

Bayside
Gallery



Prehistoric Bayside Education Resource

This exhibition will demonstrate the unique potential that these fossil sites have to offer. There is no place on earth like 'Prehistoric Bayside' ...

Prehistoric Bayside

29 June to 25 August 2024

Guest curated by Ben Francischelli

Published by Bayside City Council on the occasion of the exhibition

Prehistoric Bayside

29 June to 25 August 2024 at Bayside Gallery

Photography: Mark Ashkanasy, except for pages 7, 9 courtesy Ben Francischelli

All other images supplied by Ben Francischelli

Bayside Gallery

Brighton Town Hall
Corner Wilson and Carpenter Streets
Brighton VIC 3186

T: 03 9261 7111

E: gallery@bayside.vic.gov.au
bayside.vic.gov.au/gallery

  @baysidegallery

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Introduction

Bayside is home to one of the most important fossil localities in Australia. Two sites date back roughly 5-6 million years and have yielded thousands of critically important datapoints for understanding the evolution of entire groups of animals.

From giant Killer Sperm Whales to monstrous sharks half as long as a basketball court, *Prehistoric Bayside* gives a unique snapshot into these creatures tumultuous lives, showcasing this ground-breaking fossil material for the first time. This material was found with the help of numerous citizen scientists, whose contributions are helping scientists to piece together prehistoric Bayside one bone at a time.

Working with palaeo-artists, educators, curators from Bayside Gallery, citizen scientists and numerous palaeontologists across Victoria, *Prehistoric Bayside* integrates the most informative up to date science of what these extinct creatures once looked like and attempts to reconstruct the marine ecosystem of Bayside from more than 5 million years ago.

This Education Resource is suitable for Grades 3 – 10.

Guest curated by Ben Francischelli.



Ricketts Point



Located just off the coast of Beaumaris in Melbourne's southeast, **Ricketts Point Marine Sanctuary** is well known for its sandstone cliff platforms, sea caves and offshore reefs. Home to an extensive array of marine life including various species of fish, crustaceans and invertebrates, the sanctuary provides children and adults a place to learn about an important marine ecosystem.

As well its marine life, **Ricketts Point Sanctuary** is also significant for its rich fossil heritage that is preserved within the coastal sandstone of Beaumaris and Black Rock. According to Dr. Vicki Karalis, a passionate advocate for the fossil sites, 'the Sandstone of the Bay's cliffs was more than 5.5 million years old. Every time they crumble, they release fossils' (cited in The Herald Sun, 2018).

Ricketts Point is arguably the 'jewel in the crown of Bayside', Professor John Long (Flinders University) and Environmentalist Tim Flannery, discovered a number of fossils at Ricketts Point including *Lovenia* (heart urchin) as well as

fossilised shark teeth and remains of extinct sea creatures. More recently in 2014, sea turtle fossils were discovered in Beaumaris, filling a '66-million-year gap in the historical timeline of Australian reptiles' (The Herald Sun, 2018).

In 2018, there was support for councillors at Bayside City Council to put in an application to the National Heritage Department to make the fossil site of Beaumaris a National Heritage site. Among groups who have signed up for the push for heritage listing are local indigenous groups; the Sandringham Foreshore Association; Bayside Earth Sciences Society; Beaumaris Conservation Society Inc; the Gould League; The Society of Vertebrate Palaeontology; The Royal Society of Victoria; The Royal Society of South Australia; RMIT University; Australasian Palaeontologists and the Victorian Artists Society (cited in The Herald Sun, 2018).

Artists have long been fascinated by the beauty of Beaumaris Bay/Ricketts Point. Artists including Tom Roberts, Arthur Streeton and Charles Conder all produced works depicting the Bay. Recently, illustrator Peter Trusler created a work based on extinct animals from the site.

About the curator



Ben Francischelli is the Guest Curator for *Prehistoric Bayside*. He is a Bayside-based palaeontologist and science communicator who lives and works on the lands of the Bunurong people of the Kulin Nation. With a background in Environmental science and conservation he previously worked as a vertebrate palaeontologist with Museums Victoria and currently works as the media advisor for conservation and science at Parks Victoria.

