bones are (not - as I initially thought during my first dig at Inverloch -) bones from the shoulder area of various animals, they merely are the bones that are usually not identifiable or too fragmented to be of any use and therefore might be "thrown over one's shoulder" (in our case thrown into a bucket and kept "just in case"). This was not only done out of sheer interest but to see as well what kind of bias was introduced into our record books by only collecting and cataloguing the bones that are of interest for us and not too fragmental to be identified.

The following numbers of bones were counted:

turtle fragments	C: 659	SST: 164	C/SST: 25
fish fragments	C: 323	SST: 124	C/SST: 17
Dinosaur fragments	C: 30	SST: 1	
Fish scales:	C: 6	SST: 6	
Dermal ossicles.(whole):	C: 8	SST: 3	
Dermal ossicles. (fragments):	C: 62	SST: 2	C/SST.1

C. = conglomerate
SST. = Sandstone
C/SST. = conglomerate/sandstone boundary

The count shows a clear bias towards turtles and fish. Although both are very abundant, few of them are diagnostic, as they are largely unidentifiable and broken. Therefore, they are not catalogued. So, we have to bear in mind, that there are many more turtles and fish fragments than actually occur in the catalogue.

Progress Report by Dr. Tom Rich:

Three more mammalian dentary fossils were recovered from the Flat Rocks locality in 1999. Each had only one or two teeth in them and the dentaries themselves were quite incomplete. They were significantly smaller and less complete than the first three mammal dentaries found. That such specimens are now being recovered is a testimony to the thoroughness with which the fossil-bearing rock is now being examined. The rock is now being broken down manually to the size of single sugar cubes. This is about a tenth the minimum size that was formerly the one where no further work was done on a rock.

One of these new mammals is clearly the middle lower molar of *Ausktribosphenos nyktos*, the possible placental mammal from Flat Rocks. It adds valuable information about the variation to be expected on that tooth, information that will help determine just what *A. nyktos* is.

The second new mammal has a premolar quite unlike *Ausktribosphenos nyktos*. Yet a damaged molar preserved on the same dentary suggests it is *A. nyktos*. How to interpret this specimen is uncertain. Possibly the premolar is a deciduous one of *A. nyktos* and the previously known ones are permanent ones or it could be the other way around. {Deciduous teeth are those that fall out; *i.e.* baby teeth.} Or it could be a mammal altogether different from *A. nyktos*.

The third new mammal is a jaw fragment with two teeth. It is such a difficult specimen to extract from the rock that Mr. Chuck Schaff from Harvard University is flying to Australia at the end of September to help Lesley Kool prepare it. We do not know what kind of mammal it is.

When *Dinosaur Dreaming* 1999 was underway, a lengthy description of *Ausktribosphenos nyktos* was published* together with a description of another mammal, *Teinolophos trusleri*. For more than 200 years, scientists have recognised only three groups of Australian mammals: monotremes, marsupials, and placentals. *T. trusleri* is the first group new to this continent in all that time. It is a member of the eupantotheres, an extinct group of mammals that died out about the time the dinosaurs did. The eupantotheres are thought to be the group ancestral to the placentals and marsupials.

In the same paper, the affinities of *A. nyktos* were considered in detail. It was concluded that <u>if</u> *A. nyktos* was a placental at all, it appears to be most closely related to hedgehogs, the Erinaceidae. If so, that is interesting because at 115 million years of age, *A. nyktos* is twice the age of the oldest known hedgehogs, which lived in the northern hemisphere. It appears that relatives of *A. nyktos* may have reached the northern hemisphere by riding aboard microcontinents that were peeling off the northern edge of Eastern Gondwana of which Australia was a part, and drifting north to southeast Asia. Some of those micro-continents today are places like western Burma. The trip may have taken 60 million years but there is enough time for it between the age of *A. nyktos* and when hedgehogs first appear in the northern hemisphere.

If this scenario proves to be the case, it represents a quite radical change in our view of the history of mammals on this continent. Ever since the time of Charles Darwin and more particularly, the co-discoverer of natural selection, Alfred Russel Wallace, biogeographers have been virtually unanimous in the view that placental mammals arose in the northern hemisphere and only subsequently reached the southern continents. This interpretation challenges that idea.

