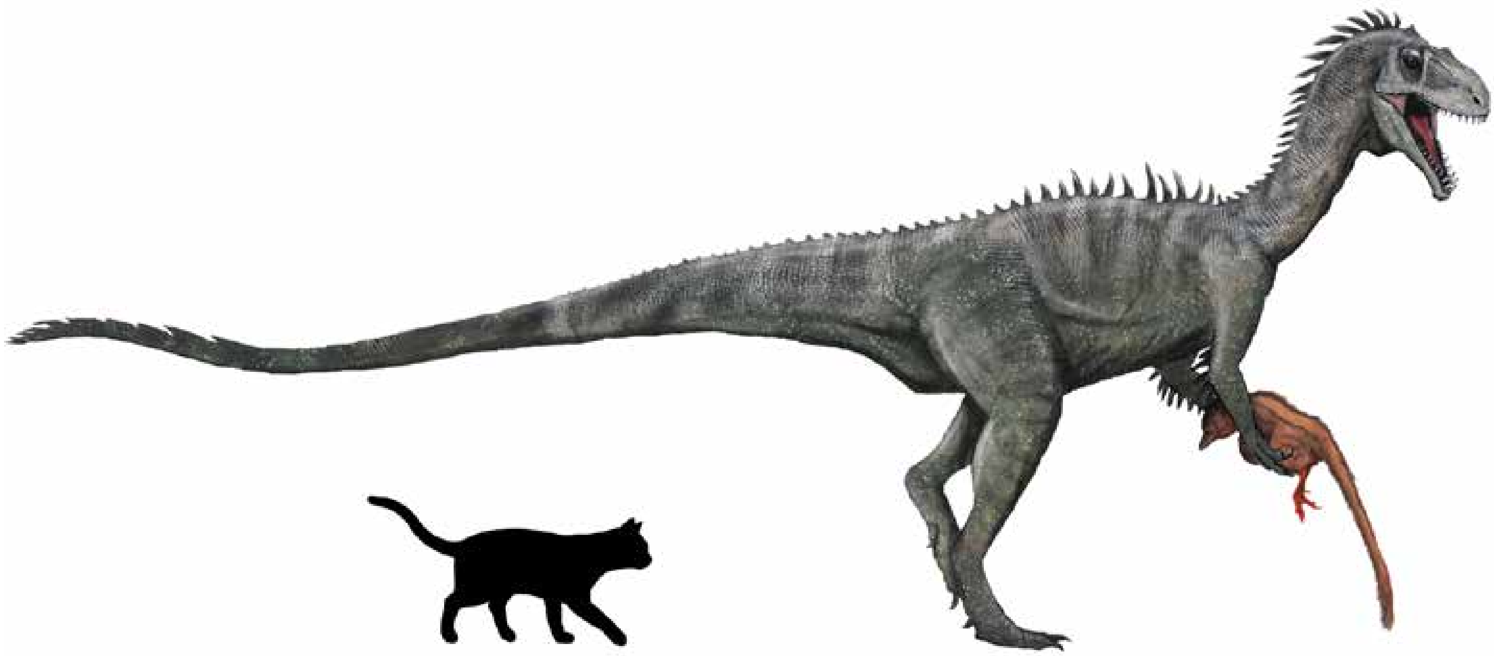
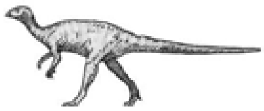
DINOSAUR DREAMING 2012 FIELD REPORT





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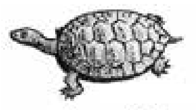

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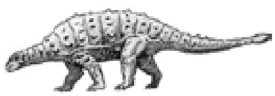

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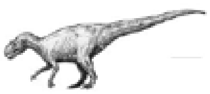

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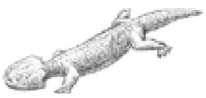

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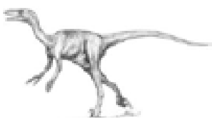

Visit our websites:

www.dinosaurdreaming.monash.edu
www.dinosaurdreaming.net

And our blog:

www.dinodreaming.blogspot.com

FRONT COVER: Reconstruction of the Ceratosaur from San Remo (with a cat for scale). See Ceratosaur (p58). Artist: Brian Choo.

BACK COVER: The cliffs at Flat Rocks reflected in an early morning tidal pool. Photograph by Sue Flere.

Dinosaur Dreaming 2012 Field Report edited and compiled by Wendy White. Special thanks to my proofreaders Mary Walters, Tom Rich, Marion Anderson and Lesley Kool and my Adobe® InDesign® coach Sarah Edwards. Also thanks to Alanna Maguire for being mistaken in her belief that she'd accidentally deleted last year's template.

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Dinosaur Dreaming 2012 Field Report

By Lesley Kool

The Dinosaur Dreaming 2011 field season ran for three weeks from the 11th February to the 3rd March inclusive. It was the 19th consecutive field season to be conducted at the Flat Rocks site, near Inverloch, Victoria and it was gratifying to see that after so many years, the site still had surprises for us to find.

The primary Dinosaur Dreaming site was discovered in 1991 by a research group from Monash University and Museum Victoria and annual digs commenced in 1994. The original fossil layer, measuring approximately four metres wide by twenty metres long, was exposed on the shore platform from the intertidal zone to the base of the cliff. The sedimentary rocks exposed along the Bass Coast are tilted due to seismic activity that took place millions of years ago. Consequently, the rocks at the dig site are tilted at around 14°, which means that the fossil layer gets deeper the further north along the beach it extends. Over the last 19 years the Dinosaur Dreaming crew has followed the fossil layer, and have been forced to excavate up to a metre below the level of the shore platform. This is a huge logistical problem when we only have 3-4 hours either side of low tide to expose and excavate the fossil layer.

The fossil layer has been subdivided into smaller units over the years in an effort to differentiate between the subtle changes in the composition of the conglomerate rock. The Main part of the site was the first area to be excavated and dominated the first twelve field seasons. By 2005 it became apparent that even with our excavation manager, Nick van Klaveren's ingenious "system" to keep out most of the sand from invading the excavation area during each high tide, we were fighting a losing battle against Mother Nature.

In the last days of the 2005 field season Nick noticed that a small patch of conglomerate (fossil-bearing rock) was exposed to the east (seaward) of the Main fossil layer. As this rock was much more accessible than the Main fossil layer it was decided to excavate this area during the 2006 field season. The results were immediate with many interesting bones discovered in what became known as "Bridge East". Since the 2006 field season excavations have concentrated on Bridge East, leaving a spit of rock – The Bridge, separating Bridge East from Main. By the end of the 2011 field season it became apparent that The Bridge was impeding extraction of the fossil layer close to its western edge. So the decision was made to "take the Bridge" in the 2012 field season, thereby removing the partition between Main and Bridge East.

The excavation of The Bridge was quite straight forward as it was exposed on three sides. The Dinosaur Dreaming crew attacked the sandstone capping the fossil layer with great gusto and with great results.

Alan Tait and Andrew Giles ready to attack The Bridge

Going...

...going...

...gone!

The fossil tally for the three weeks doubled the 2011 tally. Over 320 fossil bones and teeth were collected, including four theropod dinosaur teeth, four ornithopod dinosaur teeth and one ankylosaur tooth. A number of well preserved dinosaur limb bones and vertebrae were also found in The Bridge, including a hollow limb bone, which decided to remove itself from the rock without our help. The limb bone was lying in the softer weathered rock at the top of the fossil layer. During excavation, the rock fell apart to reveal the bone. I wish all bones prepared themselves that easily. Just to keep us on our toes the site yielded a couple of specimens that had us scratching our heads. Tom Rich discusses them in his report.

Self-prepared limb bone

The 2012 field season was marked by being the wettest field season we have experienced. We lost a number of half days during the dig and for the first time ever, we lost two whole days of work in the last week. The crew came up with some ingenious ways to amuse themselves during these down-times as can be seen on the Dinosaur Dreaming blog (www.dinodreaming.blogspot.com.au).

Theropod Tooth

Despite the inclement weather we accomplished the goal of excavating the Bridge as well as additional excavation of the Prep Rock area at the western end of the fossil layer, which is less fossiliferous than Main and Bridge East, but has yielded some of the best preserved mammal jaws in past field seasons. True to its reputation, Prep Rock gave us the only mammal jaw found during this year's field season and the first mammal jaw from the site in three years. Tom Rich discusses this jaw in his report.

As in previous years, we had a number of school groups visit the site, including students from Wonthaggi North Primary School. The school has visited the site before, but this year the students were treated to a special activity by Andrew Stocker (Education Information Coordinator of the Melbourne Wildlife Sanctuary, La Trobe University), who devised an activity involving everything the students could find lying on the beach and turning the detritus into fantastic creatures. Andrew gives an amusing summary of the activity in this annual report.

Jaw found by Andrew Ruffin

The Dinosaur Dreaming 2012 T shirt design by Joceline Lee (see Sarah Edwards' article) is quite apt as theropod dinosaurs have featured prominently this year. Not only did we find some well preserved theropod teeth during the field season but two papers were published on Victorian theropods, each coming to the same conclusion regarding dinosaur distribution. Reports on these papers are included in this annual report.

We have had publicity this year in the form of a series of interviews in the Milk Gippsland Magazine (issue 15, July/Sept 2012). Tom Rich, Mike Cleeland and myself were interviewed by the magazine, which also included a comprehensive background on the current research into dinosaurs in South Gippsland. It also included a fun interview with Dorothy the dinosaur who was hoping to find some of her relatives around Inverloch.

Although the excavation of The Bridge was successful, its removal has changed the dynamics of the site. The presence of The Bridge prevented sand from the Main part of the site from moving into Bridge East. Now that The Bridge has gone the sand has mobilized to be more uniform in the site, necessitating plans on how to remove the excess sand each day during Dinosaur Dreaming 2013. Excavation manager, John Wilkins has been working hard on a combination of methods to remove the sand as quickly and efficiently as possible. He explains more in his report.

We are very proud to announce that four of our Dinosaur Dreamers handed in their PhD theses this year.

Jacqui Tumney from La Trobe University completed her thesis on "Environment, landscape and stone technology at Lake Mungo, southwest New South Wales, Australia".

Doris Seegets-Villiers from Monash University completed her thesis on "Palynology, Taphonomy and Geology of the Early Cretaceous Dinosaur Dreaming Fossil Site, Inverloch, Victoria, Australia".

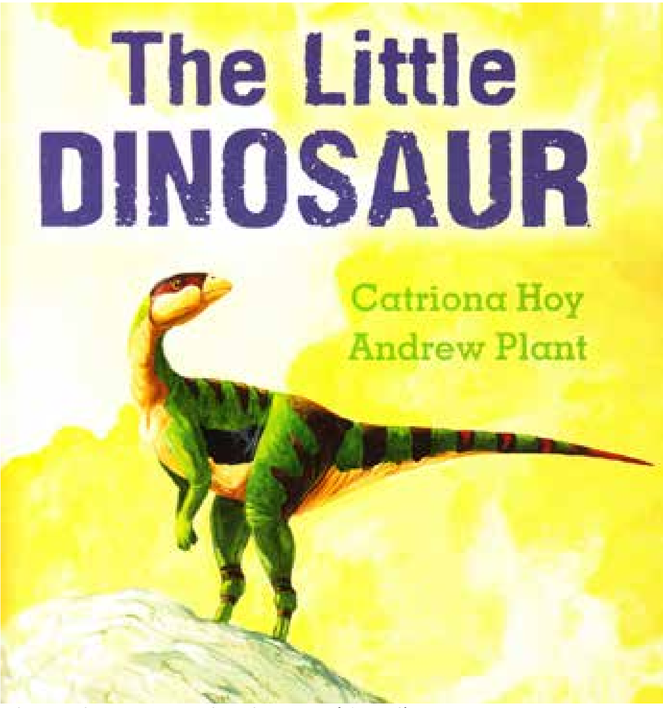
Sheahan Bestel completed her thesis entitled "An Archaeobotanical Analysis of Late Palaeolithic, Peiligang and Yangshao Sites in Henan and Shanxi Provinces, North China" at Monash University.

Matthew Inglis from Kyoto University, Japan, completed his thesis entitled "A New Interpretation and Reconstruction of *Kimberella quadrara* Glaessner and Wade (1966), Based on Detailed Descriptive Evidence".

Congratulations to all four Dinosaur Dreamers. We are very proud of their achievements and wish them well for the future.

In early June I was contacted by Andrew Ruffin, who has found a number of fossil bones along the Bass Coast, to tell me that he had found a bone near San Remo and thought it could be very interesting. The following weekend Andrew, Mike Cleeland and a group of enthusiastic helpers braved the wind and rain to collect the specimen. I took the fossil to Museum Victoria, where it was examined by the researchers in the Department of Vertebrate Palaeontology. One of the researchers is Kat Pawley, who is an expert on temnospondyl amphibians and she was able to confirm that the fossil bone was the lower jaw of a temnospondyl, probably *Koolasuchus cleelandi*. Andrew was very pleased with his find as he had already found a partial skull of *K. cleelandi*, however he would have preferred that it had been a theropod dinosaur. Better luck next time, Andrew.

Also in June, the Monash Science Centre hosted the official launch of “The Little Dinosaur”; a wonderful children’s book, written by Catriona Hoy and illustrated by Andrew Plant. The concept for the book is based on the discovery of a dinosaur skeleton found at Dinosaur Cove in 1989. The dinosaur had a diseased leg bone and the book, written so sympathetically by Catriona, tells the story of how this little dinosaur lived and died. The dinosaur is brought to life by Andrew’s beautiful illustrations and is a must for all budding palaeontologists.



The Little Dinosaur book cover (detail)

After the field season ended, longtime Friend of Dinosaur Dreaming, Rob Huntley offered to set up a website to promote the Dinosaur Dreaming book and CD. The web site was launched in May 2012 and includes monthly features on the fossils and localities along the Bass Coast. You can check it out at www.dinosaurdreaming.net.

Most people would be aware that NASA’s Curiosity rover landed on the surface of Mars on the 6th August this year. However, not many people would know that one of the people involved in the decision as to where Curiosity would land is also a long-time member of Dinosaur Dreaming. Marion Anderson is the first year Geology co-ordinator in the School of Geosciences at Monash University and has also had a long association with NASA. We are very proud to acknowledge her part in the successful landing of Curiosity as well as being a core crew member of Dinosaur Dreaming. Congratulations Marion.

On August 16th a small group of Dinosaur Dreaming crew were invited to morning tea with Sir David Attenborough at the Monash Science Centre. Sir David was in Melbourne to give a couple of public talks and as patron of the Monash Science Centre, he made time in his busy schedule to visit the Centre and have a brief chance to talk to those people who have been deeply involved in the activities at the Centre over the last near 20 years . It was a great thrill to meet this amazing man who has made numerous documentaries on every aspect of life on earth over the last 50 years or so. Thank you to Professor Pat Vickers Rich for giving us that once in a lifetime opportunity to meet a legend.


Dinosaur Dreamers with Sir David Attenborough

Plans are already underway for Dinosaur Dreaming 2013, which will be the 20th consecutive field season at the Flat Rocks site, making it the longest running dinosaur dig in Australia.

ACKNOWLEDGEMENTS:

Firstly, I would like to sincerely thank all the crew members of both the Inverloch and Otway digs for all their help and enthusiasm during the two field seasons this year. We had a great combination of experienced crew and new volunteers, which worked perfectly.

I would also like to make special mention of Wendy White who has the gigantic task of running the “dig house”. This year was the second year we spent at our new dig house in Cape Paterson, having been unable to secure our old dig house in Inverloch, which was our home for 17 field seasons. The layout of the new dig house is quite different to the old dig house, which meant completely rearranging sleeping accommodation and catering areas. Last year was quite a challenge for Wendy to get the household running as smoothly as she had it in the old dig house. But this year she assured me that she had ironed out all the kinks and, true to her word, she had it running like clockwork from day one. Admittedly, she had help this year in the form of Lisa Nink. Lisa took time off from her busy job at Museum Victoria to be Wendy’s assistant and did a marvellous job. Thank you to both ladies. We are in your debt.

The Committee for Research and Exploration of the National Geographic Society funded the research carried out by Dr. Jim Cull (see his article in this report) in addition to funding the preparation of “Noddy”, the partial dinosaur skeleton, by David Pickering. The National Geographic Society has a long association with head researchers Dr. Tom Rich and Professor Pat Vickers, having supported them in various projects over the last 30 years.

Bosch Australia Pty. Ltd. donated a laser level, which Dinosaur Dreamer/surveyor Dean Wright used most enthusiastically during the dig. Many thanks to Bosch and John Wilkins for arranging the donation.

One of our long term volunteers is Dean Wright. Dean works as a surveyor for SP-AusNET. Earlier this year he applied for a grant from SP-AusNET Cornerstone Project on behalf of the dig. We are delighted to say that his application was successful and Dinosaur Dreaming is the happy recipient of $500, which will go towards a new pump for Dinosaur Dreaming 2013. Many thanks to Dean and SP-AusNET.

Dean presents Lesley with a cheque from SP-AusNet

Each year we are supported by local businesses. Dom and Tracie Brusamarello and their friendly staff at the Inverloch Foodworks supermarket in Inverloch have been long-time supporters of the Dinosaur Dreaming project and we thank them for their ongoing generosity.

Wonthaggi optician, Dennis O’Donnell donated six pairs of optical sunglasses for the crew, which adds to the hand lenses and portable microscope that he has donated in previous years. Many thanks for your continuing support Dennis.

Rob Huntley helped us transport the dig equipment from its storage area to the dig house, and back again. Normally Rob accomplishes this task with the use of his combi-van the “Bob Mobile”, but just before the dig commenced his van was hit by a falling branch and was out of commission for many months. But he still came along and helped load and unload, so we thank him sincerely for his support.

Our acknowledgements would not be complete without a special thank you to Michelle O’Leary and Lee-anne Knight who, on behalf of Blundstone Pty. Ltd., provided the steel-capped boots for the Dinosaur Dreaming team. Blundstone has supported the Dinosaur Dreaming project for many years and their generous donations of safety boots are always gratefully received.

Friends of Dinosaur Dreaming

By Gerry Kool

As is the case each year, Friends of Dinosaur Dreaming were once again invited to attend a day at the site to chat with crew members and be given special treatment for a few hours. This year the event took place on the 26th February as low tide was around midday making the site suitable to be accessed and viewed by visitors for about four hours.

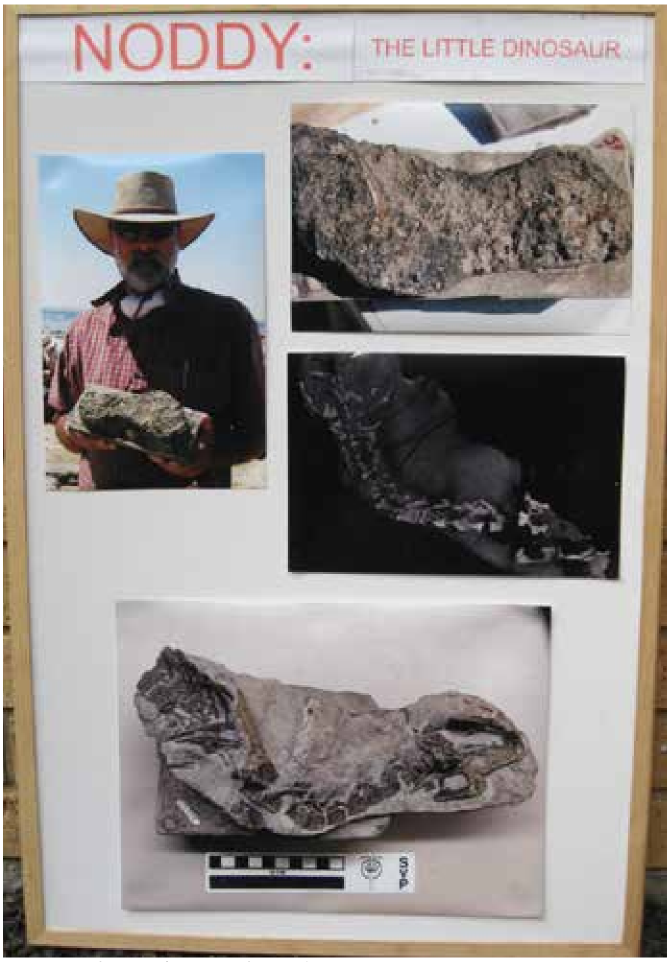
About 70 Friends took the opportunity to visit and with the usual general public blow-ins (it is a public beach after all) numbers swelled to around 90-100 during parts of the day.

