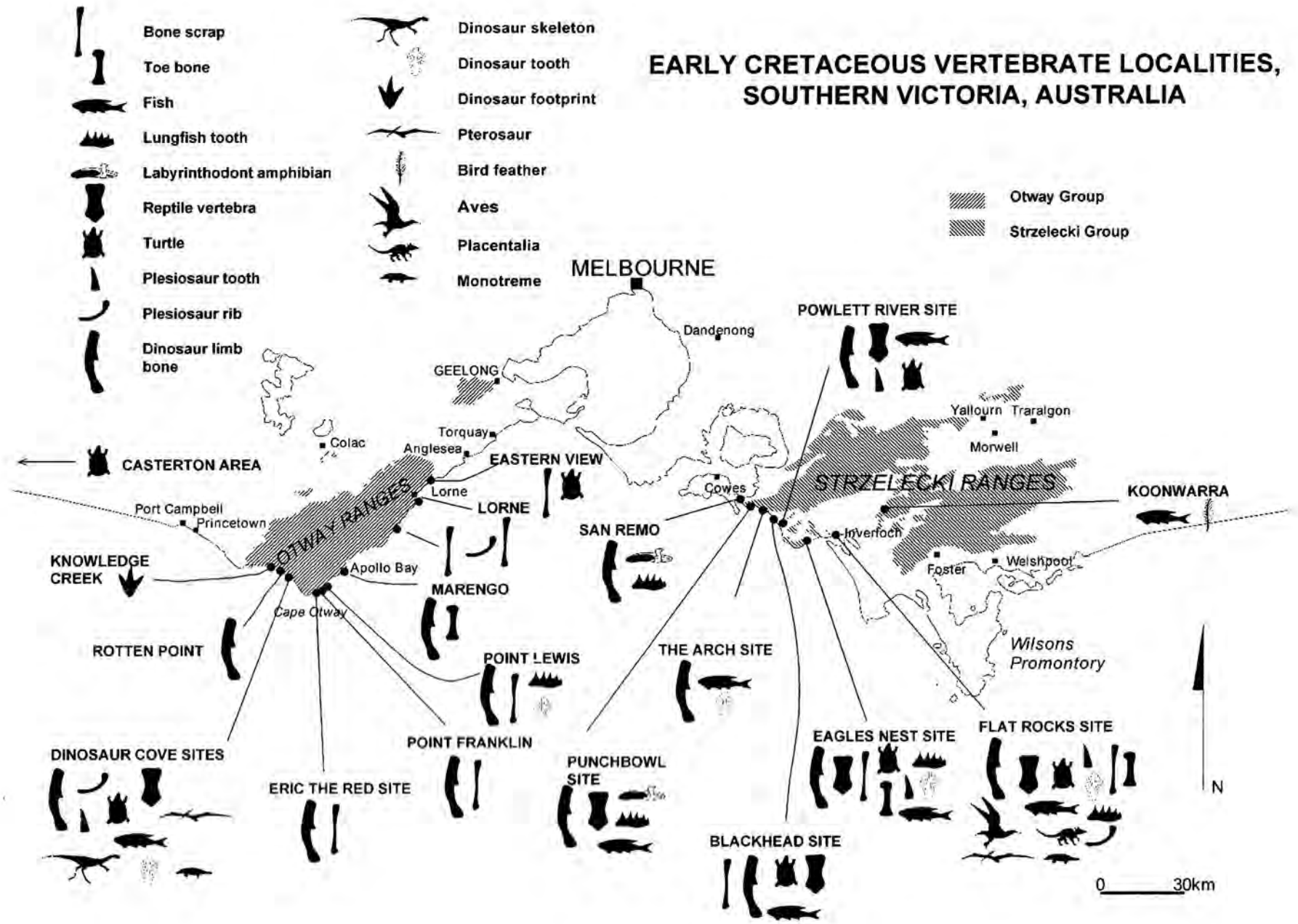
DINOSAUR DREAMING 2004 FIELD REPORT


EARLY CRETACEOUS VERTEBRATE LOCALITIES,
SOUTHERN VICTORIA, AUSTRALIA
Bone scrap
Toe bone
Fish
Lungfish tooth
Labyrinthodont amphibian
Reptile vertebra
Turtle
Plesiosaur tooth
Plesiosaur rib
Dinosaur limb bone
Dinosaur skeleton
Dinosaur tooth
Dinosaur footprint
Pterosaur
Bird feather
Aves
Placentalia
Monotreme
Otway Group
Strzelecki Group
MELBOURNE
Dandenong
GEELONG
Torquay
Anglesea
Colac
CASTERTON AREA
EASTERN VIEW
Lorne
LORNE
Port Campbell
Princetown
OTWAY RANGES
KNOWLEDGE CREEK
Apollo Bay
MARENGO
Cape Otway
ROTTEN POINT
POINT LEWIS
POINT FRANKLIN
DINOSAUR COVE SITES
ERIC THE RED SITE
PUNCHBOWL SITE
SAN REMO
THE ARCH SITE
BLACKHEAD SITE
POWLETT RIVER SITE
Cowes
STRZELECKI RANGES
Yallourn
Traralgon
Morwell
KOONWARRA
Inverloch
Foster
Welshpool
Wilsons Promontory
EAGLES NEST SITE
FLAT ROCKS SITE
N
0
30km

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About the cover

The jaw fragment on the cover of this year's report is one of ten new fossil mammal jaws recovered this year. It is also the most exciting discovery as it represents a new group of Australian fossil mammals. The image shows both sides of the diagnostic premolar. Dr. Tom Rich is currently studying this specimen and his comments can be read in the report.

Field Report

by Lesley Kool

The Flat Rocks site is the principal site of the Dinosaur Dreaming project and was discovered in 1991 as part of a prospecting program conducted jointly by Monash University and the Museum of Victoria. It is situated on the southern coast of Victoria approximately 150 kilometres south-east of Melbourne. The main part of the fossil layer lies within the inter-tidal zone and is only accessible for 3-4 hours either side of low tide. The first field season at Flat Rocks took place in 1994 and we have returned to the site each year since then. Since 1998 we have had to install a "system" over the targeted excavation area, which looks a little like a giant shower cap that keeps more than 75% of the sand from re-entering the excavation during high tide. The system was devised when it became obvious that the excavation was so far below the level of the shore platform that it was taking the crew two to three hours each day, just to remove the sand and expose the fossil layer. The implementation of the system in 1998 reduced the time taken to uncover the excavation to just under one hour and in the subsequent field seasons this was further improved upon. However, the 2004 field season turned out to be quite a challenge.

The Dinosaur Dreaming 2004 field season began inauspiciously. The system, that had proved so effective in keeping out most of the sand from our excavations in past field seasons, failed after the first exposure to the incoming tides. We had spent the first three days of the dig establishing the system of rock bolts, tarpaulins and steel mesh, and in one short night Mother Nature destroyed it. It was estimated that it would take up to a week to replace all the damaged equipment and reinstall the system, which was time we could ill afford. However, we had a few factors in our favour. The sand level was lower than it had been for the previous forty years according to the locals. This meant that not as much sand as normal was entering our excavation at each high tide. So it was decided to abandon the system for this year and go back to good old fashioned muscle power. We also had large crews of willing and able volunteers who rose to the challenge and we found we were able to empty the excavation almost as quickly as it would have taken us with

The new hole

the system in place. It also meant that we could excavate right up until the incoming tide was threatening to engulf our excavation before having to pull out.

Having come to terms with having to dig out the excavations manually we set to work, eagerly anticipating the rewards of new and exciting fossils. The area we had chosen for the 2004 field season was a section of the fossil layer that we had leap-frogged over after the discovery of the two mammal jaws in December 2000. These jaws were found during the volunteer training day at the site when we exposed a small section of the fossil layer further up the beach from where we had excavated the previous field season. In a block of fossil layer not much

Beautifully preserved mammal jaw Bishops whitmorei

larger than a bread box two beautifully preserved mammal jaws, later to be named *Bishops whitmorei,* were recovered. This led to us relocating the area we had previously planned to excavate, up to where the new jaws had been found, in the hope that more evidence would turn up. In the following three field seasons we did recover a further seven mammal jaws, but by the end of the 2003 field season it became obvious that the fossil layer was diminishing and becoming less fossiliferous. So the decision to return to where we left off at the end of the 2000 field season was made.

Four mammal jaws were recovered during the 2000 field season so we had every expectation that this trend would continue. However, for the next two weeks we struggled to keep track of the fossil layer. It seemed to pinch in and out with no structure to the layering. One day we would pull out 30 to 40 fossil bones and the next day we would find only a handful. The highlight of those weeks was the recovery of a mammal jaw, found by our intrepid Norman Gardiner, that on initial observation looked like *Teinolophos trusleri*, a micro-monotreme no larger than the shrew-sized ausktribosphenids. What made the discovery more exciting was that this little jaw possessed three teeth, whereas the holotype has only one tooth and all the other *Teinolophos* jaws have no teeth preserved. So this one little jaw will provide more vital information on the tooth structure of this group of primitive mammals.

