



Inverloch Dinosaur Discovery

(SLOW TEMPO MUSIC)

MIKE CLEELAND:

Welcome to this Summer by the Sea activity run by Coastcare Victoria, which aims to get you excited about the coast, its protection, and maybe even inspire a generation of future palaeontologists.

Welcome also to Bunurong Country, this part of South Gippsland along the Inverloch coast here, is the traditional land of the Bunurong people from this area, and we acknowledge those people, their Elders, past, present, and emerging.

What we're going to do today, is have a really good look at the dinosaurs around here. So we're gonna have a look at some of the specimens in the display boxes here. We're going to go down to the site and have a look around, and then we're gonna go through the rock breaking and see if we can actually find any dinosaurs. So hang on, let's see how we go today.

OK, come and have a closer look in some of the display specimens.

And we might have a look at some of the actual dinosaur bones that have been found in the area, and this is probably our best and most obvious example. This is actually a metatarsal, still embedded in the rock from about 126 million years ago. It's a foot bone, it goes there in the dinosaur's foot. So that's actually the bone that dinosaurs would've used to kick a footy with, if dinosaurs played footy back then. Well, I don't think they actually did, but there's probably still a few dinosaurs playing for Carlton. I probably shouldn't have said that, should I? Anyway, what you can see here in this bone, this is what we're gonna be looking for at the site today, is the hard outside edge there, showing on the outside of the bone, and the spongy porous interior of the bone on the eroded ends there. That's the giveaway that it's telling us that it's a real dinosaur bone exposed in the rock there.

Here's another good example. Here's a rib bone from not far from here. That's from Harmers Haven, this one. You can see the long curved shape of one of the dinosaur's ribs. Not quite sure which dinosaur this comes from, but that's obviously a medium-sized animal of some sort. So that gives us a bit of an idea of what the actual bones look like. In addition to the dinosaur bones, we see numbers of plant fossils, and here's a very good example of a rock that's been broken open, with a beautiful fern leaf preserved inside it. And the way this has come about is that, about 120 million years ago or more, we've had a lake slowly filling up with mud coming in from outside, and leaves will fall into the mud, and then more mud piles up on top of the leaf until it gets buried in mud like that, and then the mud turns to mudstone. And that's how our fossilised leaf gets preserved in the mud from millions of years ago. Just as mud turns into mudstone, guess what sand turns into? Sandstone. We're onto it today.

Right, what else have we got? This was all happening at a time when the world was very different. There we have the continents of the southern landmass of Gondwana. And maybe I'll put this on the lid here, just so we can see how it's arranged. It would've been very different for the dinosaurs back



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then. They were right up against the edge of Antarctica, so they would never have experienced hot weather like we're getting in the Australian summer today.

So what happened since then is Australia has split and moved north, we're up about here, India. Everything moved away from Antarctica. I don't know what the problem is with Antarctica. Weather was too cold, or something. So we're on our way up there, so our dinosaurs were living in a totally different environment. Not only being a fair bit colder up against the edge of Antarctica, but also darker. This is within the Antarctic Circle. So, from about May through to September, they might've had pretty much no light at all.

OK, let's have a look at some of the other specimens on display. And this is one of the few specimens that doesn't come from around here. This is Tyrannosaurus Rex. We don't have T-Rex in Australia. This is a plaster cast of an actual T-Rex tooth, life size. And the interesting thing for the junior palaeontologists watching the show today, is that groove there is where the next tooth sits. So what happens as the animal grows and ages, is this tooth falls out, and the next one grows down to take its place. Just like the young people, you know, at the age of six or seven who are getting their new teeth coming through, the old tooth falls out, and the new ones grows down and takes its place. And as my dentist always says, you don't have to brush all your teeth, only the ones you want to keep. There's a good one to remember.

From teeth to claws, here's an interesting bone that was found a while ago, and when it was found, there was only that much of it showing in the rock. And when we got it out of the rock, this emerged from underneath it. And can you see that this is actually part of that. So this is a fragment of what would've once been a dinosaur claw this big. It's a hand claw off one of the big meat-eating dinosaurs, probably, or at least possibly, Australovenator, which is perhaps the top of the food chain in the lower Cretaceous in Australia at that time. So we certainly did have big meat-eating dinosaurs in this area.

We also had these strange things, which is a jawbone. And you see it comes in two pieces there, and that is a lower jawbone, it goes there. Not a dinosaur, actually. This is a giant amphibian, it's called a Temnospondyl amphibian, and it's a bit like if you imagine a axolotl, one of the Mexican Walking Fish, about three or four metres long. Koolasuchus is actually named after me. It's full name is Koolasuchus Cleelandi, and I'm Mike Cleeland. That's because I actually discovered this specimen near San Remo a few years ago. So there you are, if you become a palaeontologist, and if you find something that hasn't already got a name, we might name it after you.