Ben has been exploring the fossil deposits across Victoria for the last decade and works with an incredible group of citizen scientists to retrieve fossils for the state repository. Their discoveries represent some of the most ground-breaking fossils ever discovered in Victoria. Hundreds of scientifically valuable fossils are now lodged within the state repository of Museums Victoria due to their generous contributions.

Ben explores the relationship between animals that live in the past and how this relates to the modern ecosystem. His discoveries have uncovered new species of ancient whales, megafauna, giant penguins, and sharks in Victoria. He has a fortnightly science slot on ABC 774 AM discussing these discoveries in detail with the general public.

Glossary of terms

- **Fossil deposits:** Fossil deposits refer to accumulations of preserved remains or traces of organisms from past geologic ages, typically found in sedimentary rocks.
- **State repository:** refers to the area where scientifically important fossil specimens are held in Victoria, so that scientists can study and look after them.
- **Megafauna:** any creature that weighs more than 40 kilograms in weight is technically megafauna. This term is usually denoted for the prehistoric megafauna (such as Diprotodon) that lived in Australia from 40,000 years ago.
- **Evolution:** describes how populations of living organisms undergo genetic changes over time, leading to the development of new species and the diversity of life on Earth.
- **Citizen scientists:** individuals who voluntarily participate in scientific research activities, often in collaboration with professional scientists or scientific institutions.
- **Radiometric dating:** a method used to determine the age of rocks, fossils, and other geological materials by measuring the abundance of certain radioactive isotopes and their decay products.
- **Brachiopods:** Brachiopods are characterized by a two-part, hinged shell, which superficially resembles a bivalve mollusc (such as clams and mussels). While they are not as common or well-known as some other marine invertebrates, they play a significant role in palaeontology as valuable index fossils, helping scientists date and correlate rock layers in geological formations.
- **High energy depositional environment:** refers to a setting where sedimentation is influenced by strong and dynamic physical forces, resulting in the deposition of coarser-grained sediments. In these environments, energetic processes such as strong currents, waves, or turbulent flows play a significant role in transporting and depositing sediment.

What is a fossil?

Fossils represent the remains of animals and other organisms that are tens of thousands, to millions of years old. The fossils in Bayside are geologically altered and retain the mineral composition of the sediments they were buried in, rather than the original structure of bone. These fossils in Bayside are universally acknowledged to be between 5-6 million years of age, based on the radiometric dating of smaller organisms (such as brachiopods) in the strata and surrounding rocks.

As an animal (like a whale) dies, its carcass eventually descends to the bottom of the sea floor. In most cases, these skeletons are scavenged immediately and very little remains of any individual whale. In rare cases, the carcass can be covered by sediment immediately after death, for example in a storm and this covering can protect some of the strongest elements (i.e. bones) within the carcass. Over millions of years and with subsequent layers of sediment accumulating on top of them, these bones can be preserved and eventually become fossils.



*Fossil shark teeth from Bayside retrieved by Ben Francischelli after a dive in Beaumaris. These teeth belong to **Cosmopolitodus plicatilis**, one of the largest sharks ever found in the fossil record.*

More than 99% of all fossils found in Bayside are of a single bone, rather than a skeleton. Skeletons of entire individuals are extremely rare in the Victorian fossil record, but they do occur on occasion. Most of the Bayside fossil deposits are thought to represent a 'high energy depositional environment'. This would have broken up many individual animal carcasses on the bottom of the seafloor prior to fossilisation.