We struggled on trying to keep in contact with the fossil layer until the half way point in our six-week dig. On the Sunday our experienced excavation crew, for the first time since we had begun excavating in 1992, found no fossils in the hole. This was inconceivable. We had prided ourselves on always finding some fossils whenever we excavated the site and now, for the first time, we had come up empty. This desperate situation required desperate measures. Nick van Klaveren, the excavation manager, Doris Seegets the PhD student studying the taphonomy of the site and myself stood in the middle of the excavation and held a post-mortem. It seemed obvious that we could not continue in the area we had been working for any longer, but what could we do? It was at that moment that the lack of a system paid off. Because we were not locked into a specific section of the fossil layer, we had the flexibility to move, which is what we decided to do. Doris had recorded a relative location for Norman's jaw earlier in the dig and so we decided to abandon the top or western end of the hole and move the excavation three metres back down the beach to where we hoped the fossil layer was thicker and richer.

During the field season, crew rotations occur each Sunday so the new crew for the fourth week was given a baptism of fire. On

the Monday we removed all the sand from the old excavation, removed the sandbag walls that delineated the selected area and moved the hole. This took five hours of hard work, but the weather was kind and the crew was fresh and keen. There was even time in the late afternoon to commence excavating the new area, with immediate results. Fossil bones began emerging as soon as the fossil layer was exposed. In the last three weeks of the field season we catalogued over 500 fossil bones, compared to less than 300 in the first three weeks. More importantly, another three mammal jaws were also recognized. For the first time since excavations began an isolated mammal tooth was recovered. Ironically it was found by Anne Musser who is studying fossil monotremes and it appears likely that the tooth she found is in fact from a monotreme, but possibly from an animal larger than *Teinolophos*.

It was gratifying to see the results of our decision to move the excavation mid way through the field season. Indeed, after the field season was over six more mammal jaws were found during subsequent preparation of some of the specimens. Ten mammal jaws and one isolated tooth have been recovered this year alone, bringing the total number of mammal jaws from this one locality to 33 and counting. As if the finding of ten mammal jaws was not exciting enough, what caused even more excitement was the discovery that one of the mammal jaws provided evidence of a totally new group of primitive mammals. A small jaw fragment containing one beautifully preserved tooth was found by Mary Walters, but it was not identified in the field. Mary has been a founding member of the Dinosaur Dreaming crew since the site was first discovered in 1991, but had never found a mammal jaw until this season. So it is fitting that she became the finder of this very special jaw. It was not until three months after the dig had ended that I had a chance to examine Mary's find under the microscope and realized that what I had thought was a cross-section through a small shaft was, in fact, a cross-section through part of a jaw. After preparation it was obvious that the only tooth preserved in the jaw fragment was unlike any other mammal tooth that I had prepared in the past twenty years. In fact it could belong to a group of primitive mammals that have been previously unknown on this continent. Tom Rich discusses this tooth and the other mammal jaws in his report, so stay tuned.

Of course mammal jaws are not the only fossil bones we found during the 2004 field season. Numerous interesting skull fragments were collected and some have already been prepared. Unfortunately individual skull elements are difficult to identify without more complete specimens to compare them with. So Tom Rich is planning an extensive trip overseas next year in an effort to compare our fossils with other museum collections.

Interestingly, we recovered a number of fossil bones in the overlying sandstone. Most of the bones appear to belong to hypsilophodontid dinosaurs, including a dinosaur metatarsal, a hypsilophodontid femur (thigh bone) and a section of fused vertebrae, possibly from the base of the tail.

The lower jaw from a small dinosaur, containing two unerupted teeth, could belong to *Qantassaurus intrepidus*. It is more robust than the other two small hypsilophodontid lower jaws that were also recovered this field season. A number of very small dinosaur elements were also found that could suggest the presence of juvenile dinosaurs at the site. It is very difficult to determine whether a small bone belongs to a juvenile dinosaur or an adult individual of a small species. This is another area Tom hopes to cover during his overseas trip next year. Fortunately, hypsilophodontid dinosaurs have been found on all continents so Tom will have plenty of comparative material.

Numerous isolated teeth were also recovered, including a plesiosaur tooth, what we believe may be pterosaur teeth and a couple of small recurved teeth that look like small theropod dinosaur teeth, but have no serrations. Tom Rich and colleague Steve Salisbury, from the University of Queensland, have recently made a detailed study of the approximately 100 theropod dinosaur teeth we have collected from the Flat Rocks site over the last eleven years. Tom discusses the results of their study in his report.

Isolated fossilized remains of the turtles that used to swim in the ancient river channel we are excavating are very common. Unfortunately the fossil turtle shells are broken and fragmentary and even the tough box-like turtle skulls have not survived intact. However, we are building up a picture of what this group of primitive short-necked turtles looked like and it is becoming apparent that they are not the same genus and species as the other groups of Mesozoic turtles from Victoria. We have an extensive collection of fossil turtle bones from Dinosaur Cove in the Otways, which led to the naming of *Otwayemys*. The turtles from the Strzelecki Group are approximately ten million years older than *Otwayemys* and differ in a number of characteristics. It is hoped that we will soon have enough material to be able to describe the turtles from Flat Rocks.

We took time out from excavating the Flat Rocks site to re-prospect one of our favourite localities at Eagle's Nest, home of the first Australian dinosaur bone, discovered in 1903. Only one fossil bone was found, which turned out to be an unusual vertebra (part of the back bone). Initially it looked like a typical hypsilophodontid vertebra, but on closer inspection it possesses an extra pair of articulations. So, further research into this specimen is called for.

The Monash Science Centre conducts visits by school groups to the Flat Rocks site each field season. The students are given a tour of the site by Priscilla Gaff, a science teacher from the Monash Science Centre, and are shown examples of the fossil bones that have been found during previous field seasons as well as fossils found on the day the school group attends. This

Priscilla Gaff & class at Flat Rocks

field season more than twenty school groups visited the site and enjoyed a pleasant day at the beach.

Apart from the usual interested visitors to the dig we were also visited by three film crews this field season. Coxy from "Postcards Victoria" spent an afternoon with us, as did the crew from "Totally Wild". Ruth Berry and her film crew from "Big Island Pictures" spent three days filming and interviewing members of the crew for the up-coming documentary "The Terrible Lizards of Oz". The first two programs have already aired on television, but the documentary is expected to be shown later this year or early next year, so watch out for it.

We are constantly warning people of the dangers of rock-fall from the unstable cliffs near the site and in the last week of the dig, a large rock-fall occurred near the cryoturbation site just 100 metres from the excavations. More than 20 tonnes of rock fell overnight, including a couple of blocks the size of a small

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*

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

MAMMAL JAWS DISCOVERIES	
YEAR	**No.OF JAWS**
1993	1
1994	2
1995	1
1996	1
1997	1
1998	1
1999	2
2000	7 (3 On Rookies Day 3.12.00)
2001	3
2002	2
2003	2
2004	10 + isolated tooth
TOTAL	**33**

car. Only the day before Tom Rich had been showing Patrick Green, director of Museum Victoria, the cryoturbations. Recent heavy rain over the winter months have made the cliffs even more unstable, reinforcing the need for more vigilance.

The following taxonomic lists indicate the number of different groups of animals that lived contemporaneously at the Flat Rocks site and throughout the Gippsland Basin during the Early Cretaceous. These lists reflect the high diversity that existed in this polar region more than 115 million years ago, but represents just a fraction of the taxa that actually lived at that time.

Table 1 indicates the biased distribution of some of the fossil groups. The evidence for labyrinthodonts is limited to sites along the western exposure of the Strzelecki group, whereas the fossil mammals have so far only been found at the Flat Rocks site. Evidence of dinosaurs have been found at all sites except Koonwarra, which is the only lacustrine (lake) deposit and is famous for its beautifully preserved fish fossils and a handful of bird feathers. It is obvious from this table that the Flat Rocks site is the most prolific of all the sites within the Gippsland Basin, with evidence of almost all the animal groups except the ceratopsian dinosaurs and the labyrinthodonts.

TAXONOMIC LIST OF FOSSIL VERTEBRATES FROM THE GIPPSLAND BASIN SITES, VICTORIA								
TAXA	**San Remo**	**Potters Hill**	**Punch Bowl**	**The Arch**	**Blackhead**	**Powlett River**	**Eagles Nest**	**Flat Rocks**	**Koonwarra**
MAMMALIA:									
Ausktribosphenos nyktos								X	
Ausktribosphenos sp.								X	
Bishops whitmorei								X	
Teinolophos trussleri								X	
Monotreme indet.								X	
DINOSAUR indet.	X	X	X	X	X	X	X	X	
Qantassaurus intrepidus								X	
Hypsilophodontid sp.	X	X	X	X	X	X	X	X	
Theropod dinosaurs	X			X			X	X	
Ankylosaurs/nodosaurs								X	
Ceratopsian dinosaurs				X					
Ornithomimid dinosaurs	X				X			X	
Plesiosaurs						X	X	X	
Pterosaurs							X	X	
Testudines					X	X	X	X	
Aves								X	X
Ceratodus sp.	X					X	X	X	
Paleoniscoid fish					X	X	X	X	X

***Table 1**: Distribution of taxa recovered from the main fossil localities within the Early Cretaceous sediments of the Gippsland Basin*

Table 2 deals specifically with the Flat Rocks site and reflects the different types of fossil bones and teeth that have been collected and prepared over the last eleven field seasons. The table only represents material that has been prepared so far and more information will be added in the future. It is plainly seen that the fossil mammals are only known mainly from their jaws and teeth, with only one confirmed limb element represented. Although a number of dinosaur taxa are present at the site, the fossil bones of the hypsilophodontid dinosaurs are, by far, the most common and they are representative of many different parts of the skeleton.