Let's have a look at couple of other specimens. Here's an interesting one. That's actually a dinosaur leg bone, and you can tell that because it's got the fourth trochanter coming out the side. Obviously this is only a small bone. That's the main femur. As you can see, it's much smaller than my femur. So we're looking at a dinosaur only about, you know, chicken or turkey size. Possibly Qantassaurus, or



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Leoneosaurus, or something like that. One of the small Ornithomimid dinosaurs that really were quite small in comparison to the bigger dinosaurs getting around in the environment at the time.

OK, dinosaur footprints. This is a plaster cast of the dinosaur footprint that we're going to see down at the site today, and the odd thing about this is that it has four toes. Now as most people would be aware, these theropod type of dinosaurs usually have three toes, but this has got four. One, two, three, four. The toes are the raised up bits, they are not, one, two, three. The toes are one, two, three, four. What we've gotta do today is try work out how a three-toed dinosaur can make a footprint with four toes. Well the answer is, it's not just one dinosaur, it's actually two. The first dinosaur has stood there, and made that toe print, and the second dinosaur has stood on top of it. So that's the middle toe, there are the two outside toes, and they're the underneath ones. When we actually get down to the site, we'll see the original specimen of this one.

When you're out on the beach looking for fossils, there are some safety considerations to be mindful of. Please make sure to wear appropriate footwear, keep an eye out for tides particularly. Know what the tides are going to be before you go to the site. Consider your personal safety by keeping sun-smart, wearing a hat, long-sleeved top, and sunscreen. And please make sure to take any rubbish home with you.

OK, there it is, that's the dinosaur footprint. This is the real one. We saw the plaster cast, but that is the original specimen. And here we can see the four toes again. One, two, three, four. So our first dinosaur has stood there, and our second dinosaur has stood on top of it like that. Let's move on to the next site.

OK, and here we are at the actual dig. And as you can see, nothing's happening today, but if you were here in summer a few years ago with the dig crew operating, what happens is, all the water gets pumped out, and then we dig all the rocks and sand away from under there and expose the fossil layer in the rock face on that side. That seems to be where all the best fossils are coming from. And over the years, since this was started in about 1992, we're up to nearly 15,000 bones out of this hole. And not just dinosaurs, but lots of bones from fish, turtles, even small mammals, occasional birds, wide variety of fossil animal bones have all been washed down into this fossil deposit. So the system is that we clear out the hole, and then we get hammers and chisels and start breaking out big chunks of rock from there, hopefully about this big. Then we take them up onto the beach there, and another lot of people up there work on the chain gang, breaking them down into small pieces right down to about the size of sugar cubes, to make sure that we find all the smaller teeth and bones that can be preserved in this rock.

We had an interesting incident one day when the convicts turned up. What happened was, a few guys got out of jail down at Warrnambool Minimum Security Prison down there at Sale, and they were out on day release doing beach cleaning. So they were coming along the beach, picking up rubbish, and they come up to these people literally breaking rocks in the hot sun. And they said, "What are



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you guys in for?" They didn't understand that people would be breaking rocks for fun. So that's what we do, get big rocks, break them up into small rocks, and on a good day with a full crew going here, we'd get 50 or 60 bones. OK, we're gonna move on a bit further, and head over to the volcano, which is just over this way.

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OK, and we've arrived at the volcano. This is it, and it's probably not what you expect. When we said "volcano", you were probably thinking of a cone-shaped volcano like this. This is not that at all. What it is, it's a volcanic dyke, and we can see the lava going along in that direction and going right out to sea out there, across the shore platform. This is an unusual type of lava called 'dolerite', and it goes under the beach, into the cliff there. Then it goes under the road and into the farm on the opposite side of the road and keeps going.

So we've got a long narrow fissure through here, where what's happened about 100 million years ago, was the pre-existing rocks, old dinosaur rock, sandstone and mudstone have split open, and the lava has flowed upwards through the split. If I was standing here, 100 million years ago, I would've been swimming up through the hot liquid lava, with hard rock on either side of me, and then I would've shot right up to the surface up there, which was probably where the clouds are now, then I would've been erupted at the surface, or would've been spread out in a lava flow across the surface, in my super magic protective heat suit of course, but that unfortunately wouldn't have saved me from the dinosaurs, which would've eaten me as soon as the lava cooled down. Anyway, very good example of what we call a volcanic dyke, where the lava has come up through the pre-existing rock, and solidified in position, in this case.

So we're looking here, at the lava that didn't make it to the surface, which solidified underground, when the surface was way up there, 100 million years ago. What's happened since then, is the volcano which might have erupted up there, has all been eroded away, and eroded right down to this level, which might have been three or four kilometres underground. Very good example of a volcanic dyke. OK.

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And this is the dinosaur tree. There it is, and we call this the dinosaur tree because it's a big petrified tree that was alive at the time of the dinosaurs. There, we can actually see the petrified wood, that yellowish tinged material is wood, that's literally turned to stone. "Petra" is the Greek word for stone. So when we say, "petrified wood", we mean wood that has solidified into stone. I think what's happened with this tree is, it's fallen down that way. That's been the base end of it there, the butt end with even a little root going down into the subsoil at the time. So it's fallen down in this direction, and then it goes to here and it suddenly gets cut off there, and then it starts again over there, and goes off in that direction.



