Dinosaur Dreaming 2005 Field Report

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Images of “Friends Day 2005”.
Members of the Dinosaur Dreaming Crew showing the Friends some of the fossil bones that have been found at the site and explaining how the fossils are excavated.

Field Report

By Lesley Kool

Over the past twelve years of excavations at the Flat Rocks site, near Inverloch, there have been some excellent field seasons where everything just seemed to work out right. The 2005 Dinosaur Dreaming field season was not one of them.

The fossil layer at the Flat Rocks site, near Inverloch, Victoria, is situated in the inter-tidal zone, which restricts access to between three and four hours either side of low tide. Low tides during the first week of the dig were either in the late afternoon or early morning. This meant working in low light conditions at both ends of the day, with long days starting as the sun came up and getting back to the dig house after dark.

Nick van Klaveren, our excavation manager, had chosen an area of the fossil layer that had not been sampled before. In the past eleven field seasons we had slowly nibbled away all the easily accessible fossil layer and were now faced with the daunting prospect of following the layer deeper under the overlying sandstone.
In 1998 Nick devised an ingenious system of rockbolts, steel mesh and tarpaulins, which over the following field seasons had adequately kept most of the sand from entering the designated excavations.

Crew installing the system in the first week of the 2005 dig.

The extra depth of the fossil layer meant that more overburden had to be removed before the system could be installed. Consequently it was into the second week of the dig before the system was finally completed.

The day after the system was finished Victoria experienced the “worst storm in a century”. Cyclonic winds and rain lashed the state for more than 24 hours, causing widespread damage to property and vegetation. Most of our intrepid “tenters” abandoned their canvas homes in the back garden of the house we rent in Inverloch and took refuge inside. Norman Gardiner, one of the core crew and finder of three mammal jaws, refused to leave his tent even though the trees in the back garden were swaying madly. During the night a branch did fall on the edge of his tent causing some minor damage and he was congratulating himself that it could have been much worse when he heard that a tree had actually fallen on his house in a Melbourne suburb. He was forced to return home to supervise its removal.

When the winds finally abated and we were able to get down to the site we were confronted with major damage to the system. It was so frustrating that after more than a week of struggling to install the system, mother nature managed to bend steel girders and rip tarpaulins to shreds in a day.

We had to decide on whether to rebuild the system, which could take up to a week to replace some of the components, or modify the system and use the remaining undamaged materials. We decided on the latter choice as we had already lost too many days with the setting up and the storm.

The tide coming in and covering the system.

Experience over previous field seasons had shown that an excavation area five metres long and two and a half metres wide was the optimum size. With fewer materials to work with we reduced the length to three metres and began excavating.

The fossil layer was approximately one and a half metres below the shore platform and although the modified system kept most of the sand out of the excavation, it did not prevent the sea water from filling the excavation. The increased depth of the excavation resulted in more water filling the excavation, which in turn took longer to pump out each day. The added problem was the amount of water that seeped into the excavation during the day from the surrounding water-saturated sand. This proved to be a real problem when we were trying to remove the fossils from the floor of the excavation. The water was seeping in faster than we were able to pump it out using the solar pumps that Nick had devised.

One of the few highlights in the days after the storm was the discovery of the first two mammal jaws for the 2005 field season. The first jaw was found by Anne Leorke, one of the “not-so-evil” overseers, and contained three molars. The second jaw was found by Rohan Long and turned out to be an edentulous jaw (having no teeth preserved) of Teinolophos trusleri, the tiny monotreme. It was very gratifying to know that the new area of fossil layer was producing the precious mammals and all our hard work was not in vain.

We persevered with the modified system for another week, but the storm had produced abnormally rough tides in its wake and we were constantly having to partially rebuild the sand bag walls. Finally on the morning of Friday 11th February, after a particularly rough night, we found the system irreparably damaged. One of the steel girders had been bent at a 40 degree angle and in the process had almost ripped our large truck tarpaulin in half. The tarpaulin was now too small to cover the system and without that the system was ineffective.

A new tarpaulin would take time to replace - time we could not afford to lose. So the decision was made to pull out the system and go back to the back-breaking task of digging out the sand each day. It was going to be logistically too difficult to dig out the deep section of the fossil layer in the time we had between tides, so Nick suggested moving the excavation area to a shallower section of the layer.

This decision to move the excavation area was not made lightly, but was made easier with the help of a large crew. Every-one pitched in, including three visiting Japanese academics who had joined us just for the weekend to make a live interview between the dig and another palaeontologist in Tokyo.

Dr. Yoshitaka Yabumoto was making his third visit to the dig and is very interested in the fossil fish that we recover from the site. His colleagues, Jiro Murumatsu and Seiji Iwasaki, were representing the Education Department of the National Science Museum in Tokyo.

Dr. Yabumoto (in yellow) and Mr. Iwasaki helping to move the excavation area.

Moving the excavation to a shallower area of the fossil layer meant there was not as much sand to dig out each day, but it was still very time consuming and labourious work and was not made any easier by the constant showers that persisted day after day. We later found out that February 2005 was the wettest February since records had begun over 100 years ago. So much for the traditional Australian hot, dry summer.

Our spirits were lifted when the third mammal jaw turned up during the fourth week of the dig. Caroline Ennis found her second mammal jaw with one tooth preserved, joining Anne and Rohan as multiple jaw finders.

The weather gradually improved by the following weekend, which was a relief as Saturday 19th February was our annual “Friends of Dinosaur Dreaming” Day. We were joined by approximately 50 Friends during the afternoon and were able to show them some of our newest finds. The crew is always happy to see the Friends as many of them have been supporters of the project since the organisation was created. One of our most ardent Friends has kindly written an account of his reasons for supporting the project. You can read his comments later in this edition.

The fourth mammal jaw turned up the day after Friends Day and was also found by another crew member with prior experience. John Wilkins has been an integral member of the core crew for at least eight years and besides being the dig’s “mister fix-it” he is also an ace fossil finder. The latest mammal jaw was his third jaw and I am sure it will not be his last.

The following week the crew was given the opportunity to spend a day prospecting along the coastline at a spot called Harmer’s Haven. The sedimentary rock, which makes up the shore platform, looks very “juicy” with plenty of mudstone conglomerate layers, but we have only one fossil bone recorded from this area.

The weather was once again overcast and showery, but it did not deter the intrepid crew. They spent the day crawling over the rocks and came back with two specimens. One of the fossils was a one centimetre cross-section through the end of a small limb, but the second bone was a cross-section through a fairly large dinosaur phalanx (toe bone) about three centimetres long. Most of the phalanx had been eroded away by erosion, but the outline was very clear

This week also produced the dig’s second isolated mammal tooth. Helen Wilson is an original “Dinosaur Cover” - one of the few remaining volunteers who worked at Dinosaur Cove in the Otways between 1984 and 1994. At Dinosaur Cove Helen’s nick-name was “the Tooth Fairy” because of the amazing number of dinosaur teeth she found. After Dinosaur Cove she took some time away from dinosaur hunting to raise a family, but the lure of the fossils was too strong and she has managed to join us for a few precious days each year for the last three field seasons. True to her nick-name, this year she found a tiny mammal tooth - smaller than a pin head, as well as a dinosaur tooth.

The four mammal jaws and single mammal tooth were, of course, not the only discoveries this field season. Although we were plagued with bad weather we still managed to catalogue in excess of 650 fossil bones and teeth. Among the specimens that have since been prepared are two small teeth that have Dr. Tom Rich, our head researcher, quite puzzled. One tooth is as tiny as a mammal tooth, but has only one root, where-as most mammal teeth have two roots. It is possible that it belonged to a very small or juvenile dinosaur, but if so, it is the smallest dinosaur tooth collected at either Dinosaur Cove or Flat Rocks.

The second tooth is about the size of an average hypsilophodontid tooth (approximately one centimetre long), but the crown of the tooth is unlike any hypsilophodontid tooth and the root is bulbous in shape.