TAXONOMIC LIST OF FOSSIL VERTEBRATES FROM THE FLAT ROCKS SITE, INVERLOCH, VICTORIA.

TAXA	Skull Element	Jaw	Tooth	Vertebra	Limb	Girdle	Rib	Shell/Armour	Scales
MAMMALIA:									
Ausktribosphenos nyktos		X							
Ausktribosphenos sp.		X							
Bishops whitmorei		X							
Teinolophos trussleri		X							
Monotreme indet.	X	X	X						
Multituberculata?		X							
DINOSAUR indet.	X	X	X	X	X	X	X		
Qantassaurus intrepidus		X							
Hypsilophodontid sp.	X	X	X	X	X	X	X		
Theropod dinosaurs	X		X	X	X				
Ankylosaurs/nodosaurs			X					X	
Ornithomimid dinosaurs				X					
Plesiosaurs			X				X		
Pterosaurs			?		X				
Testudines	X			X	X	X		X	
Aves					?	X			
Ceratodus sp.		X							
Paleoniscoids	X	X	X						X

Table 2. *Reflects the high faunal diversity at the Flat Rocks site, near Inverloch. Note that all the fossil mammals are represented almost entirely by jaws.*

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 2004. 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's excavation was located in a remaining trapezium shaped outcrop of rock between the 2003 and the 2000 field season areas. Both of these areas yielded a number of mammal jaws and it was hoped that the area in between would continue to be as rich.

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 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 sandstone overburden was removed with one air powered and two Cobra petrol driven jackhammers. 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:

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.

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 and a new method of securing the edges involved using more pins and girders.

Things however, did not go as well as planned as using concrete (instead of the expansion bolts) to secure the pins in the ground was inadequate and on the first night the pins were partially pulled out of the ground by the incoming tide. It was then decided in the interest of safety to revert to the old method of shovelling out each day. The sandbag wall was retained and was supplemented by cross walls, which reduced the working area to a minimum. A bonus of using this method was that it was more flexible and when the rock, which was to be directly under this years' system proved poor, the excavation area was relocated 3m further east.

Sump Pump:

The sump pump and solar power unit performed poorly this year as the original pump unit failed to work and the new pump unit with a smaller intake area became easily clogged and eventually the impellor was damaged and it also failed to

pump. The amount of water flowing into the excavation area was considerable due to the large mass of surrounding sand and it is doubtful that the present arrangement will be able to keep up in the future as the excavations get deeper. Augmenting or upgrading the present power system is an option as the small pumps presently operate at about 50% capacity.

Four Stroke Pump:
A new four stroke petrol pump was acquired this year and worked well pumping out the pool area to stop this water returning to the excavation area. The new pump also fitted well onto a cobra backpack and was more easily transported down to site than by using the furniture trolley as in previous years.

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 to be built and Area B where small amounts of poorly fossiliferous conglomerate overly the basal mudstone. 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:
The main excavation area was chosen as it lies in between two profitably mined areas on either side, and the fact that it is the shallowest exposure left in the main channel zone.

Excavation at this area revealed that like the previous year the upper conglomerate was transitory and fragmentary and the middle units consisted of two thin conglomerates. The uppermost middle conglomerate proved the most productive and all others were very poor.

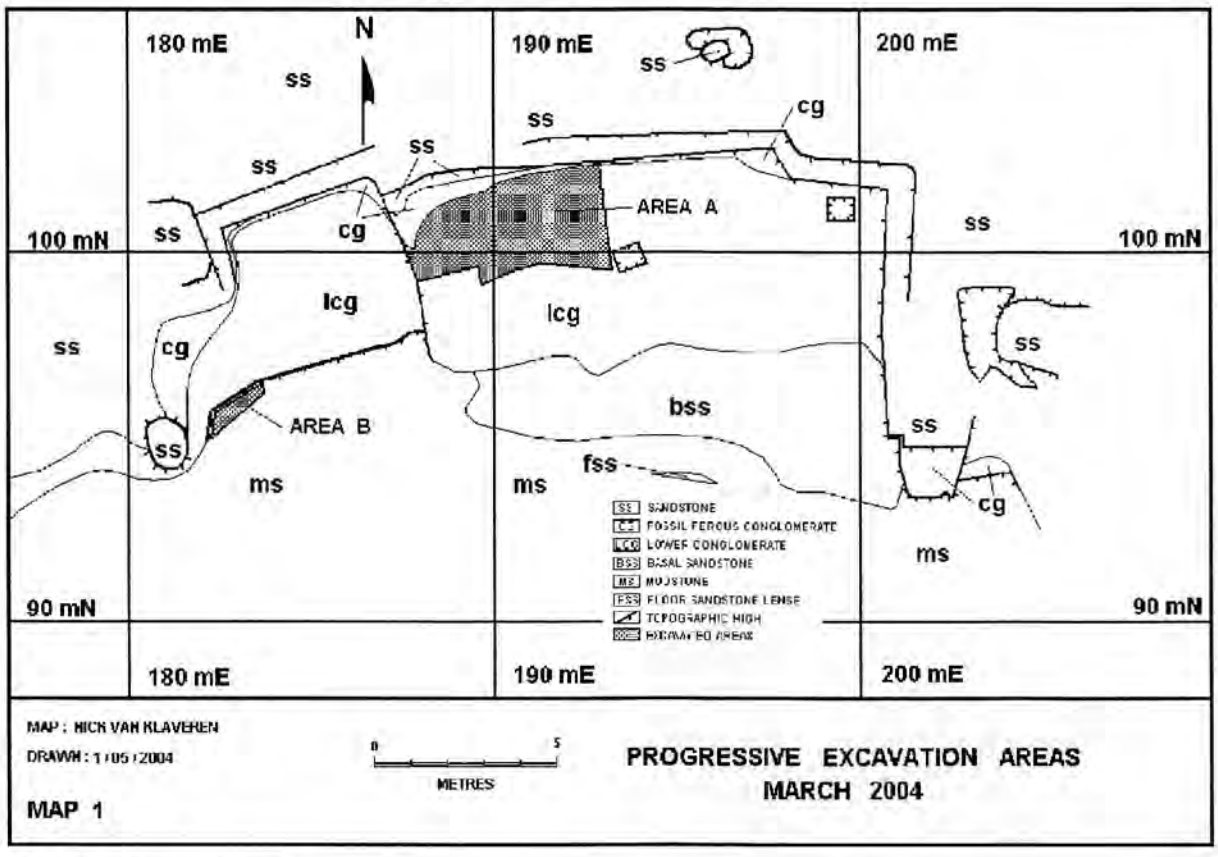
The area directly below where the system was to be set up this year was once again directly above a sand bar, which was characterised by increasingly massive and clean sandstone and by the fossil units becoming increasingly poor as the fault at 187mE was approached. As a result the excavation area was relocated 3m to the east and recovered the middle units left behind during the 2000 field season. This area was found to contain a number of mammal specimens

Area B:
The lowermost conglomerate directly overlying the mudstone was excavated only for a few days and only a small number of valuable specimens were recovered the majority being fragmentary fish and turtle remains.

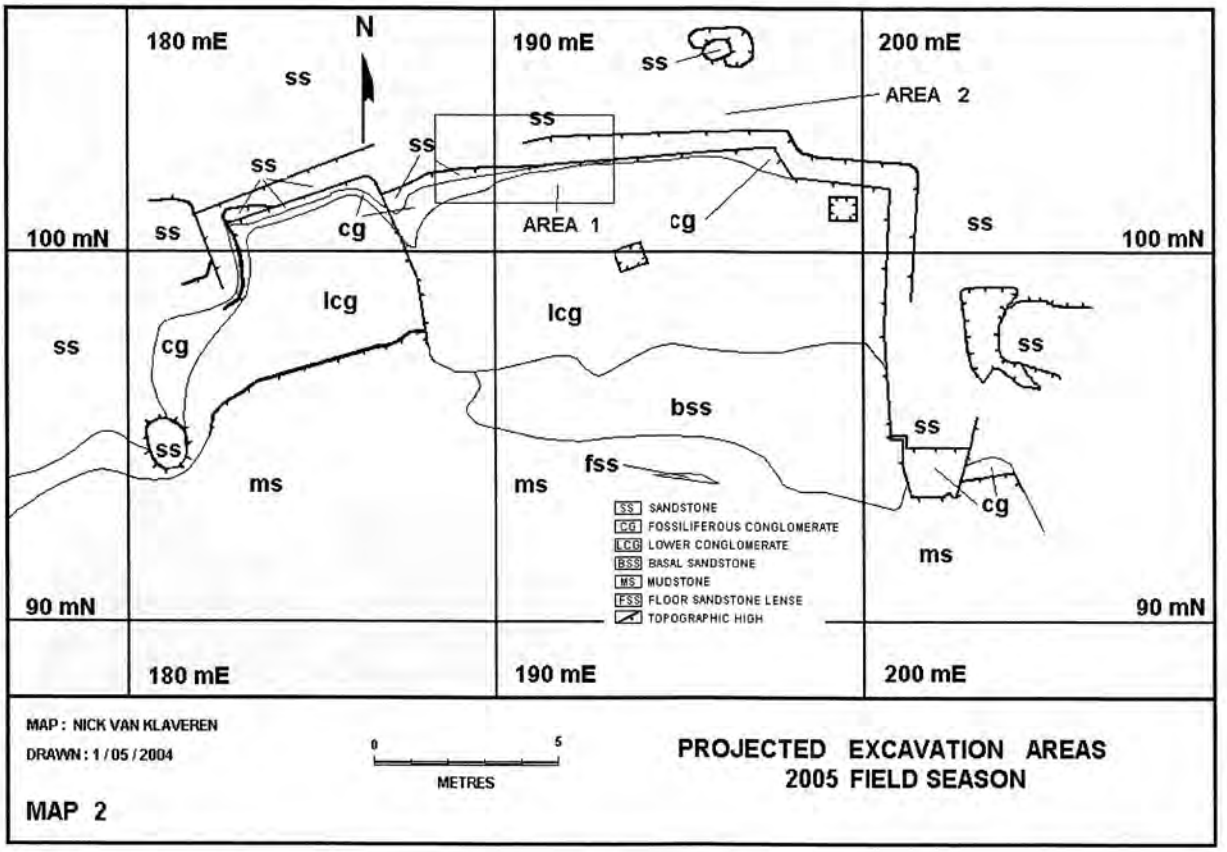
Future Plans:
The failure of the system this year was a setback in that three days were lost in implementing it and the truck tarpaulin was damaged. However the rock directly underlying where the system was to be located proved to be poor and the target area relocated 3m to the east was found to be far more productive.