Until now, all the mammals known from Flat Rocks have been quite small which is typical of Mesozoic mammals generally. One of the few exceptions to this generality are the monotremes. At the two other sites in Australia where Mesozoic mammals are known, Lightning Ridge and Dinosaur Cove, only monotremes are known. This odd coincidence may be just that and the evidence for that being the case is a single tooth. The tooth appears to be a lower incisor of a mammal far larger than any known from Flat Rocks before. It is its size that suggests it may be a monotreme.

Although mammals certainly had the lion's share of attention, the study of the dinosaurs from Flat Rocks was not neglected. As it has been a decade since the last review had been published of the most abundant group of Victorian dinosaurs, the hypsilophodontids, another study was recently carried out**. What it showed was that many of the conclusions published in 1989 were no longer the most reasonable interpretation of the all still too scanty evidence. It still seems that Victoria had a more diverse assemblage of these dinosaurs than is typical elsewhere. But the boundaries between the various groups are drawn differently than they were ten years before.

One new dinosaur is named in this review: *Qantassaurus intrepidus*. The type specimen is from the Flat Rocks locality, the first dinosaur to be named from there. It was found by Mrs. Nicole Evered, a stalwart volunteer on every dig at the Flat Rocks site. What clearly sets it apart from other hypsilophodontids both in Australia and overseas are the jaw proportions. It is a short and deep jaw with only a dozen teeth instead of the 14 or more seen in other hypsilophodontids. These differences are quite marked and show up in three jaws, at least one of which was clearly diseased when the animal died.

Because the dig at Flat Rocks will continue indefinitely now that mammals are known to occur there, the known sample of hypsilophodontids from there can reasonably be expected to increase significantly in size. That may eventually provide the vital key to working out the relationships among the Victorian hypsilophodontids.

*Rich, T.H., Vickers-Rich, P., Constantine, A., Flannery, T.F., Kool, L. & van Klaveren, N. 1999. Early Cretaceous mammals from Flat Rocks, Victoria, Australia. *Records of the Queen Victoria Museum.* 106:1-35.

**Rich, T.H., Vickers-Rich, P. 1999. The hypsilophodontidae from southeastern Australia. In Tomida, Y., Rich, T.H. and Vickers-Rich, P.(eds.), Proceedings of the Second Gondwanan Dinosaur Symposium. *National Science Museum Monographs No. 15:* 167-180

DINOSAUR DREAMING 2000:

As mentioned in Nick's report the current plan for the next field season will be to continue the removal of fossiliferous matrix at the western end of the 1999 excavation where it appears the fossil layer is much closer to the surface of the shore platform. This means there should be far less overburden to remove and the set up at the beginning of the dig should take much less time.

Dinosaur Dreaming 2000 will commence two weeks earlier than in previous years. It was decided to begin the field season in mid-January, instead of the beginning of February, as in previous years. The dig will run for 6 weeks as usual, concluding at the end of February thereby allowing tertiary students the opportunity to attend the dig right to the end without missing the beginning of the university year.

With the recovery of seven mammal lower jaws, we now really need to find an upper jaw. To this end, the training program for the new volunteers will concentrate on the recognition of the tiny slivers of bone in the rock. What looks like a small brown smudge or dot with the naked eye, can take on a totally new dimension under a hand lens or microscope. That is what we need to convey to the "new chums". It is imperative that a potentially exciting find is not discarded, or even worse, not seen, through inexperience.

ACKNOWLEDGEMENTS:

Once again, without the volunteers who gave us their time and enthusiasm, there would have been no field season. The work was often laborious and hard, especially removing the last of the wet sand from the hole, but everyone gave one hundred per cent, which is what makes a good crew. With so many people from all walks of life and from different backgrounds, it is always amazing to see how the love of fossils acts as a common bond. To everyone who participated in the 1999 field season I would like to offer my deepest thanks and hope to see some of you back again next year.

DINOSAUR DREAMING 1998 FIELD CREW

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Terry Smith
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Nick van Klaveren
Mary Walters
Astrid Werner
John Wilkins
Corrie Williams

The 1999 field season also depended a great deal on the generous support from a number of institutions, companies and individuals. Once again we received financial support from The National Geographic Society and the Friends of Dinosaur Dreaming. We received logistical support in the form of tools and equipment from Cyclone Hardware in Wonthaggi and Ingersoll-Rand. Blundstone Pty.Ltd. kindly supplied 40 pairs of steel-capped boots for the crew. We would also like to thank Brian Martin and the other rangers from the Department of Natural Resources and Environment for their support.