Most hypsilophodontid dinosaur teeth have a root that is narrower in diameter than the crown. This tooth is the opposite. The crown is narrow and the root is wide. Tom Rich has been invited to Texas in September and is planning on taking these specimens, along with a number of other mystery bones and teeth, with him in the hope of getting some of them identified.

Rohan Long’s edentulous Teinolophos trusleri mammal jaw

Teinolophos trusleri appears in *Science*

The highlight of the 2005 field season was the publication of a paper in the prestigious journal *Science 11, Feb 2005, Vol 1 307, No. 5711, pp 910 - 914.* Titled "Independent Origins of Middle Ear Bones in Monotremes and Therians" by Thomas H. Rich, James A. Hopson, Anne M. Musser, Timothy F. Flannery and Patricia Vickers-Rich, the paper puts forward evidence of the independent evolution of the Monotreme middle ear. Tom Rich discusses the importance of this paper and its implications to mammalian evolution in his report.

The lower jaw discussed in the paper is an edentulous jaw discovered three years ago at the Flat rocks site. The remarkable preservation of the jaw allowed Tom Rich and his colleagues to identify certain facets on the back of the jaw where additional bones were originally attached. This is the first evidence of these facets in Early Cretaceous monotremes.

About three years ago the Dinosaur Dreaming project applied for a small grant from Parks Victoria on behalf of the Friends of Dinosaur Dreaming. The grant financed the creation of four metal information panels, which will eventually be installed at The Caves carpark lookout. The panels depict what Australia was like more than 100 million years ago, the types of animals that lived in that ancient landscape and the current excavations that have taken place at that site.

The panels were finally completed at the end of 2004 and were placed on display at the Inverloch library during the 2005 field season. Although some of the information is now out of date because of the new fossil material that has been recovered since the panels were commissioned, they will still provide visitors to the site with the opportunity to learn about its significance, particularly during the months when there are no excavations.

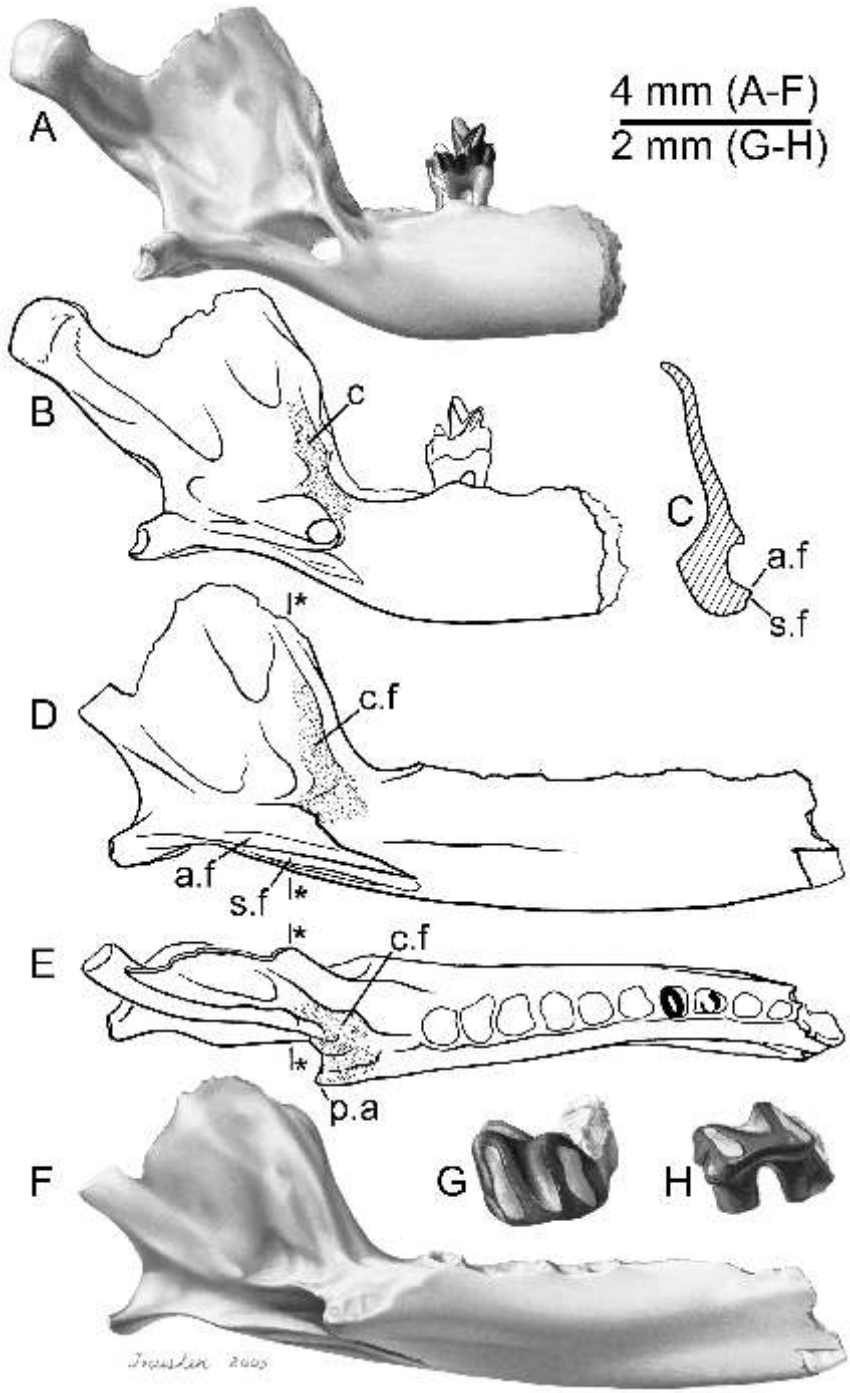
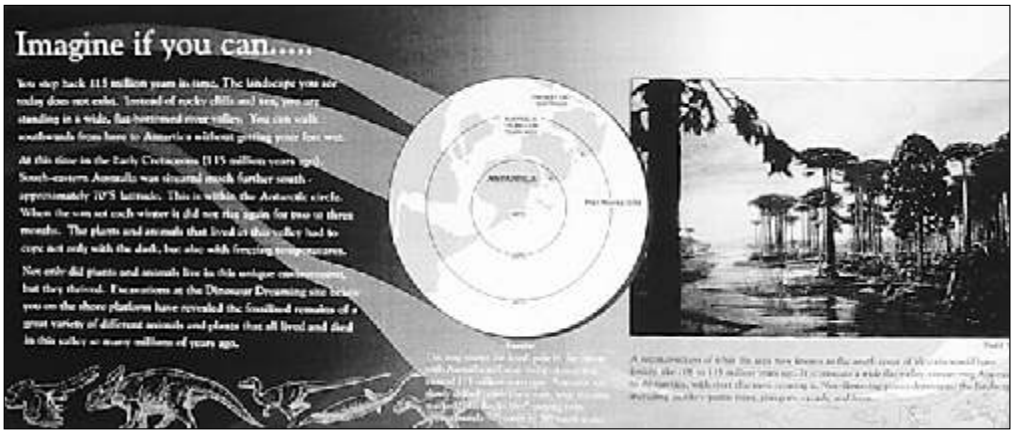
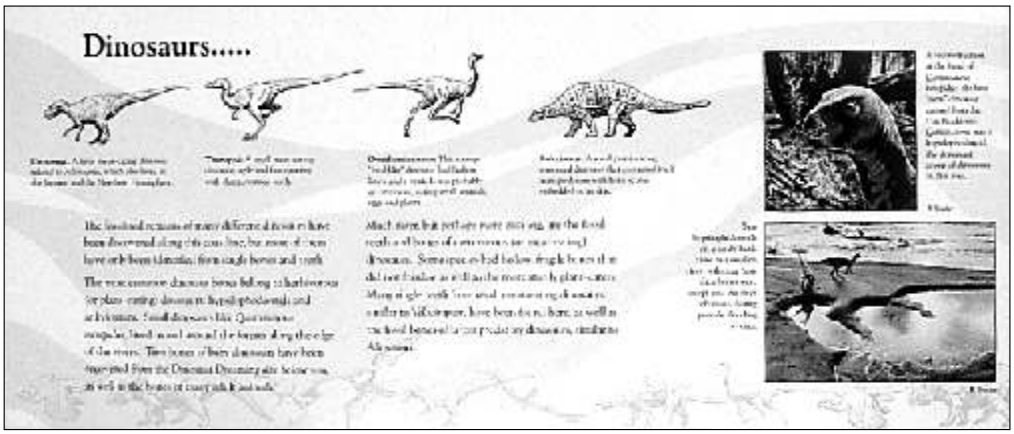