Next year's excavation area will involve the system being set up on the area directly down dip of the most productive part of this years` site.

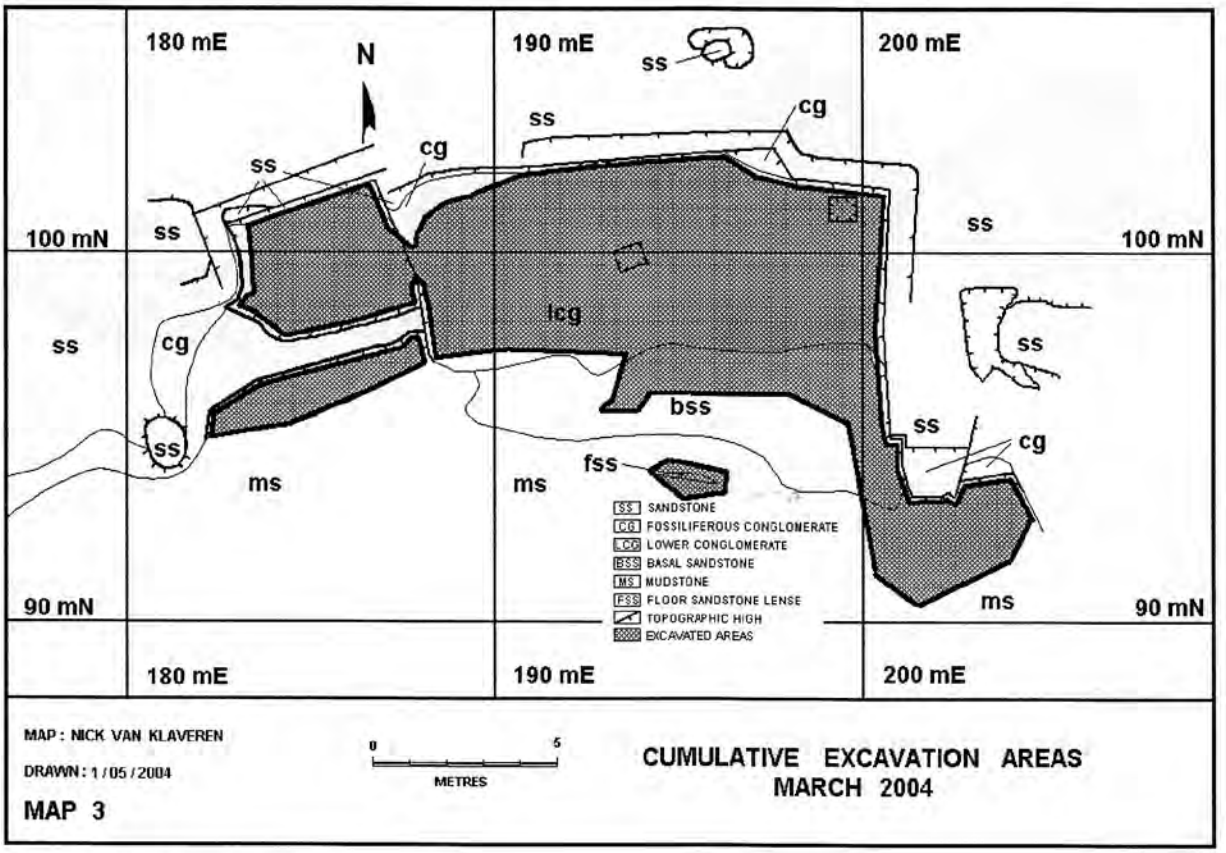
The procurement of new rock bolts, expansion anchors and upgrading the power supply for the sump pump should remedy the troubles encountered this year.



Map 1. *Progressive excavation areas*



Map 2. *Projected excavation areas*



Map 2. *Cumulative excavation areas*

Research update

by Dr. Tom Rich

One of the marked differences between the fossils from Dinosaur Cove in the Otway Ranges and Flat Rocks in the Strzelecki Ranges is the number of isolated teeth of small theropod dinosaurs found at each. From Dinosaur Cove has come exactly one whereas Flat Rocks has yielded in excess of 100 specimens. Why there should be this difference in the quantity of such fossils is unknown. Further north at Lightning Ridge and again in Queensland, there are a few more such teeth but nothing like the quantity of them from Flat Rocks. Small theropods were intelligent predators that were fleet footed. On the basis of isolated teeth, it is unwarranted to name species of dinosaurs. However, examining their shape does make it possible to make a reasonable estimate of how many different species there were even if a name cannot be given to them. On the basis of such comparisons, Dr. Steven Salisbury has concluded there were three different species of small theropods present at Flat Rocks making that group about as diverse as the hypsilophodontids, the other common dinosaur group in the assemblage. This is about the same diversity of small theropods as is found in the richer dinosaur assemblages on other continents.

Since they were first found at Flat Rocks in 1997, mammals have been the principal goal of the excavations carried out there. At present, there are three named species from this locality. In addition, fragmentary remains suggest that another five species were present. Ultimately, we hope that more complete specimens of these scanty remains will be found which will be adequate to name the new species that we know are there. The fragments of these unnamed species that we do have are too incomplete to base a name of a new species upon.

multituberculate tooth?

This past field season ten more mammalian specimens have been found, more than during any previous field season and over a quarter of the total recovered since 1997. The most intriguing of these is a jaw fragment with a single tooth in it. The tooth has a blade-like form such as is known in only four groups of mammals. Only one of these groups is known from the Mesozoic Era when the dinosaurs lived. This group is called the multituberculates. They have previously been found on every continent except Antarctica and Australia. While the general form of the new tooth is what is expected of a multituberculate, there are details of the Flat Rocks specimen that are found on no other multituberculate. What we seem to have is either a highly unusual multituberculate or a heretofore unknown group of mammals.

A fragment of a jaw with two molars that are larger than those of *Ausktribosphenos nyktos* probably represents a larger species of that genus.

These specimens add two new species to the total count of mammals from Flat Rocks, bringing the named species to five. With the addition of the unnamed species, this means that this site has one of the most diverse Mesozoic mammal assemblages from the southern hemisphere.

The monotreme *Teinolophos trusleri* has previously been represented by two jaws each with a single molar and a number of toothless jaws. This year a specimen was found that had two complete molars and part of a third. It shows that the molars steadily increase in size going from the front to the back. This gives us just a little bit better knowledge of the animal and thus helps to place this monotreme within the

Teinolophos trusleri jaw

group as a whole.

Two more lower jaws of the placental mammal *Bishops whitmorei* each with a complete set of molars, and one of these had the most posterior premolar as well, were found. These specimens will add to our knowledge of the size and shape variation of the teeth. Because the affinities of this group of mammals is quite controversial, anything that adds information about the teeth adds to the evidence for understanding just what kind of mammal it was.

Bishops whitmorei jaw

By increasing the sample size, the variation in the dimensions and shape of the teeth can be more accurately ascertained.

Sedimentology

by Doris Seegets-Villiers

In order to get a better picture of the fluvial system, it is not only necessary to record the changes within the actual channel that is being excavated, but also to take logs (stratigraphic columns) along sections of the cliff. With the cliffs being unstable it was not possible to map the sections of the upper cliff (the areas that were not reachable from the ground) in detail. Assumptions such as grain size, sedimentary structures and fossil content had to be made as best as they could.

Some of the lithofacies (facies means all primary characteristics observed within a sedimentary unit) that have been identified within the sediments of the cliff face are described below:

Figure 1. also shows a simplified example of a stratigraphic column.

Gravel Facies:
This facies comprises all the sediments that were deposited under the highest energy environment present at the site. Hence, they are the coarsest ones, consisting of a mixture of sandstone and clasts. A general rule is, the bigger the clast the higher the energy level. This, of course, assumes that all the clasts are made up of the same material, which is mostly the case at Inverloch. Except for very few quartz pebbles, all other clasts are so called intraformational clasts (see explanation below).

