NORTH-EASTERN TASMANIAN FIELD NATURALISTS CLUB

GUIDED TOUR

OF

SELECTED PERMIAN FOSSIL SITES AT LIFFEY AND POATINA

OCTOBER 8TH, 2022

Guide Notes

by Philip Tattersall

Drys Bluff (taytitikithika)

Recognition of Traditional Owners

Today we visit two sites that are not only significant in terms of their natural values, but more importantly offer us an opportunity to pay our respects to the traditional owners past, present and future. The Liffey site in particular has a sad history.

Geological Context

Sections 1 and 2 of the handout provide a basic overview of the broader global and local geological contexts here in Tasmania (Section 1, Pages 1 & 2). Pages 1 to 8 of Section 2 present a general overview of Tasmanian geology for background reading. Section 3 deals with the specific Permian contexts we will visit today.

Geological Time Series in Tasmania

The chart on Page 2 of Section 1 shows the geological time series here in Tasmania.

The sedimentary rocks we will be looking at today are located in what is termed the Lower Parmeener Super-Group (Section 2, Page 9). These are rocks that were deposited during the Carboniferous and Permian periods (about 300–250 million years BP). At the end of this time (the boundary between the Permian and Triassic periods), there was a period of great upheaval, during which over 90% of marine species went extinct (one of the great die-offs during the history of life on Earth).

The Upper Parmeener Super-Group (a fresh water group of formations) was formed during the Triassic period, which occurred approximately 250–205 million years BP.

Fossil Types and Abundances over Geological Time

Section 1, Page 3 presents an idea of the types and abundances of fossils over time. The context is global, so the application here in Tasmania is quite general.

Site visits

Liffey: Lower Car Park Reserve

Our first stop will be the lower carpark at Liffey. As you drive in you will glimpse the grandeur of Drys Bluff **(**taytitikithika**),** part of the Great Western Tiers (Kooparoona Niara)**.** Near the reserve area are two beautiful waterways: Liffey River (tilapangka) and Pages Creek. On arrival, we can take a few moments to enjoy the setting as we reflect on the history of the area and I hand out some background reading material.

There are amenities nearby.

As we ascend the nearby track, heading toward Drys Bluff {MAP 1} we will pass near Pages Creek. We can take a few minutes to enjoy the ambience before commencing a short walk up the track to view some of the early Permian formations, before reaching the Liffey sandstone (the lower Permian Freshwater Formation). There we can observe some of the plant fossil residues. This will be followed by a walk further up the track to see some of the marine fossils (part of the Poatina Formation).

Poatina – Liffey Sandstone Fossil site nearby Poatina Village

Our second stop is a fossil site near the Poatina Township [MAP 2]. Poatina is on the fringe of the Central Plateau and the name is aboriginal for "cavern".

There are some good examples of plant fossils at this site. I thank the Poatina Management for permission to enter the site area.

There are cafés and amenities in the township.

Acknowledgement of permissions

The following sources are acknowledged and thanked for permission to copy selected documents for distribution at today's field tours

1. Department of Resources and Energy for copying of pages from Pike, G.P. et al, 1973, *Quamby* Geo Survey, Tasmanian Department of Mines.

2. Tasmanian Parks and Wildlife Service for permission to copy *Formation of Tasmania Times & Processes.*

3. Tasmanian Parks and Wildlife Service for permission to copy *The Lake Highway: A Geological Journey Back in Time.*

4. The Royal Society of Tasmania for the copying of page 107 of Papers and Proceedings of the Royal Society of Tasmania (vol 108), *Status and subdivision of the Parmeener Super-Group* by Forsyth, S.F., Farmer N., Gulline, A.B., Banks, M.R., Williams, E., and Clarke, M.J. (1974).

5. Poatina Management for permission to enter the Poatina Liffey Sandstone fossil site.

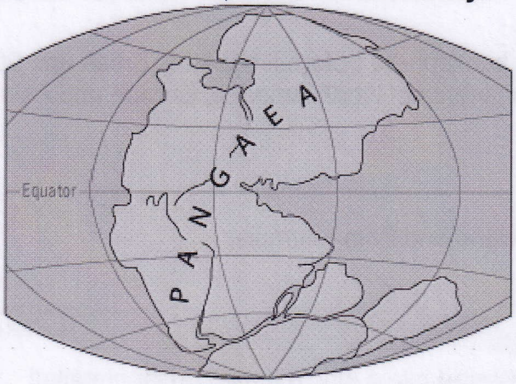
6. Queen Victoria Museum and Art Galley for allowing copies of selected fossil images.

SECTION 1

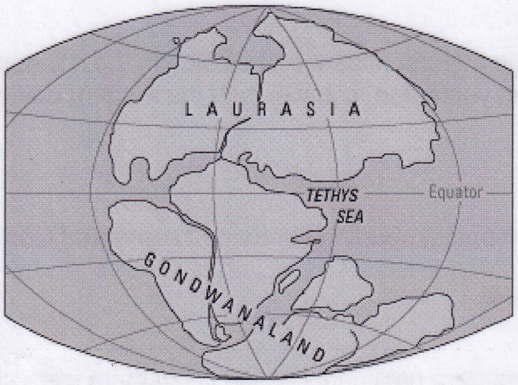
earthguideonlineclassroom
Southern California Edition