Figure of the edentulous *Teinolophos trusleri* lower jaw indicating the facets on the back of the jaw. The jaw at the top of the figure with a single tooth preserved is the holotype of *Teinolophos trusleri*

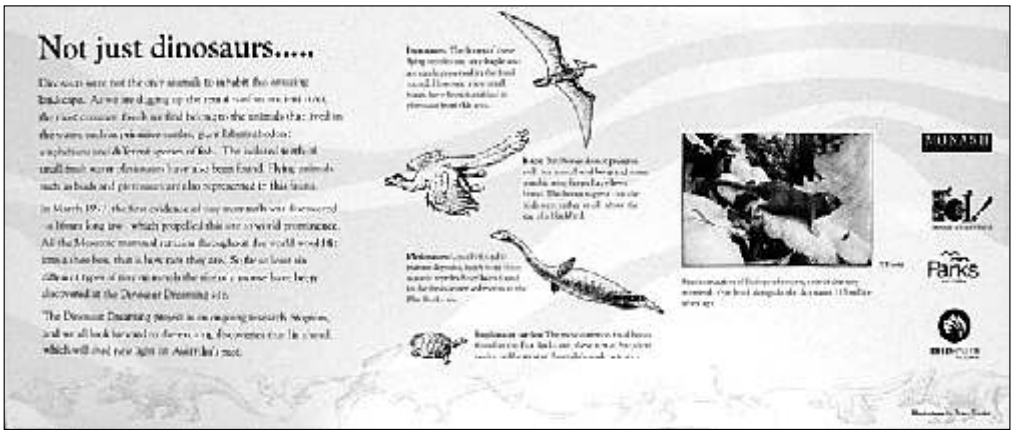


Panel one: Introductory panel explaining Australia's global position during the Early Cretaceous and what the environment may have looked like.

Panel two: The Dig... Illustrates some of the fossil bones and teeth that have been found at the site over the years and the excavation technique involved.



Panel three: Identifies the different groups of dinosaurs that lived in the area, including *Qantassaurus intrepidus*, the first dinosaur to be named from the site.



Panel four: Mentions the other animals that have been found at the site, including the tiny mammals that have made this locality so important.

Excavation Report

by *Nicholas Van Klaveren*

The Flat Rocks fossil locality was excavated for a period of six weeks, from late January to early March 2005. This period was chosen to coincide with the university holidays and to avoid the tourist season at Inverloch.

All the fossil material was collected under permit number 10002039 of the Department of Natural Resources and Environment Victoria.

This year the excavation was located down dip of the most productive eastern portion of the area excavated in 2004. The eastern edge was also chosen to straddle a possible palaeochannel at the old sump site.

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

The unfossiliferous overlying sandstone overburden was removed with the two Cobra petrol driven jackhammers. This season the amount of overburden was considerable due to the area chosen being the furthest north yet and was made more difficult due the jackhammer exhaust fumes and high temperatures during the first week of the dig. 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.

Equipment:
Due to its location at the bottom of a cliff in the inter tidal zone facing Bass Strait, the Flat Rocks fossil locality presents a number of difficulties with regard to the difference in elevation and large waves at high tide.
In previous years, a construction consisting of packing material, plastic tarpaulins, steel mesh and rock bolted down iron beams was built to help exclude sand and thereby increase access time to the fossiliferous units.

Construction:
This year's new version of the construction was to be of steel beams and mesh above and below the heavy truck tarpaulin. Once again the system had its flaws, operating reasonably well for the first few days, but the recurring problem of sand infiltrating under the tarpaulins arose. It is unclear whether this was due to the switch to the smaller hessian sandbags or that the whole construction was built higher exposing it to more wave action, or even rougher weather this year. In any event the "Storm of the Century" in early February destroyed the heavy truck tarpaulin and once again the site was relocated slightly updip and the method of extraction reverted to sandbag walls and shovels.

Sump Pumps:
The small sump pump design that was most effective in previous years was duplicated and provided with increased salt water protection. A larger solar panel was built from the old solar/battery unit and increased by 50% in output. Two twelve volt lead acid rechargable batteries supplied the power.
Despite this significant increase in pumping capacity, the amount of water inflow was even higher due to this year's site being deeper and surrounded on three sides by sandbag walls.
A venturi pump provided for the day by David Shehan was successfully trialed, but requires a high pressure water pump of considerable weight.
A later trial using our own centrifugal impeller pump failed to produce high enough pressure to operate the venturi.

Excavation Areas:
Examination of Map 1 shows the two areas of excavation this year with Area A being the main area where the construction was built and Area B where small amounts of poorly fossiliferous conglomerate were excavated at the Bridge Area. Area B was excavated to provide extra rock at times when early morning or late evening low tides made it impractical to open up the main excavation area.

Area A
This area was chosen to follow downdip the conglomerate that produced a large number of mammal jaws and the l isolated multituberculate tooth found at this location last year. It was also placed to investigate the old sump area where it thought that a channel or thickened middle conglomerate is located.

However, with the failure of the construction the excavation area was relocated slightly updip to remove patches of conglomerate left from last year and was eventually linked up to the area removed under this year's construction.

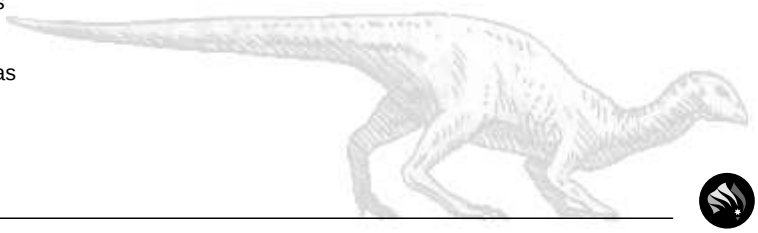
Area B
The lowermost conglomerate directly overlying the mudstone was excavated at the "Bridge Area" and once again was poorly fossiliferous and rapidly thinning to the east. Only a small number of valuable specimens were recovered, the majority being fragmentary fish and turtle remains.