The weather was once again kind and this made the day a huge success. There was even a bit of work accomplished.

Both adults and children were well entertained and educated during the various tours led by Rohan, Roger and Lisa, all of whom took on their tasks with great endeavour.

Rohan and Roger covered the Geology of the site and surrounding area whilst Lisa took care of the general workings of the actual fossil extraction as well as talking about the variety of animals found at the site over the many years. Dave Pickering

Friends' Day at site



Dave Pickering's story board

from Museum Victoria brought along his story board telling the tale of the partially prepared specimen affectionately known as ‘Noddy’. This was found by Mike Cleeland in 2010, north of the dig site in a nodule (hence the name) and has created much interest. To date it is still being further prepared and we all wait with bated breath for further developments. Thank you Rohan, Roger, Lisa and Dave.

Thanks also to Nicole Evered, who was unable to negotiate the steep(ish) steps this year, for holding the fort in the car park, marking off the attendance roll and selling merchandise.

One of the reasons, in part, that the Dinosaur Dreaming dig is able to continue, is the backing of the Friends throughout these last fifteen years and once again we thank all those members for their continuing support.

Suck it and see

By John Wilkins

It's amazing the things you get to play with at the dig and the range of principles that can be applied. From the very basic and old fashioned to the modern and ground breaking, from shoveling and cooking to Laser Topography, 3D imaging and particle accelerators. It's kind of like the dig itself: modern day back to the Cretaceous.

This year we used the tried and true methods of shoveling and sledging. With the help of the human bulldozer, Alan Tait, sand and overburden was shoveled, chiseled and hammered away to expose the precious fossil bearing layer beneath.

On a suggestion from Lesley Kool, we trialed washing the sand away from the planned excavation area. Using a length of layflat hose and a two stroke water pump, water was siphoned from our deepest point in Bridge East and jetted into the sand in the excavation area to dislodge it and wash it out into the non-working area. This washing away of the sand and debris worked best when the sand was still below water level and there was a channel for the sand to flow down unimpeded.

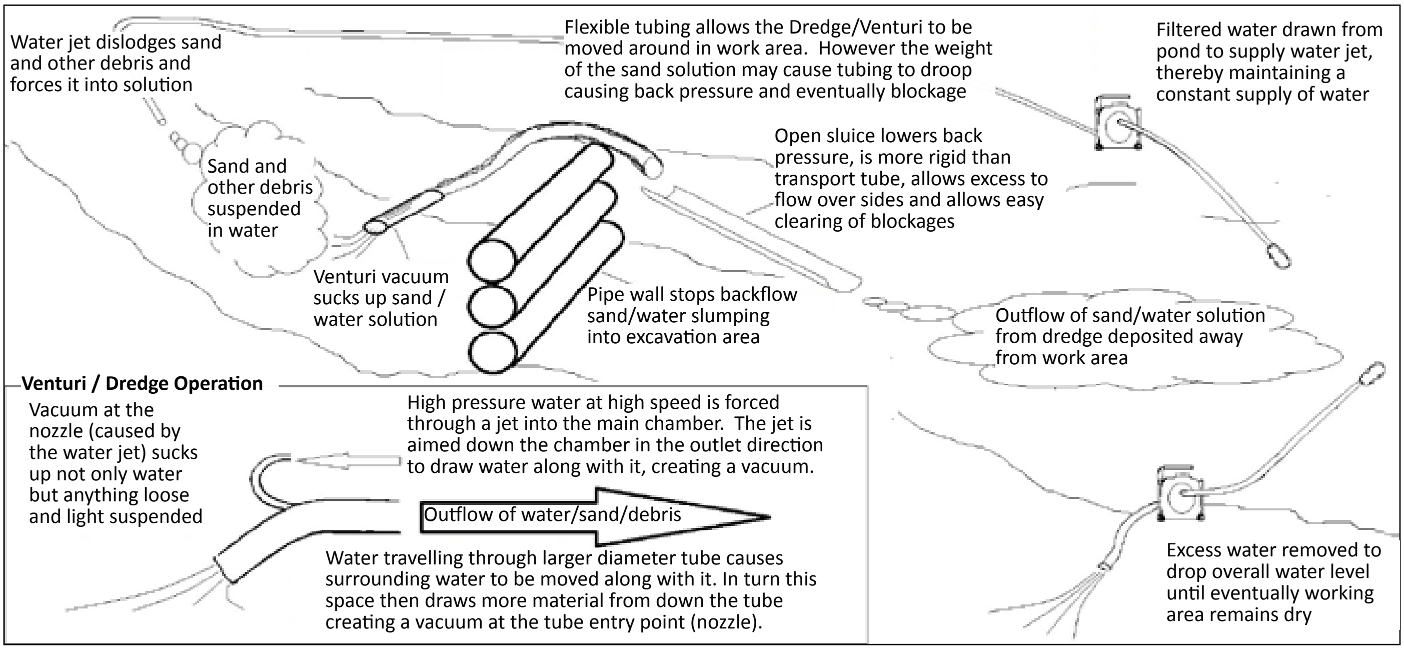
The dredge at work

However one of the problems with this method was that the sand and debris would eventually settle out of the water, once the force and speed of the water can no longer support the mass of the sand and debris suspended within it. This caused the sand and debris to form a sand bank and further impede the flow of water and allow further sand to fall out of suspension, quickly causing the sand and debris to bank back towards the working area we were trying to clean out.

Gerry Kool and John Wilkins adjust the dredge

There was a bonus to this method, however, in that the working surface is washed clean by the freshly pumped in water, making it ready for extracting rock from the fossil layer. A secondary bonus is that the water passing through the pump absorbs the waste heat generated from the motor, warming the water in the area being worked. Ahhh.. most welcome on those cold, cold morning forays. I won't go into the dangers associated with disturbing the biological nasties, the sand filtering out of the water inside your speedos or getting limbs trapped when the sand and debris settles back into the nicely cleaned hole you're standing in.

Previous work with Venturii and dredges proved it is possible to move the sand and debris away from an area, down lengths of piping, to be deposited elsewhere. After this years' dig, Mike Cleeland, our expert palaeo-prospecter, introduced us to a friend of his, Paul Brody. Paul was able to visit the site and pass on his experiences and knowledge of his years of gold dredging. He also kindly donated materials to build another dredge. A small band



of diggers helped test designs during the year (a big thank you to those for the help and support) in preparation for the next dig. Dredging enables us to overcome some of the problems associated with washing only and the subsequent sand banking, as the sand is moved further away down the inside of a plastic tube which keeps the velocity and pressure of the water up and therefore maintains the sand and debris in solution for longer until, again, it reaches a point where it can no longer keep the material suspended in solution and the sand and debris drops out of the flow, ideally after it has left the piping

Another problem that we encounter when digging is the constant slumping of the surrounding sand. The hole is dug out but the height and mass of the sand and debris surrounding the hole causes it to collapse back in. This necessitates further removal of this extra sand from around the working area until the pressures are in equilibrium. One foot in the wrong place and you start digging again! Previously, we have combated this with sand bags, truck tarpaulins and metal frames to hold up the sides of the sand walls, and more recently with plastic tubing and rock bolts.

Whilst we still may need something to address this slumping at the sides of the excavated area (pipe wall and rock bolts), slumping within the dig area is actually a beneficial occurrence when using the dredge. Slumping at the dredge head gets the sand particles into motion. This breaks the bedding and bonding forces holding the sand and debris in place, making it easier for the vacuum from the dredge to suck up the loosened particles and expel them away from the work site.

During the trialing of the dredges we found the dredge moved so much material that the plastic pipe itself started slumping under the weight of material inside it. This in turn caused the water flow to reduce and more sand and debris to settle out of the flow until there was so much built up within the pipe that it could no longer flow out. We plan to test fixing this by bracing the plastic outlet pipe with left over pipe wall material, varying the pipe length and increasing the pump capacity to make sure the material flows out fast enough that it doesn't have time to settle within the pipe.

The culmination of all this will be to combine the washing and the dredging in an effort to wash the sand and debris away from the working area and transport it to a non working area. There will still be some digging remaining for aficionados, but this will hopefully not be the back breaking amounts that we have sometimes moved. We'll just have to suck it and see…

Research Report

By Tom Rich

An enigmatic small cluster of tiny bones close to one another was found at Flat Rocks during the 2012 dig. The bones were embedded in a fine grained, relatively soft brown rock quite unlike the hard, bluish-green coarser sandstone that composes the vast majority of the fossiliferous rock at Flat Rocks. This fine grained rock was only present in the immediate vicinity of the small fossil bones.

The cluster of tiny bones

In order to get a better idea of the nature of this accumulation, a preliminary CT scan was made of it by Dr. Karen Siu of the Australian Synchrotron. Using what is essentially a miniature version of the CT scanners that are employed in hospitals, she was able to show that the bones are distinct from the surrounding rock when imaged that way and that the only bones present are those that are already visible on the surfaces of the two rocks {part and counterpart} where the fossils occur.

Based on her initial results, arrangements will be made to scan the two rocks using more powerful equipment such as the Australian Synchrotron. This will give much more detailed images. That data can then be used to make highly accurate, enlarged three dimensional models of the tiny bones. This means that the fossils themselves will never have to be removed from the rock and yet they will be available for examination. What is more, the models of these tiny bones can be much larger than the actual fossils which will make working with them far easier.

What this group of bones represents is uncertain. The fact that they are associated sets them apart from all the other fossils found at Flat Rocks in the nineteen years that work has gone on there. Whatever the bones are, they are of something quite small. Perhaps they represent an animal not previously known from Flat Rocks. Alternatively, they could be bones of something already known to us such as one of the mammals which would be of about the right size.

How this cluster of bones came to be associated the way they are in a rock type quite uncommon for Flat Rocks is a question not yet settled. One hypothesis is that it represents fecal matter of a larger animal that ingested the vertebrate that possessed these bones. Such fecal matter preserved as a fossil is known as a coprolite. Usually coprolites are more spherical or lozenge shaped than is the fine-grained matrix surrounding the bones. However, if a mass of fecal matter weathered somewhat before being finally buried, it could be dispersed in the pattern seen in this specimen.

In younger rocks, it is common to find masses of small bones associated in what are known as owl pellets. Owl pellets are formed when an owl regurgitates a mass of bones and hair typical of a small rodent that it has previously killed and eaten. There were no owls in the Early Cretaceous but it is not impossible that some other vertebrate had a similar behaviour.

Whatever this small cluster is, it certainly is tantalizing because nothing like it has ever previously been found in the Cretaceous rocks of Victoria.

The only upper molars of mammals found in the Cretaceous of Victoria (discovered by Alanna Maguire) continue to be studied intensely. After being electronically scanned in Japan, Finland and Germany, they were finally scanned at the Grenoble Synchrotron. Using that data, a high quality three dimensional, enlarged model was made of this fossil. Peter Trusler is now using that to make final modifications to his painting reconstructing this important specimen. Once that is done, it will be written up for publication in which it will be both described and interpreted. That interpretation will be quite provisional because of the extensive wear and damage to the fossils. However, the following adage certainly applies to this one-of-a-kind specimen. "What is the best fossil to have? The one you have got."

Ben Kear who is now based at the University of Uppsala in Sweden together with Anne Warren, will be describing a partial skull of *Koolasuchus cleelandi*, by far the youngest known member of a major group of amphibians, the temnospondyls. That group, appeared about 330 million years ago. *K. cleelandi* is about 120 million years old. Until it was found, the group was thought to have died out about 190 million years ago. A Swedish colleague of Ben's has a vast library of synchrotron scans of the skulls of many vertebrate fossils. So scans of *K. cleelandi* will be compared with those to understand the animal in more detail.

Although knowing full well that during the 38 years associated with the National Geographic Society's Committee for Research and Exploration had only once funded the preparation of a significant fossil while funding literally thousands of field trips during that time, just before Christmas I wrote them an e-mail. In the e-mail I asked if they would consider assisting with the preparation of Noddy, the partial skeleton of a small dinosaur, quite likely to be *Qantassaurus intrepidus* that Mike Cleeland had recently found. After an initial exchange of e-mails and then not hearing a thing for more than one month, I was pleasantly surprised to be informed that money had been provided without even going through the laborious process of submitting a formal grant proposal. That such an exception was made to a long standing policy is recognition of the importance of Noddy as seen by an organization that has funded hundreds of dinosaur-related projects. The preservation of both gut contents and possibly skin on this fossil coupled together with the potential to expose the fossil using time-lapse photography, giving an image of the fossil literally coming out of the ground, apparently were the key factors in their making this exception. Or maybe it was because it was Christmas time.

After a two year drought, a fossil mammal turned up at Flat Rocks. It appears to be a lower jaw of *Ausktribosphenos nyktos*, the first mammal species found at this site. The rear part of the jaw is better preserved than previous specimens of this species so it adds significant information about this enigmatic animal. It is enigmatic because exactly where it should be placed within the mammals is still unresolved 15 years after the first specimen of it was discovered. One view is that it is a placental mammal which includes whale, dogs, donkeys and us. The other is that it is a representative of a group of Mesozoic mammals confined to the Southern Hemisphere that although vaguely resembling placentals, are an independent group. It will probably take the discovery of at least an upper dentition if not a whole skull to resolve this debate.

Mary and John W's Ausktribosphenos jaw, Flat Rocks 2012.

A specimen affectionately known as The Blob or The Egg-shaped bone provided plenty of room for exercising the imagination of the dig crew. Erich Fitzgerald has pointed out that the external layer where the densest bone occurs is quite thin. That is a characteristic seen in marine reptiles and mammals as compared to their terrestrial counterparts. So perhaps at Flat Rocks there is now the first specimen of a plesiosaur that is not a tooth but rather a very rolled and tumbled fragment of a limb bone of one of these aquatic animals.

The Blob

As an experiment to test the feasibility of using ground penetrating radar to detect fossiliferous rock not visible on the surface, Dr. Jim Cull carried out a trial survey of the Eric the Red West site. Jim provides a description of this technique as well as a summary of the results elsewhere in this report.

They stormed (or at least stomped on) the beaches…

By Andrew Stocker

Standing on the beach in anticipation…

….stress levels rising as the time approaches…

… knowing we're about to be invaded!

Invaded by an animal known to most of the Dinosaur Dreaming Crews as *Smallerious childerensis*, an animal that is unpredictable, excitable, often noisy and certainly hard to control in their naturally occurring 'hoards' of about 50.

The last two days, apart from the usual

Andrew Stocker explains the activity

A student placing rocks into the "round" catagory

rockbreaking and household hubbub, I've been preoccupied with what on earth to do during the pending onslaught - keeping the young occupied, engaged and entertained to minimise their impact... and now, as it comes down to the wire, my heart, my head and my imagination is racing as I've got about 30 seconds to make any final decisions.

My adrenalin is pumping as I keep a watchful eye on the horizon, waiting for the signal from fellow crew members.

'They're here' is the cry as I look up from drawing random squares on the beach and see, almost in slow motion, like you imagine seeing your life flash before your eyes, what seems like thousands of grade twos from Wonthaggi North State School piling onto the beach platform.

Thousands, hundreds or even 50, it's all a blur as they move closer and closer to the crew. I panic, wanting to run in the opposite direction... but, I've been left with a task, they're here to learn, to investigate, to experience the world that is Dinosaur Dreaming and all I have to do is keep some of them entertained while the rest are learning from the experts! Challenge was accepted, now it's my time to suck it up and

Grade Two Dino Art

take the plunge into a world, not unfamiliar, but nonetheless confronting.

So they arrive, get divided into groups and we end up with 3 groups of about 20 and I have 20 minutes to do 'something amazing' with them. So there's no questions, no doubt, no option but to attempt a dance... a dance that clearly demonstrates my understanding (or lack) of Dinosaur behaviour as we ROARRRRRR and Stomp around the beachfront looking for objects that can be classified to form part of an artistic impression of an ancient animal. Rough, Smooth, Sharp, Soft, Small, Shiny, Round, Furry are all words that can help describe various dino-textures and these grade twos take to collecting things like prehistoric toothed ducks to water.

Once collected, classified and sorted, our beach paraphernalia was then used to construct a prehistoric scene ... 'what do you think this beach would have looked like 120m years ago?'

Again, the artistic flair of 7-8 year olds can never be anticipated, nor described, but I can tell you, after almost 60 students we had 10 works of art that would have stood up against any cave paintings I've seen.

So, exhausted, but extremely satisfied, students clambered back up the cliffs to leave 'us oldies' to recuperate with a cuppa and a biscuit while we contemplate what awesome things we could do next time...

It's OK now to ask about my thesis...

By Doris Seegets-Villiers

It has been a long time in the making, but finally, after what seems to be aeons, a long journey has come to an end. It, therefore, seems to be a fitting conclusion to wrap it all up and summarise the findings of all those years of study.

Geology

The predominance of lithologies (sandstones and subordinate conglomerates) indicative of high energy environments, along with the less common occurrence of low energy clay successions at the Dinosaur Dreaming Fossil site suggest deposition in braided river environments. While the vastness of the system is agreed upon, the origin of the materials that make up the fluvial deposits, however, is not. One school (Bryan *et al*., 1997) proposed volcanoes of the Whitsunday Volcanic Province to the northeast as source rocks for the thick deposits of the undifferentiated upper Strzelecki Group deposits (of which the Dinosaur Dreaming Fossil Site is part), whereas Duddy (2003) suggested sources from contemporaneous volcanoes within the rift valley. The evidence collected at the Dinosaur Dreaming Fossil Site suggests that both camps have a point. On one hand, we find a higher concentration of quartz (which takes relatively longer to disintegrate during transport) compared to feldspar (which disintegrates faster) and in part also nicely rounded quartz grains which indicated substantial travel supporting the ideas of Bryan *et al*. (1997). Angular to subangular quartz (indicative of less travel) fragments, on the other hand, strongly suggests a second, much closer source area, possibly within the basin, thus supporting Duddy's (2003) proposal.

The Flat Rocks excavation site itself was most likely deposited under hyperconcentrated flow conditions, which equates pretty much to a thick "soup", not unlike thickened minestrone, consisting of sands, conglomerates, bone and timber materials. Due to a gentle topography, the transport distance was short, explaining poor sorting of all incorporated and held in suspension materials and the low degree of abrasion in bone material. Although conglomerates indicate a higher transport velocity compared to sandstone, it seems that the flow velocity was pretty much the same throughout the formation of the Dinosaur Dreaming Fossil Site and at the same time also much higher than needed for the deposition of conglomerates or sandstone alike. This is shown in the rare occurrence of large quartz grains (up to approximately 15 mm) in both conglomerates and sandstones.

Fossil Plants

Palynoflora (Pollen and Spores)

Based on the occurrence of two index fossils, *Pilosisporites parvispinosus* and *Cooksonites variabilis* (Fig. 1 and 2), the age of the Dinosaur Dreaming Fossil Site has been determined as between 120 to 116.5my or early to mid Late Aptian.

For a majority of taxa recovered from fine grained sediments (affected and unaffected by possible periglacial influences) around the

Fig. 1: Zone indicator Pilosisporites parvispinosus

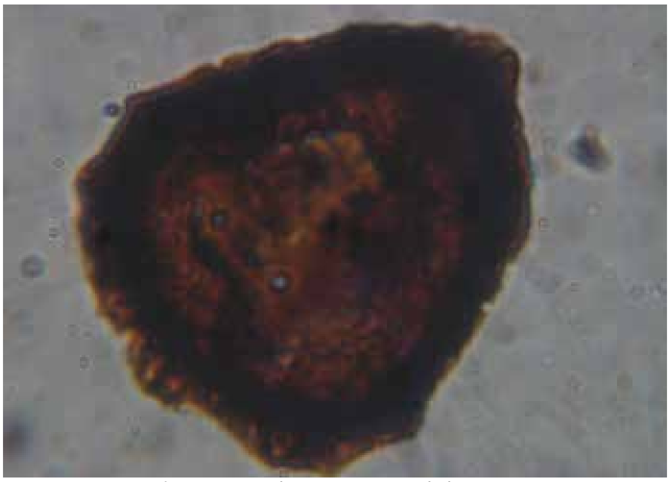


Fig. 2: Zone indicator Cooksonites variabilis

Dinosaur Dreaming Fossil Site affinities, and with it environmental preferences, are unclear or too broad to allow a sophisticated estimate of prevailing climatic conditions during the Early Cretaceous of the Gippsland Basin. And even in the cases where affiliations are more certain and environmental settings of the modern equivalent taxon are known, one needs to be aware that taxa might have changed their preferential habitats over time. Bearing this in mind and utilising the process of elimination, some comments about the general climate in the investigated section of the Gippsland Basin during the Early Cretaceous can be made. The majority of species recovered from the Dinosaur Dreaming Fossil Site are tolerant to a wide range of climatic settings, varying from tropical to subpolar. Given the high latitude position of Australia during the Early Cretaceous (Schmidt and Clark, 2000), a tropical to subtropical setting can be eliminated. The occurrence of the gymnosperm *Microcachryidites antarcticus*, (in present day settings restricted to cool – temperate, alpine to sub – alpine settings), numerous taxa linked to the lycopod *Lycopodium* (some researchers also tie this taxon to cool – temperate to subpolar environments) and the moss *Stereisporites antiquasporites* (occurring in modern polar regions) might give some support to the possible setting being cool-temperate. However, few taxa support such conditions, whilst a majority of taxa indicate somewhat milder conditions. It is, therefore, most likely that the climate during the Early Cretaceous at the Dinosaur Dreaming Fossil Site was mainly temperate to possibly cool – temperate. It is also suggested that a major climate change in the investigated section of the Gippsland Basin did not take place as changes in occurrence of taxa between individual sample sites, regardless of a connection to periglacial or nonperiglacial facies, are not distinct enough to allow such a proposal.