Responding and making

Mapping fossils

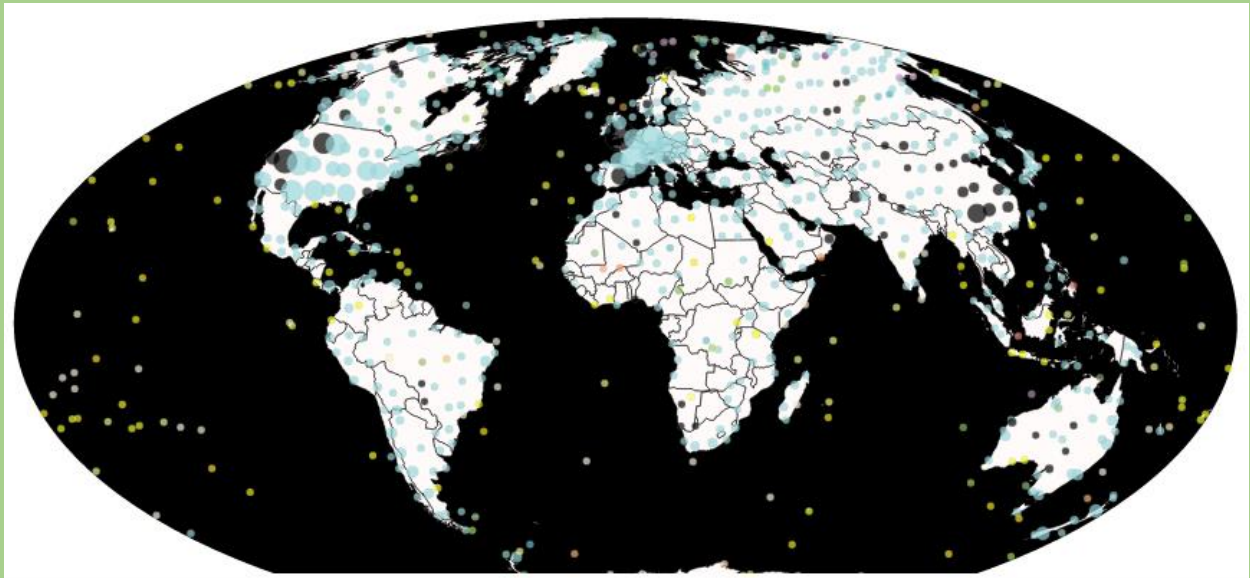


Image credit: Popular Mechanics

Visit the website below to see where fossils have been found around the world and the different time periods they are from:

<https://paleobiodb.org/navigator/>

Find a map about Australian fossils and geology.

Compare these maps to other types of maps we use: hand-drawn maps, weather maps, mining maps and landform maps. Find some similarities and differences between these maps.

Why do we need all of these kinds of maps to have a better picture of the world we live in? How could scientists use them to plan for a more sustainable future for the planet?

Palaeontologist for a day



Image credit: *Cosmopolitodus plicatilis* teeth

Imagine you have just made a major fossil discovery! You have found the jawbone of a mysterious creature. Imagine the kind of teeth that might still be attached, the size of the bone etc. What might this tell you about what animal this jawbone belonged to?

Draw your discovery, making notes about things you might have seen or found on the fossil.

Create a profile about your creature, including its habitat, diet, and a sketch of what it may have looked like. Explain what it is about the fossil that has led you to believe this information is correct.

Flesh and bones – onsite activity



Image credit: Pip Abraham

During a visit to the exhibition *Prehistoric Bayside*, students will reconstruct some of the most famous animals that have ever lived in Victoria and Bayside! Utilising up to date scientific knowledge, students will slowly flesh out prehistoric animals by adding muscles, skin, fur and feathers to a two-dimensional fossil skull that is provided to them on paper.

They will be provided with insights into what these animals once looked like by investigating their modern/closest relatives and aspects of their anatomy.

This program will take roughly 45-60 minutes.

The students will then be taken for a walkthrough of the exhibition space and compare how they created the animals that feature in the exhibition compared to the palaeo-artists interpretation.

Citizen scientist



Image credit: Ben Francischelli holding a Livyatan tooth

You are a citizen scientist heading out for the day to see what you can discover at your local beach. What do you take with you? Create a list of essential items.