Paraconglomerate or mud-supported conglomerate (Lithofacies Gmm):
Paraconglomerates (the larger clasts that are part of this sediment are mainly floating freely in a sandstone matrix, on occasion they may touch). They are usually found as a lag deposit at the base of scours or channels. Clasts are grey in colour, made up of mud and subrounded to well rounded. Their size falls mainly within the pebble (4-64mm) range but can also be smaller (granule size: 2-4mm) or larger (cobble size: 64-256mm). Clasts derived from within the sedimentary basin are therefore called intraformational. In our case this means that the river system would have flowed over an area of mud, with the latter being ripped up by the water current, transported down stream and eventually being redeposited with the sandstone. The base of these units is sharp or erosional, indicating an incision of the lithofacies Gmm into underlying sediments. So far, no vertebrate fossil remains have been found within this lithofacies. Plant material is scattered throughout the entire unit and is represented by small parts of detritus, but rarely also by small logs and charcoal. Lithofacies Gmm is interpreted as a high-energy, sandy to gravely, braided river channel deposit.

Sandy Lithofacies:
The sandy lithofacies represents the major constituent of all facies in the area. Characteristically they are a grey to green, light brown to beige colour. Grain sizes range from very fine to coarse, but can (rarely) be up to very coarse.

Horizontally laminated very fine to coarse (pebbly) sand (lithofacies Sh):
This unit consists of mainly medium grained sand, with subordinate fine and coarse influence. Intraformational grey mud clasts of moderate to well rounded and mainly pebble size can occur at the base of/or in very small numbers throughout the entire unit. Lamination is mainly caused by interbedding of layers with and without plant material and by changes in grains size. Fining upward can be observed in some of the units.

Base and top are usually sharp and non-erosional, but can be erosional. Thickness of individual laminae ranges from 1 to 5 mm, overall thickness of the unit from about 0.1m to well over 1m. Fossil content is mainly restricted to small plant detritus that traces the lamination and, in rare cases, to larger (a few mm) sized plant fragments which equally enhance the lamination. Horizontal lamination in sand size sediment is mainly formed by turbulent flow in upper flow regimes.

Ripple cross-laminated sandstone (lithofacies Sr)
Lamination is caused by the deposition of plant-rich material (in this case) along parts of the current ripples. Grain size is usually medium sand with little variations towards fine and very rarely coarse. This facies occurs very rarely at the site. Individual ripples are no more than 15 mm, the entire unit, however, can be more than 0.3 m thick. Base and top boundaries are usually marked by an erosional horizon. Ripple cross-lamination is formed during a lower flow regime.

Fine grained Lithofacies:
Sediments of mainly silt to mud size are comprised in this lithofacies. Colouring changes from light grey, slightly beige for the silts to medium to dark grey for the muds.

Laminated sand, silt and clay (lithofacies Fl):
This light to dark grey unit consists mainly of interlaminated silt and clay. Sand can also be observed in rare cases. Lamination is caused by the change of grain size between individual laminae and the change in organic content (which accounts for the contrast in colouring). The clay component represents one of the lowest energy environments captured within the sedimentary deposits. It could have easily been followed by a period of complete drying up. Yet, so far, no indications of roots, bioturbation or desiccation cracks have been observed. This hints at either relatively fast deposition with constant input of new sediment and, at the same time, adequate sinking of the sedimentary basin, plus possible ongoing submergence of the area under water or the non-preservation of any of these features due to erosion. The latter must have been occurring in at least a few cases. Palynological investigations of some of the mudstones have disclosed a well-vegetated "overbank" area revealed in very high numbers of spore/pollen grains and a high content of plant debris. Roots or imprints of roots should be present, but were all eroded.

The base of this facies is often sharp but non-erosional, whereas the top is often marked by a sharp erosional horizon. Individual laminae are usually between 0.5-5mm, beds between 0.05 and 0.6 m and the entire facies up to several metres thick.

Stratigraphic column:
The stratigraphic column (*Figure 1*) graphically depicts the described above lithofacies units. The lowermost part is an indicator of the grain size from smallest (left) to coarsest (right). The extent of the actual column to the right shows the maximum grain size present within any of the lithofacies. The lowermost unit (Fl) is made up of interbedded areas of mud and silt, all the other areas exhibit a grain size of maximum medium sand. Also shown is a bar that shows the energy level interpreted from the observed sediment structures. The lowest energy level within the sediments is found within the Fl deposits. It is followed (with increasing energy) by Sr then Sh and finally the highest energy level of Gmm. The bar shows that the energy first increases up to about 200cm, then decreases and increases briefly, to finally decrease again.

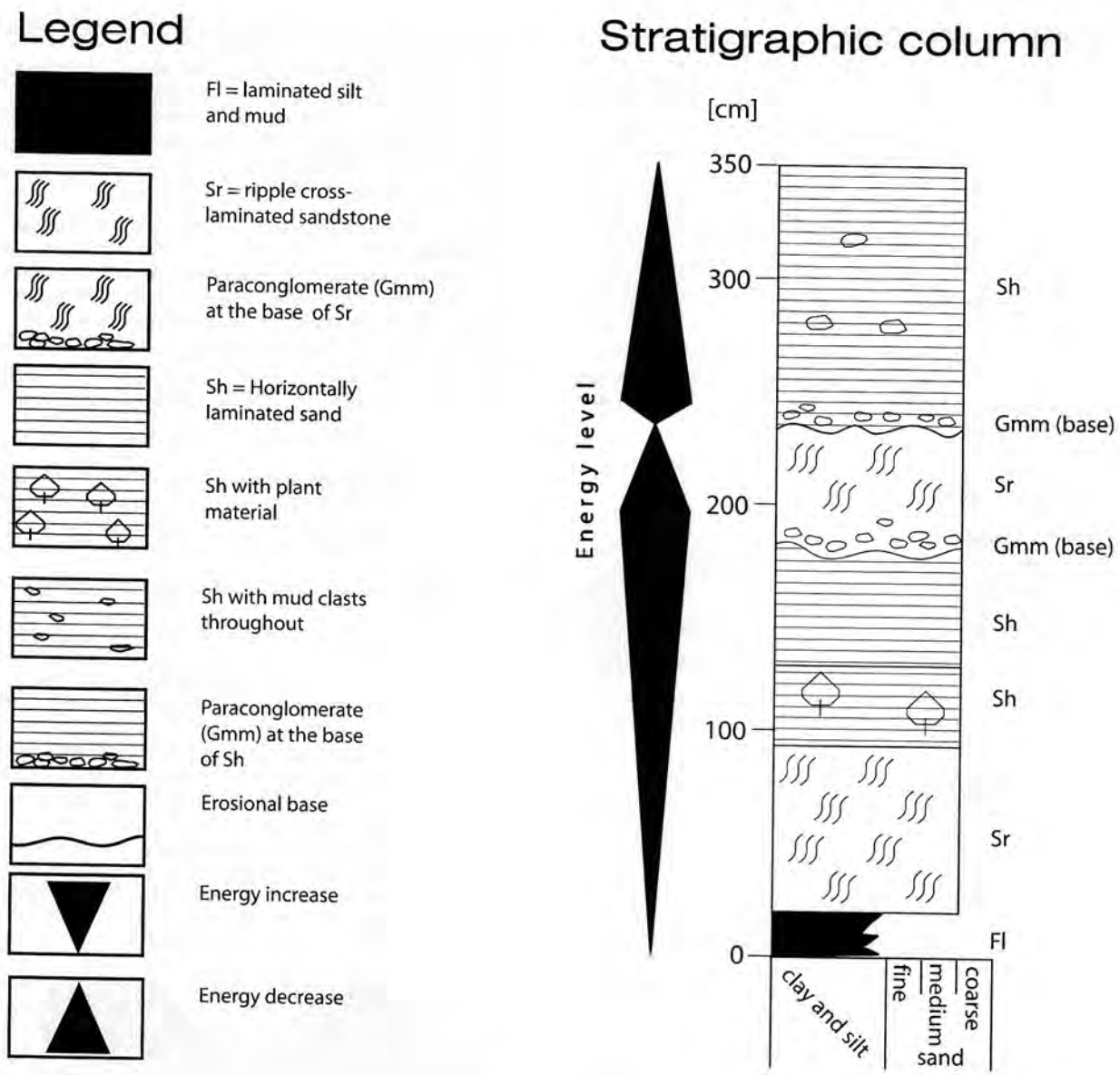


Figure 1

"Shoulder Bone" Count:

The term "shoulder bones" refers to the bones that are simply "shouldered" which means they are kept but not catalogued. This can have various causes. They can be fragments of a dinosaur bone but because e.g. only the shaft and not the ends of a long bone are preserved there is no hope for us to ever identify them. They can be fragments of a turtle but because they are too small for identification they are not catalogued. Included in the figure below are the counts for some of the shoulder bones for the 2004 season. Whilst counting the bones we distinguished between entire bones and fragments thereof (1/2).It was also noted which unit they came from: the sandstone or the conglomerate. The latter was subdivided into the thin (very thin bands of conglomerate within the sandstone) and the true (several cm thick) conglomerate. It can be seen that most of the "shoulder bones" are turtle and fish. They are part of the fauna that lived in and closely around the river system, the fauna that would overall make up the most fragments to be excavated. It also can be observed that there are only a few dinosaur bones that never make it to the cataloguing stage.

