GEODIVERSITY

Tasman Peninsula

Landforms explained

Parks and Wildlife Service Tasmania

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

The Tasman Peninsula has some of the most impressive coastal scenery in Australia. Arguably, the most important influence on the coastal landforms of the Tasman Peninsula is the sea level, which has fluctuated over 100 m, a number of times over the last 2 million years.

It is interesting to ponder what type of rocky landforms lie drowned below many of the features (the word from scuba divers is that there are sea caves, sea cliffs and notches at depth, which resemble those above the current sea level).

How do rocks change?

The erosional effects of waves are very obvious throughout the Tasmanian coastline, most notably on the Tasman Peninsula. Erosion is dependant on the structure of the rock along the shoreline and its durability to erosional processes.

When looking at spectacular sea cliffs, blowhole and tessellated pavement consider the following erosion processes that may be active.

Hydraulic action
The energy of the waves have significant impact on the coastline (in Scotland waves have been known to exert over 32 tonnes of pressure per square m) and similar stresses may have resulted in features such as the Blowhole on the Peninsula. Hydraulic action is aided by compressed air pushed into cracks and fractures in the rocks. The retreating water results in the expansion of air which can often be an explosive force, heard as a deep thud from above.

Abrasion
Particles driven by waves also erode coastlines. Sand and pebbles can be thrown against the rocks surfaces with great force. Similarly the surf acts as a softer yet more repetitive force, dragging fragments back and forth across the bedrock surface, resulting in a smooth rock surface and making rocks and pebbles smoother and smaller.

Salt crystallisation and chemical processes

As mentioned in the formation of the Tessellated Pavement, the crystalisation of salt results in many of the extensive cracks seen on platforms around Tasmania.

Saltwater penetrates the cracks and surface of the rockplatforms. At high tide, salt water seeps into the rocks at the surface, while water deeper in the rock is pulled to the surface.

Rocks furthest from the sea dry out first and so salt crystalisation is more concentrated there. The crystals grow and exert pressure on the rock, causing small cracks and the flaking of surfaces.

Tessellated Pavement

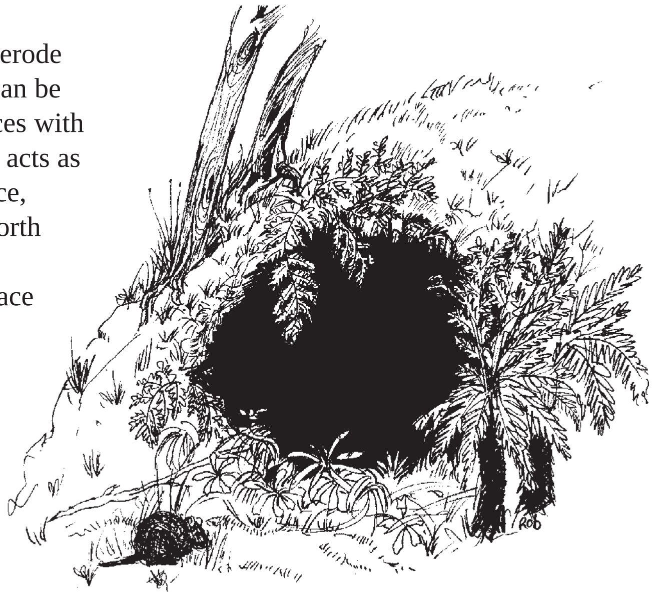
The Tessellated Pavement is an inter-tidal rock platform - a common enough coastal landform. But here an unusual set of geological circumstances have resulted in a rare landform.

The flat-lying siltstone was cracked by stresses in the Earth's crust, possibly between 160 million years ago and 60 million years ago. The resulting cracks (joints) are seen as three main sets, one aligned to the north- northeast, a second to the east-northeast and the third to the north-northwest.

This jointing, exaggerated by processes of erosion, has created the 'tiled' appearance.