Pangaea, Gondwanaland, Laurasia and Tethys

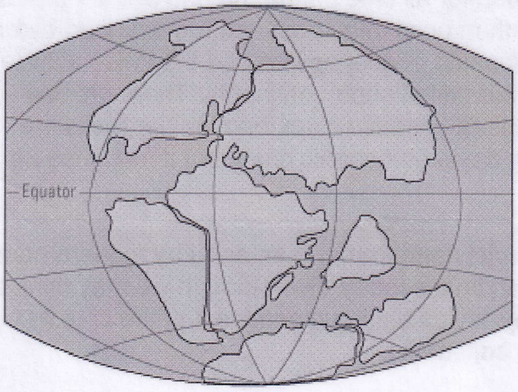
Home



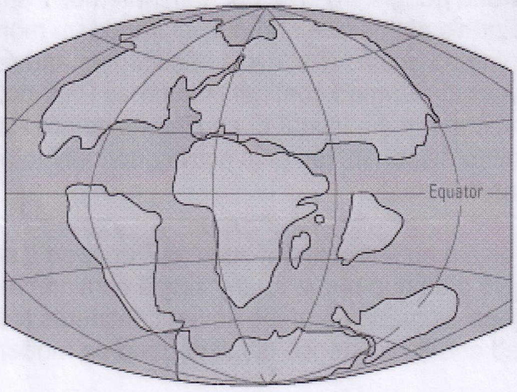
PERMIAN
225 million years ago



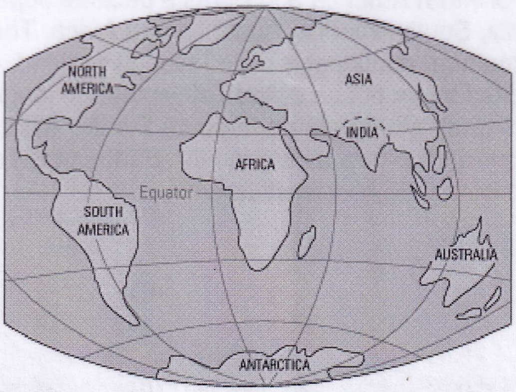
TRIASSIC
200 million years ago



JURASSIC
150 million years ago



CRETACEOUS
65 million years ago



PRESENT DAY

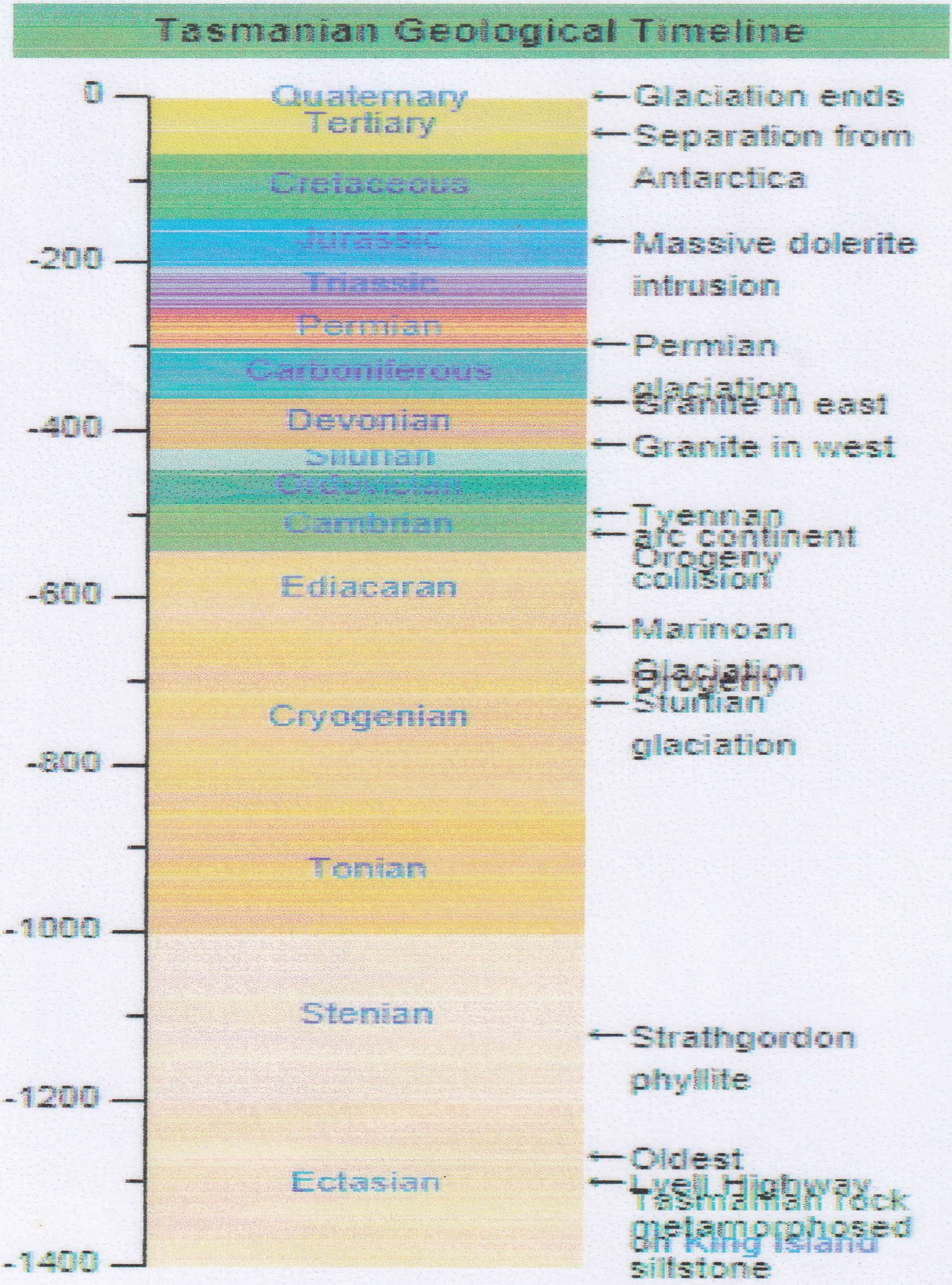
Larger image [420 KB] **Definitions**

Animation Source: CERES
TBA

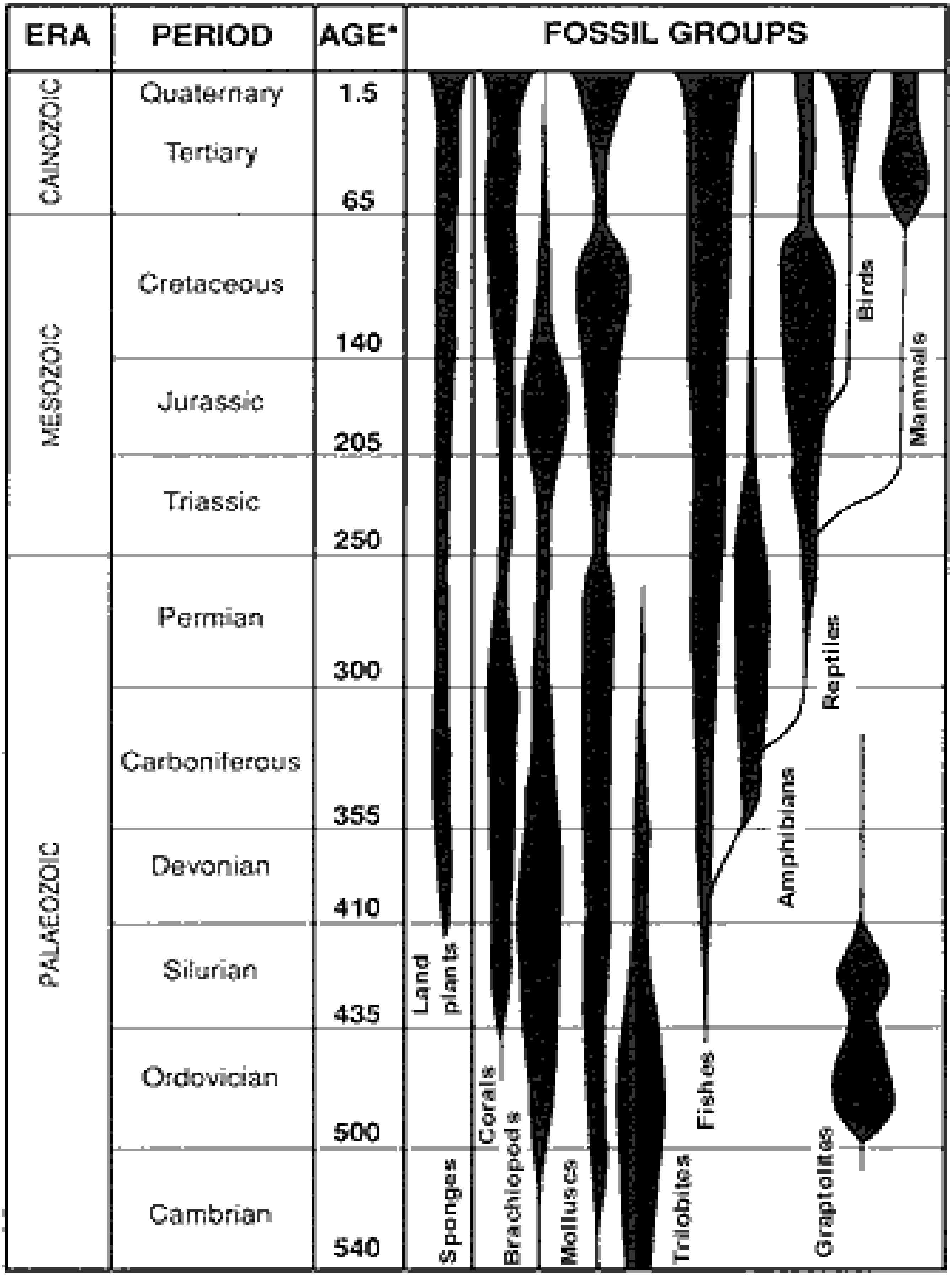
Pangaea, Gondwanaland, Laurasia and Tethys
Pangaea

a large supercontinent that existed existed ~225 million years ago at the .. between the close of the Paleozoic and start of the Mesozois (at the Permo-Triassic).

Gondwanaland



An approximate time-scale of events in the Geological history of Tasmania. Axis scale is in millions of years ago.