Element	Half bone	Full bone	CH thin	CH true	Sandstone
Fish scale	5	2	1	3	3
Fish jaw	2	0	1	1	0
Fish	74	59	34	28	71
Ossicles	4	8	6	2	4
Turtle	63	33	33	21	42
Ossified tendons	1	1	2	0	0
Dinosaur	9	11	8	1	11
No idea	1	1	1	0	1

Thank you to all those people who have, yet again, helped me with my tasks at Inverloch. Anne, John, Lesley, Mary, Nick, Norman, to mention just a few. Thanks to all of you and everyone else. Your help is much appreciated.

A Summary of the status of known Cretaceous vertebrate fossil localities on the Strzelecki Coast, Victoria, Australia.

By Mike Cleeland

Prospecting for vertebrate fossils in this area could be said to have begun with the discovery of the "Cape Paterson Claw" near Eagles Nest on 7th May 1903.

No further material is known to have been collected until the late 1970s when Monash University personnel and associates including Tim Flannery, John Long, Rob Glennie, Mike Archer, Cindy Hann and Tom & Pat Rich began a prospecting program which covered much of the area, then progressed into the Otways eventually leading to the discovery and excavation of the celebrated Dinosaur Cove site.

Then in the late 1980s Lesley Kool, Nick Van Klaveren, Mike Cleeland and others began re-prospecting the Strzelecki coastline. Continuing work by Mike Cleeland, Andrew Ruffin and others during the 1990s and up to the present day has helped to amass a collection now numbering several hundred bones recovered from the area by surface prospecting.

The following descriptions give details of discovery of vertebrate material at various sites along the Strzelecki coast, and recommendations are given for future prospecting allowing for estimated rates of erosion of the host rock in the area.

San Remo Back Beach:
Access from the car park at the south end of Back Beach Rd, San Remo. Proceed down the stairs to Bonwicks Beach. The Cretaceous rock begins immediately to the south of the bottom of the access path.

As of 2004 some 50 bones have been recovered from the rock between Bonwicks Beach and Griffiths Point. Prospecting in 1978/9 discovered a small number of bones and further discoveries have been made since 1988.

Material recovered has included Labyrinthodont, dinosaur, turtle and unidentified bones.

Notable specimens include the following;

An eroded portion of what was once a large limb was found by a school student in an erratic near the bottom of the access track. Several bones including a well exposed tibia were recovered from the shore platform near the base of the cliff on the south side of Bonwicks Beach.

A fragment of ornamented Labyrinthodont skull plate (NMVP186101) and a reptile toe bone were found within 30 centimetres of each other in the base of the cliff on the south headland of Bonwicks Beach, providing evidence that these groups lived together in this area.

One large dinosaur metatarsal some 10cm long and 1.5cm wide was found in an erratic some 20m south of the south end of Bonwicks beach.

A Labyrinthodont pterygoid (NMVP186055) was recovered from a large (1m3) erratic about half way from Bonwicks Beach to Griffiths Point.

A Lungfish tooth was found on the shore platform near Griffiths Point (P186138).

A large black unidentified triangular bone (P186433) was found by Andrew Constantine some 30m southwest of Griffiths Point and after suggestions of shark tooth, ankylosaur femur and other possibilities, remains unidentified.

Concentrations of bones have been found at the south end of Bonwicks Beach and the shore platform about half way from there to Griffiths Point. Scattered bones have been found over much of the remaining area. No bones have been found above the one metre level in the cliff, a fact that could be due to the greater degree of weathering of the cliff material making bones harder to identify. However, several bones have been found in erratics, indicating that higher levels are also fossiliferous.

Very few bones have been found south of Griffiths Point even though the conglomerate in this area contains large clasts and would appear to be potentially capable of hosting large bones. The conglomerate passes into sandstone some 100m southeast of Griffiths Point and no bones have been found between here and the eastern end of Bore Bay. One prominent layer of coarse conglomerate outcrops in an undercut beneath a cliff about halfway from Shelley Beach to Bore Bay but no bones have been recovered from this site.

Sporadic prospecting since 1988 has covered most of the exposed rock on San Remo Back Beach on several occasions. Slow erosion has revealed new bones particularly in the southern half of the beach. As of January 2004 virtually all the exposed area has been recently prospected and is not in need of further work.

Supervised visits by school groups has resulted in virtually all of the smaller erratics being carefully checked.

Recommendation; prospecting should be carried out every 3 years, resuming in 2006. Erratics should be prospected on an occasional basis at any time, since wave action can turn rocks over and expose new bones.

Storm events during the 1990s resulted in exposure of rocks normally hidden under sand and this area was searched without success. It is considered therefore that there is no need for further prospecting after storms in this area.

The shore platform at the south end of Bonwicks Beach is unusually soft and should be checked annually.

Potters Hill Region:
Access is via Potters Hill Road, and down to the beach and around to the east. No fossils have been found at Quarry Rocks at the west end of the beach, and it is considered unlikely that any will ever be found there. Massive sandstone dominates the area.

Scattered bones have been found in the cliff and shore platform between the access track and the small boulder beach some 150m to the east, including a reptile tibia (P186053) found by Lesley Kool in March 1989 in the cliff some 50m east of the access track.

No bones have ever been found in the erratics on this beach despite repeated searching. Two small bones have been found in the shore platform on the western side of the cove.

The shore platform between this (unnamed) beach and Rowells Beach, a section of some 200m, has produced several bones including a large Labyrinthodont rib fragment.

Recommendation; prospecting should be carried out approximately every 3 years.

Rowells Beach:
Rowells Beach is the "local" name of the sandy beach about half way between Potters Hill Rd and The Punchbowl. The name is derived from Mr Tom Rowell who owned the abutting property during the 1960s. It has been the site of several important discoveries and is therefore discussed in some detail here.

Erratics at the west end of the beach have produced several bones and are noted for a relatively rapid erosion rate.

A prominent knoll approximately 2m high some 100m east of the western headland of Rowells Beach has produced a large vertebra (P186238) from the top surface, and a Labyrinthodont clavicle (P186237) from the lower eastern side.

The shore platform to the southeast of this knoll was the site of the discovery of the type specimen of *Koolasuchus cleelandi*, (P186213) two lower jaws of which were found exposed on 30th April 1990. An exploratory dig around this area at the time removed up to a cubic metre of rock but was unable to recover any more associated bone apart from a toe bone.

The shore platform to the east of the sandy beach has produced scattered bones including three Labyrinthodont clavicles but is subject to only very slow erosion.

A severe storm in the mid 1990s removed nearly all the sand from Rowells beach for a short period and allowed prospecting of nearly all the rock platform and erratics beneath the sand. A prominent dolerite dyke was exposed near the west end of the beach. A small number of bones were recovered from the erratics exposed on this occasion including a possible Labyrinthodont or therapsid(?) tooth.

Recommendation; the area should be prospected every 3 years, except for the erratics at the west end which should be prospected annually, particularly when the sand level is down. Sand levels vary by up to 2m on this beach so prospecting should be carried out when the sand is down if at all possible, which occurs at times of extreme southwesterly storms or strong southeasterly winds.

Rowells Beach to the Punchbowl:
Access to this section is only practical at low tide from Rowells Beach.

Several bones have been found in this section, most notably the Labyrinthodont skull (P208084) found by Andrew Ruffin about halfway between Rowells Beach and the Punchbowl. A labyrinthodont cleithrum (P186158) was found in the base of the cliff near this site.

A cove some 50m across just to the west of the Punchbowl was the site of the discovery of a large dinosaur claw fragment (P186153), and a fragment of vertebra, in gravel erratics on the eastern side. These erratics evidently derive from a gravel layer several metres above shore platform level in the cliff on the east side.

Recommendation; Prospecting should be carried out every 3 years as erosion in this sector is relatively slow. Effort should be concentrated on the raised shore platform at the eastern end of Rowells Beach, and the cove to the west of the Punchbowl in the hope of finding more of the large carnosaur remains.

The Punchbowl:
Access to much of this area is difficult and hazardous, and should not be attempted by anyone with any physical restriction or problem coping with heights.

From the end of Punchbowl Road access is via a lookout below the carpark, then on over a saddle between the Punchbowl and the cliff, then down to shore platform level to the west of the Punchbowl.

The crossing of this saddle is considered one of the riskiest paths on the Strzelecki coast and should not be attempted any more often than necessary. Crumbly rock and steep drops on either side make the area particularly hazardous.

The Punchbowl itself is evidently a collapsed sea cave as the original entrance, now blocked by rockfall material, is visible from the shore platform.

The most celebrated specimen recovered from this site is the "GOK", a bone now recognised as a fragment of Labyrinthodont jaw. For some time after its discovery in the late 1970s. it was unidentifiable and was given the acronym "God Only Knows" until the suggestion was made that it could be Labyrinthodont. This was initially regarded as unlikely because at that time these animals were unknown in sediments younger than approximately 180 million years old. The recovery of Koolasuchus and other specimens from the San Remo area in subsequent years confirmed this identification.

The GOK comes from a large erratic some 30m west of the sea cave at the base of The Punchbowl.

