GONDWANAN PLANT FOSSILS - LAKE MACQUARIE COAST

Gondwana - the great southern continent

The sea cliffs and rock platforms, from Nobbys Head Newcastle to Wybung Head south of Catherine Hill Bay, entomb myriad amazing remains of plants that grew here 255 to 252 million years ago, in the Permian Period.

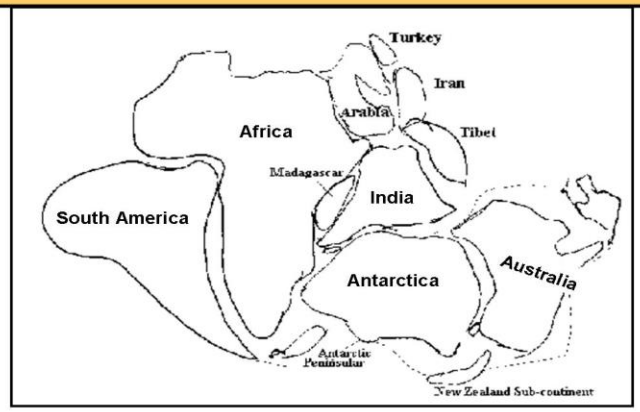
Similar plant fossils of the same age are found in Antarctica, Africa, South America and India. Vast oceans separate these land masses today. As well as plant fossils in common, these lands contain similar animal fossils and have similar geology. Together with the distribution of some modern plants and animals, the similarities led to the idea that these land masses were once joined into a great southern continent. Reassembling the land masses also shows a geographical good fit. The great southern continent was named Gondwana, after an Indian word meaning 'land of the Gonds'.

During the Permian Period Australia lay at the end of Gondwana. The Lake Macquarie area was located near the South Pole. The climate was cool and wet, with snow on the mountains in winter.

Gondwana began to split into smaller land masses about 160 million years ago. Australia finally broke away from Antarctica 45 million years ago. Australia, the island continent, is still drifting north-northeastwards away from Antactica at a current rate of 7 cm per year.

Lake Macquarie Fossil Beds

The fossil-bearing rocks are sedimentary rocks of the Newcastle Coal Measures. The layers of sandstone, conglomerate, shale, coal and tuff originated as river sands and gravels, floodplain and lake muds, peat swamps and volcanic ash layers respectively. The low-lying wet environment supported a profusion of plant life. Plants growing in peat swamps provided the raw material for the numerous coal seams mined here. The plants were non-flowering. Flowering plants did not evolve until 130 million years ago.



Gondwana, the great southern continent, before it broke up into present day continents.

The kinds of plant fossils that occur are leaves, stems, roots, tree trunks and branches (logs), seeds and seed pods, tree resin.

Leaves are by far the most abundant fossils. They are preserved as black carbon films and impressions along bedding planes in fine grained rocks: grey and brown shales and pale coloured tuffs. The leaves fell from nearby trees growing on river banks and around floodplain lakes. They were washed into lakes where they settled in the quiet, muddy water. Carbon leaf fossils generally display very fine detail of vein patterns, which can be used to identify the leaf.

The best places to find leaf fossils are in blocks of shale at the base of a cliff. These have fallen down from shale layers above. The naturally broken pieces of rock can reveal excellent leaf fossils on bedding plane surfaces.

Prepared by Roz Kerr 2010, updated 2015
Photography by Shayne & Roz Kerr

Flattened stems are also found along bedding in shale. They have a black carbon film on the outside with fine sediment filling the stem. They also leave impressions in the enclosing rocks.

Tree trunks and branches, as well as tree stumps sitting in their original growing position with roots still attached, are preserved as petrified wood. The original porous wood was replaced by minerals after burial, turning wood into stone. Growth rings (indicating a seasonal climate), bark texture and detailed cell structure are retained. Pale coloured chalcedony (a form of silica) and grey siderite (iron carbonate) replace wood tissue. On exposure to the weather, siderite rusts to form red-brown limonite. Bark can be turned into black coal.

Petrified wood of the *Glossopteris* tree, the most common fossilized tree, has a structure similar to the wood of the modern Hoop and Norfolk Island pines.