Macroflora

A small site containing leaf remains was discovered in the mid 1990's but was lost to a rockfall before samples were taken. Subsequently, a "slab" of claystone was unearthed from right below the excavation area, containing leaf litter of the fern *Coniopteris fruitiformis* (Fig. 3). Although further leaf remains were discovered by Jack Douglas in the 1960's and 70's from somewhere around Inverloch (Douglas refers to the general Inverloch area) these are the only identifiable leaf remains uncovered from the vicinity of the site by members of the dig crew.

Fig. 3: Coniopteris fruitiformis

Silicified fossil trees (Fig. 4) are quite frequent, especially in the area surrounding our famous “fault tree”. Unfortunately, all sampled remains were too distorted to allow comprehensive study via thin sections which might have provided us with the identity of these remains. Some of the less distorted sections, however, showed the clear presence of early wood and late wood. The occurrence of this generally wide early and narrow late wood suggests that favourable conditions during, for example, warmer months permitted adequate development of rings, but also that abrupt termination of these settings caused rapid shut down of growth, which in turn was again followed by the renewed onset of favourable conditions again initiating the onset of early wood segments. Abrupt cessation of growth can be interpreted as a consequence of sudden change of conditions such as a drop in temperature and/or severe drought. It, however, can also be suggestive of another event, especially in high latitude settings such as the Early Cretaceous of Victoria, such as the quick onset of polar night conditions resulting in the fast cessation of any influx of light (McLoughlin *et al*., 2002). It is not certain, if plant physiology allows for survival under polar night conditions in the first place. Observations by Frakes (1979) suggested that plant growth at high latitude is governed by the influx of sun whilst further experiments by Read and Francis (1992) demonstrated that plants can survive in high latitudinal areas. Their research showed that plant survival was more likely in colder (4°C) rather than warmer (10°C) winter settings as long as summers were moist and warm. It is more than likely that a combination of both conditions (temperature and light) aided the cessation of plant growth at the site. However, given the high latitudinal position of the site during the time of deposition, it has to be considered that the restricted influx of sun might have had a more marked influence on the cessation of growth than temperature.

Fig 4: Fossil Tree

Charcoal

Charcoal is omnipresent in deposits of the Dinosaur Dreaming Fossil Site, ranging in size from microscopic specks in pollen slides to larger (up to 20mm) fragments, indicating that the landscape must have been, at times, dry enough to allow plant material to burn. Analysis of micro-charcoal does generally not yield a huge amount of information. Due to its small size, determination of provenance is impossible. Although sample gaps between pollen slides were irregular (in some cases several meters), a general remark in regards to fire frequency is possible. Low micro-charcoal counts most likely do not indicate continuous burning of the landscape, but rather suggest influx (via wind or water) from areas further afield or erosion and re-deposition of sediments containing charcoal fragments. High counts of charcoal, on the other hand, suggest fire activity closer to site of deposition. Based on the intermittent occurrence of those close-by fires, low frequency of fires of increased magnitude might be implied, suggesting irregular fire patterns.

Macroscopic charcoal is easily distinguished from diagenetically altered coal particles by its unique silky lustre, fibrous habit and dark streak (Scott, 2000). The most outstanding property, however, is the retention of detailed internal cellular structure, which can increase the identification potential of burnt floral elements.

Similar to micro-charcoal, the provenance of macro-charcoal remains are difficult to ascertain. Based on the degree of rounding it can be assumed charcoal was transported from the original area of fire to the site of deposition. It is, however, difficult to reconstruct or more thoroughly estimate the distance these fragments have been moved as parameters such as degree of water logging, disintegration, settling velocity and indeed taxa involved are unknown (Nichols *et al*., 2000; Scott, 2000). Settling velocity in modern taxa depends on the temperature of the fire that created the charcoal (Vaughan and Nichols, 1995) and on the original material burned (Nichols *et al*., 2000). As no exact modern equivalents of taxa recorded at the Dinosaur Dreaming Fossil Site are known, it is very difficult to estimate these parameters. Homogenisation (Fig. 5) of cell walls in the Dinosaur Dreaming Fossil Site samples, on the other hand, allows narrowing the temperature creating the charcoal particles to between 230° and 340° Celsius (Jones and Chaloner, 1991). Taking into consideration the relationship between sinking of a charcoal particle and the charring temperature, a settling time of up to about five days (Vaughan and Nichols, 1995) can be expected in modern settings. This in turn could account for several (if not tens or hundreds) of km travel depending on the velocity the sediments travelled, assuming fossil taxa exhibited the same behaviour as modern taxa.

Homogenisation of all observed macro-charcoal fragments allows for a tentative comment on the fire temperature. As was pointed out by Scott (2000) crown fires tend to create higher burning temperatures (in many cases 800 – 900°C) indicating the possibility of disintegration of charcoal fragments due to intense heat after a certain critical temperature is reached and passed. Surface fire, on the other hand, tends to burn at lower temperatures (300° – 600°C; Scott, 2000). It might be, therefore, tentatively suggested that the fires creating the macro-charcoal fragments were surface fires rather than crown fires as internal structure of charcoal fragments collected

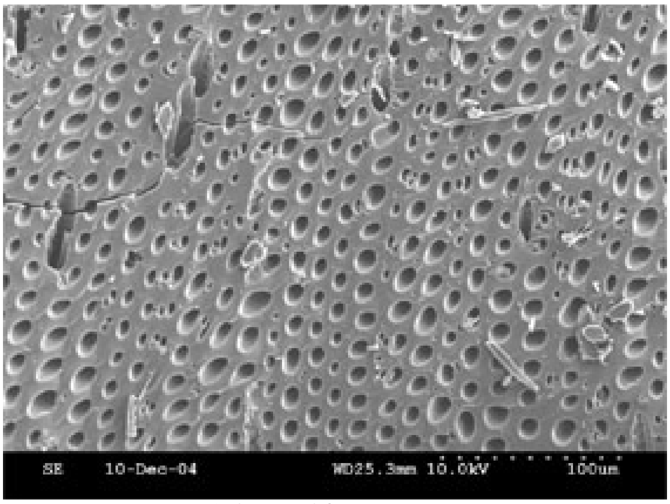


Fig.5: Homogenised charcoal fragment

from the Dinosaur Dreaming Fossil Site indicated that the homogenisation stage never passed into disintegration stage.

Although many of the microscopic fragments are impossible to identify, macroscopic fragments can be, in at least some instances, assigned to family level. In the absence of any other identifiable macrofloral fragments, these are the only plant fragments contributing information to the macrofloral composition of the site. Fragments were recognized as belonging to the families of the *Araucariaceae* and *Podocarpaceae* (D. Cantrill pers comm.). Specimens of any other definite taxa were absent.

Taphonomy

Complete lack of articulation strongly indicates that partial or full carcass floatation did not play a role in the accumulation of fossil material at the Flat Rocks excavation site (Lucas *et al*., 2010). Instead, all material was completely or at least highly disarticulated prior to entrainment into the fluvial system. This, in turn, infers that carcasses had ample time to decompose before being transported, a time frame suggested to be between several weeks (for aquatic environments, Weigelt, 1989) and several years (in a non-aquatic setting, if bones were, for example, well protected by vegetation, Behrensmeyer, 1991). Carnivorous behaviour can also result in disarticulation. So far, however, only few bones have been excavated with clear marks of carnivorous behaviour, suggesting that carnivore action was not necessarily a major cause of disarticulation.

Bone colour does not reflect that of the embedding sedimentary rock, indicating that coloration was acquired before final deposition. Brown staining might suggest prolonged exposure to dark brown soil horizons whilst the (very few), bones orange-brown in colour might be derived from iron stained deposits.

Although the exact distribution of elements is not known, estimates suggest that most bones and teeth are not in hydraulic equivalency to embedding sediments (i.e. bones and teeth are too large compared to embedding sediments, indicating that prevailing energy levels were high enough to transport sediments but not skeletal elements) regardless of the lithological units. Incompatibility between bone and sediment material is generally linked to untransported assemblages (Badgley, 1986a). Sedimentological data and bone distribution data from the Dinosaur Dreaming Fossil Site, however, imply a transported assemblage. Several researchers who have encountered a similar discrepancy between sediment and bone size have offered a variety of explanations for this anomaly. Amongst these are, for example, bloated carcasses (in this case, however, at least some articulated material should be recovered) and the burial of bones collected by predators in a dried out channel during subsequent floods (again, this should at least in some cases lead to the recovery of associated, if not articulated, material and the occurrence of gnaw and trampling marks). Neither of the scenarios, however, work for the Dinosaur Dreaming Fossil Site depositions. It is, therefore, suggested, that a much higher competence of the fluvial system than attested by the majority of deposits (i.e. medium sandstone and pebbly conglomerate) at the site and indicated by the rare occurrence of large quartz and clay clasts in both conglomeritic and sand lithologies, is the underlying cause of incompatibility between bones and sediment material. Sporadic occurrence of large quartz and clay clasts provides evidence compelling enough to suggest that vertebrate specimens and sediments were compatible and could be moved contemporaneously at any time during transport.

Breakage prior to mineralisation occurs in a majority of fossils from the Flat Rocks excavation site, and can be caused by scavenging, trampling or as a result of transport. Unfortunately, researchers are divided over whether transport in a fluvial environment will cause breakage to bone material and only very few traces indicative of trampling (scratching of the outer bone surface due to sediment particles rubbing against the bone) and scavenging (bite marks) have been observed, therefore an exact cause of breakage could not be determined.

A prime aim in assessing weathering stages of bone material subsequent to (near) complete disarticulation of a carcass (expressed by initial cracking of the bone, in extreme cases culminating in complete disintegration of bone material) is to establish the time elapsed between the death of an animal and its subsequent internment in the lithosphere. Whilst recent faunal accumulations allow the recording of environmental parameters (such as moisture, temperature, vegetation) all important during the process of weathering, these can commonly only be tentatively interpreted when assessing the fossil record. Unusual weather patterns (such as hot summers, high rainfalls leading to floods) or repeated switches between extreme weather conditions (such as temperature, precipitation) cannot be accurately or seasonally recorded, yet have the potential of altering the modification pattern and processes rapidly and significantly. Different weathering stages, therefore, indicate relative rather than absolute time frames of subaerial exposure. Evidence gathered from the floral composition at the site has led to the proposal of temperate (possibly cool – temperate) settings during the time of the formation of the fossil site, thus providing a broad framework for temperature estimates. Based on these climatic estimates and the general low weathering stages (0 = no cracking to 0-1 = microscopic cracking) observed, it is most likely that a majority of bones recovered from the site were subaerially exposed for several years, possibly even as long as 20-30 years (Andrews and Cook, 1985) before higher weathering stages (deeper cracking and in extreme cases complete disintegration of skeletal material) could take hold.

Tooth marks on fossil bone material, only observed on a few of the fossil bones, might be seen as underrepresenting carnivorous activity, considering the relative high number (approximately 25%) of theropod teeth recovered from the site. Fiorillo (1991b), following investigations of several dinosaur sites in the US, and recording between 0 and 4% of bones affected by carnivorous activity, proposed that carnivorous dinosaurs were not in the habit of regularly chewing the bones of their prey. Shipman (1981) on the other hand, observing the behaviour of modern mammalian taxa noted the, in many cases, partial to complete destruction of prey bones, which drastically reduced their preservation potential. Although dinosaurian behaviour is not well understood, the possibility of similar behaviour to mammalian carnivores, suggested by Shipman (1981), should not be dismissed. However, the occurrence of bite marks, at the Flat Rocks excavation site, on a few specimens only (which does not support extensive chewing or gnawing action) is, at this stage, considered to be in line with Fiorillo's (1991b) observation. especially taking into account the generally low number of tooth marks on each affected bone.

Ornithopod Tooth Size

Ornithopod teeth make up just over 50% of isolated teeth recovered from the Flat Rocks excavation site. So far 38 jaws (mandibles) and fragments have been collected, most of which are missing at least some, if not all, teeth. Comparison between isolated teeth (regardless of morphotypes) and jaws has shown that some teeth are too big to fit into the alveoli (the sockets in the jawbone in which the roots of teeth are set). At the same time, some roots were simply too long to be accommodated in these jaws. Therefore, it seems that the jaws into which these larger teeth would have fitted are missing from the assemblage.

Exfoliation of Outer Bone

Several bones recovered from the Flat Rocks excavation site exhibited various degrees of exfoliation of the outermost bone periosteum, which could not be linked to the removal of sediment particles and pyrite. There is evidence to suggest that burning (fire) was responsible for the exfoliation. Careful comparison to categories of weathering styles (Behrensmeyer, 1978) and published images (Behrensmeyer, 1978; Johnson, 1985) suggest that the cause is not linked to flaking during Behrensmeyer's (1978) Stage 2 weathering stage. This stage seems to be generally associated with cracking of the bone and also with deeper penetrations of these cracks into the compact bone. Boundaries of flakes also seem to leave more angular shaped traces on the bones after detachment. Similarly, bones affected by bacterial attack show periosteum removed in a very irregular manner (Fernández-Jalvo *et al*., 2010). A presentation of experiments undertaken by Emanovsky (2002) to determine if sharp force trauma on a bone could be disguised by the process of burning shows an image (Emanovsky *et al*., 2002) with clear exfoliation of the outermost bone caused by burning. Equally, lecture notes of Gifford-Gonzales (2006) incorporated an image with exfoliation along a shaft of a modern bone, noting heat exposure as the cause. Regrettably, neither paper deals with the temperature range involved. Further papers by Shipman (1984) subdivided bone modifications due to fire into temperature intervals, but do not suggest at which temperature exfoliation occurs. Fig. 6 (NMV P 228439) illustrates a bone suspected of having been exposed to some degree of burning with

Fig. 6: Exfoliation of outer bone

subsequent exfoliation of the outermost bone. This image also clearly illustrates cordical bone underneath the lost periosteum to be lighter in colour than the remainder of the outer bone, a phenomenon which has been observed in several other bones at the site. If burning is indeed the cause of exfoliation on these fossil bones, then temperatures for this event are suggested to have ranged between 230° and 340° Celsius in accordance with charcoal fragments collected from the shore platform.

Although this is only a very short compilation of findings, it seems clear, that still more can and needs to be done to get a comprehensive picture of the life and also death of both flora and fauna at the Dinosaur Dreaming site.

Finally, a big “Thank You” to all of you. Without your help and determination I could have never completed this thesis. Without your willingness to dig holes, break rock, carry equipment come rain, hail or blistering heat, this thesis would have never eventuated. Thank you all for your blisters and calluses.

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ETRW 26-27 November 2011

By David Pickering

A crew of 12 met at Bimbi Park for a short weekend dig organised to sample areas for the annual Eric The Red West (ETRW) dig which was scheduled for late summer.

On our arrival at the shore platform we were presented with a sight we had not witnessed previously. The entire shore platform from the rusty Erich the Red anchor to the excavation area had been completely stripped of sand courtesy of a recent king tide. Lesley and Mary immediately began a systematic search of this previously “unpicked” area and quickly identified 6 bones. Some of these were removed by trainee rock-sawers Erich and Travis.

Unfortunately, heavy rainfall restricted work to only a couple of hours each day but 13 specimens were collected which was a good result under the circumstances. The good news is that we now know that the fossil layers extend for approximately 300m from the western excavation area, where the articulated ornithopod was found, to the ETR anchor.

The November Otways crew

The Beauty of Mudstone

By Mike Cleeland

Diggers who have been at the Dinosaur Dreaming site when the sand is down will have had a good view of the fossil layer resting on an extensive base of mudstone.

Even older diggers, who were around in the heyday of the Dinosaur Cove excavation, will have noticed that the main fossil layer at Slippery Rock also rests on a thick strata of fine sediment.

The third of our major Cretaceous fossil layers of considerable bone density, the Powlett River site, shares the same characteristic.

Why is it so? Why are the three best fossil layers along our coast all underlain by fine sediment? Why not sandstone, or conglomerate, or coal?

And what about the less significant fossil layers; are they also overlying mudstone?

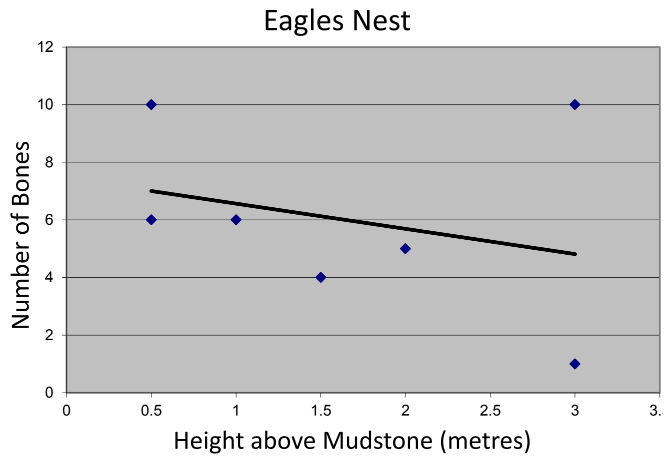
During the winter of 2012 Lesley Kool and Mike Cleeland surveyed all the known fossil layers from The Caves through to Flat Rocks, as well as all those in the Eagles Nest area.

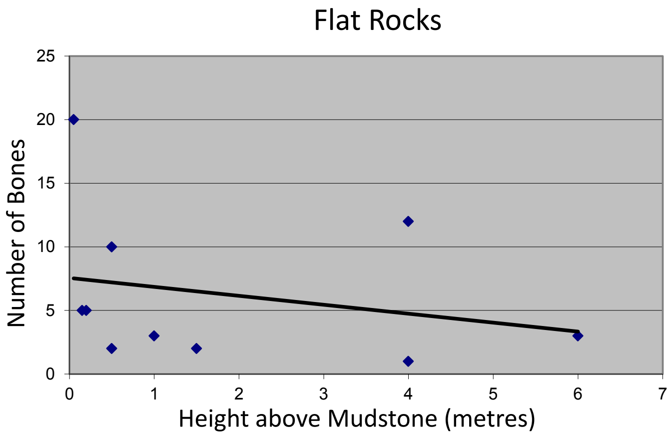
Thanks to the technical ingenuity of John Wilkins the results are graphed below.

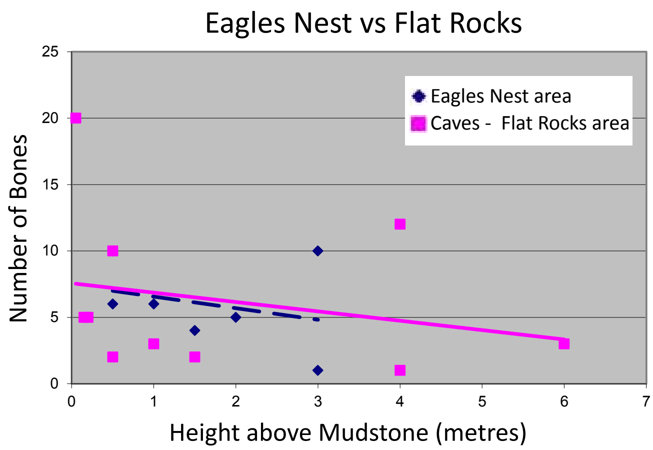
The line of best fit shows a trend in the data indicating that as the stratigraphic distance between a fossil layer and the closest underlying fine sentiment increases, the number of bones in the fossil layer decreases.