When seawater covers the rock platform, fragments of rock are carried away. Near the seaward edge of the platform, sand is the main cause of the erosion.

When combined with wave action the erosional process causes 'loaf' or 'pan' formations.



A 'loaf' or a 'pan'?
Away from the seashore the pavement dries out for longer periods at low tide and this allows greater development of the salt crystals. The salt forms on the surface and erodes the pavement's surface more quickly than the joints. The surface of the pavement is lowered, while the 'joints', which erode more slowly, become rims.

These 'pans' contrast with the 'loafs', where the joints erode more quickly than the surface, because of abrasion by sand and other particles carried by water.

The 'loaf' formations have eroded down to a harder bed of mudstone. The joints in the lower bed are visible and sea water, sand and silt act upon the cracks. Even before the old breadloaves have been dislodged by wave action a new cycle of erosion begins on the next layer of the Tessellated Pavement.

The 'loaf' features are closer to the sea and so spend a longer time under water. As the drying period is shorter, salt crystallisation is less significant and occurs predominantly further inland. Sediment, such as sand, carried by water is the main form of abrasion. The joints tend to channel the water and the margins of the blocks are eroded and the loaf tops thus appear to 'rise' above the platform. At the shoreline, wave action breaks the 'loaves' from the joints.

Devils Kitchen

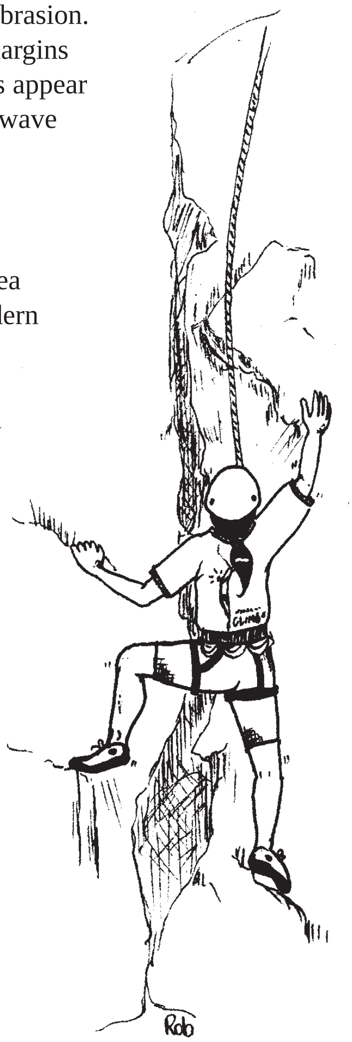
This geological feature probably started as a sea cave, then a tunnel and developed into its modern form after the collapse of the cave roof.
It is one of several such coastal landforms in the Tasman National Park that have developed in the Permian-age siltstone (about 270 million years ago).

Tasman Arch

Tasman Arch is basically what is left of the roof of a large sea cave, or tunnel, that was created by wave action over many thousands of years. The pressure of water and compressed air, sand and stones acted on vertical cracks (joints) in the cliff, dislodging slabs and boulders. Eventually the arch will collapse and Tasman Arch will become another 'Devils Kitchen'.

The Blowhole

The Blowhole was once a sea cave and tunnel. The roof at the rear of the tunnel collapsed to create a broad arch with a blowhole behind it. The Blowhole point was originally an unbroken line of cliffs of siltstone. This flat lying rock was formed like a giant layer-cake when mud and silt were deposited into the sea about 270 million years ago. Earth movement cracked the rock, creating vertical joints which enabled the sea to erode caves and tunnels into the sea cliffs. The Blowhole only lives up to its name when the seas are rough and in the right direction. Swells enter the tunnel, and sea-spray and air are blasted through the funnel, creating an explosive effect in the small joints at the back of the 'inlet'. The sound of the 'thump' is the impact of water on the rock and the expansion of air that had been compressed into cracks. When seas subside the Blowhole runs out of puff and it may then be described, although rarely, as a millpond.



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