* Millions of years before the present

TIME RANGES AND RELATIVE ABUNDANCES OF COMMON FOSSIL GROUPS

SECTION 2

GEODIVERSITY

Formation of Tasmania

times & processes

Parks and Wildlife Service Tasmania

Produced in consultation with Nature Conservation Branch, DPIWE

DEPARTMENT *of* TOURISM, PARKS HERITAGE *and the* ARTS

Tasmania's geodiverstiy has contributed directly to the islands biodiversity, that is the numerous and varied plant and animal species. The States geodiversity is a result of continental drift, ice ages, humid hot conditions and earthquakes occurring over many millions of years.

A very brief and summarised account of Tasmania's geological history is outlined below. Keep in mind that although Tasmania is referred to frequently throughout these notes, it was not until about 70 million years ago that Tasmania began to look like it does today, an island to the south of the Australian mainland.

Precambrian

1,000 to around 600 million years ago.

Life was restricted to the oceans & land was an extensive desert.

The oldest rocks in Tasmania are estimated to be of Precambrian age and occur mainly in the west, extending from Port Davey in the far south west to the Rocky Cape in the north coast. The harder rocks form the mountains and ridges, while the softer Precambrian rocks, such as schist, occur in the valleys.

Examples of these ancient metamorphic rocks can be seen in the Arthur and Frankland Ranges, Frenchmans Cap and other sites on the west coast.

Precambrian rocks were deposited so long ago that there was no life on land it was an extensive desert and only single cell life could be found at sea. Plants had not evolved and the rocks were left unprotected from strong wind and rain.

The **quartzites** (found in the south-western ranges) and other Tasmanian Precambrian rocks are thought to have been deposited in a shallow sea, originally as sand, mud and silt.

Sequences of rock known as **dolomite** (aged at around 800 million years) contain Tasmania's oldest fossils. The fossils are single celled stromatolites and have changed very little over millions of years- living examples can still be found in some parts of Western Australia.

The Precambrian is a mysterious part of the Earth's geological history as far as animal life was concerned. Very few fossils have been found, due to the lack of animals with hard body parts which had not evolved yet. The softer organisms were less able to be preserved as fossils because the softer parts decomposed.

Cambrian

600 - 500 million years ago

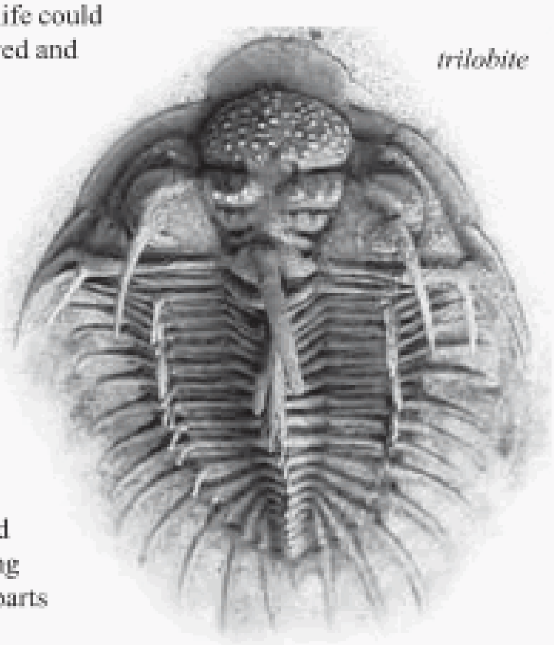
Volcanoes and the explosion of life on earth

The Cambrian period is renowned around the world for the explosion of life in the seas. It has been argued that at this time there was greater diversity of life in the seas than currently exists on earth. However this (life) explosion was followed by major extinctions.

Tasmania has some small fossils from this time, including (small) trilobites which are extinct relations of crayfish and crabs.

Tasmania entered a period of stretching. Earthquakes and faulting produced depressions and left higher areas. The depressions were covered by sea water and the highlands remained as a chain of islands. The highland areas provided the raw material for erosion during the Ordovician.

Eventually the stretching times were replaced by periods of squeezing. Chains of volcanoes formed across Tasmania. The volcanoes occurred intermitantly for millions of years. Many of the rocks on the west coast of Tasmania were produced by volcanoes and some of these are known as the Mt Read Volcanic Belt, a highly significant mineralised belt.



trilobite

Ordovician

500 - about 400 million years ago

Highlands, erosion and migration

The start of the Ordovician period was a major period of mountain destruction in Tasmania. They were subjected to extensive erosion and deposition of these sediments which were then compressed to form the sandstones and conglomerates that are obvious today around Queenstown, in the West Coast Range and the Denison Range.

Big river sytems carried large loads of bolders, cobbles, gravels, sands and clays wearing down the mountains. Large alluival fans formed at the foot of mounatin slopes. The rivers carried fine sediments, into the oceans where abundant animal life occurred. Similar processes are still occurring today in areas of active mountain building and erosion such as the Himalayas.

In the middle of the Ordovician, Tasmania was covered by sea, shallow in some areas, deep in others. The times were very warm and due to continental drift Tasmania was part of a much larger land mass situated near the equator. Warm seas provided the ideal environment for the accumulation of marine debris and limestone deposits, from waters that were quite deep to those that were shallow and tidal.

The Gordon Limestone (2 km deep), formed from these marine and limestone deposits (known as calcium carboante), is one of the most complete carbonaceous (limestone) sequences in the world. It outcrops in parts of the Franklin and Gordon River valleys and around Mole Creek.

Devonian

400 - 300 million years ago

The building of mountains and very quiet times

The Devonian were very quiet times to start with. Sediments accumulated on the edges of seas. It was about this time that life started to invade land.

Tasmania had two discrete geological provinces up to this time - separated by a major fault known as the Tamar Fracture System. In many ways it may have resembled the San Andreas Fault system. This fault was the boundary between two continental plates along which there was considerable lateral movement.

The major collision of the two continental plates occurred along the whole of south east Australia - the Great Dividing Range is the eroded legacy of this event. This was a major mountain building event and it generated a tremendous amount of heat resulting in widespread melting in the crust deep below the surface.

The heat produced magma (molten rock), which gradually cooled at considerable depth below the surface. It is this cooled magma that has formed the spectacular granites extending from the Tasman Peninsula to Wilsons Promontory in Victoria.

Permian & Triassic

300 - 200 million years ago

Glaciers, fossils and swamps

Newly formed mountains to the north west, the result of the collision of continents, were again subject to erosional processes. The eroded material was deposited in what is known as the Tasmania Basin.

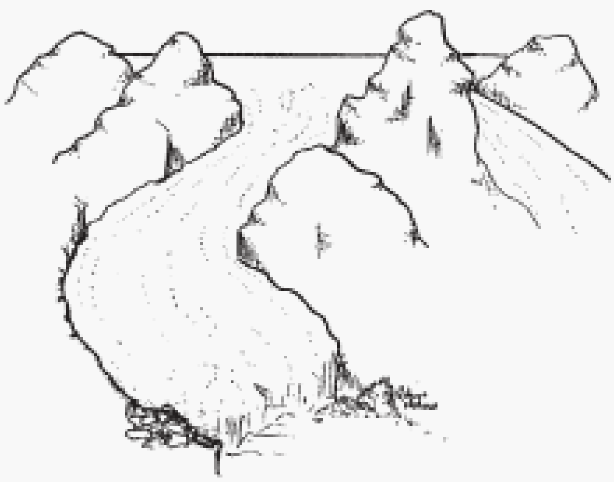
The Tasmania Basin covered a large part of central and eastern Tasmania. Some of the deposits indicate glacial times as Gondwana had again drifted south. Many other Gondwanic continents have similar rock sequences.

Fossil Cliffs on Maria Island is one of the best examples in the world of fossils from this time. The dense fossil shell deposits, mark one of the biggest extinctions since the Cambrian. The site contains large drop stones (granite) in layers near the fossils, indicating that glaciers or icebergs were melting and dropping the eroded material.

As the sea retreated and the climate warmed up, the Tasmania Basin was drained by broad meandering river systems.