Several further bones were found in a boulder at this site in January 1990 including a Labyrinthodont clavicle, although it is unknown whether they came from the same boulder as the GOK. A boulder containing several bones was broken into smaller pieces and transported up the cliff with the assistance of the local SES unit, who used the activity as a training exercise to refine their skills in rescuing victims with broken bones. It is considered likely that these bones all originated from the same layer and together with the GOK, constitute a scattered partial labyrinthodont skeleton.

Few other bones have been found in this area apart from a theropod dinosaur centrum recovered from the point some 20 metres west of the access track.

Recommendation; prospecting is probably not necessary any more often than every 5 years. The boulders in the area of the GOK discovery are well above tide level and not subject to erosion except in extreme conditions. The remaining rock in the area is particularly resistant and relatively unfossiliferous.

The Haybaler:
Access to this cove is via the Punchbowl to Kilcunda walking track. The Haybaler is the colloquial name given to the cove some 100m to the east of the Punchbowl, distinguished by the presence of the rusting remains of a hay baling machine which is said to have fallen over the cliff after it became disconnected from a tractor in the paddock above. Two fishermen were reputed to have been having their lunch at the base of the cliff only some 15 minutes before the plummeting machine arrived on their picnic site.

Despite this inauspicious beginning this cove became a productive site during the 1990s.

Several bones including a large eroded vertebra were found in the shore platform below the end of the access track. Other bones including an unidentified jaw and a lungfish tooth were found on the shore platform on the eastern side of the cove.

A Layer of gravel conglomerate beginning beneath a prominent overhang some 30 metres south of the haybaler and extending across the shore platform has produced the greatest concentration of bones from this cove, including a lungfish tooth (P186120) and a medium sized vertebra.

A large rockfall to the west of the access track in the early 1990s produced a supply of weathered erratics onto the beach in this area. Despite careful searching no fossils have been found in these erratics. A fragment of a large hypsilophodont femur was found in a prominent gravel conglomerate layer just to the east of the sea cave at the base of Punchbowl.

Recommendation; prospecting of the fossiliferous gravel conglomerate layer on the east side of the cove should be carried out every 2 years as it appears to be softer than the surrounding material. The remainder of the cove should be prospected every 4 years.

Haybaler to Kilcunda:
This section is probably the least heavily prospected area of the Strzelecki coast owing to its relatively remote location.

Starting from the western end, a small number of fossils have been found in the cove on the western side of the access track.

The greater concentration of bones has been found in the area east of the rock stack to the east of the access track. A prominent gravel conglomerate layer immediately to the east of the rock stack has produced around a dozen bones. A fossil layer at about 1.5m above the shore platform in the west facing cliff about 100m to the east of this location has revealed several bones.

A Labyrinthodont jaw (P186277) was found by Andrew Constantine approximately 200m east of the rock stack on 24 December 1990.

From here for the next several kilometres east only sporadic bones have been found. These have included a Labyrinthodont orbital (P186182) west of the Sandy Waterholes, and a scattering of various bones at the Tree Trunk Point locality. Because of the difficulty of identifying these locations without reference to obvious nearby landmarks it will be necessary to GPS these sites to direct future prospecting.

Recommendation; the stretch should be systematically prospected every 4 years with concentration of effort on the known sites.

The Arch, Kilcunda:
Access; along Mabilia Rd to the car park at the end, then along the path to the west.

Fossil bones were discovered here in the 1978/79(?) period and reprospecting of the locality has proved it to be relatively productive.

The main fossil layer is the prominent carbonaceous conglomerate over a metre thick in the leg of the Arch proper, which extends into the adjacent cliff to the east and into the small knoll to the west.

It was from this layer that the Ceratopsian ulna (P186385) was recovered which formed the type specimen of *Serendipaceratops arthurcclarkii*.

A one day exploratory dig was carried out at the base of the cliff here during the early 1990s which recovered over a dozen bones including a theropod tooth.

A large theropod vertebra (P212840) was found in an erratic near the base of the access track by Andrew Ruffin in approx. 2002. Occasional bones have been found in the walls and near the entrances of the caves to the west of this cove, and a notable theropod toe bone (P186151) was found on a small outcrop of shore platform fortunately exposed between erratics on the boulder beach some 50m west of these caves.

Occasional bones have also been found in the shore platform and erratics in the cove some 50m east of the Arch.

Recommendation; the area has been heavily searched during recent years but because of the quality and quantity of material recovered it is considered that it should be looked at every 2 years.

Mabilia St.:
A small number of bones have been found in erratics and in the cliff on this beach including one near complete turtle shell in a very hard sandstone erratic.

Recommendation; because of the extreme hardness of most of the rock in the area, and given that the erratics in particular have been heavily searched in recent years it should only be necessary to look at this area every 4 years.

Black Head:
Some 11 bones were found here when the site was first discovered in 1989. As far as is known there is no record of any previous finds.

Three fossil layers are found here separated by sandstones. The top layer is at eye level in the cliff, the middle layer at the base of the cliff and the bottom layer extends out over the shore platform. The two lower layers have produced the bulk of the bones from this site.

A couple of metres around the corner to the east a prominent fault cuts across the cliff and shore platform. No bones have been found east of this fault despite considerable effort.

Numerous bones have also been found in the erratics to the west of the site including probably the best find, a large theropod dinosaur vertebra (P186218) some 30m west of the point and a possible Ankylosaurid limb bone (P186219) some 20m west of the point.

Two one day digs have been carried out here during the period of operation of the Inverloch dig site and around 20 bones have been recovered on each occasion.

Recommendation; the rock at the site is relatively hard and should only need prospecting every 3 years. Recent work has exhausted the site so no further visits will be necessary until 2007.

Kilcunda area:
Relatively few bones have been found along the Kilcunda foreshore.

A lungfish tooth and a bone scrap were found on the headland on the east end of Shelley Beach, and there is a record of a vertebra being found near the railway bridge over Bourne Creek. Two vertebrae, one identified as a theropod dinosaur vertebra (P186175), were found on the far western end of the Cemetery point outcrop.

Recommendation; prospecting every 5 years.

Powlett River:
A relatively rich concentration of bones was discovered here and further searching has continued to reveal new finds.

The most productive area has been the surface of a small plateau, approx. 15m x 10m, near the low tide mark which is raised some .5m above the surrounding rock platform.

A large Plesiosaur tooth was found here by Gary McWilliams.

The fossil layer outcrops in several slightly raised areas to the north of this plateau.

A near complete, isolated turtle skeleton was recovered from unusual fine sediment near beach level some 20m inshore from this plateau.

A particularly severe November storm during the 1990s resulted in some 2m of sand being removed from the beach in this area. This resulted in the exposure of an inshore extension of the fossil layer which had been hitherto hidden beneath sand. Around 50 bones were recovered from this exposure including one notable fish jaw. The layer was rapidly submerged beneath redeposited sand and has not been seen exposed since.

Recommendation; the area should be monitored regularly to check for sand reduction and exposure of the inshore section, and exposure of the surface of the plateau which is subject to overgrowth of mussels and sea lettuce at various times.

Prospecting should be carried out every 2 years.

Harmers Haven:
Despite the expenditure of 9 days prospecting in this area no bones were recovered in an intensive search, even though numerous good quality conglomerate layers were found. One rib bone, discovered by a local resident, was subsequently recovered from near the mouth of the creek emptying onto Wreck Beach.

There would not appear to be any need for further prospecting in this area unless all other locations are exhausted.

Cape Paterson:
A record exists of a bone being found near the boat ramp at Cape Paterson. Nothing else has been recovered in the area except for a few bones found on the shore platform on the eastern side of the cove to the east of The Oaks.

Apart from a small scrap found at Shack Bay nothing has been found between here and the Eagles Nest sites.

Eagle's Nest:
Possibly the most celebrated of all the Strzelecki sites, Eagles Nest is now recognised as the site of the discovery of Australia's first Dinosaur bone, the "Cape Paterson Claw" found by W. H. Ferguson on 7 May 1903.

On revisiting the site in the late 1970s, Flannery & Long et al found the allosaurid astragalus that is now regarded as evidence of the existence of this family in Australia.

These specimens were probably both found in a layer some 200m west of the Eagle's Nest rock stack.

Numerous claygall conglomerate layers in this area have produced bones, in fact there are few layers which have not produced at least one or two bones. The most prospective layers have been

a) A layer that actually extends through the Eagle's Nest rock stack, dipping slightly to the north, and outcropping on either side. A large toe bone was found on the shore platform on the western side of the rock.

b) "Fergusons" site; ie the layer at the western end of the shore platform some 200m west of Eagles Nest. The Cape Paterson Claw was probably found either here or in another layer partially submerged below beach sand some 50m west of here. One day digs in this material during the Inverloch digging season have produced further bones. The site is marked on the Quarter sheet produced by Ferguson, and reproduced on the front cover of the Dinosaur Dreaming Field Report of 2003.

c) "Tom's layer", a layer noted by Tom Rich as being the site of the discovery of several bones during his search with Flannery et al during the late 1970s. From Eagle's Nest to the west the cliffline trends westerly for several hundred metres, then turns south for approximately 200m before turning west again to Lesley's Lair and Shack Bay. Tom's layer is about half way along the southerly trending section, and runs across the shore platform and up into the cliff.

d) "Lesley's Lair", a layer in the base of the cliff at a point nearly as far west as access will permit. Further bones have been exposed by erosion at this site since the original discovery, and a small scale dig, in the late 1980s.