While we have not drawn conclusions as to exactly what this pattern indicates, we can say that the trend is in line with the occurrence of the richest fossil layers immediately above fine sediments.

It also suggests that future search efforts be concentrated on channel deposits that are closely associated with fine sediments.







ETRW

24-31 March 2012

By David Pickering

The statistics

A crew of 21 worked at Eric the Red West (ETRW) a total of 85 person days and collected 74 fossil specimens. This exceeded the previous best haul of 61 fossils. The weather during the dig ranged from reasonable to barely tolerable.

The story

The logistics of the 2012 dig featured two new innovations. Unlike previous Otways digs where the crew paid for their own accommodation at Bimbi Park, a grant from National Geographic paid for the accommodation of the entire crew. This was not done to encourage more workers to the dig but as a gesture of appreciation to the crew members who for many years have used their own funds to work in often trying conditions and with a limited return of fossils.

Mike Cleeland makes ANZAC biscuits

Pip Cleeland at work in the kitchen

The second innovation was the return of the camp cook. For the first time since the Dinosaur Cove Dig of 1993 it was decided to use a person who would purchase provisions and organise and prepare all meals. This was done to maximise the size of the crew at the site and to take advantage of the cooking facilities which are shared by other group users at Bimbi. It is frustrating to return after a hard day's work to find that all the stoves are unavailable. Mike and Pip Cleeland accepted the

The crew enjoy a patch of sunshine

Andrew Stocker in his kelp hat

challenge – and the money – and did an excellent job. They presented a variety of delicious meals on time and on budget. I'm sure that the whole crew will agree when I say well done Pip and Mike – but what about your famous floor shows next time!

Oh yes, the fossils (sorry Tom). Numerically we had our best result in collecting 74 specimens. We found several fossils that looked decidedly

The day we forgot to bring the mugs to site

Sue's ornithopod vertebra

"mammalian" on site but disappointingly, after inspection back at the lab, were not.

ETRW can be a heartbreaker. Kerri Lee travelled down from Sydney, learned her rock breaking lessons well and worked like a machine – without success. Andrew Stocker indulged his creativity in making fantastic hats from kelp and also found time to uncover three very good fossils including a wonderful upper tooth row of an ornithopod.

Andrew Stocker's ornithopod maxilla

It was encouraging that it was not just the "old hands" who found fossils. Sue Flere found two wonderful specimens that have been registered into the Museum Collection including a complete dorsal vertebra of an ornithopod dinosaur.

Lovely lungfish tooth

It has been difficult to form an excavation "plan" at ETRW. Unlike Flat Rocks where it is possible to target various layers in the search for fossils, ETRW has so far defied our efforts in this regard. We know the type of rock in which our mammals have

Theropod Tibia

Mary, Cate and Astrid working (and Geoff resting)

been found but this rock seems to be scattered in thin layers and lenses over the entire shore platform. Likewise we have identified the pattern of the layer where the articulated dinosaur was found but this knowledge has not enabled us to uncover a similar find.

This may sound discouraging but viewing the contents of the ETRW drawers within the Museum Collection we find a growing collection of very interesting fossils – some of which are from animals unknown from other Victorian Cretaceous sites.

The potential of the place to someday deliver the 'big deal' fossils is what keeps Tom and I going back. Maybe the 2013 dig will supply "the plan" – or a "big deal" fossil.

Acknowledgements

Mike and Pip Cleeland: Keep 'em fed to keep 'em working.

Lisa Nink: If Wendy is the Sheriff, Lisa is the Deputy.

Alan Tait: who has worked tirelessly in the acquisition of the sedimentary data of the site , who has moved more rock than BHP and for his introduction of Mou Tai to the dig.

Tom and Pat: for keeping it going.

Thrilled with his Frilled

By Pat Vickers Rich

Well, it goes like this. Once upon a time Tom wrote to Arthur C. Clarke because he found out by reading *Greetings Carbon-Based Bipeds!* that Arthur had gotten interested in science because his Dad gave him cards out of his cigarette packs with dinosaurs on them. He was not impressed that his Dad smoked (because it killed him) but he WAS impressed by the dino cards.

And from there you know what happened - he wrote a bit of science fiction amongst other scientific things. Tom sent Arthur a copy of Dinosaurs of Darkness and Arthur then sent him a picture of himself with his arm around a cement dino that he had in his back yard in Colombo, Sri Lanka (the ancient name of this country is Serendip!) and asked Tom to come for a visit. Well, Pat waltzed into Tom's office and saw the picture and said "I want one of those!" So Tom told her to get one herself - so she wrote to Arthur and asked him for just that. So, she and Arthur started corresponding over several months (which turned into years) and then she said to Tom when they were looking for some place to celebrate one of their millions of anniversaries - of course not at the real time of the anniversary because something always interrupts those times - so she said, "Well why don't we just go visit Arthur?".

So, that is exactly what they did. They headed off to Sri Lanka and rolled up at Arthur's door and asked to come in for that visit, which turned into more. So, Pat decided that this rated a dino named after him and she and Tom did just that - when of course they found something in the collections that they could name after him.

Tom was not impressed that Pat had made the promise to do this without knowing for sure that there was something to name after him (she had made a similar bad judgement when she said the same thing to Qantas at some time after they had carried her dino skeletons all around the world) - but then of course the mighty dino crew did find something and thus *Serendipaceratops arthurcclarkei* came into being. Yeh team! And Arthur was really chuffed - as his inscription (see next page) on the paper about this new frilled dino clearly shows - he was thrilled with his frilled!

Sir Arthur C Clarke
'LESLIE'S HOUSE' 25 BARNES PLACE, COLOMBO 7, SRI LANKA.
PHONE: (941) 694255, 699757 FAX: (941) 698730.

1 April 2002.

Dr. Thomas Rich
Curator of Vertebrate Palaeontology
Museum Victoria
GPO Box 666E
Melbourne 3003
Victoria

Dear Dr. Thomas Rich,

Thank you very much for the handsome book.

Reading the multi-syllabic words on the bottom of the back cover I'm reminded of an old astronomical joke: `I know how you find them, but how do you discover their names?'

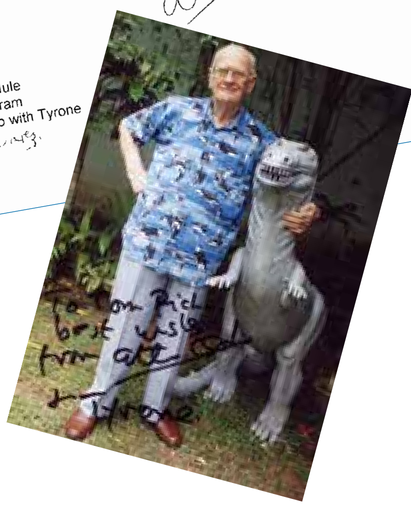
You may be amused to know that I am involved with the gentleman who first thought of cloning dinosaurs, and we're working on a project: `*Softly Come the Dragons*.'

I can see mini-raptors becoming favourite pets by the end of the century – meanwhile here's a photograph that will amuse you.

I'm appalled by the rise of Creationism in the US and it's even beginning to infect the UK, so I'm trying to spread a slogan: `Creationism = Cretinism.'

All good wishes,

Encl: Schedule
Egogram
Photo with Tyrone

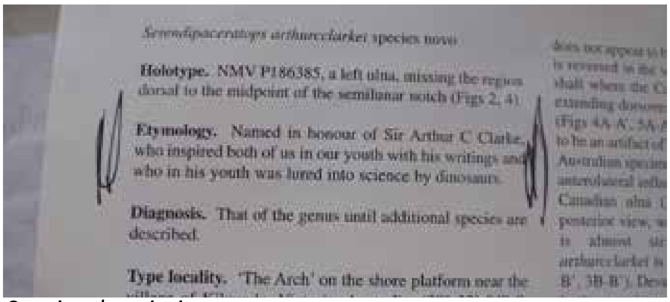


A letter from Sir Arthur C. Clarke to Tom Rich, in response to a copy of Dinosaurs of Darkness that Tom sent him. The picture of Sir Arthur is with Tyrone, a small dinosaur statue that is still in the garden of his former home in Sri Lanka.

The Estate of Arthur C Clarke

By Corrie Williams

Earlier this year, the principal researchers from Dinosaur Dreaming, Professor Patricia Vickers Rich and Dr Thomas Rich, had the opportunity to visit Sri Lanka and help with the curation of the estate of Sir Arthur C. Clarke.



Serendipaceratops arthurcclarkei species novo

Holotype. NMV P186385, a left ulna, missing the region dorsal to the midpoint of the semilunar notch (Figs 2, 4).

Etymology. Named in honour of Sir Arthur C Clarke, who inspired both of us in our youth with his writings and who in his youth was lured into science by dinosaurs.

Diagnosis. That of the genus until additional species are described.

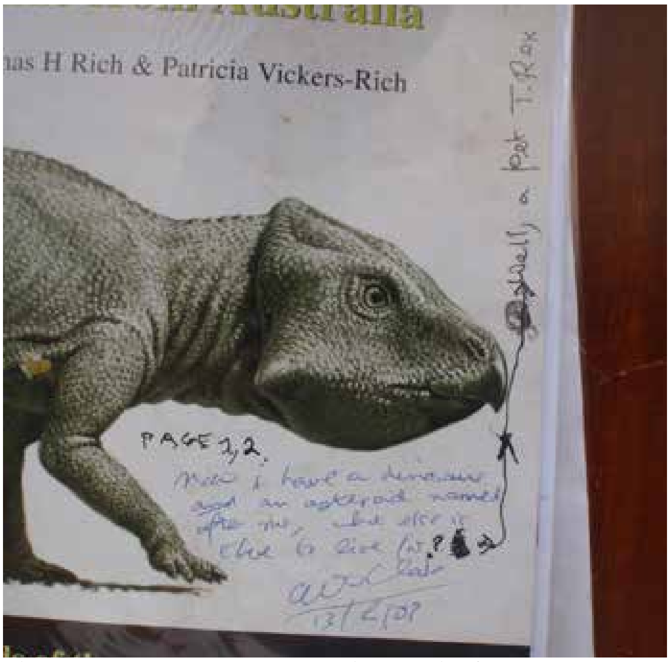
Type locality. 'The Arch' on the shore platform near the

Species description

In Sir Arthur's personal effects they found the paper from 2003 in which they had named a dinosaur, *Serendipaceratops arthurcclarkei* after Sir Arthur. The small ceratopsian dinosaur was described based on an arm bone from The Arch (a site not far from Flat Rocks). The annotation on the paper read "Now I have a dinosaur and an asteroid named after me, what else is there to live for? Well, a pet *T. rex*, A C Clarke 13/ 8/03".

Also found in his study was a clearly prized folding paper dinosaur of *Serendipaceratops*. The paper dinosaur was part of an education kit produced by

Folding paper dinosaur of Serendipaceratops



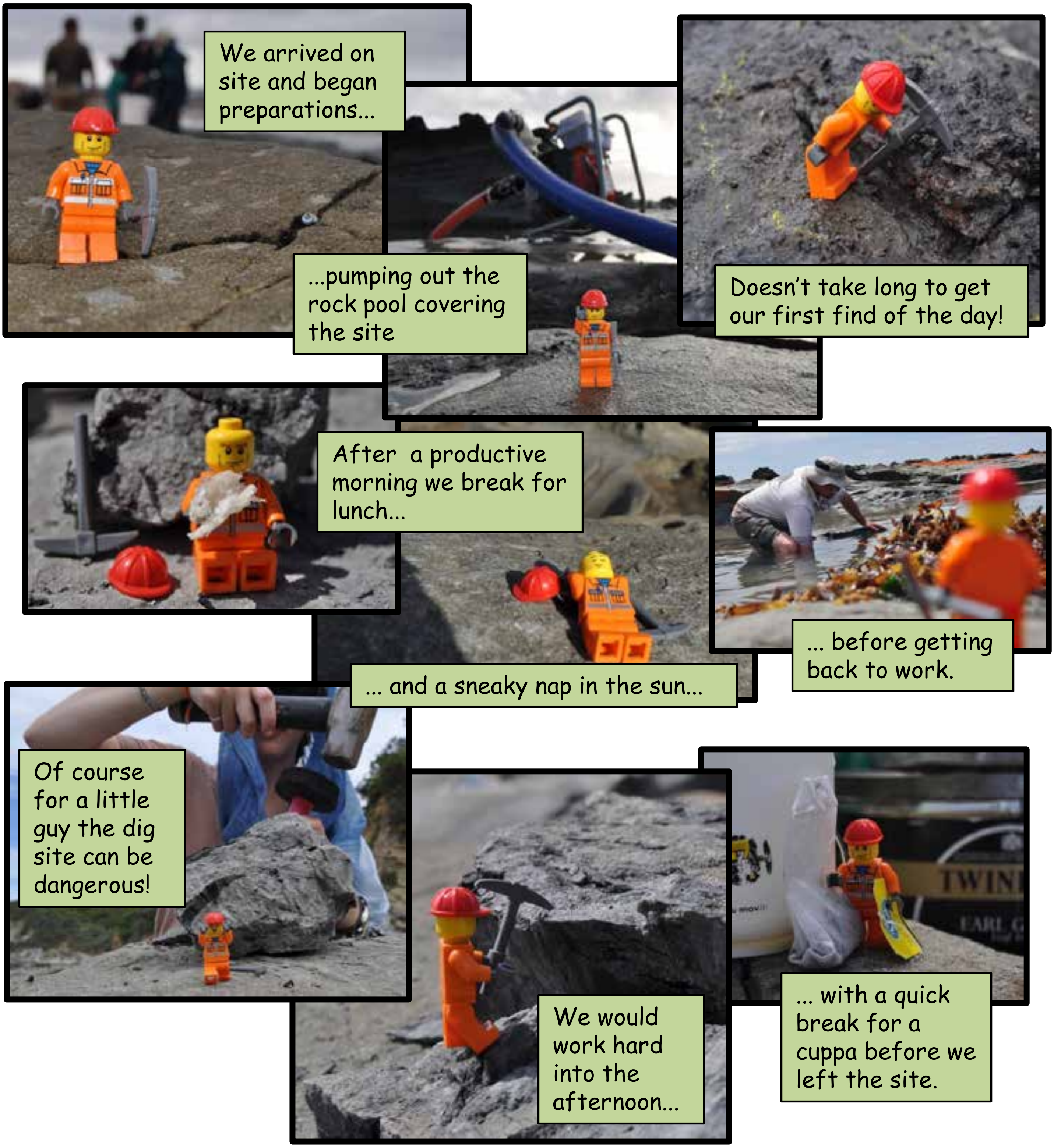
The Serendipiceretops paper with Sir Arthur's comments

Cindy Hann (at that time with Geoscience Australia and a long term Dinosaur Dreaming digger) and Professor Rich (Founding Director of Monash Science Centre).

Found in the Museum Archives

By David Pickering


INCH HIGH
PALAEO GUY
by Fil Berguson – Mini Geologist


We arrived on site and began preparations...
...pumping out the rock pool covering the site
Doesn't take long to get our first find of the day!
After a productive morning we break for lunch...
... and a sneaky nap in the sun...
... before getting back to work.
Of course for a little guy the dig site can be dangerous!
We would work hard into the afternoon...
... with a quick break for a cuppa before we left the site.


While not on site we had an area to break rock at the house.
Every break was a potential bone of the day.
Though we would never forget about conservation of the house yard
My own success was not quite as expected!
Weather was not always on our side...
... but the nightly feasts always warmed us up!
At the end of the day, all the hard work is always worth it for the treasures we unearth.
And so we leave the site for another year, eagerly waiting to get back!

Drawing on the Past: The 2012 T-shirt

By Sarah Edwards

Museum Victoria is home to over 16 million natural science and social history objects, the majority of which are kept in storage. It is a common misconception that items not on display can only be accessed by curators and visiting researchers.

During 2011, Museum Victoria was contacted by Arts Access with a request to host an Artist in Residence project with a difference. Arts Access is a government-funded organisation that provides opportunities for people living with disabilities to actively engage in the arts. They were seeking the possibility for Joceline Lee, one of their participating artists, to work with the Museum's Vertebrate Palaeontology collection.

Veteran Dinosaur Dreaming Field Leader and the Museum's Vertebrate Paleontology Collection Manager, David Pickering, positively embraced the challenge and actively facilitated Joceline and her support artist/mentor Robert Delves in the three month Residency in the Museum collection store. A series of exceptional drawings were generated out of the opportunity for Joceline to view specimens first-hand, and the resulting artwork culminated in Rendered Bones, an exhibition hosted at Federation Square as part of the Melbourne Fringe Festival. Joceline received a further accolade being voted Most Outstanding Artist by the Festival organisers.

One image in particular captured our attention: that of *Tarbosaurus bataar*. Lively discussion ensued regarding the use of an Asian dinosaur in association with an Australian dig. The decision arrived at was based on research published by Dr Tom Rich and associates that linked bones found at Dinosaur Cove in the early 80s as recently identified examples of the Tyrannosauroids from which the Tarbosaurus also hails.

More broadly, art and science have long shared a direct association. Well before photography, artists were essential to science. They provided an empirical eye and the capacity to accurately record images of the natural world. By the middle of the 19th Century, scientists and naturalists actively employed artists to draw the unique and diagnostic features of new species enabling scientists to publish their findings in texts that could be shared with colleagues around the world.

Scientists and artists also share a wide variety of methods to examine specimens. Even in the age of digital technologies, scientists continue to value drawing over other means of image capture to describe their specimens. The most critical of these methods is careful observation, a method that Joceline uses to carefully build the skeletal structure of the prehistoric specimen she is observing in front of her.

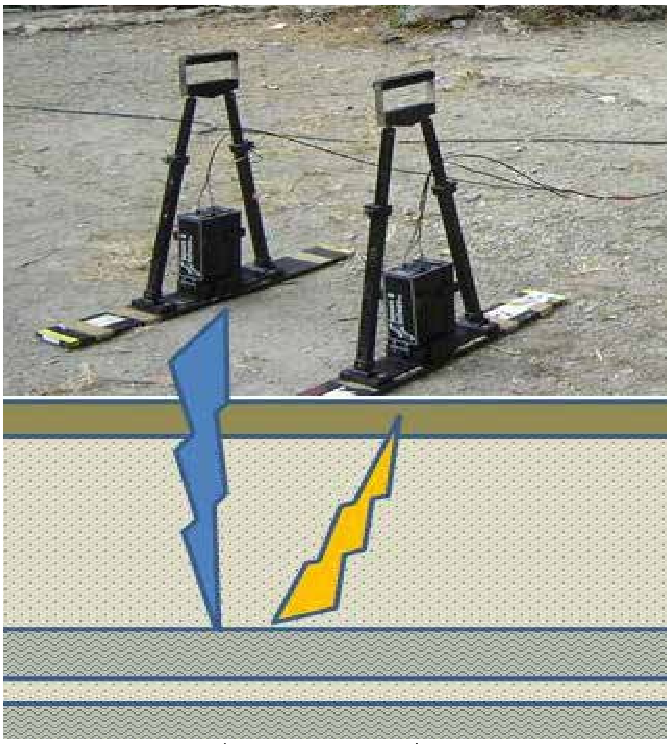
Although Joceline's drawings illustrate a past life, her beautiful renderings illuminate and inspire us to reflect on the wonder that exists in the world around us.

Travis Park and Andrew Giles model the 2012 T-shirt

X-Ray Vision for Eric the Red West

By Jim Cull

Looking for fossils would be a whole lot easier if we could see through rocks with X-ray vision. Well, we can do that right now with geophysical surveys. Not quite in Superman fashion, but there is a good approximation with ground penetrating radar (GPR). GPR has been around for quite a while now. In fact, it was the research focus for Paul Baker, my first Monash PhD graduate in 1988. The potential applications for GPR were immediately obvious and we were well supported by industry groups to purchase the first viable GPR system in Australia. CSIRO had already shown the potential for geotechnical applications in extensive tests completed by Dr Tony Siggins but their instrument lacked mobility and penetration for mineral exploration targets.



GPR Transmitter and Receiver - 100 Mhz

Basically all GPR units operate on pulse and echo principles similar to the seismic reflection method used for oil exploration. Instead of a sound wave generated by explosives the GPR signal comes from a short Electromagnetic (EM) pulse, similar to a radio or TV wave. In similar fashion to the seismic pulse, the GPR signal travels through the rock and is reflected back to the surface by any significant boundary. It is a relatively simple matter to record the time-of-flight for the travel down and back. The total time provides a measure of the distance to the reflector. Of course a GPR pulse travels very quickly indeed – in fact it goes at the speed of light. In earth materials that is a bit less than the speed of light in air but it is still up around 100 metres per micro-second!