These were the times of dinosaurs, though interestingly dinosaur fossils have not been found in Tasmania.

The Permian and Triassic periods are well represented throughout Tasmania at sites such as Maria Island (Fossil Cliffs and Painted Cliffs), Tasman Peninsula (Tessellated Pavement and Tasman Arch), throughout the Cradle Mountain- Lake St Clair National Park and Mt Field National Park.



Glaciation

Jurassic

160 million years ago

GONDWANA- the break up of the large land mass

The break up of Gondwana is a much talked about event and it had major implications for the geological development of Tasmania.

In a relatively short space of time about 165 my ago approximately, 1500 cubic kilometres of dolerite magma intruded into the earths crust just below Tasmania.

The dolerite cooled from incredibly hot temperatures, solidified and contracted, producing the columnar jointing so often apparent today forming dolerite cliffs.

Tertiary

65-7 million years ago

TASMANIA- as we know it today

It was at about this stage that Tasmania started to look something like it does today. Antarctica and mainland Australia broke free, about 45 million years ago.

The breakup of the supercontinent produced enormous tension in the Earth's crust resulting in faulting which created the early mountain ranges and valley systems we see today. These have been moulded continuosly by water and occasionally by ice to reduce the landscape we see today.

Pleistociene

The last 2 million years

Glaciations, rivers and oceans, all over Tasmania

The last 2 million years has seen a number of different glaciations occur in Tasmania. The most obvious impacts are on the high mountain areas in the form of erosional changes, caused by ice and snow.

Areas of lower altitude, being less effected by ice and snow, did not encounter such obvious changes, except that the effects on sea levels were quite significant. The sea level dropped sufficiently on some occasions to create the land bridge between Tasmania and mainland Australia.

Lakes and swamp deposits from these times now provide important information on the climatic history.

As the ice retreated and glaciers melted the sea levels rose to a level similar to today. Sand that was transported landwards by rising seas and down rivers, accumulated along seashores producing spectacular landforms such as the isthmus features on Bruny Island, Maria Island and at Freycinet Peninsula as well as many other coastal land forms.

How do we know about continental shift?

In the 1940s, similar rocks in a number of Southern Hemisphere countries alerted Alfred Wegener to the possibilty of a super continent.

Wegener was able to show that 300 million year old ice deposits in the southern Hemisphere had a rational distribution when plotted on a reconstruction of Gondwana land.

Rocks can be simple!

One can look at the types of rocks throughout the world and divide them into 3 broad classes;

igneous, sedimentary and metamorphic

Igneous Rocks:

were formed from melts deep below the earth. They are rocks made up from molten material, which forms crystals as it cools. The rocks moved, bouyantly, closer to the Earths surface and are known as 'intrusions' or 'extrusions'. The surface material must be eroded from the 'intrusion' before the igneous rock can be exposed. While extrusive igneous rocks are those which reach the surface before they cool. Igneous rocks vary depending on their crystal size, which is relative to the rate of cooling of the molten rock.

Igneous rock include: *granites, basalt and dolerite*

Examples of **granites** can befound at Freycinet Peninsula.
Examples of **basalts** can be found in the north west of Tasmania.
Examples of **dolerites** can be found throughout the Central Plateau and in the east of Tasmania.

Sedimentary Rocks:

are very common and are the accumulation of other rocks that have been broken down by weathering processes such as running water, frost and ice. The breakdown often results in the deposition of mineral fragments in thick layers in areas such as flood plains, lakes or at sea. Sedimentary rocks are obvious by the layering effect which is a result of the deposition of materials.

Sedimentary rocks include: *mudstone, sandstone, limestone, coal, shale, and conglomerates (rounded pebbles)*. Great examples of sedimentary rocks can be found throughout eastern Tasmania.

Metamorphic Rocks:

Metamorphic means 'changed form' and metamorphic rocks are derived from sedimentary and igneous rocksthat have been changed through processes involving extreme heat and pressure. Metamorphic rocks are formed by the alteration and renewal of pre-existing rocks and therefore have many similar properties to the minerals from sedimentary and igneous rocks and can be found throughout western Tasmania.

Metamorphic rocks include: *slate, schist, qaurtzite and marble.*

Further information

This notesheet was created with input from the Nature Conservation Branch, *Department of Primary Industries, Water and the Environment* and the Parks and Wildlife Service, *Department of Tourism, Parks, Heritage and the Arts*.

For further information contact:

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www.parks.tas.gov.au

Behind the Scenery, Tasmania's Landforms and Geology, Scanlon, A.P., Fish, G.J., Yaxley, M.L, 1990, Department of Education and The Arts, Tasmania

GEODIVERSITY

The Lake Highway

A geological journey back in time

Parks and Wildlife Service Tasmania

DEPARTMENT *of* TOURISM, PARKS HERITAGE *and the* ARTS

A journey from Deloraine up to the Central Plateau takes you onto the roof of Tasmania. The plateau rises sharply and has prominent escarpment edges along its northern and eastern sides. This includes the spectacular Great Western Tiers, which dominate the surrounding countryside. To the west of the plateau are the rugged glaciated landforms of Cradle Mountain, Lake St Clair and the Mountains of Jupiter, while to the south the change is less dramatic as the plateau merges gradually into the Derwent Valley.

The Central Plateau is the most extensive alpine plateau in Australia and one of its most glaciated landscapes. It is special on a world scale and is therefore part of Tasmania's Wilderness World Heritage Area. It is a wild place with such a harsh climate and rugged landscape that it almost feels as though time has stood still and the last Ice Age was only yesterday.

A drive up into the high country will take you to an altitude of over 1200 metres and, with a little imagination, back to a time of volcanoes and glaciers.

In the beginning

From shallow sea to the first rocks (1100 million years ago to 205 million years ago)

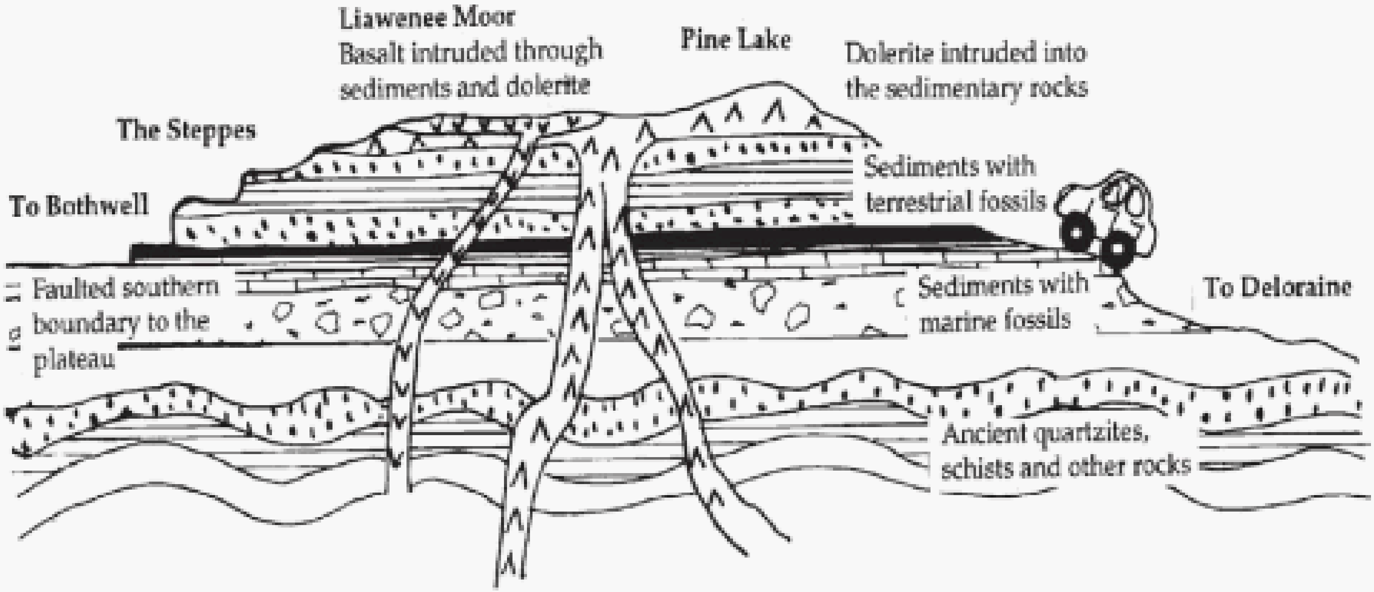
The foundations of the Central Plateau were formed when sand and silt accumulated at the bottom of a shallow sea, about 1100 million years ago, before there was any life on land.