Finally we received moral support from the local people of Inverloch and the surrounding district. This support is greatly appreciated by everyone involved in the Dinosaur Dreaming project and is vital to the continuation of the work at the Dinosaur Dreaming site.

Forthcoming Publications:

October 1999 - Wildlife of Gondwana. Vickers-Rich, P. and Rich, T.H. Indiana University Press.
This is a substantially revised 2nd edition of the lavishly illustrated history of life on the Gondwanan supercontinent, containing new photographs of dinosaur and mammalian material from Inverloch.

DINOSAUR DREAMING 1999 WAS PROUDLY SPONSORED BY:

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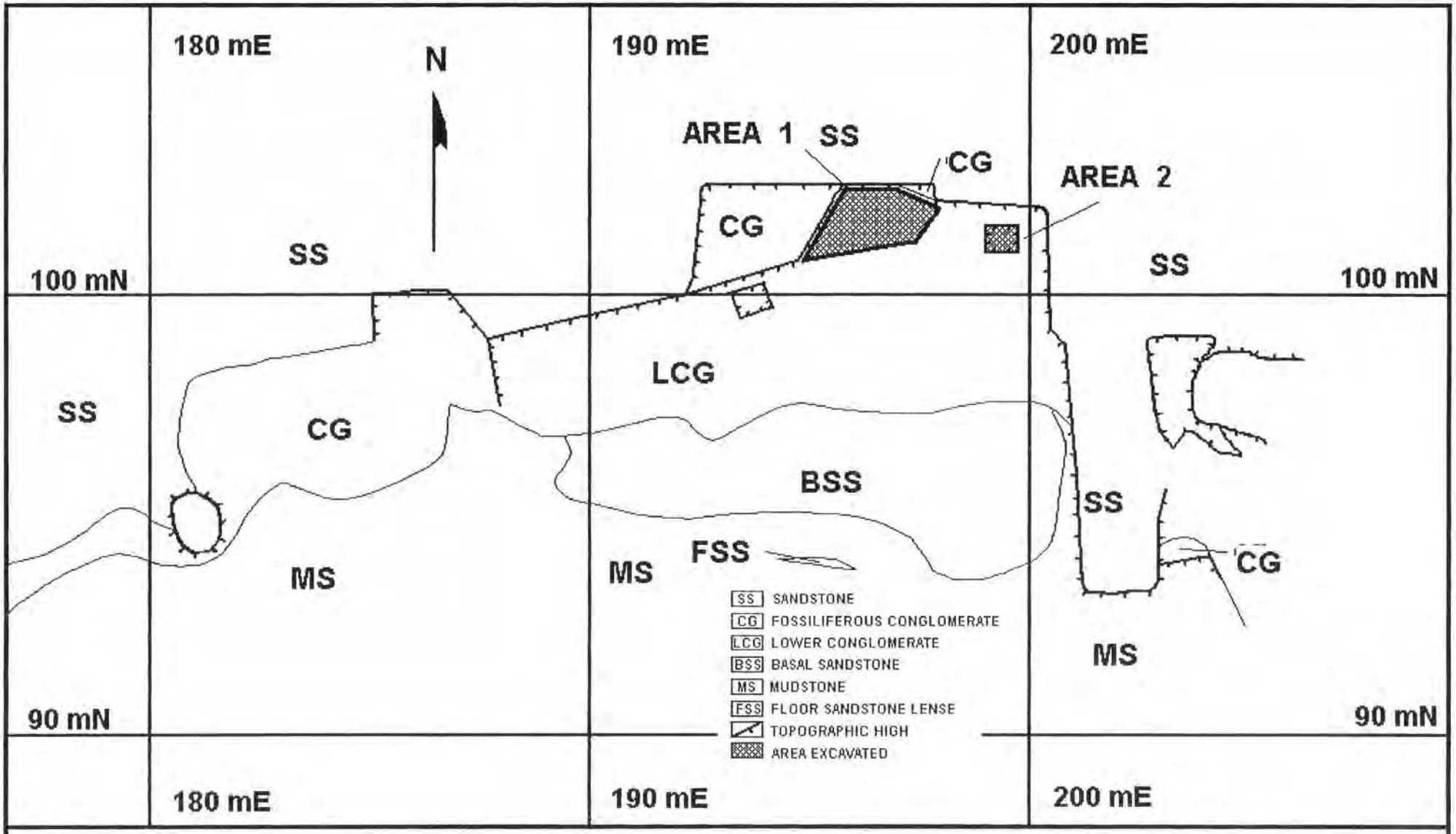