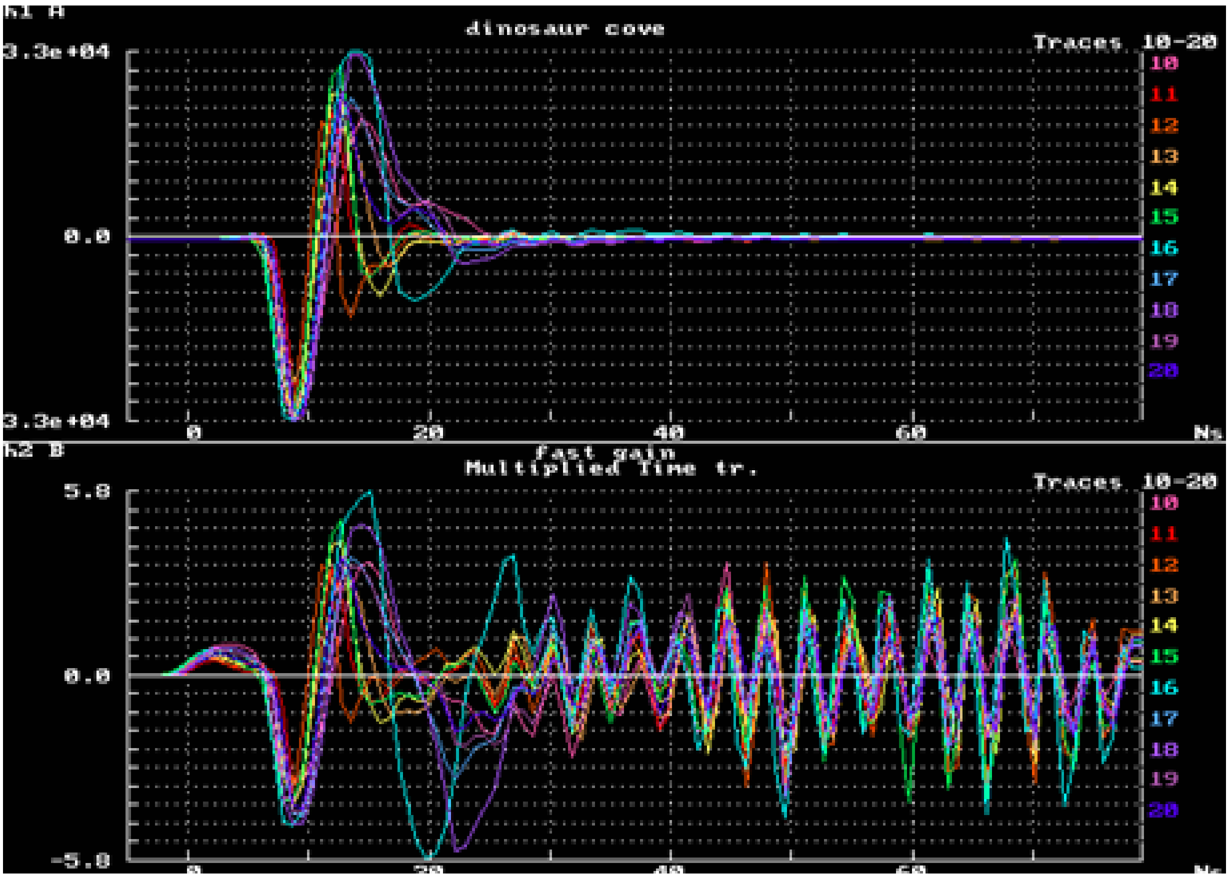
Jim Cull and Wynn operating the radar

Unfortunately radar signals also get absorbed as they pass through rocks and soils. In particular wet clays and sands are considered good conductors of electricity (absorbing the EM pulse) and consequently GPR results can be unpredictable.

There is also a trade-off between the depth of penetration and the resolution available from the signal obtained. Long wavelengths are required in order to obtain clear GPR reflections at significant depth but short wavelengths are required to provide detail from thin sections or small artefacts. In the building industry GPR units commonly used (for example to detect steel mesh in concrete) typically operate at 1000 Mhz; corresponding to wavelengths around 10 cm providing a resolution better than 2.5 cm (quarter of a wavelength). However the depth of penetration seldom exceeds 50 cm for units of this type.

In order to test the application of GPR for fossil mapping at Eric the Red West we were able to mobilise a Pulse Echo 100 Mhz system. This unit is highly flexible and can be configured in several different formats. The system control centre can be placed away from the operating antennas – putting it in relative safety from sea water. The more mobile antennas are linked by optical cable to the control centre and it is only necessary to advance them in small steps to build up a profile over broken ground and backwash from the rocky outcrops. The wavelength in this instance is around 1.0 m with resolution better than 25 cm. Assuming adequate penetration, this resolution would allow the detection and mapping of key stratigraphic units (such as layers of sandstone and mudstone) as a marker for the proven fossil beds.

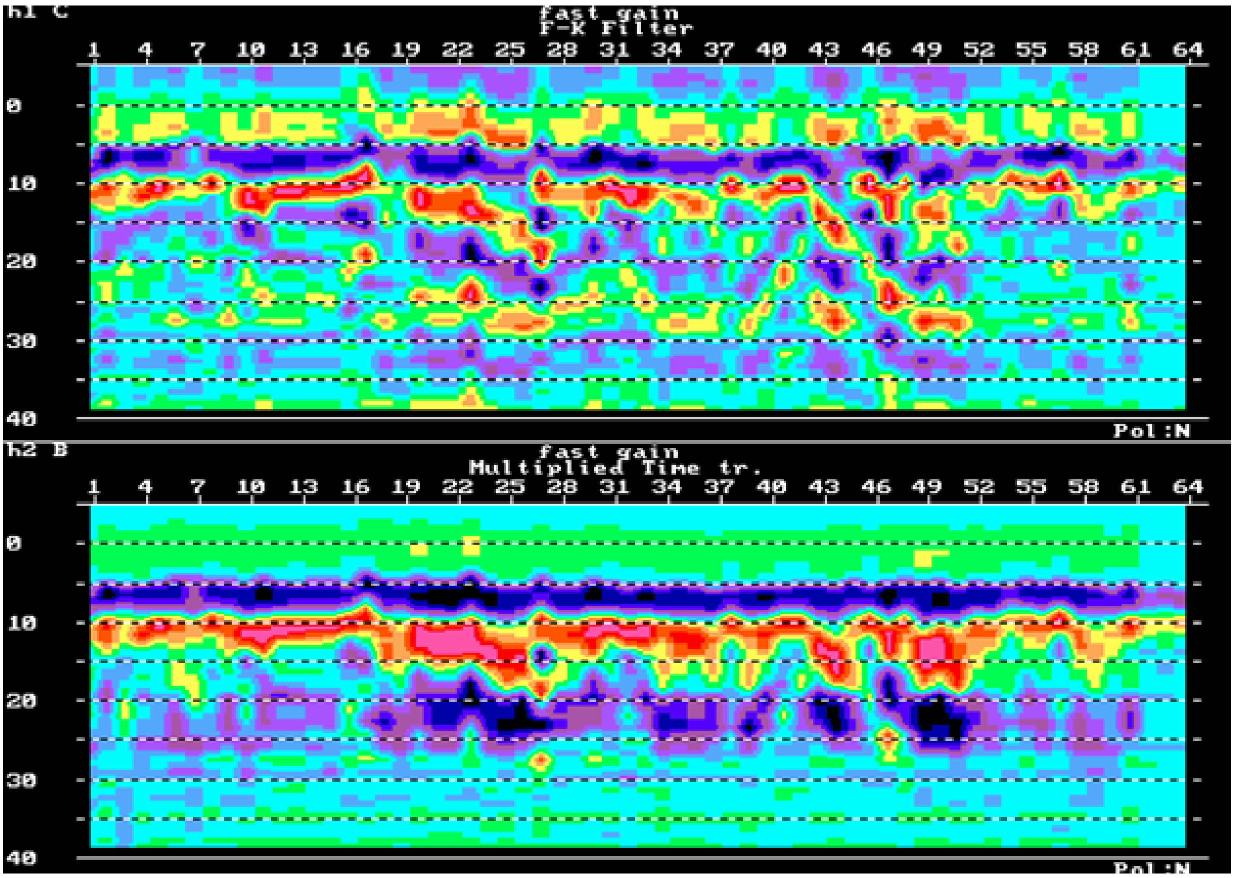
With the guidance of Tom Rich we arrived at Eric the Red West on a fine day. We were optimistic that some good data would be obtained - but we were also apprehensive concerning the effect of sea water washing over our target. Although we knew there would be some salt water content in fractures and pores we were hoping that there would be some penetration in the tighter units, such as mudstone. We were expecting the tide to be well out at that time of day but were sadly disappointed. On more than a couple of occasions we were forced to rescue the antennas from the sudden waves and surges that lapped onto our target zone. Even so we were able to complete our main traverse lines parallel to the shore along with some shorter lines normal to the beach. Now for the data.



GPR signals before and after numerical processing to provide additional gain at depth.
Note large reflections from salt water in the upper trace.

Rather than providing an immediate image of the sub-section on this occasion we were mainly interested in the limitations of the technique. So back in the lab we examined the raw radar signal. Our problem is immediately obvious with significant amplitudes at early time (signals that bounced back very quickly from the top layers of rock) and very little signal down the trace. This indicates that sea water at the surface will remain a major obstacle. However we pressed on with some very heavy data processing involving signal averaging, statistical reductions, filtering and fudging in an attempt to tease out some real signal from the sub-surface.

After some basic processing for gain and loss of signal at the surface it is possible to produce a cross section which should provide information on the sub-surface. The resulting profile requires some skill and experience in interpretation. In particular only gross structure can be expected for the available configuration and no fine structure can be resolved in view of the wavelengths available. So it should be relatively easy to map “layers” of sandstone mudstone, and conglomerate, but finding individual fossils with this equipment is still a long way off. Even so there is some consistency in the data with potential structural trends identified within each trace.



GPR cross-section for Eric the Red West shoreline. Bottom profile is obtained from trace averaging and late channel gain function described above. Top section is obtained after additional spatial filtering to enhance structural trends. Vertical scale is given in two-way time; estimates of depth in metres can be obtained by dividing the vertical scale by 20. Horizontal scale is fiducial multiplied by 0.5m.

House Report

By Wendy White

The 2012 Field Season saw us inhabit the Cape Paterson House again, this time with newbies. We had 10 newbies this year (Andrew, Eve, Jocelyn, Jacqui, Jacquie, Sue, Gavin, Catherine, Phil and Jodi) who lifted and carried and made morning tea. It was great to have new volunteers again and I thank each of them for their enthusiasm and wide-eyed sense of wonder. All of the new volunteers found fossils

Determined to remember our lessons from the 2011 Field Season, we set up the garage downstairs as our main living area, hooked up some lights and turned on the second fridge. This fridge was a donation from Helen Hughes, and made living with 20 people in one house so much easier.

Week one saw the beginning of a year of intense Jenga tournaments. After a long day of swinging sledgehammers and gazing at tiny specks in rocks, we unwound by concentrating on precariously balanced wooden blocks. I know. Go figure.

Week one also saw a spontaneous outbreak of Haiku in the back yard. I am happy to be able to publish some of the better ones:

Dreaming Dinosaurs
Roamed Cretaceous Riversides
Now we dig them up
- MA

Dinos lived and died
Fossils buried in the rocks
Searching with hammers
- WW

Gondwana stream-bed
Yielding precious ancient life
Shit. The other half?
- RL

Once again we chatted to the lovely locals who visit our beach, their kids and their dogs. After spending weeks at the dig every year since 1994, we are proud to be a part of the Bass Coast community.

Mary Walters makes friends with a local

We amuse ourselves on evenings and rain days in various artistic endeavours. We play guitar and sing, read the poetry that Mike writes, and create sculptures using materials on-hand.

Art Projects: Mike gets noddified; Jenga Balloon Puppet

Competative Jenga

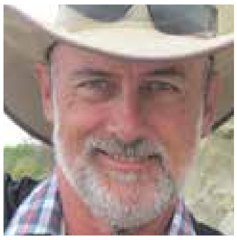
Congratulations to rookie diggers Catherine and Gavin Williamson, who are expecting their first child in November. We believe this child to be conceived whilst on the dig, and has been attributed to a rainy day.

Museum Victoria employee and seasoned dig volunteer Lisa Nink wrote a couple of articles for the Museum Victoria blog (http://museumvictoria.com.au/about/mv-blog/). The first talked about the extraction techniques, and the second the geology. Unlike the Dinosaur Dreaming blog that I write, these were official Museum pieces, and Lisa was kept busy checking facts and confirming names and titles.

The Dinosaur Dreaming blog (http://dinodreaming.blogspot.com.au/) continues to attract a devoted audience, and has clocked up 33,000 page hits since we started it. Now more friendly on mobile devices, we get 3,000 hits a month during the Field Season and around 500 hits a month in winter.

On a personal note, after eleven years of me digging dinosaurs, my parents made the trek down from Brisbane for Friends' Day. Despite a train breakdown causing them to miss their plane on the way here, they happily followed Rohan on the geography tour and listened to Lisa and Dave explain our fossils. A big thanks to Nicole and the crew for looking after them so well and showing them all the dig treasures that keep me coming back year after year.

Waiting for dinner in the back yard



Prospecting Report

By Mike Cleeland

Prospecting over the last 12 months commenced with the recovery of four bones from the Point Franklin area in the Otways, adding to the dozen or so that have come from this moderately productive site over the years.

A well-presented lungfish tooth was found at Point Lewis, but visits to Skenes Creek, Apollo Bay, Elliot River, Ryans Den and Marengo found nothing further at the known sites at these localities.

In the Strzeleckis, small numbers of bones continued to be recovered from the shore platform between The Caves and Flat Rocks, as well as known localities at Eagles Nest, Rowells Beach and Black Head.

A highlight of the season was the discovery by Andrew Ruffin of the fifth Temnospondyl lower jaw from the Victorian Cretaceous.

The partially eroded specimen was recovered from a remote unnamed cove east of The Punchbowl, close to the site where Andrew Constantine found a similar specimen some years ago.

In recognition of the discovery of both mandibles at this locality by people named Andrew, the area has now been informally dubbed Andrew's Beach.

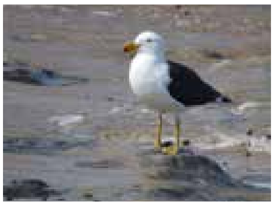
Following the discovery of a hitherto unknown outcrop of Cretaceous sediment on the southwest coast of French Island, a search was carried out which identified a productive fossil plant layer, and several large petrified wood fragments, but no bones despite the presence of several promising gravel conglomerates.

Extant Flora and Fauna of the Dig Sites

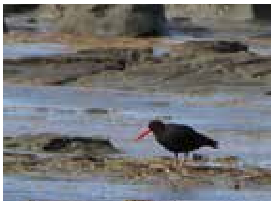
By Lisa Nink

Each year at the Inverloch Dinosaur Dreaming Dig and the Cape Otway Eric the Red West digs we hunt for the fossilised remains of plants and animals that lived in Victoria millions of years ago. However, as we busily break up rock in search of these ancient treasures it is easy to forget that we are surrounded by so many amazing living species that call Victoria's coast home. Although many are hard to find (or require scuba gear to do so) the following is a selection of those we managed to photograph during this year's dig season.

School Shark (*Galeorhinus galeus*) Growing to 2m school sharks are ovoviviparous (the pups hatch from their eggs inside the female shortly before they are born). The name school shark comes from the fact that several individuals will often swim together in schools.



Pacific Gull (*Larus pacificus*) A large gull common along the southern coast of Australia. This is the eastern form with its white eye and red tipped upper and lower beak. Young birds are mostly brown and can take 3-4 years to mature. They feed along the shore or by plunge diving into shallow waters.



Sooty Oyster Catcher (*Haematopus fulginosus*) Found right around the Australian coast they feed along intertidal zones and mudflats using their long beak to probe for invertebrates. Lays 2-3 eggs in a nest scraped in soil among rocks or shells and both the male and female share the duty of incubating the eggs.

Bluelined Leatherjacket (*Meuschenia galii*) These fish are found in reefs from Western Australia, where they are most common to Victoria. This specimen was washed up on the beach just west of Cape Paterson and these fish are rarely found that far east.

Silver Gull (*Larus novae-hollandiae*) Although it prefers coastal inlets and bays the silver gull or seagull as it is more commonly known is also found on wetlands and inland. They are opportunistic feeders.

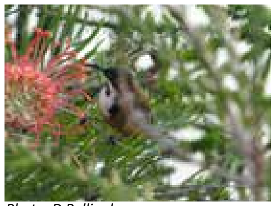


Photo: D Bellingham

Eastern Spinebill (*Acantho-rhynchus tenuirostris*) Spinebills use their long bill to probe flowers for nectar or to catch insects. Although they prefer heath, woodland and forest habitats they are often found in gardens and parks in eastern Australia and Tasmania.

Globefish (*Diodon nicthmerus*) Common in southern Australian waters the globefish is covered with spines that are usually held tightly against its body. When threatened the globefish fills its body with water or air and erects its spines to appear bigger.

Superb Fairy Wren (*Malurus cyaneus*) Found in south-eastern Australia and Tasmania. Females are dull brown and males in breeding plumage have a black tail and chest, white belly and black and blue head. They feed on insects in thick undergrowth and live in groups with a dominant male, several females and young.

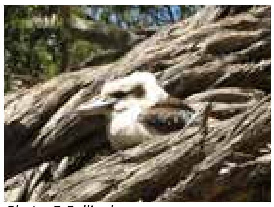


Photo: D Bellingham

Laughing Kookaburra (*Dacelo novaeguineae*) Although it is the world's largest species of kingfisher it doesn't fish but sits on a perch and watches for prey which it kills by pouncing or hitting it against a branch. It eats invertebrates, reptiles and small mammals. Family groups call at dawn and dusk to enforce their territory.

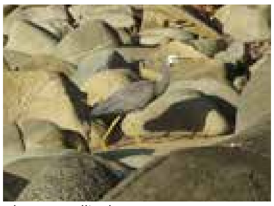


Photo: D Bellingham

White-faced Heron
(*Egretta navae-hollandiae*)
Commonly found in shallow salt and freshwater habitats as well as flooded or moist pasture. They feed on small fish and invertebrates. These herons nest in trees and are found all over Australia.

Sea slater
(*Ligia australiensis*)
These crustaceans live on rocky shores. They hide amongst the rocks during the day and come out to feed on both animal and plant detritus at night when they can avoid predators such as birds.

Chiton
(*Ischnochiton elongatus*)
Chitons are often found hiding under rocks and graze on rock encrusting organisms such as algae and bryozoans. Females produce a string of eggs which are then fertilized by sperm released by the male.

Koala
(*Phascolarctos cinereus*)
Bimbi Park (ETRW dig home) has many koalas. Males can be incredibly noisy at night with their territorial bellows. Males have a brown patch on their chest where scent is secreted and rubbed onto trees to mark their territory.

Black house spider
(*Bedumna insignis*)
These spiders live in webs resembling lacy funnels similiar to funnel web spiders. However, funnel webs are ground dwellers while the black house spider lives above the ground.

Five-armed cushion star
(*Parvulastra exigua*)
Like the eight-armed cushion star the five-armed cushion or green sea star feeds by inverting its stomach which then engulfs the prey and digests the edible parts

European shore crab
(*Carcinus maenas*)
The European shore crab has been known to exist in Australian waters since 1900. It is believed to have been transported to Australia in the dry ballast of wooden sailing ships traveling down from Europe. These crabs feed on native crab species.

Eight-armed cushion star
(*Meridiastra calcar*)
These sea stars feed on seaweed, sponges and some molluscs. Sea stars are a type of echinoderm and are able to regenerate limbs they have lost.

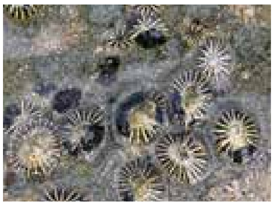
Australwink or blue periwinkle
(*Nodilittorina unifasciata*)
These little shells are found clustered together along the upper reaches of rocky shores around Australia. They are grazers, feeding mostly on lichens moistened by the sea spray.

Eastern grey kangaroos
(*Macropus giganteus*)
These are seen early in the morning grazing at Bimbi Park. Females can have one young living out of the pouch but suckling, one young in the pouch and suckling and an embryo which is temporarily halted from going to full term (embryonic diapause) inside her all at one time.