You are in luck and have made a number of findings for the day! Write up a report for one of your items, noting its size, colour, location found and any other details you think might be relevant.

If you have found something you think might be significant, what should you do?

Toothy truths

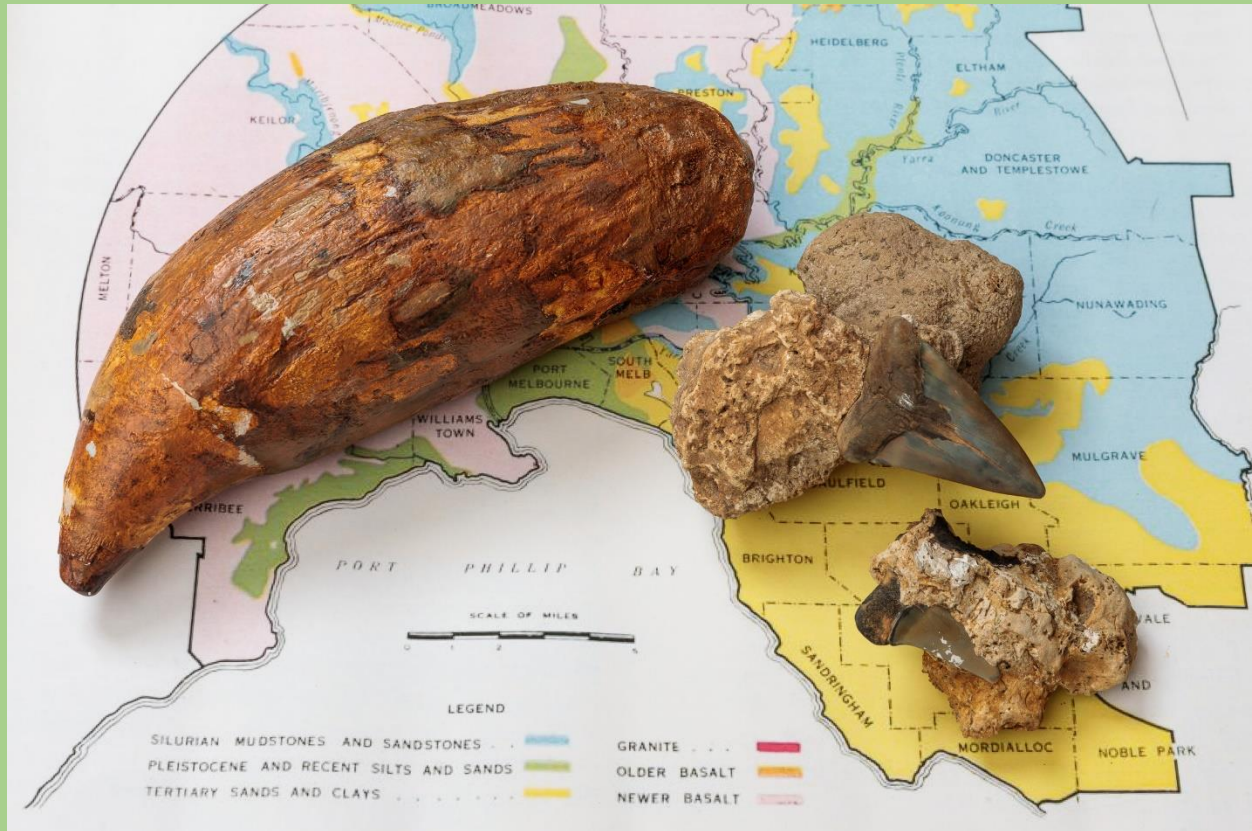


Image credit: Livyatan tooth (left) with *Cosmopolitodus plicatilis* teeth

In 2016, citizen scientist Murray Orr discovered a major find on the beaches of Beaumaris. It belonged to a predator comparable in size to the Megalodon and would have been more than half the length of a basketball court! The tooth belonged to Livyatan, a monstrous whale, with a mouth filled with 40 of these teeth. It hunted and ate other whales, representing one of the biggest predator-prey interactions that may have ever existed on our planet.