Petrified logs are commonly found in coarse grained rocks: sandstone and conglomerate. The logs were carried by fast flowing rivers along with sand and gravel. They eventually became waterlogged, sank to the river bed and were buried. Fossil logs are exposed in cliff faces and on rock platforms. Loose pieces of petrified wood, eroded from the host rock, lie at the foot of cliffs and around rock platforms.

Some tree stumps are fossilized in their growing position because the trees were drowned by flooding and were quickly buried by mud and sand. Other trees, such as those at Swansea Heads, were blown down by a volcanic blast of hot gases and ash, which snapped the trunks off above their base. The remaining tree stumps were then buried quickly by volcanic ash, which hardened to form tuff. Tree stumps are exposed on rock platforms.

Lake Macquarie City Council

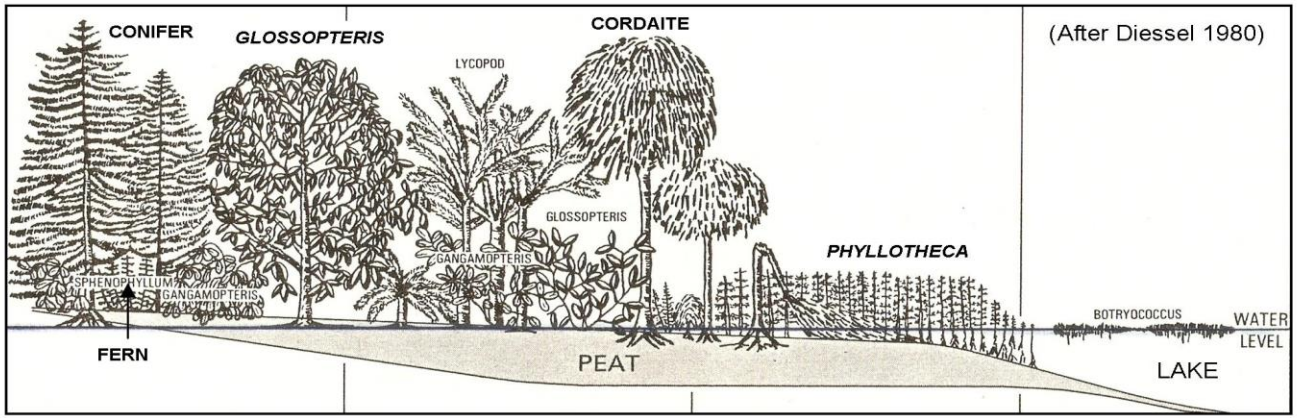
WHAT FOSSIL IS THAT?

Glossopteris Group

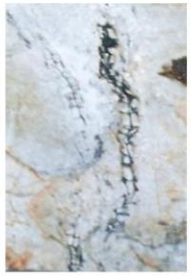
Trees and shrubs of the *Glossopteris* group were deciduous, shedding masses of tongue-shaped leaves every autumn. They thrived in boggy ground: in peat swamps, on lake margins and river banks, forming extensive forests. They became extinct at the end of the Permian. Some evolved into modern plants. Leaves varied in length from a few centimetres up to 1 m. There is a gradation of leaf patterns between the types shown below.

Glossopteris. The most common leaf fossil found locally. It has a strong midrib and cross connections between lateral veins forming a mesh pattern. Dudley Beach.

Gangamopteris. Leaf with median groove composed of parallel veins. Lateral veins form a mesh pattern. Dudley Beach and Estelville.



Cross section of a Permian peat swamp showing plant types related to water level.



Vertebraria. Root of a *Glossopteris* tree. Looks like the vertebral column (backbone) of an animal. It had large aeration chambers adapted to waterlogged soils. Catherine Hill Bay.

Tree stump with roots in original growing position. Trunk was snapped off above its base by a volcanic blast. Swansea Heads.

Fallen tree, flattened by a volcanic blast. Tree trunk still has some branches attached. Swansea Heads.

Phyllotheca. A horsetail, grew like rushes in shallow water. Stem had circlets of leaves around nodes. Estelville.

Long strap-shaped leaf of a non-deciduous Cordaite tree, strong parallel veins. Swansea Heads.

Conifer stem. The Hill Newcastle.