Garden orb-weaver
(*Eriophora biapicata)*
A common garden spider it hides during the day and emerges each night to build a strong circular web. The spider sits in the middle of the web waiting for insects which may become entangled in it. At dawn the web is dismantled and consumed. They live up to 12 months.

Sea cucumber
(*Chiridota gigas*)
This species can be up to 25cm long and lives in the soft substrate at the bottom of reefs. This species also occurs in New Zealand. When threatened sea cucumbers can cast out their intestines which may serve to distract a predator. If the predator eats some of the intestines, the sea cucumber can grow new ones

Variagated limpet (*Cellana tramoserica*)
These molluscs survive exposure to the air at low tide by tightly clinging to the rock surface making a watertight seal to retain water inside its shell. They feed using their radula (a rough tongue-like structure) to scrape algae off the rocks.



False limpet (*Siphonaria diemensis*)
These animals belong to the pulmonate group of molluscs. They don't have gills but breathe air which they trap under their shell when exposed on the shore platform. This trait hints at their likely terrestrial origins.

Leech (family Haema-dipsidae)
These leeches are terrestrial and feed on the blood of other animals. This leech was observed crawling through the grass along the pathway down to the Eric the Red West site.

Dead mans fingers (*Codium galeatum*)
A species of algae which is often found in rockpools. The common name derives from the appearance of the elongated green 'fingers' of this species floating back and forth slowly in the water.

Red waratah anemone (*Actinia tenebrosa*)

Anemones feed by dangling their tentacles in the water. The tentacles capture any little bits of food or small organisms that pass by and pass it down to the mouth at the center of the animal.

By-the-wind sailor (*Velella velella*)
This jellyfish has a sail like structure on top which, like a sail on a boat, catches the wind and allows the jellyfish to travel.

Photo: D Bellingham

Neptune's necklace (*Hormosira banksii*)
A type of algae which lives in the littoral zone of rocky shores. The 'bubble' structures can be filled with air allowing the algae to float in the water or filled with water to ensure the algae remain moist while the tide is out.

Sea lettuce (*Ulva lactuca*)

A species of algae found in rock pools on rocky shores.

Orange caterpillar wasp or ichneumon (*Netelia producta*)
Female ichneumons (such as this one distinguished by her long ovipositor at the end of her abdomen) capture a caterpillar and paralyse it with their sting before laying their egg inside it. When the ichneumon larva hatches it has a ready made meal in the caterpillar its mother provided for it.

Sea tulip (*Pyura australis*)
The sea tulip is a type of tunicate. They start life as free swimming larvae before settling down and attaching themselves to a rock where they live out their sessile adult lives. They feed by filtering plankton out of the seawater. They are in the same phylum as humans, Chordata.

'Arry the solitary ascidian
After it died 'Arry (thanks to Melanie Mackenzie, Marine Collection Registration Officer, Melbourne Museum for the name) was tossed about in the sea before being dumped on the beach. Much of its defining features have worn away but the two siphons on the top identify it as a solitary ascidian.

Thanks to the following people who helped with the identification and information about some of the species:
Dianne Bray, Museum Victoria
Melanie McKenzie, Museum Victoria
Lisa Goudie, Victorian sponge expert
Simon Hinkley, Museum Victoria

And thank you to Darren Bellingham, photographer extraordinaire for allowing me to use his photographs

Sponges (*Euryspongia* sp. (purple) order *Poecilosclerida* (orange) *Dendrilla cactos* (red)
Sponges are made up of a community of many cells which have various roles in the functioning of the sponge. Some cells are involved in forming the sponge's overall structure and other cells are involved in feeding. One type of cell, the choanocytes, line the internal channels within the sponge. Water is drawn into the sponge at it's base and the movement of the choanocyte flagella directs water upwards and out through the top of the sponge. Food particles are collected from the water as it passes through.

References:
Websites –

Port Phillip Bay Taxonomic Toolkit - http://portphillipmarinelife.net.au

Birds in Backyards - http://www.birdsinbackyards.net/species/

Fishes of Australia - http://www.fishesofaustralia.net.au/

Books –

Rockpooling around the Bunurong, Fiona Eagger, Margaret Rowe and Christine Larson)

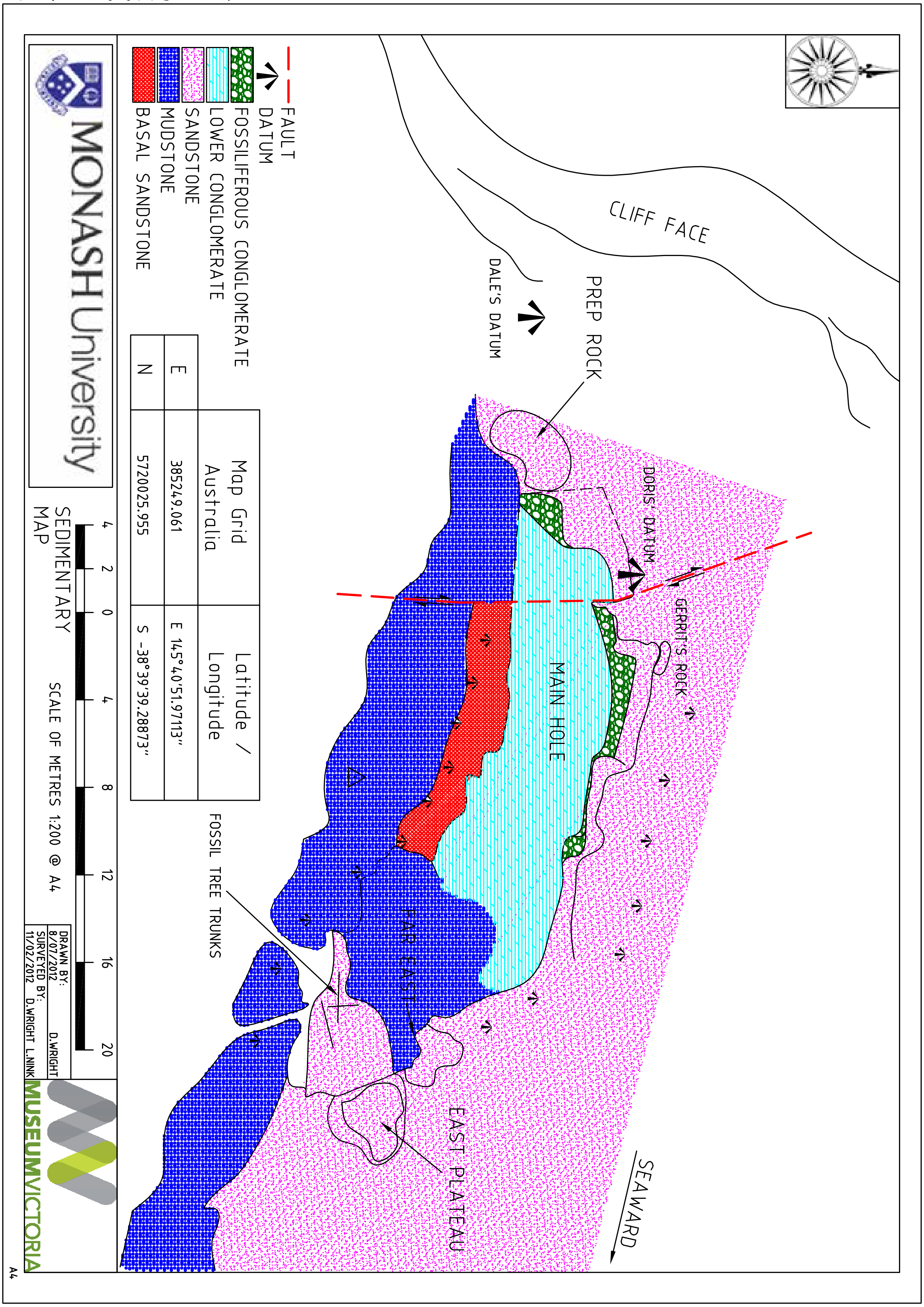
Melbourne's Wildlife: A field guide to the fauna of greater Melbourne, Museum Victoria

The Slater field guide to Australian Birds 2nd Edition, Peter Slater, Pat Slater and Raoul Slater

Photographic Field Guide Birds of Australia Second Edition, Jim Flegg

Cartoon by Pip Cleeland

Flat Rocks Site Map



Mapping

By Dean Wright

Last year in late May we ran a short mapping exercise. It produced an improved map of the site and a sketchy 3D map. This year we had planned to expand upon the map adding sedimentary layers and taphonomic information. Perhaps we assumed we would have prolonged access to the equipment we used last year; perhaps we were too bold. I am glad to say we can scrape something together. The hyper accurate equipment loaned to us by RMIT School of Spatial Sciences was not available; luckily Bosch came to the rescue.

Bosch donated a Bosch GLM 80 Disto. The gadget was a small handheld laser pointer with digital display. It fires a laser pulse in a straight line and measures the time that passes before it is reflected. It is accurate to the millimetre. Half our problem was solved. We could measure how far from our measuring point a fossil or sedimentary boundary was, but in order to get three dimensional coordinates we also needed to know the bearing. I watched five episodes of MacGyver, quickly followed by three episodes of Myth Busters. The answer came to me and it was simple, if not a little crude. In the past we had used an Alidade (a disc divided into 360 degrees which is orientated to the North) to acquire our measurements. We would do the same this year. So with a quick trip down to Office Works I purchased a handful of circular protractors and drilled holes in the centre. Mounted on the tripod that supported the Disto we could acquire both distance and bearing.

Dean Wright, Mary Walters and John Wilkins using the Disto

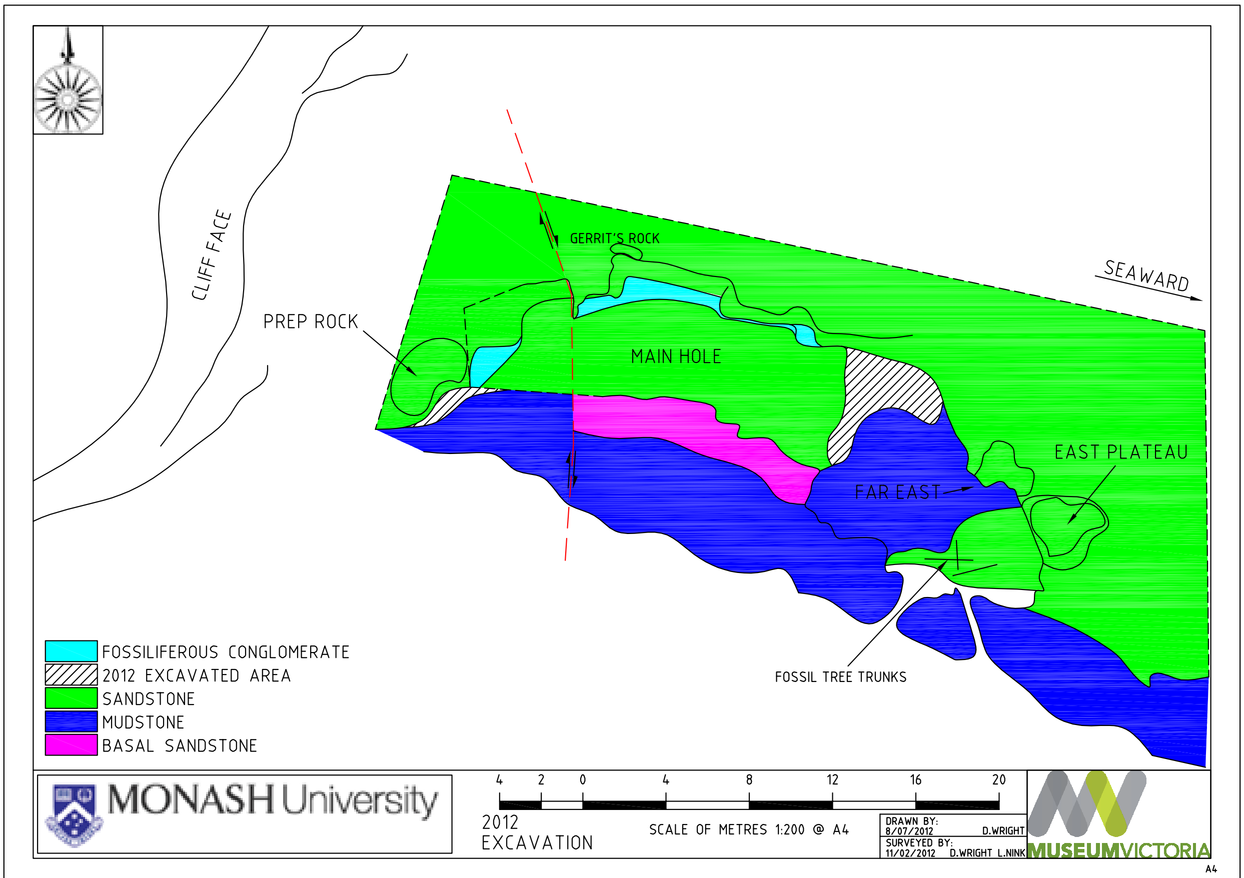
With the stern guidance of John Wilkins I had constructed an old fashioned Theodolite. With pedantic manual recording of shots and my knowledge of Trigonometry we were now capable to take on any mapping challenge… Well kind of.

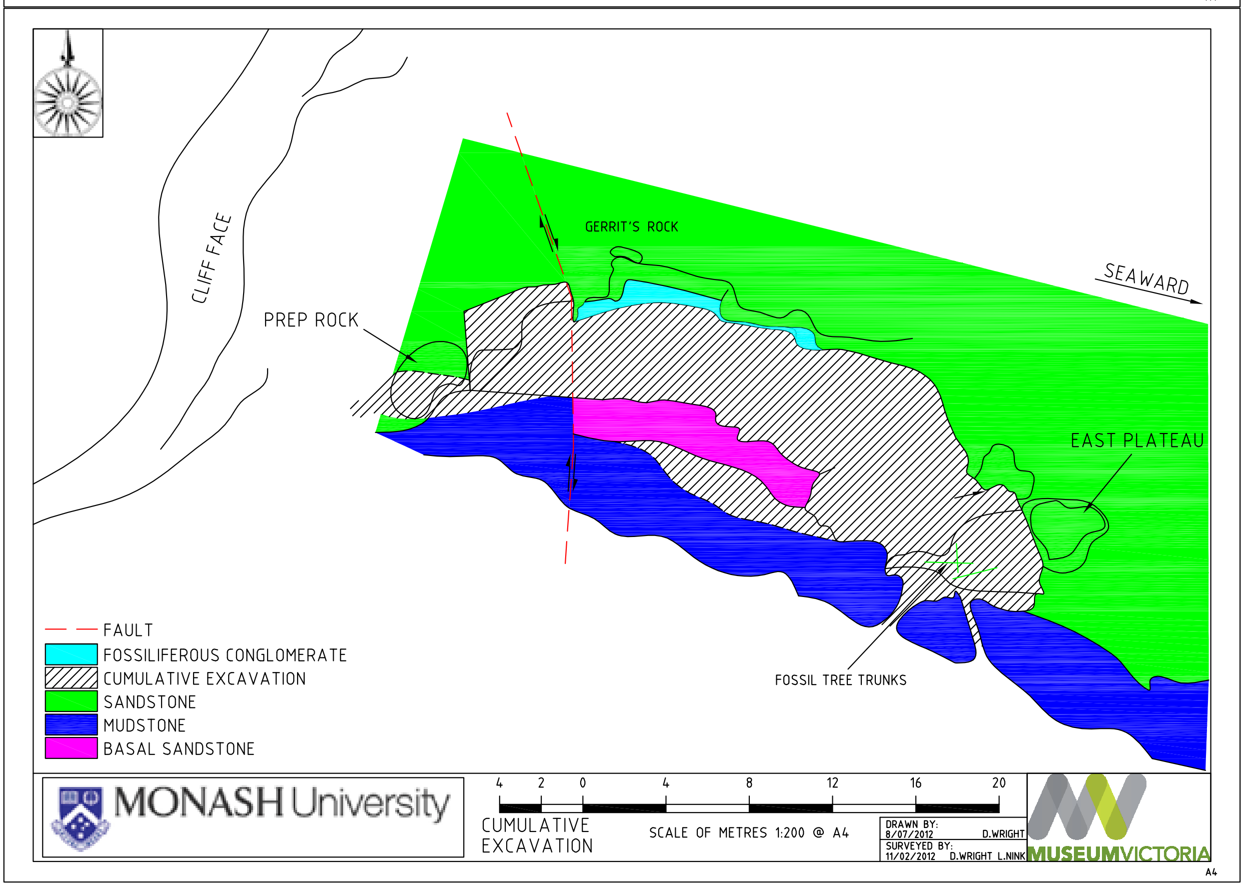
Let me make this clear; there was nothing wrong with the Disto. It was perfect, even told us the slope angle which is needed to calculate depth and horizontal distance. The problem was that every time you set the Alidade with a compass, you were a few degrees left or right of your last setup. Someone (evil and sloppy; who will not be named) suggested that this is ok. This is not OK, especially since we are incorporating this year's results with the latter years.

To fix this we did some Pop Science. We borrowed the accurate Total Station for one day, and picked up as much sedimentary data as possible. We also marked out (accurately; bearing set by corrected GPS coordinates) a series of Datums. A Datum is a point of known coordinates.

Now, before we read the position of a bone or sedimentary feature we took a shot to datum. The distance was almost always spot on, but the recorded bearing (which varied) was adjusted to that taken by the accurate Total Station, allowing us to remove error from our results. With further refinement to technique we have an accurate method of recording 3D coordinates of surfaces, boundaries and objects. The Disto and its tripod are lightweight and easy to set up. Thanks to Bosch and RMIT we now have a reasonably accurate means of mapping.

Flat Rocks Excavation Maps





Theropods

A new paper by Roger Benson

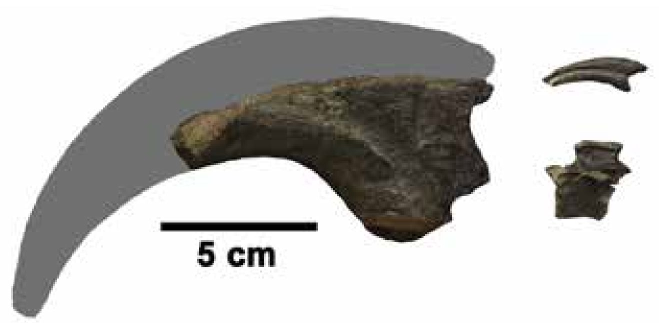
At least seven different killer dinosaurs once lived in what is now south-eastern Australia, a new study led by Dr Roger Benson, from Oxford University, has found.

Research published on 16 May in PLoS ONE describes the findings of scientists and volunteers from Monash University and Museum Victoria who uncovered a higher than expected biodiversity of meat-eating, theropod (bird-like) dinosaur fossils from between 105 and 120 million years ago.

"The largest predator was about 9 metres long, with powerful arms and razor-sharp claws. We known nothing about its skull, but several other bones and teeth are known" says Dr Benson.

"We had not expected to find fossils from such a large range of dinosaur species in this area. The fossils we have collected range from tiny, cat-sized killers to Australia's version of *T. Rex*, a nine-metre-long predator with powerful arms and razor-sharp claws"

In total 1500 isolated bones and teeth of various kinds of dinosaurs have been found in Victoria so far. Their meaning is only beginning to be unravelled by detailed study and comparisons with other fossils world-wide.



The claw of a giant meat-eating dinosaur (left) dwarfs the claw and vertebra (right) of a cat-sized killer.

"At the time these dinosaurs ruled, southern Australia was part of the Antarctic Circle. Despite the cold, there was a high diversity of small predators, similar to the *Velociraptor* featured in 'Jurassic Park'. One of the reasons for the success of small theropod dinosaurs may be their warm blood. As close relatives of birds, they had feathery insulation which helped maintain high body temperatures."

"The cool, damp climate may also explain the discovery of the same dinosaur species in both Australia and the northern continents. The other southern continents, Africa and South America, were joined to Australia 110 million years ago, but were covered by a vast desert with its own distinct faunas."

The study released in PLoS ONE focuses on the discovery of these meat-eating theropod dinosaurs. Dr Benson said the study reports new discoveries and rationalises previous investigations.