Imagine you have found what looks like a large tooth on the beach. How would you go about finding out what kind of tooth it is?

Many of the fossil finds in Bayside have been teeth. Why do you think so many teeth have been found?

What kind of information can palaeontologists discover about an animal from their teeth?

Critical thinking extension questions



Image credit: Cosmopolitodus plicatilis teeth

- What if some of the creatures featured in the exhibition were still alive today? What impact do you think they would have on us, and us on them? Do you think we could live together harmoniously?
- What do you think caused these creatures to become extinct? Why does a whole species become extinct?
- What tools would you need to be a palaeontologist? Have they changed from what tools were used in the past?
- Why are there so many sharks' teeth found near Ricketts Point? Why haven't they found other parts of the shark?

Further reading

Fossils of Beaumaris

https://www.bayside.vic.gov.au/sites/default/files/2021-08/beaumaris_fossil_book_museum_victoria.pdf

How do fossils form?

<https://australian.museum/learn/australia-over-time/fossils/how-do-fossils-form/>

The fossils of the urban sanctuary: Ricketts Point, Victoria 3193

[https://hdp-au-prod-app-bays-yoursay-files.s3.ap-southeast-2.amazonaws.com/3515/2842/1677/The Fossils of the Urban Sanctuary Ricketts Point_Vic.pdf](https://hdp-au-prod-app-bays-yoursay-files.s3.ap-southeast-2.amazonaws.com/3515/2842/1677/The_Fossils_of_the_Urban_Sanctuary_Ricketts_Point_Vic.pdf)

Ricketts Point Marine Sanctuary

<https://parkweb.vic.gov.au/explore/parks/ricketts-point-marine-sanctuary>

Video resources

Beaumaris: 'One of Australia's most significant fossil sites'

<https://www.youtube.com/watch?v=3NyBlybWw2Y>

Underwater VLOGS 'A Fools Experiment'. How do you find the fossils in Bayside?

<https://www.youtube.com/playlist?list=PL9aLtVpYjaxA7B-u4n7EQ1Gcdp57cFDT7>

The demise of the Australian megafauna

<https://www.youtube.com/watch?v=mGupWiQ5RFA&t=5s>

The rise and fall of the mega-toothed shark

https://www.youtube.com/watch?v=wzfi00p0_rY&t=2032s

Links to Victorian curriculum

Content descriptors from the Victorian curriculum that are related to fossils, artist interpretations of extinct animals and climate change.

Science understanding - Earth and space sciences:

1. Year 6:

- VCSSU098: 'Sedimentary, igneous and metamorphic rocks contain minerals and are formed by processes that occur within Earth over a variety of timescales.'

Science as a human endeavour:

1. Year 7:

- VCSSU076: 'Science knowledge can develop through collaboration and connecting ideas across the disciplines of science.'

- VCSSU077: 'Scientific knowledge is used to inform personal and community decisions.'

Science inquiry skills:

1. Year 4:

- VCSIS086: 'Pose and respond to questions about familiar objects and events.'

2. Year 6:

- VCSIS090: 'Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge.'

The Arts - visual arts:

1. Years 5 and 6:

- VCAVAV052: 'Explore ideas and artworks from different cultures and times to use as inspiration to create visual artworks.'
- VCAVAV053: 'Explore different materials, techniques, technologies, and processes to make artworks.'
- VCAVAV054: 'Plan and design artworks that represent artistic intention.'

Geography - geographical knowledge and understanding:

1. Years 7 and 8:

- VCGGK100: 'The causes and consequences of an environmental issue, and the responses to this issue, including a case study of a specific environment.'

2. Years 9 and 10:

- VCGGK133: 'The human-induced environmental changes that challenge sustainability, including land clearing, erosion, salinity, urbanisation, industrialisation, agricultural development, and water resource management.'



Image credit: Cosmopolitodus plicatilis tooth