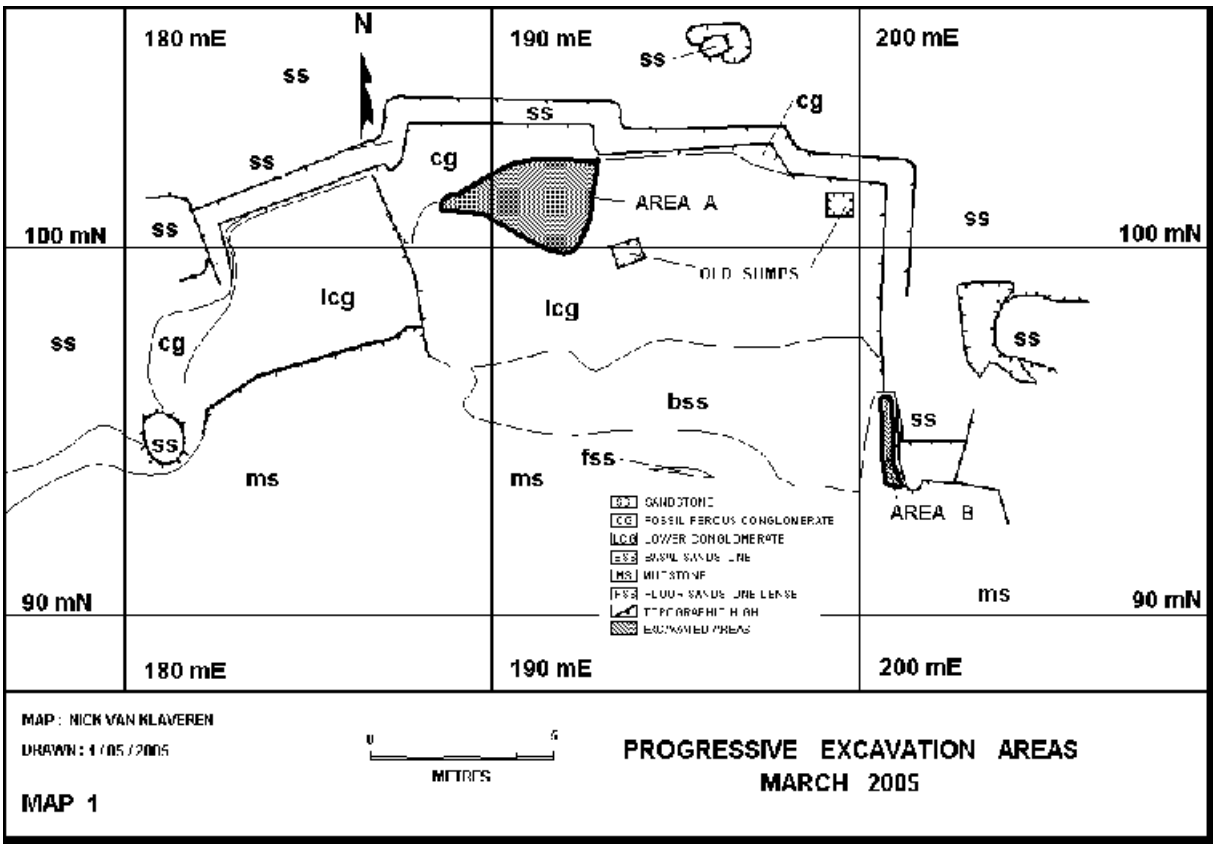
Future Plans:
Once again the failure of the system this year was a setback and future constructions will require increased structural strength and an as yet undetermined new system of "pinning down the edges" to exclude the sand and seaweed.

The excavation area next year is to investigate the Lower Conglomerate (LCG) that was left behind in previous years. The thickness and nearly barren overlying Lower Sandstone Unit (LSS) has deterred any large scale excavation as it was processed in the same manner as the more fossiliferous overlying units resulting in poor yields and monotonous rock breaking. The method next year will be to coarsely process the LSS and take up a large volume of the LCG.

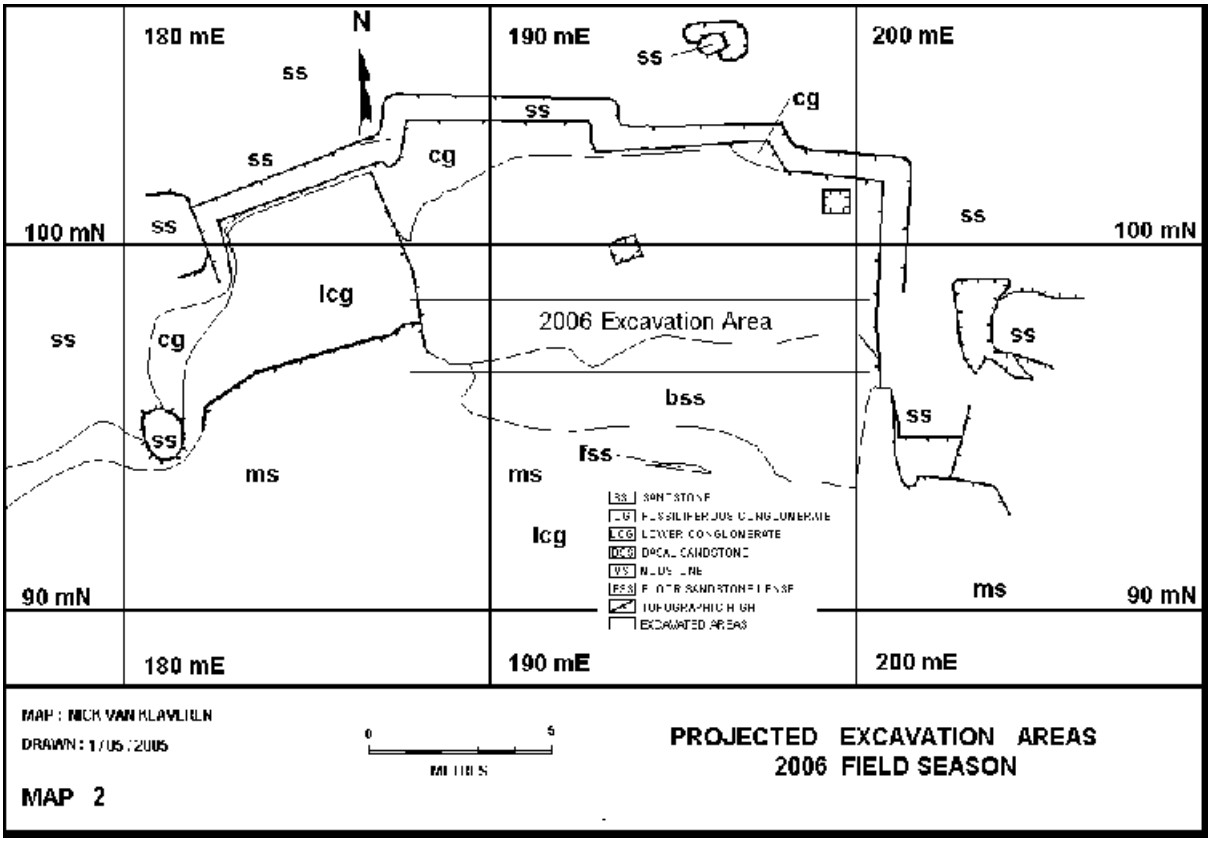
Observations on the two middle conglomerates in recent years has noted the rapid change from thin stringer to major channel over distances of less than half a metre, so the possibility of undiscovered channels in the LCG would significantly increase the yield of larger fossils.

NOTE:
The engineering departments of both Monash University and the University of Melbourne have been approached to ascertain if any third year engineering students would like to take up the challenge of designing a new system for the excavation. As no system will need to be installed next field season, we are hopeful that the break will give us time to come up with a solution to the logisitical problems involved in excavating deeper sections of the fossil layer.