Over considerable time these deposits were buried beneath more layers of silt and sand and as the continents moved they were subjected to great pressures and temperatures. This produced quartzite and schist which are the oldest rocks in Tasmania. The harder quartzite takes longer to erode and so forms many of the ridges and mountains in western Tasmania, while the softer schists, along with other rock types, have been eroded forming the valleys below.

Much later, between about 300 to 205 million years ago, sedimentary rocks were deposited on top of the quartzite and schist. Good examples of this can be seen on the Lake Highway between Golden Valley and Pine Lake. These sediments are essentially flat lying, like a layered cake, and were formed after life had evolved in the sea and on land. As a result in some locations these rocks contain many fossils.

During a past ice age, about 300 million years ago when Tasmania was still part of the giant super-continent Gondwana and covered by a large ice sheet, glacial deposits called tillites were laid down. These outcrop on the pass between Golden Valley and Pine Lake.

As the road winds further up the escarpment you will see outcrops of younger sedimentary beds consisting of sandstone, mudstone and some limestone which were deposited as the sea level rose when the ice caps melted. These sediments contain marine fossils.



Sedimentary rocks which are visible on the upper slopes were, in contrast to underlying rocks, deposited in a freshwater environment. By this time, about 240 million years ago, Tasmania was once again a land environment and the types of fossils present in the rocks reflect this. Plant fossils suggest a relatively humid, cool environment with swamps and lakes. Fossils of reptiles, amphibians and fish have also been found and provide clues which link Tasmania to other Gondwanan continents such as Antarctica, South America and South Africa.

A time of great upheaval

The Gondwanan break-up (205 million years ago to 130 million years ago)

On the upper part of the escarpment dolerite is clearly visible especially where it has formed spectacular columns, giving an 'organ pipe' effect. These columns may have formed as the cooling magma contracted, in much the same way as drying mud contracts to form polygonal flakes. During the break-up of Gondwana, about 175 million years ago, tremendous pressure and tension caused fractures in the earth's crust. The central part of Tasmania was pushed up for the first time to form a vast plateau and the dolerite magma in the earth's crust was forced up into the overlying rocks. Enormous masses of dolerite, enough to fill several Sydney Harbours, were pushed up into the sedimentary rocks which have since been removed by erosion. Today dolerite covers most of the plateau and due to its resistant nature often caps many of the higher mountains in the state.

Continuing pressure and tension in the earth's crust during and following the Gondwanan split resulted in further uplift of the Central Plateau and the development of deep valleys in the Midlands and Derwent River areas.

A time of volcanoes

(65 million years ago to 2 million years ago)

Basalt, which is very closely related to dolerite, underlies the undulating plains of Liawenee Moor, St Patricks Plain and parts of the Lake Augusta area. About 65 million years ago very runny basalt lava was thrust up onto the land surface and oozed into depressions such as river valleys and lakes. Water systems such as the Ouse, Shannon and Upper Nive, which were blocked by the basalt, changed their course. Rapid cooling under water resulted in the formation of pillow lava. These are rock forms which are pillow shaped and form as a result of rapid chilling of the outer skin of the lava by water. Examples can be seen in the road cutting of the Nive River near Bronte Park.

Basaltic plugs, or the solidified neck of volcanoes, were also formed and although these have been eroded in the Lake Augusta and Liawenee region, two excellent examples occur as conical hills 10 km southeast of Bothwell near Ram Paddock Hill.

A time of glaciers

(The last 2 million years)

In the last 2 million years a number of glaciations have occurred which resulted in the formation of an ice cap mainly on the western side of the plateau. Large glaciers flowed down the Forth, Mersey and Narcissus rivers on the western side of the Central Plateau forming U-shaped valleys. Ice spilt over the escarpment edge of the Great Western Tiers and onto the plains below.

Many of the features you will see from the road have been shaped by past ice ages. The glaciers scoured the landscape to the west of the highway and deposited glacial debris which has created thousands of lakes and tarns on the plateau. Many of the large boulder fields and scree slopes you can see from the road started to form during glacial times and are probably still developing. They typically occur at the base of cliff lines or on steep slopes as a result of dolerite boulders toppling from the cliffs above.

The ice sheets also left their mark underground. The meltwater from retreating ice flowed down from the plateau and helped to erode some of the caves in the Mole Creek area. The water often carried large dolerite boulders that may have smashed the older decorations in caves, such as Marakoopa, which are close to the escarpment edge.

After the glaciers finally retreated, about 7 000 years ago, the landscape was probably barren and the climate was cooler and drier than today. Lunettes or small sand dunes and sand sheet deposits formed on the margins of the lakes in areas from Lake Ada to Lake Crescent. The lunettes around Lake Ada were probably formed from wind blown glacial material such as dolerite fragments. They are the only alpine lunettes in Australia and, together with the glacial landforms, are very important geomorphological features.

Soils

The link with the living world

Soils began forming after the glaciers retreated and vegetation invaded these areas. On the Central Plateau better drained locations usually have very rocky yellow-brown mineral soils while more poorly drained locations such as around Lake Ada and Pine Lake, and those in higher rainfall areas such as Lake St Clair, have dark organic or peat soils. Like most alpine soils, peat soils take a long time to develop as plant growth at high altitudes and organic accumulation on the ground is very slow. A centimetre of peat, for example, probably takes about 100 years to develop. Some of the most extensive peatlands in the southern hemisphere occur in Tasmania.

The future

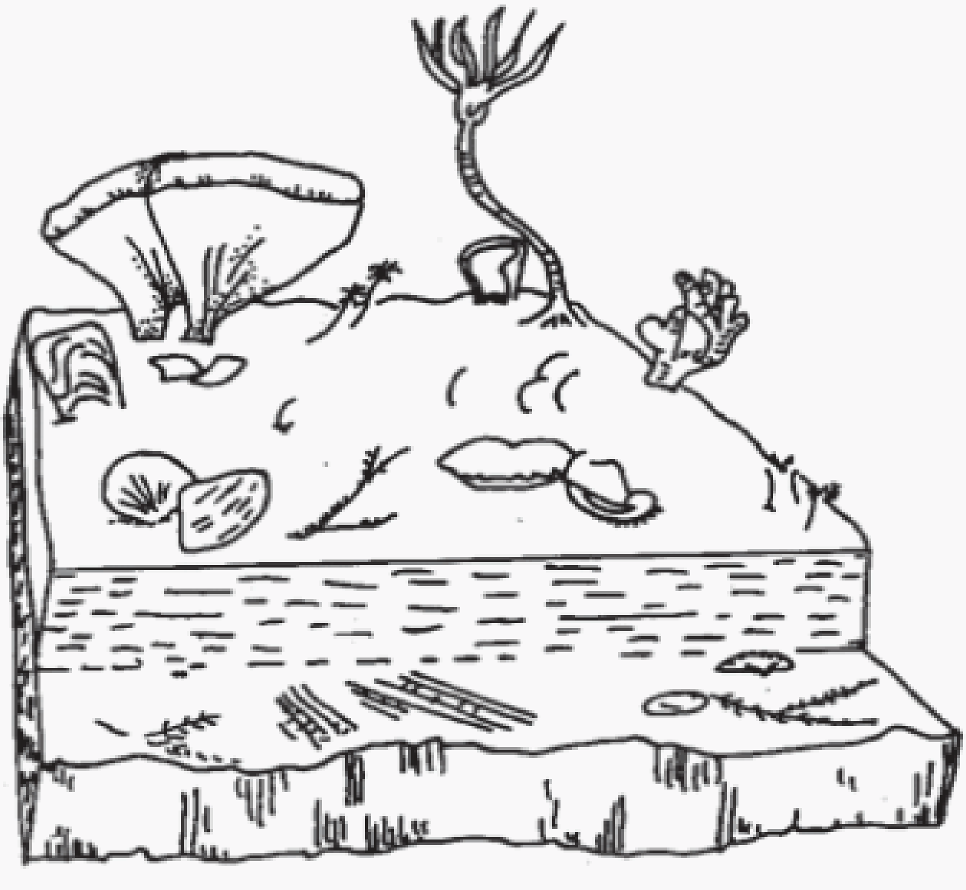
A fragile balance

Soil plays a vital role in the ecology of the Central Plateau, so any threat to the soil threatens the whole ecosystem. One of the greatest threats is fire which can have a devastating effect in alpine areas. Fire not only destroys ancient pencil pines but it can also burn the organic soils.