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What's happened here, is there's been an earthquake. And there's the fault line going through there, so our tree would've originally gone off in that direction, but the earthquake has come through and thrown the other half of it a metre and a half over there. So that'd probably get us about a 1.5 or 2 on the Richter scale, a small to medium-sized earthquake, which has split our tree right through the middle.

The other interesting thing about this tree, is that it's hollow. That pattern there is not actually dinosaur ribs, what it is, is layers of sedimentary material. What's happened is the hollow tree has filled up with some sort of sand or mud, which has then turned into hard rock and filled up the centre of what was a hollow tree. So we call this 'The Dinosaur Tree' because it was alive at the time the dinosaurs were alive around here, 126 million years ago, and the small Ornithopod dinosaurs like Qantassaurus and Galleonosaurus may have even eaten the leaves off this. We don't know exactly what sort of tree it was. It wasn't a gum tree, it's too old for gum trees. It might have been something like a Norfolk Island Pine, or one of the big conifers, from the ancient forests down in Gondwana. From here, we're gonna head back towards another earthquake fault line, and have a look at another example of petrified wood before we head off to our rock breaking. So let's go.

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OK, we're just having a look at a fossil tree in the cliff up there. Talking of cliffs, we do have to consider our safety on these beach visits. All those rocks there, I used to think that they'd been washed in from out to sea. I now know that they actually fall from the cliffs. So it can be a safety hazard getting in underneath steep cliffs like that one there, so we do keep a safe distance from those when we're on our field trips. Just between the two little green Coast Everlasting bushes there, halfway up the cliff, we can see a big fossil tree trunk going up on an angle there. So that's one of our dinosaur trees. Again, about 126 million years old. And the little Ornithopods, like Qantassaurus and Galleonosaurus, probably would've been eating the leaves off that, and might've even been climbing around in the branches. Good example of a fossil dinosaur tree, right here at Inverloch. OK, we're heading over to the earthquake now, so over this way.

Right, there we go. Here we are at the fault line, and what we're looking at here, is a big diagonal crack going up the rock face there. And you can clearly see, there's different rocks on either side. On the right hand side, we've got this blueish-grey mudstone about halfway up the cliff, and then we've got sandstone up to the top. Whereas on the left-hand side of the line, it's exclusively sandstone. So what's happened here, is we've had a big earthquake along here, and what would have been the continuation of that mudstone, which would've continued across the other side and come out about the top of the cliff, has dropped down. We're not quite sure how far it's gone down, but that's completely out of view on the other side.

So this is what we call a 'normal fault', where your left-hand side as you look at it, has gone down like that. So there's been quite a big earthquake, that one. You can actually see the curve in the little



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layers going through the mudstone. If you look at those dark layers of organic rich material, as they approach the fault line, they actually bend over. And people might not think that rocks can bend, I mean obviously if you get a rock and try and bend it, nothing happens. But imagine that it's deep underground when the surface of the land was much higher, that's under tremendous pressure, and under that amount of pressure, rocks can and do bend, and eventually break in earthquakes like that. So a very good example of a major fault line, where we've had quite a big earthquake.

What we're gonna do now is head off for our rock breaking. So we're gonna drive into Inverloch, get our hammers and chisels, and see how many dinosaurs we can find.

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Right, this way ladies. Welcome to the Koolasuchus. So what we're going to do here is a bit of rock breaking. So I'm gonna demonstrate to the ladies here, the scientific way of doing this. With our safety glasses on.

And we get a sample rock here from the nearby Cretaceous, and the first thing we do is just check the outside of the rock and see if there's any fossils on it. And no, I can't see anything there, that's chemical staining across there. So we're ready to get our hammer and get to work.

And as soon as we break it, we stop and check. No, nothing there. We'll keep breaking it down. About this size until we find something. Nothing there. Being very careful of course, not to hit our fingers. And trying very hard to keep the two pieces together, because, remember the golden rule, is that when you find something, you've gotta be able to produce both halves. So we hope we don't have people saying, "Oh, look, here's a dinosaur". Well, I'm just gonna say, "Well where's the other half?" We've gotta be able to put our two halves back together. Alright, you ladies ready to choose your weapons and have a go? I'm just gonna keep going with this one.

Ah, there's something. Aha! There's a little bit of a plant fossil. That could be, *Taeniopteris Daintreei*. I think that's a leaf of one of the ferns from the early Cretaceous. We have discovered dinosaur food.

OK team, that's it for today. We've had a reasonably successful day. Looked at a lot of interesting geological features and found a few interesting fossils. If you'd like to join in with a bit more of this, we do have field trips going out to the dig site where we were today, most days during January, with the Bunurong Coast Education Holiday Program. Otherwise, contact us through Bunurong Coast Education to make a booking for that.

So, good luck for the young palaeontologists coming through, hope to see you all again someday, and keep breaking rocks.

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