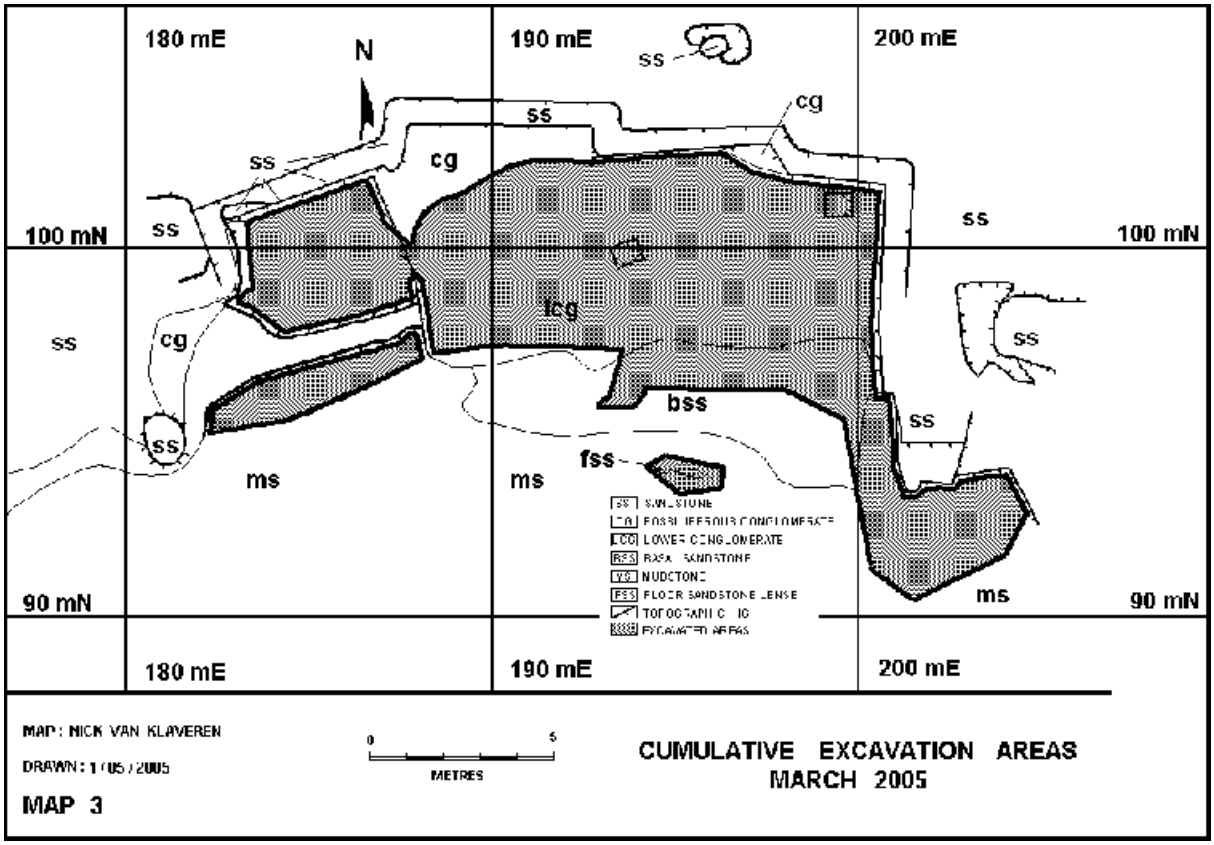




***Map 1**. Progressive excavation areas*



***Map 2.** Projected excavation areas*



Map 3. *Cumulative excavation areas*

Doris Seegets-Villiers jackhammering the sandstone overburden before the storm damaged the System

John Swinkels and Troy Radford helping to rebuild the sandbag walls after the System was dismantled.

Research update

by *Dr. Tom Rich*

The 11 February 2005 issue of the journal *Science* had an article focused on one jaw found at the Flat Rocks site. This was a jaw of the monotreme *Teinolophos trusleri*. The reason that this highly regarded journal published the article was because it provided evidence that the arrangement of the ear bones in monotremes had evolved separately from that in the placentals and marsupials.

The living mammals all have three bones linking the ear drum to the sensory tissue where sound is converted to nerve impulses located deep within the skull. Other vertebrates such as reptiles and birds, have only a single bone making that link.

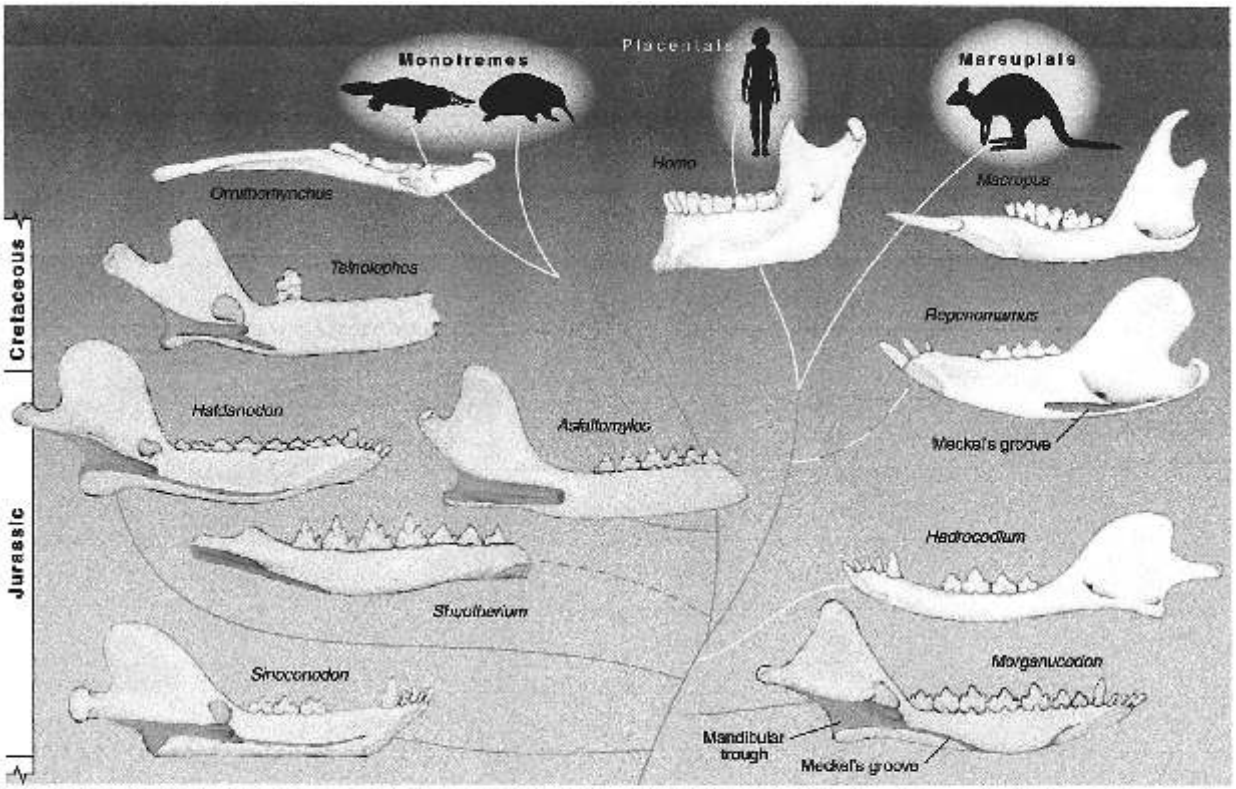
The widespread view has been that this condition so characteristic of the mammals only evolved once in the common ancestor of monotremes, marsupials and placentals. But because *Teinolophos trusleri* is a monotreme and it shows evidence in the structure of its jaw that one of these three bones normally in the middle ear of mammals was located in the jaw, it means that the more advanced monotremes evolved the condition of three bones in the middle ear at a stage after *T. trusleri*. It is not surprising that bones that were to become located in the middle ear in the ancestral forms were in the jaw in *T. trusleri*. It has been known for more than a century and a half that mammals evolved from have one to three bones in the middle ear. What is surprising is that a mammal which otherwise is clearly a monotreme has the more primitive condition of a single bone in the middle ear.

The significance of this fossil has resulted in my being invited to fly to Austin, Texas, in order that a colleague there can make CT scan images of it and the other mammal jaws from Flat Rocks. Along with those specimens will go a selection of enigmatic fossils from Dinosaur Cove and Flat Rocks in order that they can be compared with identified fossils in the collections both in Austin and the University of California, Berkeley. With luck, one or two of them can be identified and perhaps may represent a group of animals not previously known from the Early Cretaceous of Victoria.