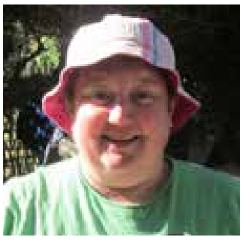
Reference:

Benson RBJ, Rich TH, Vickers-Rich P, Hall M (2012) Theropod Fauna from Southern Australia Indicates High Polar Diversity and Climate-Driven Dinosaur Provinciality. PLoS ONE 7(5): e37122. doi:10.1371/journal.pone.0037122

10 Rock Breaking Tips

By a Slacker

1. Position your rock breaking station comfortably.
2. Sit slightly behind the line of rock breakers.
3. Wear a hat that shades your eyes.
4. Always have a hammer in your hand and a rock on your breaking station.
5. Keep one questionable fossil by the side of your station to produce if someone comes over.
6. Prop your elbows on your knees for stability
7. Always pack your tools away when finished.
8. Forget to bring your tools back.
9. Always retrieve your tools via the coffee urn.
10. Try not to drool or snore.



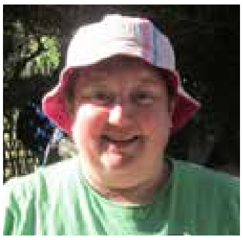
FASHIONS IN THE FIELD

Once again I bring you the best of Dig Crew fieldwear, from the wild and wacky to the elegant and coordinated (OK, mainly the wild and wacky).

BY WENDY WHITE - FASHIONISTA

Top Row L-R: Kat Rajchl strikes a pose in lime green trousers; Eve Eidelson matches hat and gloves to great effect; Mike Cleeland proves a good warm hat is never out of style; John Wilkins proves that a blue kaftan is completely irresistable.
Middle Row L-R: Andrew Giles accessorises with safety glasses and a pirate earing; Nicole Evered and Gavin Williamson coordinate beautifully; Jacqui Tumney says it with a T-shirt; Jocelyn Krewaz brings a splash of colour to site.
Bottom Row L-R: When all else fails, Darren Hastie strikes a pose; Peggy Cole and Mary Walters dress as twins; The Three Hombres - Gerry Kool, Rohan Long and John Swinkels are sun-safe and stylish in straw hats.

Dig Menus



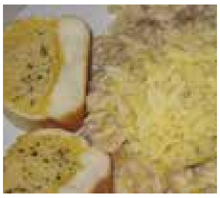
By Wendy White

After a hard day hitting rocks with a hammer, carrying stuff up and down (and up and down) the hill, babysitting pumps and swimming in the ocean, diggers are bound to be a little hungry. Each night a talented chef is recruited from the dig crew to concoct a masterpiece from ingredients at hand or purchased cheaply from local supermarkets. And they do a marvellous job. This article is a tribute to the choppers, the slicers, the grillers and the stirrers – our creators of dig cuisine. As Gerry Kool is fond of reminding us, we eat pretty well on this dig. Here are some of my favourite dishes during the 2012 Flat Rocks season.

Saturday, February 11th
Andrew Stocker's salad of tri-coloured home-grown tomatoes.

Sunday, February 12th
Marion Anderson's slow-cooked chilli served with rice and cheese.

Tuesday, February 14th
John Wilkin's Indian and Italian-inspired chicken rice garnished with tomatoes, sour cream and pappadums.



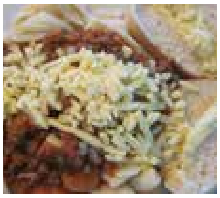
Wednesday, February 15th
Andrew Stocker's Fettuccine *Palorchestes*, rich in bacon and cream, and served with cheese and garlic bread.

Thursday, February 16th
Eve Eidelson's seafood paella with chorizo, or vegetarian paella with water chestnuts.

Sunday, February 19th
Jocelyn Krewaz's Beef Bulgogi with rice, sweet potatoes, spinach and carrots.

Monday, February 20th
Wendy White's mild coconut lentil and pumpkin curry with dill raita, rice and pappadums.

Wednesday, February 22nd
Mike Greenwood's Lab Scouse - a fusion of bacon, corned beef, 'taters and 'neeps.



Thursday, February 23rd
John Swinkel's Shell Pasta with Bolognaise sauce accompanied by grated cheese and garlic bread.

Friday, February 24th
Norman Gardiner and Lisa Nink's Corn Fritters with Tuna Mornay

Monday, February 27th
Helen Hughes' Indian shepherds' pie made with yoghurt mash, chilli beans, tri-coloured coleslaw and pappadums.

Tuesday, February 28th
Phil Spinks' fennel, roast vegetable and goats' cheese pasta.

Thursday, March 1st
Pip Cleeland's Jumbuck Stew with mash and peas.

Ceratosaur

A New Paper by Erich Fitzgerald

The first evidence in Australia of ceratosaurs, a major group of meat-eating dinosaurs that lived 125 million years ago, lends weight to the idea that this continent was once a melting-pot of dinosaur diversity.

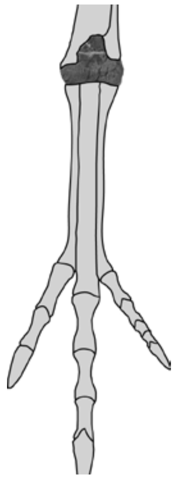
"Until now, this group of dinosaurs has been strangely absent from Australia, but now at last we know they were here – confirming their global distribution," said Dr Erich Fitzgerald, Museum Victoria palaeontologist and lead author of the scientific paper announcing the new discovery.

Carnivorous creatures one to two metres in height, ceratosaurs have been found in both the northern and southern hemispheres. "This discovery joins other widespread carnivorous dinosaurs now known to have lived in Australia – tyrannosaurs, spinosaurids and allosaurs," Dr Fitzgerald commented.

Published in the prestigious journal, *Naturwissenschaften*, the ceratosaur discovery improves understanding of the distribution and evolution of dinosaurs in eastern Gondwana, the super-continent of which Australia was once a part.

Ceratosaur reconstruction by Brian Choo (head close-up)

"It had been thought that isolation played a lead role in the formation of Australia's dinosaur fauna. But the ceratosaur and other new discoveries show that several dinosaur groups were here. These dinosaur lineages date back to the Jurassic, 170 million years ago, when dinosaurs could walk between any two continents."



Bone position

"So perhaps Australia's dinosaurs represent those groups that achieved global distributions early in their history, before the continents split up. It's the old age of their lineages – not continental isolation – which explains these dinosaurs' presence in Australia," said Dr Fitzgerald.

"Apart from Antarctica, Australia has the world's most poorly known dinosaur record – one of the last frontiers for dinosaur hunters. Although discovery rates are accelerating, we're still in the early days of exploring which dinosaurs actually lived here. Each discovery has the potential to change what we know."

The ceratosaur fossil, an ankle bone (tarsus) only six centimetres wide, was discovered in 2006 near the seaside town of San Remo, 87 kilometres southeast of Melbourne.

The paper "First Ceratosaurian Dinosaur from Australia" by authors Erich M G Fitzgerald (Museum Victoria), Matthew T Carrano (National Museum of Natural History, Washington), Timothy Holland (Museum Victoria), Barbara E Wagstaff (University of Melbourne), David Pickering (Museum Victoria), Thomas H Rich (Museum Victoria) and Patricia Vickers Rich (Monash University) was first published in *Naturwissenschaften* Online First edition.

Reference:

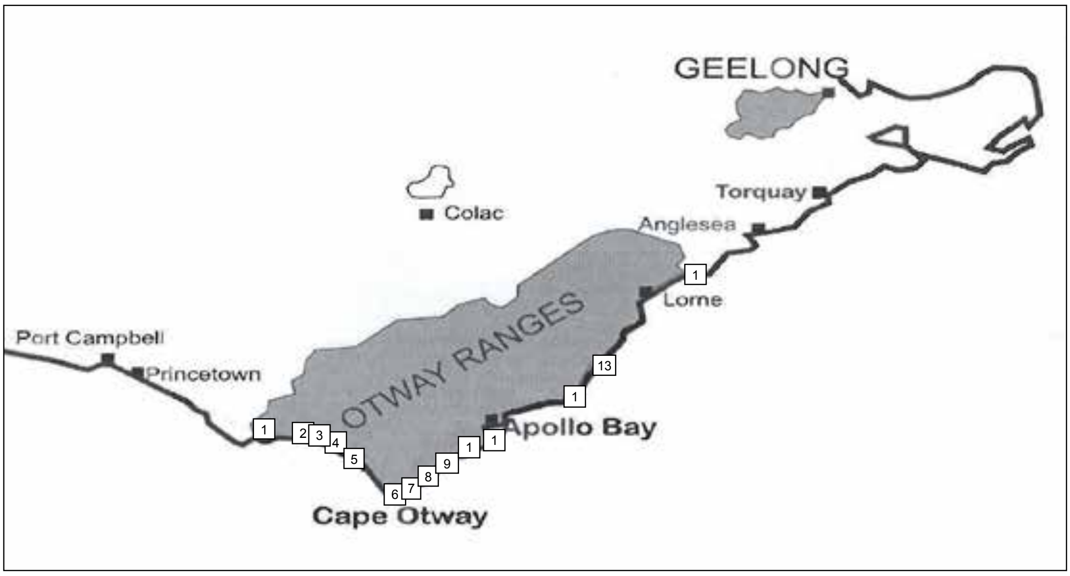
Fitzgerald, E., Carrano, M., Holland, T., Wagstaff, B., Pickering, D., Rich, T., & Vickers-Rich, P. (2012). First ceratosaurian dinosaur from Australia Naturwissenschaften DOI: 10.1007/s00114-012-0915-3

The Mammals of Victoria's Cretaceous

As long-time Dinosaur Dreaming diggers can attest, the tiny fragments of Cretaceous mammals that we find are celebrated and prized. But mammal jaw (and other element) finders don't always get to find out what became of their precious scrap. So here is a list of all confirmed mammal fossils identified since 1997 with Museum catalogue number, notes and taxa.

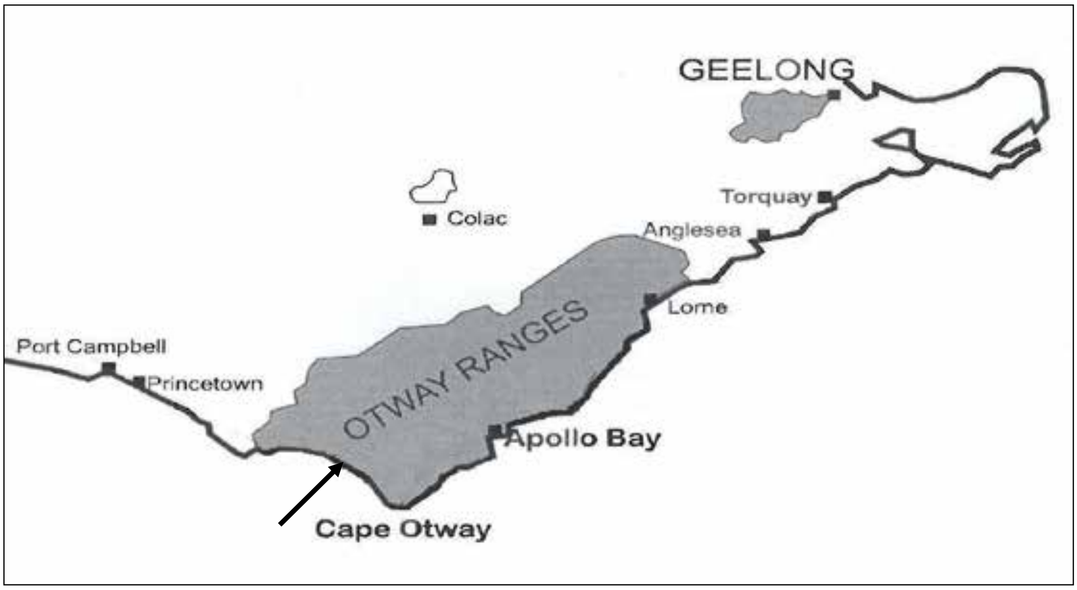
Reg #	Taxonomy	Collector	Field Number	Year	Preparator	Notes
P208090	Ausktribosphenos nyktos	N. Barton	#1111	1997	L.Kool	HOLOTYPE. Right. P6, M1-3
P208094	Kryoryctes cadburyi		Dinosaur Cove	1993	L.Kool	HOLOTYPE. Right humerus. Slippery Rock Pillar, Dinosaur Cove
P208228	Bishops sp.		#329	1995	L.Kool	600my Exhibition display. Right. P4-M2
P208230	Ausktribosphenos ?			1995	L.Kool	Edentulous jaw fragment
P208231	Teinolophos trusleri		Mentors trip	Nov. 1993	L.Kool	HOLOTYPE. M3 or M4
P208383	Monotremata		Dinosaur Cove	1993	L.Kool	Premolar. Slippery Rock Pillar, Dinosaur Cove
P208482	Ausktribosphenos nyktos	N. Gardiner	#150	1999	L.Kool	Right. M2-3, badly crushed. Found in rock from DD1998
P208483	Ausktribosphenidae ?	N. Van Klaveren	#140	1999	L.Kool	Probably Left. x1 premolar & partial tooth
P208484	Bishops whitmorei	K. Bacheller	#450	1999	L.Kool	Right. M2
P208526	Teinolophos trusleri		#560	1994	L.Kool	Right. Edentulous
P208580		A. Maguire	#200	2000	L.Kool	Jaw fragment. (unprepared)
P208582	Ausktribosphenidae	L. Irvine	#500	2000	L.Kool	Right. M3
P209975	Bishops whitmorei	R. Close ?	#387	2000	L.Kool	Right. Roots M1, worn M2. OK M3
P210030	Teinolophos trusleri			2000	L.Kool	Right. Edentulous
P210070	Bishops whitmorei		Rookies day	03.12.2000	L.Kool	Right. Badly broken M1, M2 and x6 Premolars
P210075	Bishops whitmorei		Rookies day	03.12.2000	L.Kool	HOLOTYPE. 600my Exhibition display. Left. P2-6, M1-3. (P1 lost since initial preparation)
P210086	Ausktribosphenidae ?	J. Wilkins	#250	2001	L.Kool	Right. Root fragment
P210087	Ausktribosphenos sp.	G. Kool	#620	2001	L.Kool	Right. Rear half M1, M2-3
P212785		M. Anderson	Rookies day	03.12.2000	L.Kool	Fragment only
P212810	Bishops whitmorei		#300	2002	L.Kool	Left. M2-3
P212811	Teinolophos trusleri	D. Sanderson	#187	2002	L.Kool	Right. Edentulous
P212925	Mammalia ?		#222	1996	D.Pickering	Edentulous
P212933	Teinolophos trusleri		#179	2001	L.Kool	Left. Edentulous. (Plus associated molar: since lost)
P212940	Ausktribosphenos nyktos	W. White	#171	2003	D.Pickering	Left. M1, M2-3
P212950	Bishops whitmorei	C. Ennis	#292	2003	L.Kool	Left. P6, M1-3
P216575	Teinolophos trusleri	N. Gardiner	#180	2004	D.Pickering	Left. x2 molars. Probably M2-3
P216576		A. Musser	#500	2004	L.Kool	Isolated tooth
P216578	Bishops whitmorei	A. Leorke	#600	2004	D.Pickering	Left. M1-3
P216579	Teinolophos trusleri	N. Van Klaveren	#635	2004	L.Kool	
P216580	Bishops whitmorei	G. Kool	#800	2004	D.Pickering	Right. P6, M1-3
P216590	Teinolophos trusleri	J. Wilkins	#447	2004	D.Pickering	Posterior part of right edentulous jaw
P216610	Teinolophos trusleri		#557	2004	L.Kool	Left. Edentulous
P216655	Corriebataar marywaltersae	M. Walters	#142	2004	L.Kool	HOLOTYPE. Multituberculata. Left. P4
P216670	Ausktribosphenos nyktos		#184	1999	L.Kool	Left. M2-3
P216680	Teinolophos trusleri	R. Long	#132	2004	L.Kool	Right. Fragment
P216720	Teinolophos trusleri		#648	2002	L.Kool	Right. Edentulous
P216750	Teinolophos trusleri	R. Long	#162	2005	D.Pickering	Right. Edentulous
P221043	Bishops whitmorei	A. Leorke	#100	2005	D.Pickering	Right. M1-2?
P221044	Ausktribosphenidae	C. Ennis	#300	2005	D.Pickering	Left. M2
P221045	Teinolophos trusleri	J. Wilkins	#395	2005	D.Pickering	Right. Edentulous
P221046		H. Wilson	#480	2005	L.Kool	Isolated tooth
P221150	Teinolophos trusleri	J. Swinkels	#340	2006	D.Pickering	600my Exhibition display. Right. x2 molars. Probably M2-3
P221156	Ausktribosphenidae	N. Van Klaveren	#360	2006	D.Pickering	Right. M2 (requires preparation to confirm)
P221157	Bishops whitmorei	M. Walters	#585	2006	D.Pickering	Right. Edentulous with alveolae for P6, M1-3
P221158	Ausktribosphenos ?	R. Close	#200	2006	D.Pickering	Right. P5-6, half M plus M2-3
P228432	Ausktribosphenidae		scrap rock	2009	L.Kool	Right. Molar talonid
P228848	Bishops sp.	M. Walters	ETRW, Otways	10.12.2006	D.Pickering	Left. P6, M1, partial M2
P229037	Teinolophos trusleri	M. Cleeland	#91	2008	D.Pickering	Right. Edentulous with alveolae for x4 molars and ultimate premolar
P229194	Mammalia	N. Barton	#770	07.03.2007	D.Pickering	Isolated upper Premolar
P229408	Teinolophos trusleri	M. Walters	#300	14.02.2008	D.Pickering	Left. Ultimate premolar, M1-4
P229409	Ausktribosphenidae	N. Evered	#180	07.02.2007	D.Pickering	Possibly Bishops whitmorei. Left. P5-6, M1-3
P229410	Teinolophos trusleri	C. Ennis	#90	2008	D.Pickering	Right. ?M1 plus M3
P229649	Bishops whitmorei	J. Tumney	#330	2009	D.Pickering	Right. P2-3,5-6, M1-3
P231328	Mammalia	A. Maguire	ETRW, Otways	29.11.2009	D.Pickering	Maxilla fragment with x2 molars
P232567	Ausktribosphenos sp.	M. Walters & J. Wilkins	#270	26.02.2012	D.Pickering	Right. Broken premolars. M1-3

EARLY CRETACEOUS FOSSIL LOCALITIES IN THE OTWAY GROUP



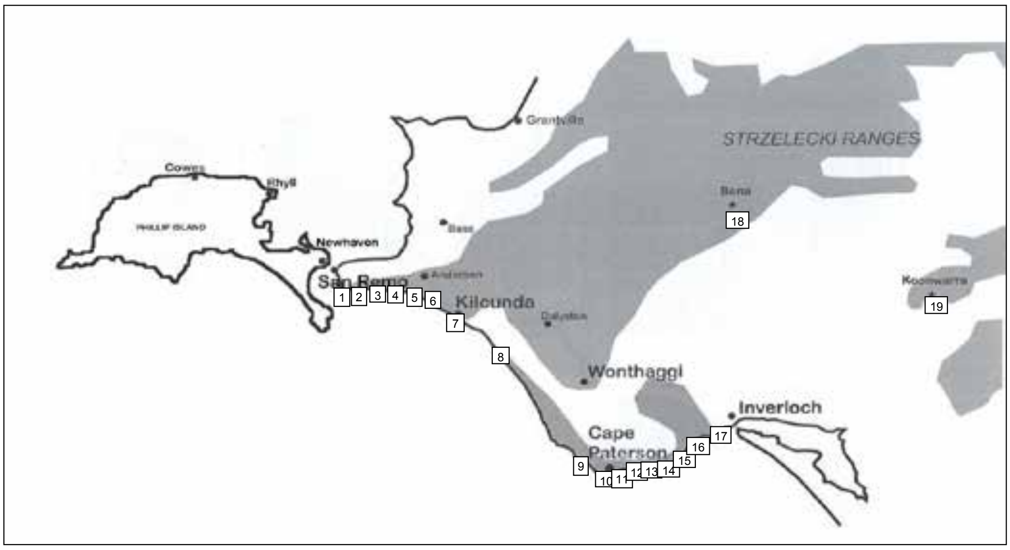
Map Key #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
TAXA	Ryans Den	Knowledge Creek	Milanesia Beach	Rotten Point	Dinosaur Cove	Eric the Red West	Eric the Red	Point Franklin	Point Lewis	Elliott River	Marengo	Skenes Creek	Cumberland River	Eastern View
MAMMALIA:														
Tribosphenic (Unidentified)						X								
Bishops sp.						X								
Monotremata (Unidentified)														
Kryoryctes cadburyi					X									
DINOSAURIA:														
Dinosaur (Unidentified)	X			X	X	X	X	X	X	X	X			X
Ornithopoda (Unidentified)	X			X	X	X			X	X	X			
Atlascopcosaurus loadsi					X				X					
Fulgurotherium australe					X									
Leaellynasaura amicagraphica					X									
Ankylosaurs/nodosaurs					X									
Neoceratopsian					X									
Theropoda (Unidentified)					X	X		X						
Spinosaurid						X								
Oviraptosaurid					X									
Ornithomimid					X									
Neovenatoridae indet.					X									
Tyrannosauroid					X									
Other Vertebrates:														
Plesiosauria (aquatic reptiles)					X	X							X	
Crocodylia (crocodiles)					X									
Pterosauria (flying reptiles)					X									
Testudines (turtles)	X				X	X	X	X	X					
Otwayemys cunicularis					X									
Dipnoi (lungfish)					X	X			X					
Neoceratodus nargun					X				X					
Actinopterygii (ray finned fish)					X	X								
Invertebrates:														
Freshwater crustaceans														
Palaeoechinastacus australianus					X									
Bivalves (Unidentified)					X	X								
Megalovirgus flemingi					X									
Trace Fossils:														
Dinosaur footprints		X	X		X							X		
Dinosaur Burrows		X												
Crustacean Burrows: Parastacid		X			X						X	X		