MAP : NICHOLAS VAN KLAVEREN

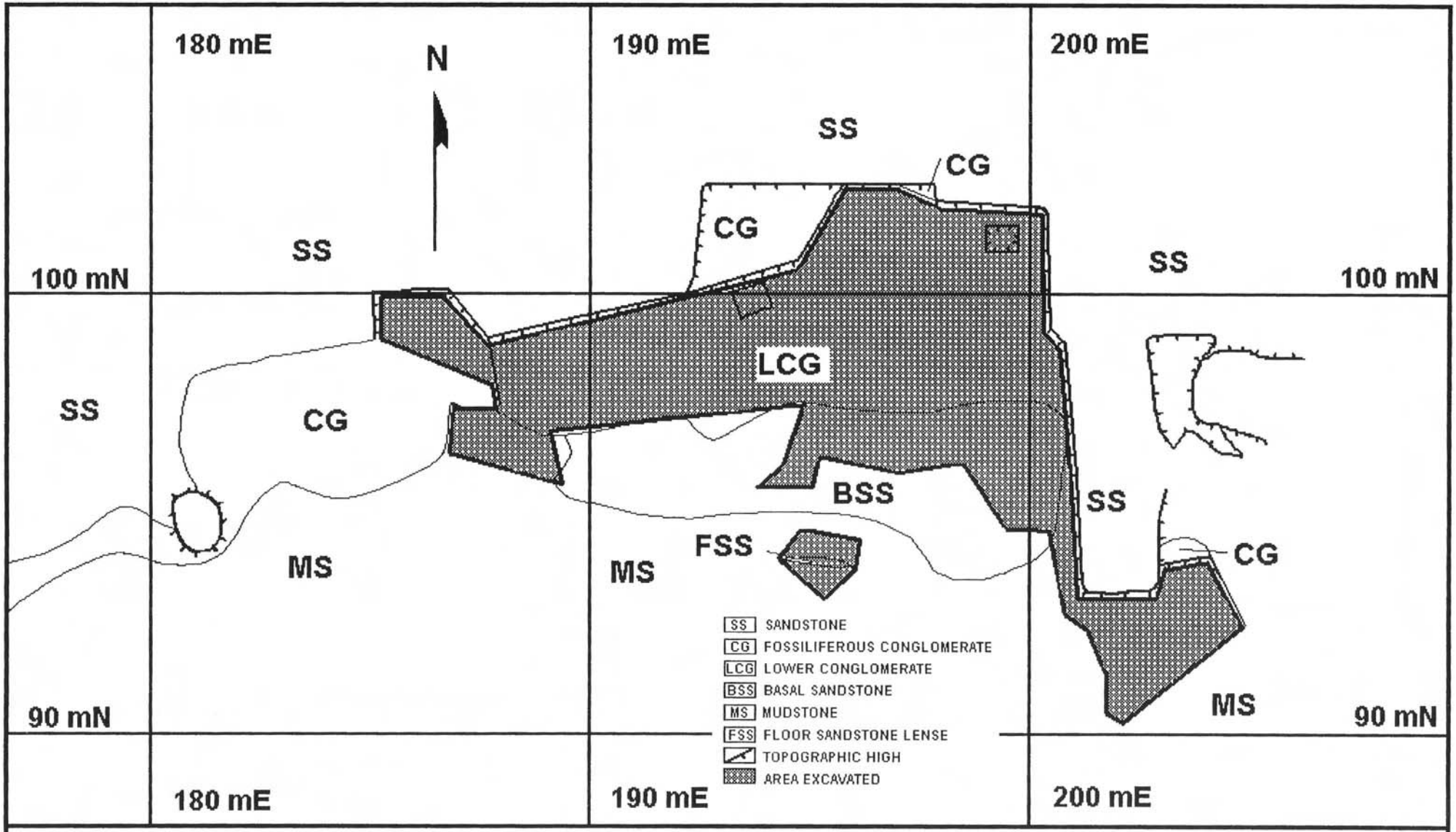
DRAWN : 18/3/1999

MAP 1

0 5

METRES

PROGRESSIVE EXCAVATION AREAS
MARCH 1999



MAP : NICHOLAS VAN KLAVEREN