In addition to these layers, erratics all along this stretch have produced bones and are deserving of further attention.

Recommendation; the area should be visited every 2 years. While some layers (eg Lesley's Lair) are eroding faster than others (eg Fergusons) there is sufficient extent of prospective outcrop to justify repeated effort.

The Honey Locality:
Located between Eagle's Nest and The Caves; numerous bones, mostly small with the exception of two Hypsilophodont femora, have been found here.

In addition, a severe storm during the 1990s exposed an outcrop of extremely hard conglomerate at the high tide level on the beach here, roughly half way from the caves to the next headland west. This layer produced two turtle skeletons in close proximity, and a third in a nearby erratic.

Recommendation; because of the hardness of the rock at this site prospecting is probably necessary only every 4 years.

The Caves/Flat Rocks:
Apart from the main dig site below The Caves carpark, numerous other layers in this area have produced bones.

An Ankylosaur rib was found in the base of the cliff some 200m north of the dig site, and a scute of the same on the rock platform offshore from here.

The rock platform area to the south of the large fossil tree has revealed numerous bones.

Various points in the cliffline and shore platform to the north have also produced fossils. However, the cliffs in this area are very unstable and prospecting at the base is discouraged.

In summary the whole area is fossiliferous and prospecting should cover all the way from the caves to the end of the cliffline to the north.

Recommendation; prospecting every 2 years.

Inverloch Foreshore area:
No bones have been found at any point from Flat Rocks to Townsend Bluff, where the Cretaceous outcrop terminates. A report by a local resident of dinosaur footprints in the rock platform at Townsend Bluff was investigated during the 1990s without success.

Recommendation; prospecting every 5 years.

Schedule
Recommended Yearly Schedule of Prospecting Sites

2004 Punchbowl to Kilcunda, Eagles Nest, Caves to Flat Rocks, Powlett River.

2005 The Haybaler, The Arch, Flat Rocks, Inverloch Foreshore.

2006 SanRemo, Potters Hill, Rowells Beach, Powlett River, Eagles Nest.

2007 The Haybaler, The Arch, Mabilia St, Black Head, Harmers Haven, Cape Paterson, The Oaks, Honey Locality, Flat Rocks.

2008 The Punchbowl, Punchbowl to Kilcunda, Kilcunda Foreshore area, Powlett River, Eagles Nest.

2009 San Remo, Potters Hill, Rowells Beach, The Haybaler, The Arch, Flat Rocks.

2010 Black Head, Powlett River, Eagles Nest.

Invite To The Dinosaur Dreaming

By Keiichi Aotsuka (he kindly translated his report into English for the non-Japanese speaking Dinosaur Dreamers)

From Feburary 8th to 22nd on this year, I have participated in "Dinosaur Dreaming" as a volunteer team member. It is Monash University's science research plan. In this report, I will tell you about what I did this volunteer.

This research is done every year from the end of January to March at Inverloch. There is the small town from the Melbourne city about 100km to southeast from the Melbourne city. These days, it is summer in Australia then, Temperature so high about 30°C and the maximum 40°C. At such a hot place we tried to dig with other volunteers. Our life schedule needed to be changed according to the tide because the digging place is at the coast. So, what time we should start to dig or finish, that is depended on the tide. And wake up time was changed too. The earliest wake up time was 4.00am, I felt so sleepy on that day.

Now I will tell you about digging way. First, dig a hole. Second, remove the sandstone and break that rock with a hammer. Finally, look for fossils in that breaking rock. It has many tiny bones. So, we tried to look through the rocks carefully. Sometimes that rock has tiny wood chips and mud or some minerals. Those colors are very similar to that fossil. So, I asked the team staff "Is this a bone?" but they told me "It's not a bone". My expectant was wrong.

Incidentally many fossils were found from this pit, such as fishes, turtles, mammals and dinosaurs and so on. Most of the dinosaur bones digged here are Hypsilophodontid dinosaurs or small theropoda's bones. This year I found the hypsilophodontid dinosaurs part of the backbone? (Last year I could not find any dinosaur bones. So, the finding was made me happy!!)

Well then, I told that before, this digging need a strategy for tide. If flow tide comes, we must stop to digging. In such case, we carry lumps of rocks to the lodging's yard. After that, we broke rocks at the yard in a relaxed mood. While breaking rocks at the yard we suddenly found great fossils. This finding, I was so to speak "The greatest find in the garden!?"

In digging, the hardest work was to dig a hole. We dug a hole, but next day, that hole was filled with sand by the tide. So, everyday we had to remove the sand and sea water with some shovels and buckets. That was so hard. But, we prayed that many dinosaur bones would be sleeping under the sand. Then our strength welled up naturally.

Then 2 or 3 people worked in the hole and picked big rocks. We had to take turns digging at the hole everyday. In the turn come to each person 1 or 2 times a week. Hole worker had the high possibility to find the greatest fossils, because on hole work day, I got excited. And that work is very dynamic and so exciting.

Sometimes many elementary school students or ordinary people come to the site to inspect the digging. Every visitor looks like very interested in fossils or digging. I saw the people and thought that dinosaurs were popular all over the world. One day, a girl came to me. She saw me and said "KONICHIWA", "SAYONARA". I was surprised because she greeted me in Japanese.

After the digging, we came back to the lodge and got a free time till the dinner. In that free time, I talked to the team members or played sports or games. We could communicate

with many people, which was one of the good points of Dinosaur Dreaming. Cooking dinner was volunteer work too. So, cooking person is changed every day. Every dinner was very good and gorgeous. And every Sunday dinner was BBQ. That was good too.

This volunteer team member was so friendly and kind to us. On the day I leaved to Inverloch they gave me a good send off. I was much moved. The days are really fun. Last year, I joined only 3 days and 2 nights. I felt "It's too short!" So, this year, I stayed 2 weeks, but I felt again "It's too short". If I get next opportunity, I want to join this volunteer team again.

If you get some interest in Dinosaur Dreaming I'm so happy. If you want to join this volunteer, I will recommend you. I think this experience is really wonderful. Maybe you'll never forget in your life.

Finally I would like to say thank you for Makoto Manabe, Ryoko Matsumoto, Lesley Kool and all of the volunteer team members. Thank you so much.

Acknowledgements:

Once again we were delighted to welcome some old friends from over seas to Dinosaur Dreaming 2004. Katch Bacheller, from Alaska, found time to join us once again for an all too brief few weeks. Her contagious enthusiasm for the project kept us going during some frustrating moments. Our dearest friend Ryoko Matsumoto returned for her third visit and brought with her Keiichi Aotsuka, for his second visit to the dig. Both were very welcome, especially when they treated the crew to authentic Japanese cuisine, and a special thankyou to Keiichi for allowing us to include the report on his Aussie experiences.

Remmert Schouten, another old friend who has been sorely missed for a number of years, finally got the opportunity to join us again this year. Rem is a fossil preparator at Bristol University in the United Kingdom and has worked on a number of digs all over Europe. He was happy to add his expertise to our dig and was a great asset to the team.

On behalf of the entire Dinosaur Dreaming team I must thank all our sponsors for their continued support. I say this every year, but without the support, both financial and in kind, the dig would not be able to go ahead. We have so many enthusiastic volunteers from all over the world and all walks of life, but the logistical support involved to provide accommodation, equipment and supplies for the crew is so essential.

We are very proud of the financial support that has been extended to the project by the National Geographic Society over the last twenty four years. We would also like to thank Blundstone Pty. Ltd. for once again generously donating steel capped boots to the entire field crew. With the increased emphasis on occupational health and safety in recent years it is gratifying to know that all our crew are supplied with safety boots.

We would also like to make special thanks to the Safeway supermarket in Wonthaggi, which generously donated a $100 shopping voucher to the dig. The cost of feeding a hungry crew is the largest factor in our budget, so any help towards that cost is gratefully received.

Our grateful thanks also go to Andrew Plant who designed the image of *Qantassaurus intrepidus* for our crew T shirts. Andrew is a talented artist who teaches many forms of art to students who attend the Monash Science Centre. He is also the author and illustrator of the delightful children's book "Could a T rex play table tennis?"

Over the years we have excavated at the Flat Rocks site we have made many dedicated friends. The financial support we receive from the Friends of Dinosaur Dreaming has allowed us to purchase much needed equipment integral to the smooth running of the dig. Other friends have helped in equally important ways. Friends such as Bernie and Margaret Brown, who often call by during the dig with boxes of fruit and vegetables and cans of jam and who made their van available to transport equipment to the dig house at the start of the field season. It is friends like these that make us appreciate what friendship is all about.

This is by far the most successful field season to date and proves that one should never give up in the face of adversity. What started as a discouraging field season ended with the recovery of over 800 fossil specimens, including the discovery of an entirely new group of mammals that were unknown to Australia before the dig began.

Because we only spent the last three weeks of this field season excavating the new area of the fossil layer we intend to return to the same section in Dinosaur Dreaming 2005 in the hope that we may find more of Mary's mammal as well as hundreds of other exciting finds.

Qantassaurus intrepidus
Dinosaur Dreaming's first dinosaur

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