Two mammalian fossils were found at Dinosaur Cove before the dig at Inverloch began. They were only recognised to be mammals a few years after the dig at Dinosaur Cove closed down. One is a fragment of a tooth and the other is a humerus or upper arm bone. The tooth fragment is much larger than any mammal tooth yet found at Inverloch. Because of its size, it was probably an egg laying monotreme because similar sized monotremes are known from Lightning Ridge. The humerus is definitely a monotreme. It is about 85% complete. Two specialists in monotreme anatomy have helped write the manuscript about this specimen, Peter Pridmore from LaTrobe University in Wodonga and Peter Gambaryn at the University of St. Petersburg, Russia. They have concluded that it is less specialised in its shape than the living echidna and platypus.

The humerus is to be the type specimen for a new genus and species. The generic name means “The Cold Digger” which is appropriate because it was a digging animal and it lived within the Antarctic Circle.

The species name was given in honour of Cadbury Chocolate.



From feeding to hearing. Convergent separation of the middle ear bones from the mandible in the monotreme and therian (marsupial and placental) mammalian lineages. Convergent separation is inferred from the independent loss of the mandibular structures for the attachment of the middle ear bones. Primitive mammalian lineages (gray; blue lines) have a plesiomorphic mandibular trough for full accommodation and attachment of the middle ear bones to the mandible. The internal mandibular ("postdentary") trough is shown in brown. Derived lineages (cream; yellow lines) have lost the mandibular trough and show final separation of the middle ear bones from the mandible. Middle ear bones that are no longer accommodated by the mandibular trough but are still linked by the Meckel's cartilage to the middle of the mandible are indicated by the yellow and blue dashed line (*11*). [Tree topology is based on (*12–14, 16*); figure is not to scale.]

Martin and Luo Science Vol 307, pp 861 - 862, Feb 2005

This came about for the following reason. About 1987, in the fourth year at Dinosaur Cove, Helen Wilson, a stalwart volunteer, asked me a simple question. Knowing that I was really desirous of obtaining a mammal fossil along with the dinosaurs, she asked, “What would you give me if I found a fossil mammal?” By that time, I have given up all hope of finding one there and knowing of Helen’s fondness of chocolate, I flippantly replied, “A cubic metre of chocolate”. Mistake. Big Mistake. After the dig at Dinosaur Cove had been closed down for a couple of years and the work at Inverloch was well underway, a volunteer working with Lesley was preparing what was thought to be a turtle humerus from Dinosaur Cove.

When it was freed from the matrix, she correctly concluded that it was a humerus alright but not a turtle. Rather it was a monotreme, the first mammal from the Cretaceous of Victoria.

Now I had a problem. How was I going to get a cubic metre of chocolate? That is about 1 tonne and worth about $10,000.

Fortunately, the Gods smiled on me not only in the discovery of the fossil in the first place but in providing the reward. Another long term volunteer, Cindy Hann, at that time was a science teacher at Wesley College, Glen Waverley. It just so happened that one of her students was the son of Frank Miller. Frank was in charge of the Cadbury plant in Ringwood. She approached him about providing the tonne of chocolate and he agreed.

When the fossil was found, it was so non-descript that the label did not include the name of the discoverer. So who was the tonne of chocolate to go to? Figuring that someone on the crew had to be the person who found the specimen, the simple solution was to invite everybody who was on the dig who could get to the Cadbury plant. About twenty people including Helen Wilson showed up at the celebration where the chocolate was handed out. A tonne was quite sufficient to make everyone satisfied. Everyone carried away as much as they wanted. And there was plenty left over.

So because Cadbury got me off the hook, I am quite happy to name the species in honour of them. Besides, the colour of the specimen is most appropriately a dark chocolate.

The episode of the monotreme humerus occurred in the early 1990s. But Dinosaur Cove is still turning up surprises eleven years after the site was closed down. A small vertebrae of an ankylosaur or armoured dinosaur from there turned up late last year. This group has previously been found in the Strzeleckis but never before in the Otways.

The monotreme humerus found at Dinosaur Cove in 1993, which produced a cubic metre of chocolate

Flora of the Flat Rocks site

by *Doris Seegets-Villiers*

Over the last few years we have gained more and more information on the fauna living at the Flat Rocks Site during the Early Cretaceous. In contrast, a picture of the flora cohabiting with the fauna has been quite sketchy. Although there are quite a few fossil tree trunks to the north of the site, identification has been impossible, due to extensive distortion. Furthermore, even if identification was possible, it would only provide an idea of the arborescent plants growing around the site.

Other macrofloral remains (e.g. cones, leaves, fronds) are extremely rare within the sediments at Inverloch. Therefore, samples from six localities, starting from a few metres below the bone bed to several hundred metres north of the excavation site, have been taken and their microscopic spore and pollen content analysed. With the help of this study, a picture is finally starting to emerge, giving us a better idea what the area would have looked like in the Early Cretaceous.

All the samples taken show a high to very high contents of ferns. There are three species (*Baculatisporites comaumensis, Cyathidites australis and Cyathidites minor*) which form the major constituent in all of the samples. Along with all the other fern species found at the site, they are interpreted as being most likely low growing and definitely moisture loving.

Lycopods are encountered in all of the samples. They vary from being a dominant species to being barely present. Retitriletes, represented by six different species, is the foremost genus.

Lycopods are envisaged being herbaceous and also moisture loving. Bryophyta (mosses and hepatics) are generally ground covering floral elements growing in a moist environment. Within the spore/pollen assemblage at the Flat Rocks Site, they are usually low in numbers or even absent in the record.

The only tree forming species are found amongst the gymnosperms. It was proposed by several workers (*Douglas & Williams 1982) that the major tree layer during the Early Cretaceous in Australia was formed by araucarians and podocarps. Based on the microscopic floral assemblage this is certainly not the case at Inverloch.

Podocarps are represented by four different species of which only one, *Microcachryidites antarcticus*, occurs on the occasion as more than just a rare taxa (more than 2% of the total count per sample). The other three species (*Podocarpidites cf. P. ellipticus, Podocarpidites cf. P. multesimus, Trichotomosulcites subgranulatus*) are often entirely absent from record. Podocarps are also indicative of a moist environment.

Araucarians, on the other hand, still require moist conditions, however, to a much lesser extend than podocarps. *Araucariacites australis* is present in samples from all the six localities. However, except for samples from one entire and several samples from two other localities, *Araucariacites australis* is never present with more than 2% of the total spore/pollen count.

The species *Cycadophytus nitidus* is the most prolific of all the gymnosperms at the site, indicating that the canopy was mainly formed by this species. It is observed in every single sample from the site. Unfortunately, *C. nitidus* is a species whose affinity is not known with certainty, but does indicate an arborescent type. A statement on its environmental requirements, based on comparison with modern counterparts can not be made.

In order to be able to make a more definitive statement about other environmental factors such as possible climate, more work is needed. This does not only comprise more investigation of the micro flora, but also the macro flora and the faunal element at the site.

Additional work is needed on some of the palynomorphs found whilst analysing the spore/pollen content. A few grains were encountered that could not be identified and that did not resemble anything that had been described in the known literature on Early Cretaceous spores and pollen. This leaves two options. Either there is more literature out that was not available to us or these are entirely new species that have not been encountered previously. The later would, of course, make the palynology at the site even more interesting.