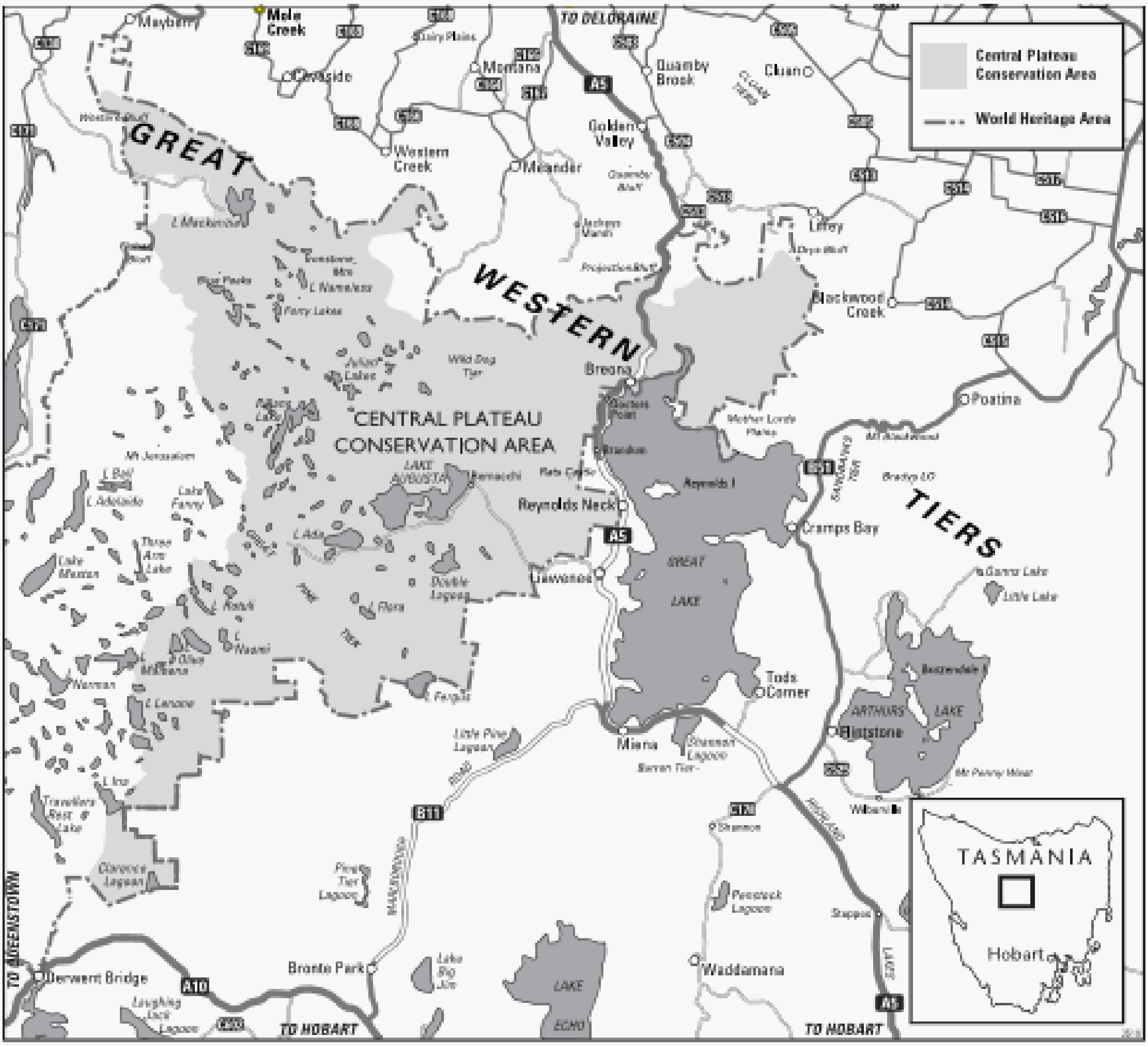
Fires associated with past land use practices and arson have caused some of the most extensive sheet erosion in Tasmania. This is where soil literally erodes away in large sheets. Some areas may take thousands of years to fully recover. Plants and animals are also affected because suitable habitats become more restricted as soil loss becomes more extensive.

Like the rocks and vegetation you see around you, the soil you walk on is an ancient survivor, the result of thousands of years of weathering and organic accumulation. By protecting areas like the Central Plateau, as part of Tasmania's Wilderness World Heritage Area, we increase its chances of surviving into the future.

As you follow the Lake Highway towards Bothwell the windswept, wild country of the Central Plateau is soon left behind. It almost feels as though you are entering another world, a world where the ice ages are far gone and time is rushing on at its normal pace.



Marine organisms on the sea floor about 270 million years ago. Some can now be found as fossils on the central plateau.
(From 'Behind the Scenery' by P. Scanlon, G. Fish and M. Yaxley)



Further information

Behind the Scenery, P. Scanlon, G. Fish and M. Yaxley

Contact

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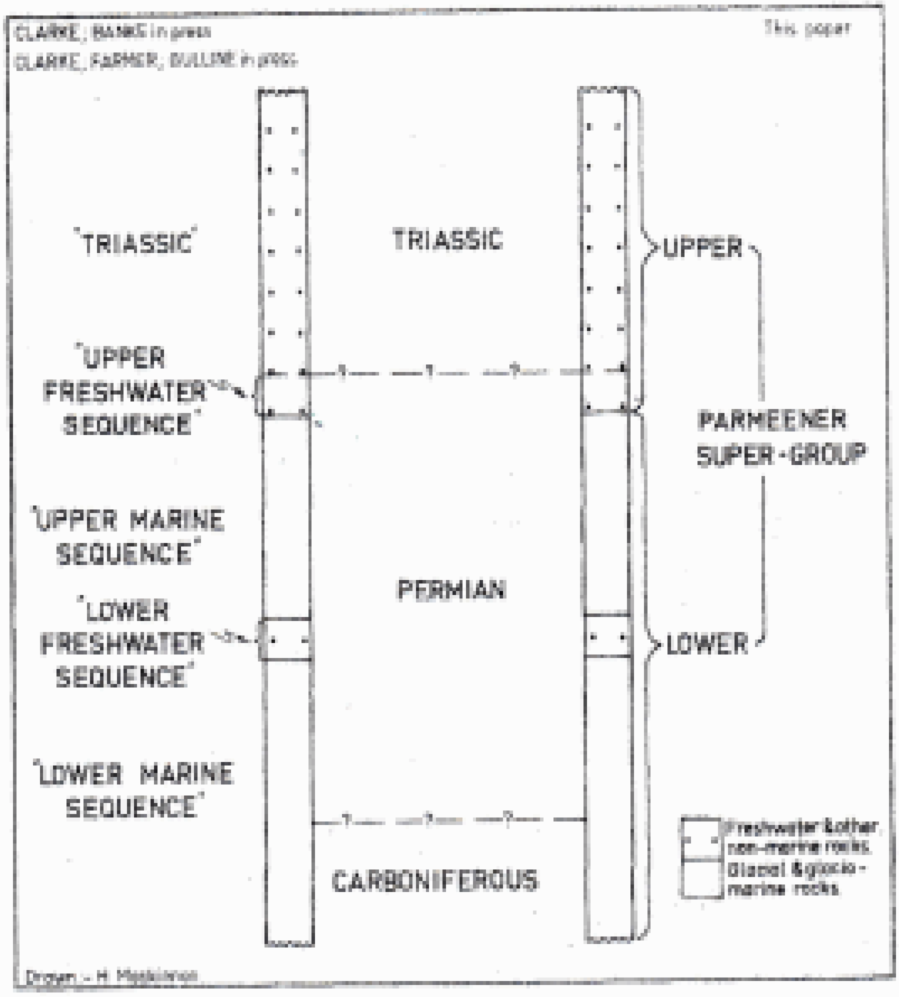
Subdivision of the Parmeener Super-Group