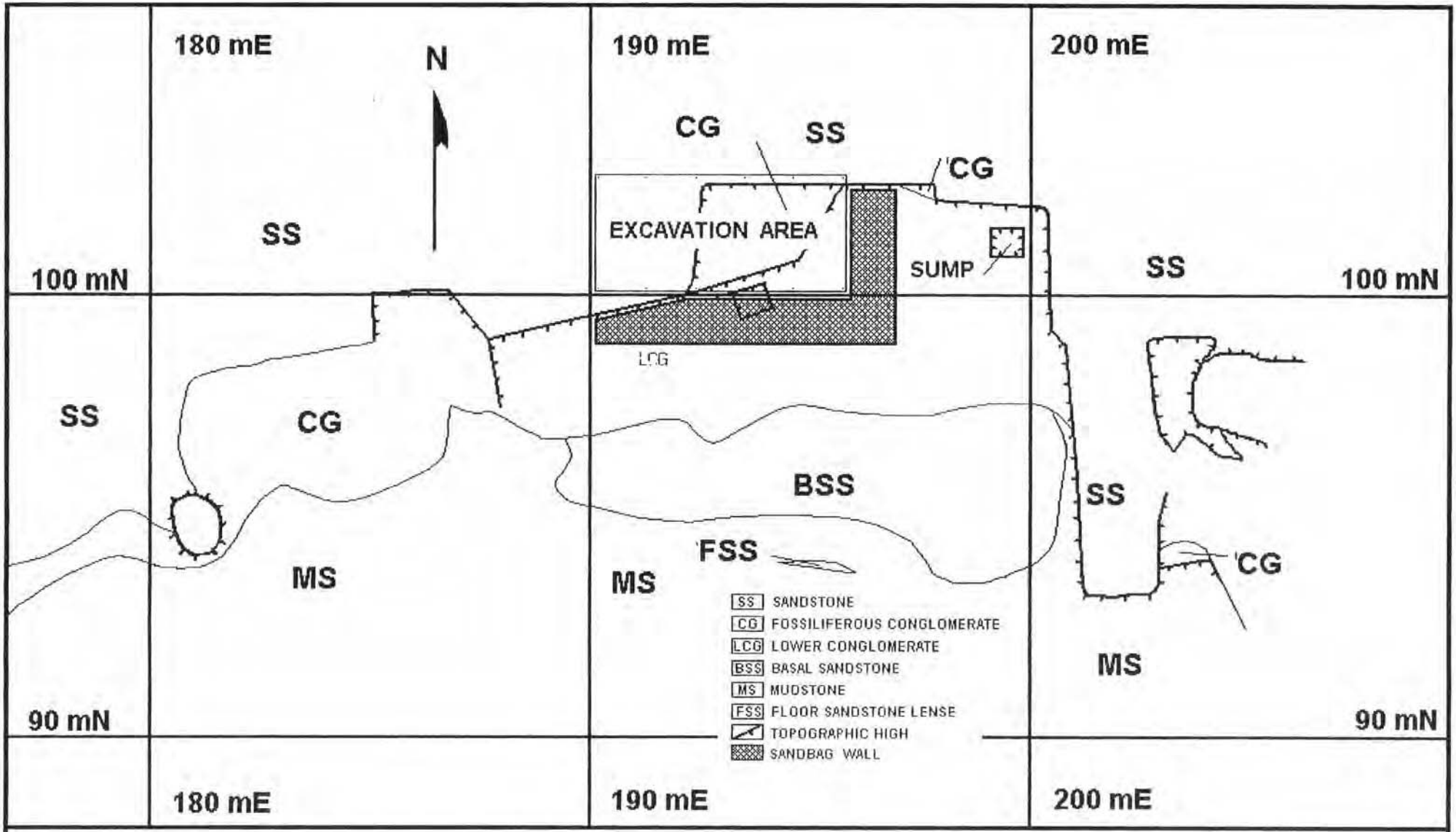
DRAWN : 18/3/1999

MAP 2

0 5

METRES

CUMULATIVE EXCAVATION AREAS
MARCH 1999



MAP : NICHOLAS VAN KLAVEREN

DRAWN : 18/3/1999

MAP 3

0 5

METRES

PROJECTED EXCAVATION AREA 2000