*Douglas, J.G and Williams, G.E. 1982 “Southern Polar Forests: the Early Cretaceous Floras of Victoria and their Palaeoclimatic Significance” in *Palaeogeography, Palaeoclimatology, Palaeoecology 39, 171-185*

Image of one of the unidentified palynomorph grains from the Flat rocks site
Size is approximately 27 X 36 microns

LOCATION OF MAMMAL JAWS FROM FLAT ROCKS SITE, THE CAVES, INVERLOCH, VICTORIA		
No.	**Museum Cat. No.**	**Year discovered**
1*	P209090	1997 (#1111 N. Barton) *Ausktribosphenos nyktos*
2*	P208228	1995 (#329) *Ausktribosphenos sp.*
3*	P208230	1994 (#560)
4*	P208231	Nov.1993 (Mentor's trip) *Teinolophos trusleri*
5*	P208482	1999 (#150 N. Gardiner) found in rock from DD1998
6*	P208483	1999(#140 N. van Klaveren)
7*	P208484	1999 (#450 K. Bacheller)
8*	P208526	1994 (#560) *Teinolophos trusleri*
9	P208580	2000 (#200 A. Maguire)
10*	P208582	2000 (#500 L. Irvine) Ausktribosphenid new species?
11*	P209975	2000 (#387 R. Close?)
12*	P210030	2000 *Teinolophos trusleri*
13*	P210070	2000 (Rookies Day 3.12.00) *Bishops whitmorei*
14*	P210075	2000 (Rookies Day 3.12.00) *Bishops whitmorei*
15	P210086	2001 (#250 J.Wilkins)
16*	P210087	2001 (#620 G.Kool) undescribed
17	P212785	2000 (Rookies Day 3.12.00 M.Anderson) fragment only
18*	P212810	2002 (#300) *Bishops whitmorei*
19*	P212811	2002 (#187 D. Sanderson) *Teinolophos trusleri*
20	P212925	1996 (#222) prepped by D.Pickering
21	P212933	2001 (#179) *Teinolophos trusleri* plus associated molar
22	P212940	2003 (#171 W.White) *Bishops whitmorei*
23	P212950	2003 (#292 C. Ennis) *Bishops whitmorei*
24	P216575	2004 (#180 N. Gardiner) *Teinolophos trusleri*
25	P216578	2004 (#600 A. Leorke) *Bishops whitmorei*
26	P216579	2004 (#635 N. van Klaveren) *Teinolophos trusleri*
27	P216580	2004 (#800 G. Kool) *Bishops whitmorei*
28	P216590	2004 (#447 J. Wilkins) base of coronoid similar to P210087
29	P216610	2004 (#557) *Teinolophos trusleri*
30	P216655	2004 (#142 M. Walters) Multituberculata?
31	P216670	1999 (#184) Ausktribosphenid new species?
32	P216680	2004 (#132 R. Long) *Teinolophos trusleri*
33	P216720	2002 (#648) *Teinolophos trusleri*
34	P216750	2005 (#162 R. Long) Teinolophos trusleri
35	P221043	2005 (#100 A. Leorke) Bishops whitmorei
36	P221044	2005 (#300 C. Ennis) Ausktribosphenid similar to P210087?
37	P221045	2005 (#395 J. Wilkins) Teinolophos trusleri?

** indicates jaws that have been moulded and cast as of June 2003*

Crew member Perspective

by *Jessica Lye*

Upon approaching Lesley Kool early in 2004, in order to collect an application form for the Dinosaur Dreaming dig at the years end, I had no idea what to expect from the trip. Friends had raved about the dig whenever the subject had been brought up, while Marion Anderson presents first year Earth Science students with a very convincing spiel about the worthiness of the research and opportunities for volunteers. Therefore, as my friend Steve and I arrived at Inverloch one cold, dark night- we had not taken too many wrong turns- I was unprepared for the site of 'tent city' which surrounds the abode of the Dinosaur Dreaming crew. Should I have brought a tent? Would I be sleeping under a tree or on the porch all week? Fortunately, a couch was available for my uses that first night (Steve was allocated a bed).

I was also unprepared for the 5.30am wake up call "Wake up diggers!" which came from Wendy, the safety officer- thanks for that Wendy. The name 'digger' was one richly deserved by the end of day 1. The system by which a new influx of sand was kept out of the hole every night during high tide, had failed the previous week. The new method of keeping the hole sand free was ingenious. It involved digging, and digging, and more DIGGING. Even to this day the voice of Wendy reverberates though my mind- "Diggers, find a friend!"- at which point shovels exchanged hands and a bailer would be called for to deal with the sea water which would rapidly fill the hole.

Then came the rock breaking. Anybody ever taken up a hammer and chisel and broken up piles of mudstone into sugar cube sized pieces for hours on end? It is surprisingly therapeutic. Then, after a few false alarms (wood can look surprisingly like bone- hey it really can), comes the moment at which you find your first bone… Mine was tiny and fragmented, but I was exuberant nonetheless. Swim o'clock is a relief in a place where shade is scarce. No swimsuit? No problem- one volunteer decided to swim in his jeans! There was also nothing better than visiting the Inverloch surf beach for a swim after a day of rock breaking (the volunteers house seems to have collected a huge assortment of body boards over the years).

Food was definitely a highlight of the trip, as different volunteers opted to cook for the group each night. Cooking for 15-20 people of course was no easy task, but fortunately for the head cook (I did find myself in this position one night), plenty of kitchen hands were always available to help. Thus, the dinner menu that week proved to be extremely diverse as well as tasty. Morning tea and lunch during the day was also supplemented by delicious cookies made by Norman- one of the veteran volunteers of the dig- and also fresh wild berries which he unfailingly harvested everyday along the roadside.

By the weeks end I was quite reluctant to leave Inverloch. I had made quite a few friends and was even enjoying the digging each morning. I had found the dig crew an extremely friendly, interesting, as well as quirky, group of people. Many returned to the dig every year, and these veteran crew members had a lot of knowledge to impart upon newcomers like me. The dig was definitely an experience that left me wanting to return the following year and should you be a volunteer of the Dinosaur Dreaming dig you will certainly find yourself having a good time in good company!

A "Friends" Report

by *Rhys Walkley*

An overcast afternoon's visit to the Flat Rocks foreshore saw three eager visitors jump at the opportunity to be on the beach watching the coastal excavation. Youngster Rory, Jill and I, a retired teacher, from Cranbourne and Seaford were fascinated by the ongoing story of the excavations into Early Cretaceous deposits and the Mesozoic animal parts seeing daylight for the first time in 115 million years or so.

Wary of falling cliff clods, we mingled around the stone chippers, rock wrappers and diggers, listening to their excavation stories, watching the careful removal and scouring with magnifying glasses of hard-won fossiliferous rock and absorbing the atmosphere. While I chatted eagerly to Lesley, Gerry, Mary and Mike Cleeland, Jill soaked in the coastal colours and hubbub watching the search for precious bones after a walk-talk-look (in 1876 literally Yan-toomnee-nangnak in the Woiwurrung language sharing up to 85% of the Bunwurrung language once spoken in the excavation area) tour and quiet Rory mingled with the children present and then was captivated by the beauty of the rockpool shelves, slithering sealife and live molluscs.

Once the noisy pump hose had emptied seawater from the main dig hole, the exposed bedded coal and rock layers were scrutinised closely for bones and teeth. Safety-area tapes fluttered in the wind as rock clumps were brought slowly to the stonechippers making dice from larger pieces, watching fresh surfaces for tell-tale signs of booty. I was caught up with the new discoveries about Teinolophos' jawbones, noting the differences from later monotremes. I got the same rush that hit me when first hooked on palaeontology as a teenager finding a large Diprotodon vertebra while excavating in the Maribyrnong terraces with Alexander Gallus in 1967. Subsequent museum work for Tom and Pat since the mid-1970s in Lancefield, attendance at frequent fossil conferences and joining Dinosaur Dreaming in the 1990s kept a keen interest alive.

My fascination with the evolution of monotremes and marsupials was further sharpened when Teinolophos, the large paired parietals and the Cadbury Dinosaur Cove humerus were in print. Will Teinolophos turn out to be a mammaliaform reptile rather than a monotreme mammal? Is it today that they discover a kollikodontid skull proving that it is a tritylodont reptile and not a monotreme? Is a dicynodont tusk about to be uncovered? Will this be the day they discover a better specimen of Gerry Kool's 2001 eyelash-sized ausktribosphenid jaw, I wondered? Perhaps, a maxilla, a whole turtle skull, a "labby", or new dinosaur genus will emerge?