The Sequences indicated in the diagram include the following characteristic units:

'Triassic' - Ross Sandstone Formation, Cluan Formation, Tiers Formation, Brady Formation, Springs Sandstone Formation and Knocklofty Formation.

'Upper Freshwater Sequence' - Cygnet Coal Measures, Jackey Formation, Clog Tom Sandstone Formation.

'Upper Marine Sequence' - Cascades Group, Malbina Formation, Ferntree Group, Poatina Group and Bogan Gap Group.

'Lower Freshwater Sequence' - Liffey Group, Faulkner Group, Mersey Coal Measures and Preolenna Coal Measures.

'Lower Marine Sequence' - Wynyard Tillite Formation, Quamby Formation, Golden Valley Group, Masseys Creek Group, Woody Island Siltstone Formation, Darlington Limestone Formation, Spreyton Beds, Kansas Creek Formation and Bundella Formation.

SECTION 3

TASMANIA DEPARTMENT OF MINES

1973

GEOLOGICAL SURVEY EXPLANATORY REPORT

GEOLOGICAL ATLAS 1 MILE SERIES

ZONE 7 SHEET No. 46 (8219N)

QUAMBY

by G.P. PIKE, B.Sc., Dip.Ed.

with contributions by V.M. THREADER, M.Sc.,

and W.R. MOORE, B.A., M.Sc.

REGISTERED IN AUSTRALIA FOR TRANSMISSION BY POST AS A BOOK

$3

	Formation	Rock Type	Thickness (m)
	Jackey Formation	Sandstone and shale	43
BOGAN GAP GROUP	Eden Mudstone	Grey to black micaceous mudstone	6-9
	Blackwood Conglomerate	Granule or pebble conglomerate	1
	Drys Mudstone	Dark grey to black massive mudstone with some sandy beds	100
	Palmer Sandstone	Unfossiliferous sandstone	3-5
	Springmount Mudstone	Hard dark grey mudstone with occasional pebbles	69
POATINA GROUP	Garcia Sandstone	Pebbly to conglomeratic sandstone	9-14
	Weston Mudstone	Micaceous mudstone with bryozoa	9
	Dabool Sandstone	Highly fossiliferous sandstone with erratics	7
	Meander Mudstone	Sandy siltstone, micaceous mudstone and thin sandstone beds	62
LIFFEY GROUP		Sandstone and subordinate shale and thin beds of conglomerate. Mottled quartz-mica sandstone towards top (Creekton Formation)	33-35
GOLDEN VALLEY GROUP	Macrae Mudstone	Siltstone and mudstone	48
	Billop Sandstone	Micaceous sandstone with erratics	8
	Glencoe Formation	Calcareous shale and limestone with erratics	27
	Quamby Mudstone	Pyritic and carbonaceous mudstone with a few pebbles. Tasmanite oil shale.	88-172
	Stockers Tillite	Tillitic conglomerate	0-100

Source : Pike, G.P. et al, 1973, Quamby Geo Survey,

Martiniopsis sp. Bronte Park

A spiriferid brachiopod but quite different from Grantonia & Spirifera. The vast majority of fossils of this organism are internal casts, noted for their very prominent beak. Most internal Martiniopsis have little detail apart from the beak area, so careful consideration of that part of the fossil must be used to separate the species, of which there are a number. If you look carefully around the edges of the fossils you can see a narrow space - where the original shell has been removed from by chemical action.

If such specimens are broken apart there is often confusion, as the details of the internal cast are quite is different from those of the external mould, the other side of said gap.

2002:GFI:0078

Keeneia platyschismoides Poatina

A Permian gastropod (sea snail). All the specimens pictures are internals - "the sediment which filled the shell". Gastropods first appeared in Ordovician times as shells which were flat coils - planispiral - on the sea floor. As time went by the coil began to spiral upwards so that Permian sea snails like this were almost as high as they were wide. Modern forms often have shells 4 to 5 times as high as they are wide at the base. The first coil of the shell from the aperture is called the body whorl, and is where the animal lived. Some gastropods coil to the left (sinstral) while others coil to the right (dextral). Keeneia is sinstral.

2006:GFI:0002

Martiniopsis ingelarensis Tas.

This species of Martinioposis is quite different from the one already pictured. It is identified as ingelarensis by the shape of the beak and the features to either side of it. Like the vast majority of Martiniopsis specimens, this fossil is an internal cast of the brachial (upper) valve. Most brachiopods tend to be buried in their normal position, pedical valve downward, which mean brachial valves are far more common amongst fossils of Martiniopsis.

2007:GFI:0013

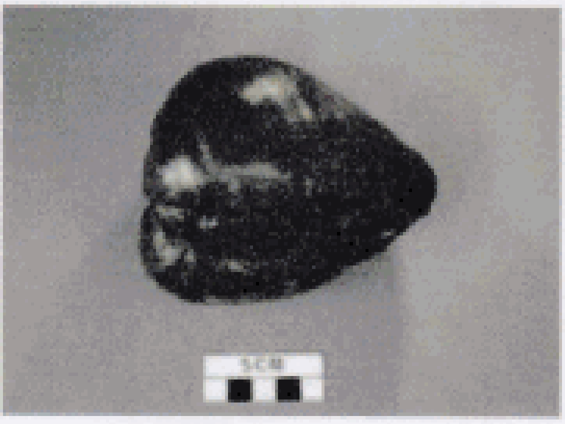
Aviculopecten sp. Latrobe
Another pectin bivalve - similar to Deltopecten. This genus had much finer ribs on the shell, a very distinctive shape along the hinge line, and is seldom as large as Deltopecten. Bivalves are described as having left and right valves (shells) when viewed with the hinge line uppermost. That makes this fossil a left valve.

The fossil appears as an external mould in the rock, with the process of fossilization assisted by recrystallization in the original limestone.
1985:GFI:0433

Fenestella fossula Tas.
Another bryozoan - like Protoretepora. This is the most plentiful of all Tasmanian Permian fossils.