DINOSAUR COVE LOCALITY IN THE OTWAY GROUP



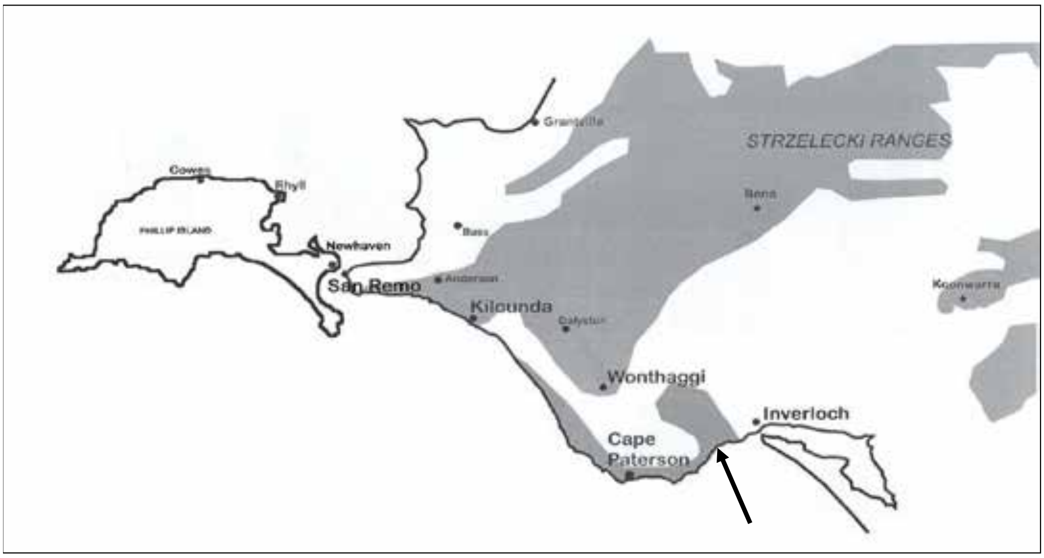
TAXA	Skull element	Jaw	Tooth	Vertebra	Limb	Girdle	Rib	Shell / Armour	Scales	Trace	Articulated Skeleton
MAMMALIA:											
Monotremata (Unidentified)			X								
Kryoryctes cadburyi					X						
DINOSAURIA:											
Dinosaur (Unidentified)	X	X	X	X	X	X	X			X	
Ornithopoda (Unidentified)	X	X	X	X	X	X	X				
Atlascopcosaurus loadsi		X	X								
Fulgurotherium australe					X						
Leaellynasaura amicagraphica	X	X	X	X	X	X					X
Ankylosaurs/nodosaurs				X				X			
Neoceratopsidae					X						
Theropoda (Unidentified)	X		X	X							
Oviraptosaurid		X		X							
Ornithomimid : *Timimus hermani*				X	X						
Neovenatoridae (Unidentified)					X						
Tyrannosauroid						X					
Other Vertebrates:											
Crocodylia (crocodiles)			X					X			
Plesiosauria (aquatic reptiles)			X								
Pterosauria (flying reptiles)			X		X	X					
Testudines (turtles)											
Otwayemys cunicularis	X	X		X	X	X		X			
Dipnoi (lungfish)			X								
Metaceratodus wollastoni			X								
Neoceratodus nargun			X								
Actinopterygii (ray finned fish)	X	X	X						X		X
Invertebrates											
Freshwater crustacean											
Palaeoechinastacus australianus											X
Bivalves										X	
Megalovirgus flemingi										X	
Trace Fossils:											
Dinosaur footprints										X	
Crustacean Burrows: Parastacid										X	

EARLY CRETACEOUS FOSSIL LOCALITIES IN THE STRZELECKI GROUP



Map Key #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
TAXA	San Remo	Potters Hill	Rowell's Beach	Punch Bowl	The Arch	Blackhead	Kilcunda	Powlett River	Harmers Haven	Cape Paterson	The Oaks	Twin Reefs	Shack Bay	Eagles Nest	The Caves	Flat Rocks	Inverloch	Bena	Koonwarra
MAMMALIA:																			
Tribosphenic (Unidentified)																X			
Ausktribosphenos nyktos																X			
Ausktribosphenos sp.																X			
Bishops whitmorei																X			
Monotremata (Unidentified)																X			
Teinolophos trusleri																X			
Multituberculata (Unidentified)																			
Corriebaatar marywaltersi																X			
DINOSAURIA:																			
Dinosaur (Unidentified)	X	X	X	X	X	X	X	X	X		X			X	X	X	X	X	
Ornithopoda (Unidentified)	X	X		X	X	X	X	X						X	X	X			
Fulgurotherium australe					X									X					
Qantassaurus intrepedus																X			
Ankylosaurs/nodosaurs					X											X	X		
Neoceratopsidae (Unidentified)																			
Serendipaceratops arthurcclarkei					X														
Theropoda (Unidentified)	X			X	X	X	X	X					X	X		X			
Ornithomimid	X					X										X			
Megaraptora					X									X					
Other Vertebrates:																			
Plesiosauria (aquatic reptiles)	X							X						X		X	X		
Pterosauria (flying reptiles)														X		X			
Testudines (turtles)						X		X		X				X	X	X	X	X	
Aves (birds)																X			X
Temnospondyli (amphibians)				X													X		
Koolasuchus cleelandi	X	X	X	X					x										
Dipnoi (lungfish)	X			X			X	X					X	X		X	X		X
Neoceratodus nargun				X										X		X			
Archaeoceratodus avus														X					
Actinopterygii (ray finned fish)					X	X		X						X		X		X	X
Leptolepis koonwarri																			X
Koonwarria sp.																			X
Wadeichthys oxyops																			X
Coccolepis woodwardi																			X
Psilichthys sp.																			X
Invertebrates:																			
Bivalves					X											X			
Megalovirgus flemingi					X														
Insecta (Insects)																			X
Trace Fossils:																			
Dinosaur footprints																X			
Crustacean Burrows: Parastacid											X	X		X	X	X			

FLAT ROCKS FOSSIL LOCALIITY IN THE STRZELECKI GROUP



TAXA	Skull element	Jaw	Tooth	Vertebra	Limb	Girdle	Rib	Shell Armour	Scales	Trace
MAMMALIA:										
Tribosphenic (Unidentified)		X	X							
Ausktribosphenos nyktos		X								
Ausktribosphenos sp.		X								
Bishops whitmorei		X								
Monotremata (Unidentified)	X	X	X							
Teinolophos trusleri		X								
Multituberculata (Unidentified)										
Corriebataar marywaltersae			X							
DINOSAURIA										
Dinosaur (Unidentified)	X	X	X	X	X	X	X			X
Ornithopoda. (Unidentified)	X	X	X	X	X	X	X			
Qantassaurus intrepidus		X								
Ankylosauria / Nodosauridae			X				X	X		
Theropoda (Unidentified)	X		X	X	X					
Ornithomimidae				X						
Other Vertebrates:										
Plesiosauria (aquatic reptiles)			X				X			
Pterosauria (flying reptiles)					X					
Testudines (turtles)	X	X		X	X	X		X		
Aves (birds)						X				
Enantiornithine						X				
Dipnoi (lungfish)			X							
Neoceratodus nargun			X							
Actinopterygii (ray finned fish)	X	X	X						X	
Invertebrates:										
Bivalves										X
Megalovirgus flemingi										X
Trace Fossils:										
Dinosaur footprints										X
Crustacean Burrows: Parastacid										X

I FOUND A FOSSIL!

BY WENDY WHITE

Nothing compares with the absolute excitement of finding a really good fossil. It's the one time I find that the crew is happy to stop what they are doing and strike a particularly cheesy pose. Here are some of my favourite photos of happy smiling fossil finders

Dale Nelson

Lisa Nink

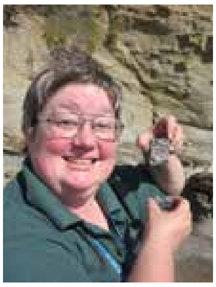
Lesley Kool

Andrew Giles

Mary Walters

Sue Flere

Darren Hastie



Wendy White

Darren Hastie

Marion Anderson

John Swinkels

Mike Cleeland

Jacqui Tumney

Corrie Williams

Jodi Salmond

Mary Walters

Andrew Stocker

Darren Hastie

Gavin Williamson

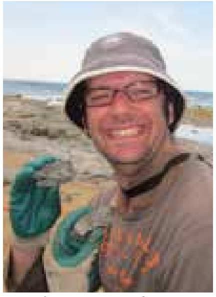
Darren Hastie

Dale Nelson

David Pickering

Corrie Williams

Andrew Stocker


Andrew Stocker


Lesley Kool


Jocelyn Krewaz


John Swinkels


Jacqui Sanders


Darren Hastie


Wendy Turner

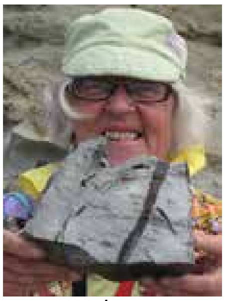

Lesley Kool


Jocelyn Krewaz

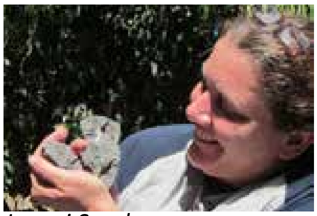

Katerina Rajchl


Doris and Nalani Villiers


Gerry Kool


Mary Walters


Jacquie Smith


Jacqui Sanders


Catherine Williamson

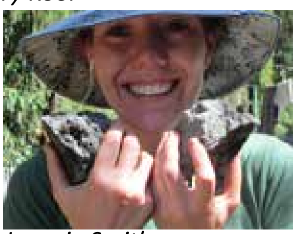

Gerry Kool


The "Hole Crew"

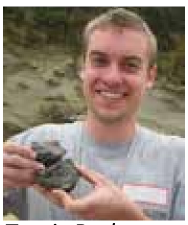

Dale Nelson


Jodi Salmond


Katerina Rajchl


Jacquie Smith


John Swinkels


Travis Park


Lesley Kool


Jocelyn Krewaz


Jacqui Tumney

Pelagornis

A new paper by Erich Fitzgerald

Dr Erich Fitzgerald has identified the first Australian fossils of these bizarre bony-toothed birds—extinct giants with 5-metre wingspans. The 5 million-year-old bones of *Pelagornis* are part of an extraordinary fossil fauna uncovered in Melbourne.

Published in the J*ournal of Vertebrate Paleontology*, this important discovery shows that gigantic birds once soared the skies of coastal Australia and across the globe 5 million years ago.

The Pelagornithidae family, commonly known as bony-toothed birds due to their tooth-like projections on their beak, had wingspans of over 5 metres. The species discovered here, *Pelagornis*, was the largest flying animal to exist on Earth after the extinction of pterosaurs 65 million years ago.

“Bony-toothed birds are enigmatic extinct seabirds with a long history spanning over 50 million years. They were previously known from all continents except Australia. The fact that they existed in Australia not that long ago changes our understanding of the evolution of seabirds in this part of the world,” said Dr Fitzgerald.

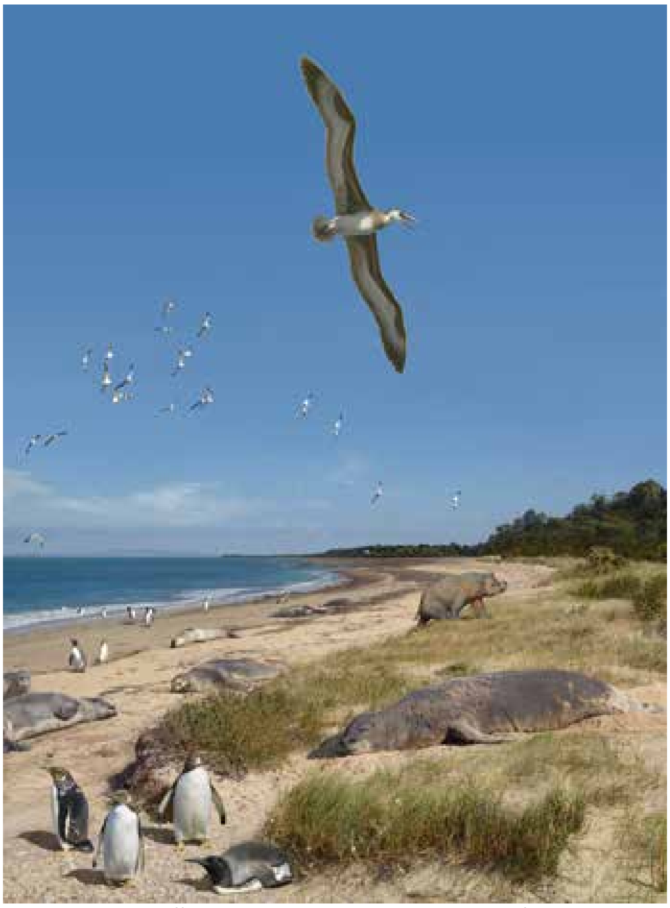
The fossil leg and wing bones found in the bayside suburb of Beaumaris in Melbourne, not only provides evidence that these bony-toothed birds were globally distributed, but also offers new insight into the diverse marine life in our seas at the time.

“We knew next to nothing about the evolution of seabirds in Australia. This finding shows us that there has been a significant change in seabird diversity between 5 million years ago and now,” explained Dr Fitzgerald. “*Pelagornis* is just one of Victoria’s long-lost marine megafauna, including bus-sized sharks, giant penguins, killer sperm whales and dugongs. Life was larger back then!”

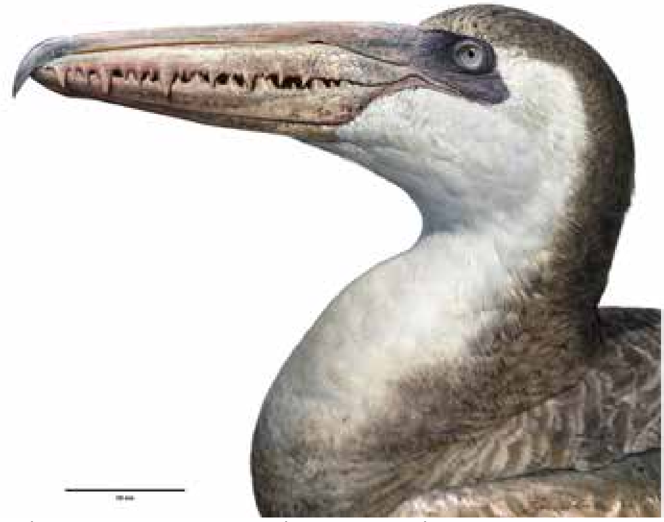
According to co-author Travis Park, Honours student at Museum Victoria and Deakin University (and dig volunteer), “the extinction of these diverse large sea creatures was perhaps linked to long-term changes in their environment.”

“The current coastal seas off southeast Australia are less nutrient-rich than previously, and therefore no longer support as many large marine animals,” noted Park.

Although this fossil discovery shows how much there is still to learn about the evolution of these strange giant birds, this research gives us a glimpse into a time when southern Australian sea life was more spectacular than at present.



Beaumaris 5 million years ago. Artist: Peter Trusler



Pelagornis reconstruction by Peter Trusler

Dr Erich Fitzgerald is a palaeontologist specialising in the evolution of marine vertebrates. He is the Senior Curator of Vertebrate Palaeontology at Museum Victoria. This research is a result of one year of study at Museum Victoria.

Museum Victoria houses the largest collection of fossil marine vertebrates in Australia.

First giant bony-toothed bird (Pelagornithidae) from Australia is written by Dr Erich Fitzgerald, Museum Victoria, Travis Park, Deakin University, and Trevor H. Worthy, University of New South Wales.

Reference:

Fitzgerald, E., Carrano, M., Holland, T., Wagstaff, B., Pickering, D., Rich, T., & Vickers-Rich, P. (2012). First ceratosaurian dinosaur from Australia Naturwissenschaften DOI: 10.1007/s00114-012-0915-3

Otways Short Dig Field Crew

20 - 22 November 2011

Sarah Edwards
Erich Fitzgerald
Lesley Kool
Gerry Kool
Travis Park
David Pickering
Lisa Nink
Tom Rich
Mary Walters
Astrid Werner
Dean Wright

Flat Rocks Dig Field Crew

11 February - 3 March 2012

Marion Anderson
Darren Bellingham
Mike Cleeland
Pip Cleeland
Roger Close
Peggy Cole
Sarah Edwards
Eve Eidelson
Nicole Evered
Sue Flere
Norman Gardiner
Andrew Giles
Mike Greenwood
Darren Hastie
Helen Hughes
Gerrit Kool
Lesley Kool
Jocelyn Krewaz
Miklos Liscey
Rohan Long
Sharyn Madder
Dale Nelson
Lisa Nink
Travis Park
David Pickering
Katerina Rajchl
Jodi Salmond
Jacqui Sanders
Doris Seegets-Villiers
Jacquelyn Smith
Phillip Spinks
Andrew Stocker
John Swinkels
Alan Tait
Jacqui Tumney
Wendy Turner
Mary Walters
Wendy White
John Wilkins
Corrie Williams
Catherine Williamson
Gavin Williamson
Dean Wright

Otways Dig Field Crew

24 March - 1 April 2012

Darren Bellingham
Mike Cleeland
Pip Cleeland
Cate Cousland
Toni-Lee Ferrier
Sue Flere
Andrei Ivantsov
Kerrie Lee
Miklos Lipcsey
Sharyn Madder
Lisa Nink
David Pickering
Tom Rich
Pat Vickers Rich
Andrew Stocker
Alan Tait
Geoff Thomas
Jaqui Tumney
Mary Walters
Astrid Werner
Wendy White
Corrie Williams
Dean Wright

Field Crew Photos

Flat Rocks Week 1 Crew

L-R standing:
Alan Tait
Mary Walters
Andrew Giles
Marion Anderson
Andrew Stocker
Travis Park
Darren Hastie
John Wilkins
Gerry Kool
Lisa Nink
Seated:
Doris Seegets-Villiers
Corrie Williams
Lesley Kool
Norman Gardiner
Dean Wright
Jacqui Tumney
Dale Nelson
Eve Eidelson

Flat Rocks Week 2 Crew

L-R standing:
Jacquie Smith
Jacqui Sanders
Jocelyn Krewaz
Kat Rajchl
Wendy White
Rohan Long
Lesley Kool
Mary Walters
John Swinkels
Sue Flere
Mike Greenwood
John Wilkins
Seated:
Dean Wright
Lisa Nink
Norman Gardiner

Flat Rocks Week 3 Crew

L-R back row:
Darren Bellingham
Helen Hughes
Phil Spinks
Mike Cleeland
Jodi Salmond
Alan Tait
Gerry Kool
Wendy Turner
John Wilkins
Gavin Williamson
Seated:
Dean Wright
Lesley Kool
Peggy Cole
Norman Gardiner
Sharyn Madder
David Pickering
Mary Walters
Catherine Williamson

Otways March Dig Crew

L-R:
Sharyn Madder
Andre Invantsov
Pat Vickers Rich
Cate Cousland
Mary Walters
Jacqui Tumney
Kerrie Lee
Andrew Stocker
Corrie Williams
Dean Wright
David Pickering
Alan Tait
Tom Rich
Miklos Lipscey
Lisa Nink