Corey's permafrost frozen soils were seen and changing sea levels discussed. The small volcanic dykes and tree fossils were pored over by Rory and I watching cast specimens being displayed and listening to the growing legend of the 1997 discovery of Ausktribosphenos.

What a great region for educating people about coastal geomorphology, future sea-level changes, changing shire visions of coastal use and values, marine invertebrates, corals and algae. What were the Bunwurrung myths about exposed fossil teeth and the formation of Eagle's Nest and Punchbowl? After 1835, decimated by war and disease and forced to live north of the Tarwin River, how did the remnant Yowengarra clan of the Bunwurrung East Kulin tribe use coastal resources and interact on Anderson's Inlet with their southern encroaching enemies, the Nulit-speaking Joto-warra-warra clan of the Brataualung division of the Ganai tribe?

As Rory checked the rockpools for darting amphipods, seastars, neptune's necklaces and ripples, he clutched to his chest a precious handful of periwinkles and shells telling private stories to him. With our heads full of several hours' conversations and vivid memories, we three trudged up the cliff to a different world of the commonplace. As I turned back from the wind to watch the workers sloshing around carefully, I wondered who was the greater dreamer, me, the academic environmentalist of 53, or the wide-eyed child of twelve.

Editor's note:
What Rhys omitted to mention is that last year he donated a number of books to the Dinosaur Dreaming library. We house the library in our rented accommodation during the dig for crew members to read more about all aspects of palaeontology. The books Rhys donated have greatly added to the collection. Thank you Rhys.

THANKS TO THE FRIENDS OF DINOSAUR DREAMING

Ever since the commencement of the annual Dinosaur Dreaming field seasons and before that, at Dinosaur Cove, The National Geographic Society has been the major sponsor. Last year, due to a change in the Society's policy, we were no longer funded by the National Geographic. Fortunately, thanks to the subscriptions from our many "Friends" over the years, there was enough funding to run the Dinosaur Dreaming 2005 field season. So it is thanks to the generous support of Friends of Dinosaur Dreaming that we were able to continue excavations this year.

We now have over 100 "Friends", both individuals and famiiles. Some, like Rhys Walkley, have supported us from the creation of the "Friends". Others have joined us more recently and we are grateful for every single contribution.

Acknowledgements:

Apart from our regular Friends, we have also received support from other sources. This year we were fortunate to receive a discount from the local Inverloch supermarket for the vast amount of groceries purchased during the dig. It is amazing how much food a hungry crew of dinosaur diggers consumes. So, many thanks go to Dom Brusamarello and his friendly staff of Foodworks (formerly Food-Rite) Supermarket.

Once again our crew was enriched with a number of overseas volunteers:
Deborah Hutchinson, a good friend of another Dinosaur Dreaming regular, Remmart Schouten, came all the way from Bristol University in England to spend the first three weeks of the dig. She was a bundle of strength and fun and was quickly accepted by the rest of the crew.
Sandra Pfeifenburger joined us for her second visit to the dig. Sandra is from Germany and also joined us for the first three weeks of the field season, after which she headed off to see the rest of Australia. Sandra had a great sense of fun and was always ready to help dig out the sand.
Al Fraser joined us yet again. Al was a regular at Dinosaur Cove in the 1990's and has lost none of his enthusiasm for Aussie dinosaurs. His "Quarrier's Quandry" is an amazing insight into how small we have to break up the rocks to find the mammal jaws. We just have to decide on how big a walnut is.
Keiichi Aotsuka is also a return volunteer. Keiichi first joined the dig three years ago when he came with a group of "Japanese Dreamers" led by Dr. Yoshitaka Yabumoto. His command of the English language has improved each time he has visited the dig, and he has learned some interesting Australian colloquial terms too.
Kentaro Yamada found out about the dig through our dear friend Ryoko Matsumoto, who was unable to join us this year. Kentaro's delight at being a part of the Dinosaur Dreaming dig was very obvious and we hope we fulfilled his expectations.

View from carpark - taken from The Caves Carpark looking down on the excavation site.

At the start of the dig, drilling holes around the perimeter of the excavation for the rock bolts.

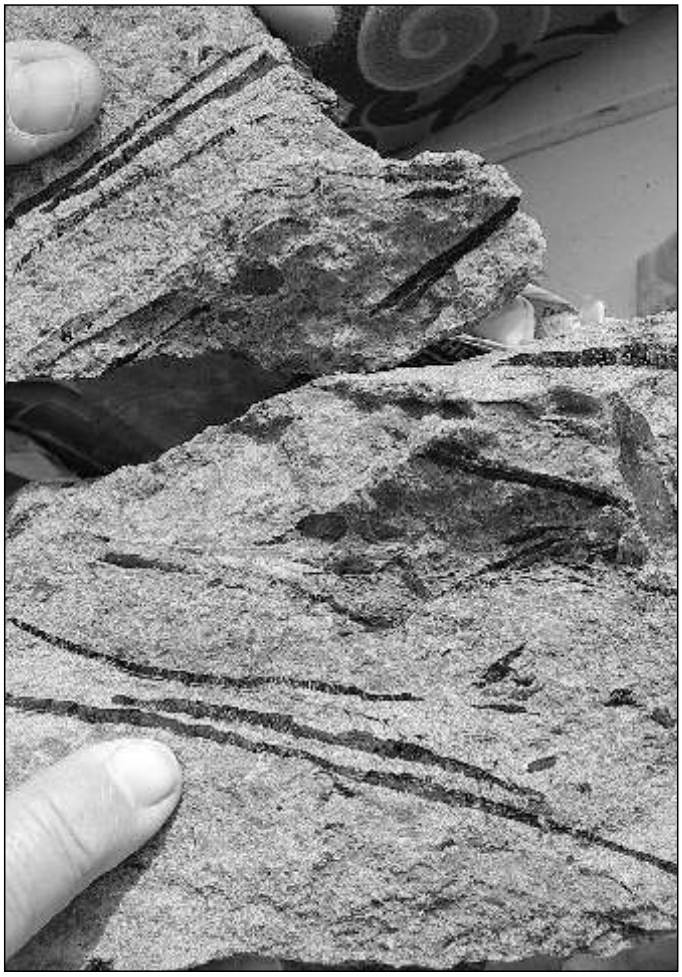
System before the storm - how the finished system looked before "the storm of the Century" damaged it.

Removing the sand that accumulated on top of the system during high tide.

After the system was dismantled, we moved to a shallower part of the fossil layer.

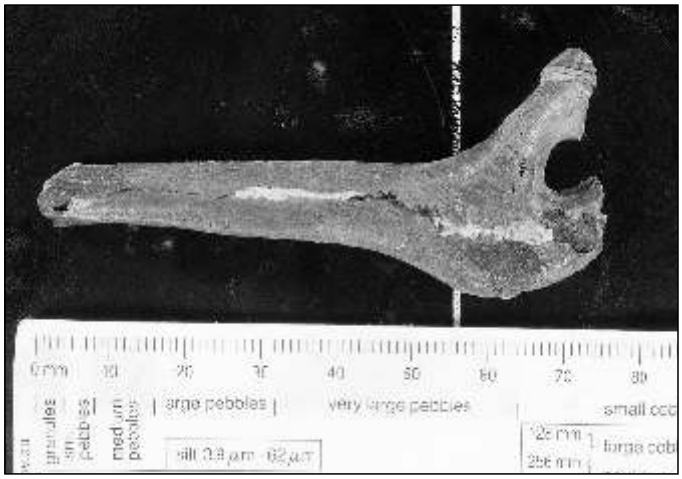
Nick van Klaveren removing a fossil from the floor of the excavation.

Deborah Hutchinson and Sandra Pfeifenberger removing fossil layer from the site



Removing the sand that accumulated on top of the system during high tide.

A cross-section through a small limb in the rock



Hypsilophodontid pubis (hip bone) removed from the rock (pairs with #9

Hypsilophodontid tooth in the rock

Hypsilophodontid tooth removed from the rock