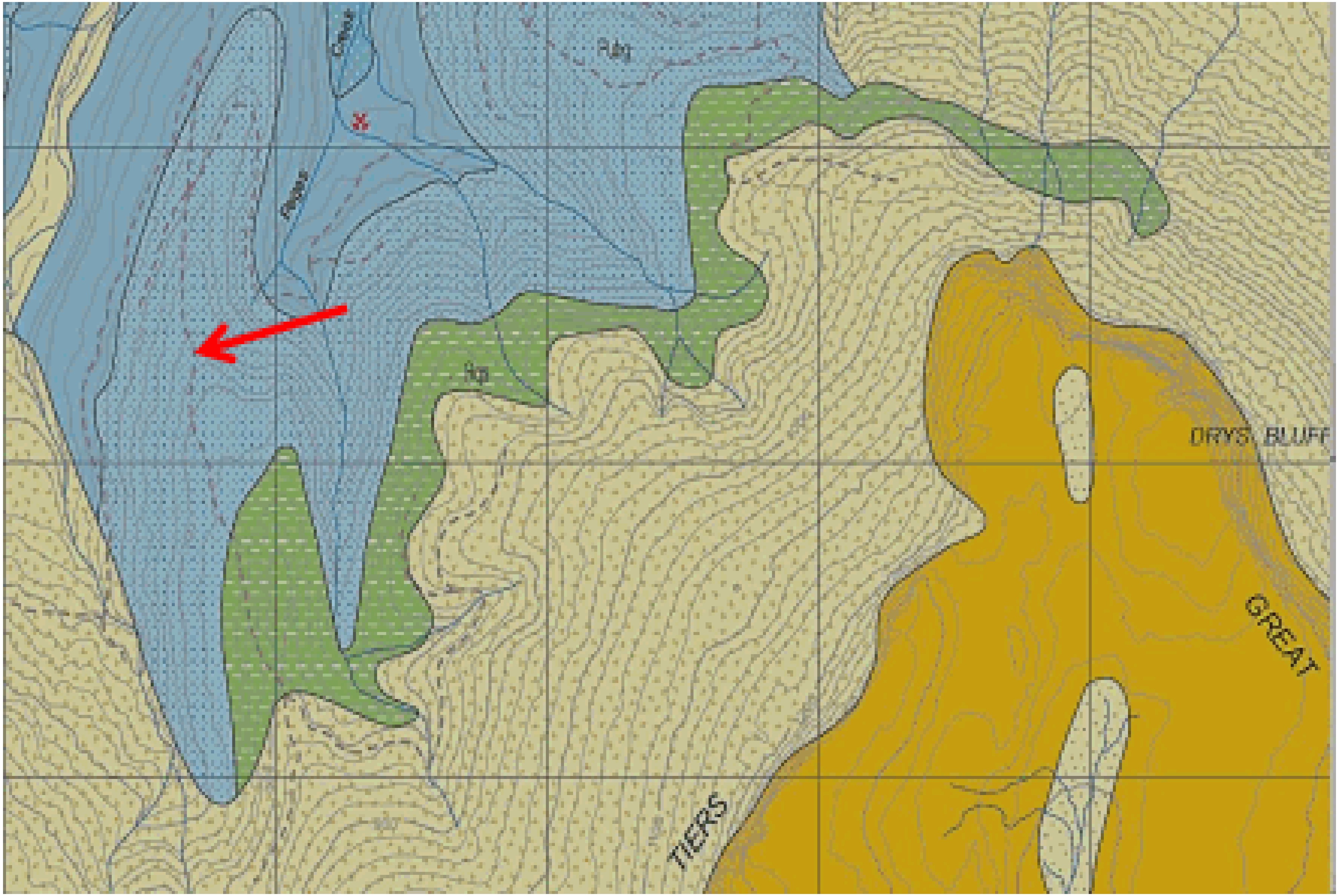
Dense "forests" of folded fans of Fenestella grew up off the floors of shallow seas, and this saw a high percentage fossilized when they toppled over into the mud and sand accumulating on the sea floor. This specimen is not an imprint, but a replacement. The actual material of the colony has been replaced by impure, fine grained carbonate material, which stands out against the backdrop of the grey limestone. The limestone itself is described as bryozoal, because these organisms were a significant component.
1985:GFI:0513

Eurydesma sp. Maria Is.
This is a bivalve mollusc, a replacement created when re-crystallizing calcite replaced the original shell.

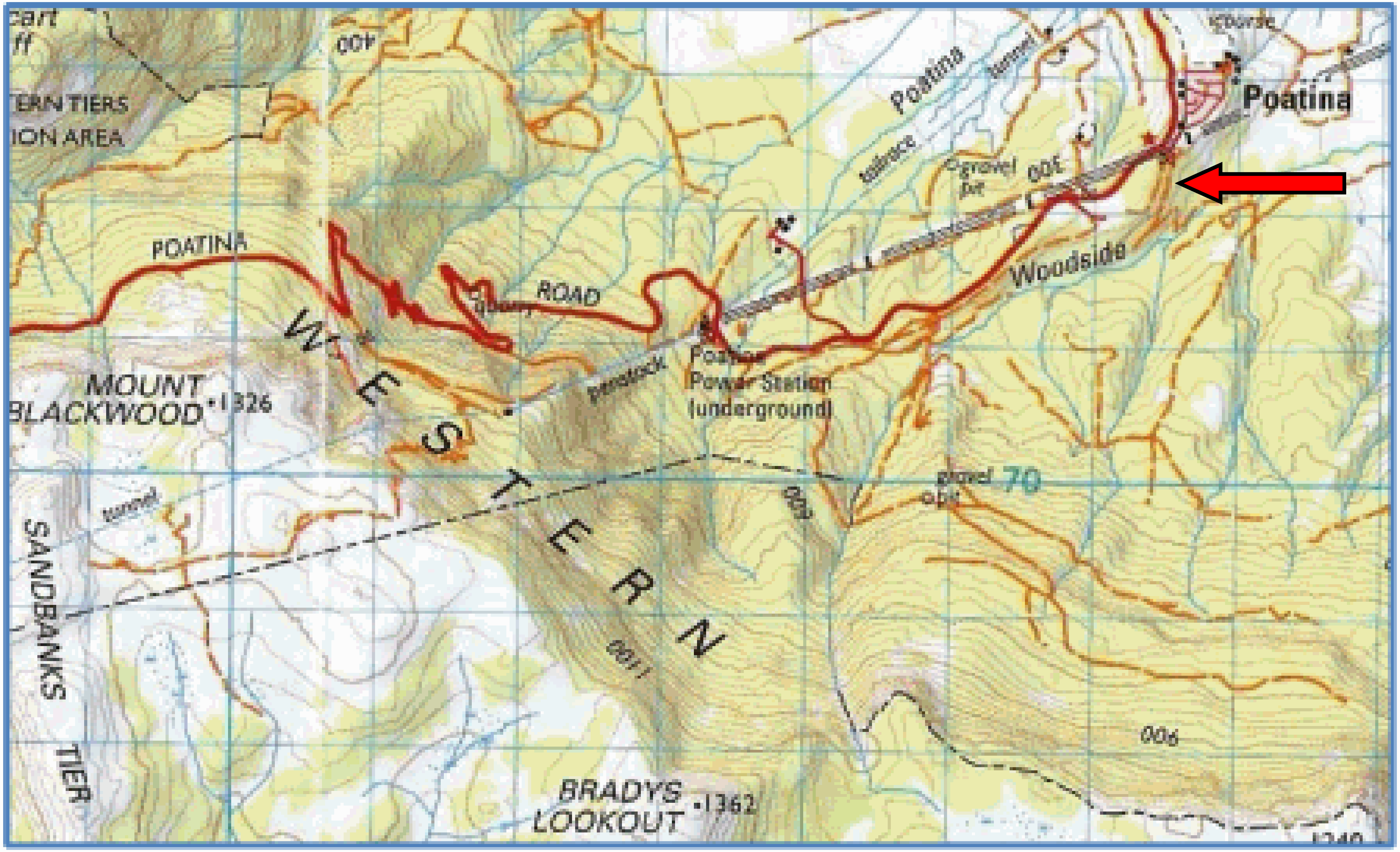


Consequently this fossil shows the details of the shell's exterior. The fossil shows part of both valves, right valve uppermost. Eurydesma is a common fossil in low grade limestones from the lower Permian, and is best known from the "fossil quarries" on the north end of Maria Is.

Although easily identified amongst other Permian bivalves by its shell shape, Eurydesma has minimal markings on its shell exterior, compared to more recent and current life forms of the same type.
1987:GFI:0125



MAP 1 : Old logging track upslope from lower Car Park Liffey



MAP 2
Liffey sandstone location near Poatina village