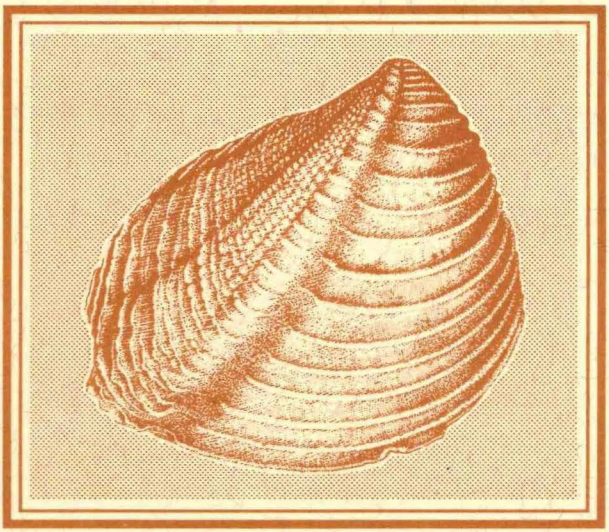
A GUIDE TO THE FOSSILS OF THE NEWMARRACARRA LIMESTONE



by

K. J. McNamara & K. Brimmell

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Cover drawing of the echinoid *Trigonia moorei*

A GUIDE

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K. J. McNamara & K. Brimmell

1992

Dept of Earth & Planetary Sciences, W. A. Museum, Perth

INTRODUCTION

This is the second in a series of guides to the fossils of Western Australia. The aim of these guides is to provide illustrations and simple descriptions of some of the more commonly found fossils in Western Australia. Full descriptions are to be found in scientific journals that are generally not readily accessible to the general public (see page 12). Not every fossil species that is known will be illustrated.The guide will concentrate on those fossils from the Newmarracarra Limestone that are most commonly found.

A few points should be considered before you go fossil collecting. Firstly, once you have decided on the place from where you are going to collect fossils, find out the name and address of the landowner of the property. Always get the landowner's permission before collecting fossils. And remember to leave the site as you found it (apart from the few fossils which you might remove). At many localities fossils weather out naturally from the rocks. All you have to do is pick them up. At other sites the fossils will be embedded within hard rock. To extract these a good hammer and some cold chisels are essential. Take care when hammering rocks that pieces of rock don't go into your eyes. Protective goggles can be a help when attacking hard rocks.

Good fossil collecting consists of the three '**R**'s': 1, **R**estraint; 2, w**R**apping; 3, **R**ecording. Collect judiciously and avoid unnecessary destruction in the process of collecting. Avoid trying to collect the 'uncollectable'. Don't collect everything you see. Leave a few for other people! Once collected, your fossils need to be carefully wrapped. After all, they have lain undisturbed for many millions of years, and may be a little fragile. Tissues, newspapers or old telephone books are all useful wrapping material. It is imperative that you record details of the locality from which each specimen was collected, along with the date and name of the collector, on a piece of paper. Wrap this with the specimen. Remember, a fossil without details of its provenance has little or no scientific value. Place the wrapped specimens in bags. Linen are the best, but plastic bags will do. However, if damp specimens are collected do not leave them too long in plastic bags or mould will grow. In addition to recording information on labels, record the same information in a notebook or diary. Record the level in the rock face from which you have collected. Annotated field sketches or photographs are useful for this purpose. If you find a fossil not illustrated in this guide bring it into the W. A. Museum where Museum staff will help you to identify it.

NEWMARRACARRA LIMESTONE

The Newmarracarra Limestone is a unit of richly fossiliferous yellow to brown limestone that reaches no more than 12 metres in thickness. It is exposed inland from Geraldton in the area around Bringo, mainly between Newmarracarra and Moonyoonooka and south-east of Bringo around Ellendale. In many places weathering has had the effect of either colouring the rocks and fossils red, or where more severe, black. In these cases the fossil shell has been dissolved away and only moulds remain. The limestone is dominated by marine invertebrates, in particular molluscs such as bivalves and ammonites, but it also contains a few gastropods, nautilids and belemnites. Other fossils include brachiopods, worms, rare echinoids (sea urchins) and fossil wood. Fossils were first reported from this unit by F. T. Gregory in 1861 and in 1870 C. Moore published the first descriptions of many of the fossils. He noted the strong similarity between these forms and many of Middle Jurassic age in England.

The Newmarracarra Limestone usually rests on either the Colalura Sandstone or the Bringo Shale and represents a transgression by the sea onto the land. The Colalura Sandstone has yielded some interesting fossils, including remains of dinosaurs and plesiosaurs. The Newmarracarra Limestone is overlain by the Kojarena Sandstone, a brown rock that contains a few of the molluscs, such as *Trigonia moorei*, that are so common in the Newmarracarra Limestone. The fossils of the Newmarracarra Limestone indicate that it is of Middle Bajocian (Middle Jurassic) age. In other words it was deposited about 175 million year ago, when a shallow warm sea covered much of the Perth Basin. The importance of this limestone lies in the fact that it represents one of the few examples of marine Jurassic rocks found on mainland Australia and it contains by far the richest fossil record from rocks of this age anywhere in Australia.

Slab showing the highly fossiliferous nature of the Newmarracarra Limestone (Photo by Mr Greg Wallace)

AMMONITES

•***Newmarracarroceras clarkei*** (Crick, 1894) - **Figs 1-3** Common

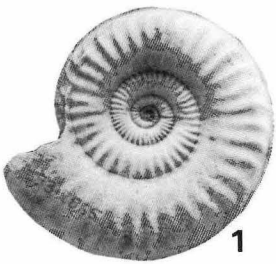
Small to medium sized discoidal shells up to 118 mm in diameter. Later whorls overlap earlier whorls by 25-35%. Inner whorls subcircular with rounded venter. Whorls become more compressed with growth, reaching up to twice as high as wide. Keel often developed on venter, but weakens onto outer body chamber. Ribs single, not bifurcating. Intensity and spacing variable, such that on some specimens (**3**) the ribs are only faintly developed, whereas on others (**1**) they are quite prominent. On inner whorls 15-20 ribs per half-whorl. On intermediate whorl ribs straight on lower flank but curve on upper approaching the keel; 20-25 per half-whorl at this stage. At a half-whorl before last septum ribs become faint on lower flanks and decline in number to 15-20 and disappear completely well before body chamber, which is always smooth. Septal sutures simple, widely and irregularly spaced. A second, much rarer, species of this genus is known from the Newmarracarra Limestone and is known as *Newmarracarroceras fairbridgei* (Arkell, 1954). It differs from *N. clarkei* in being much larger, reaching more than 130 mm in diameter; in having more widely spaced, broad and rounded ribs; and broader whorls and heavier keel.

•***Pseudotoites emilioides*** Arkell, 1954 - **Figs 4,5** Common

Like other species of *Pseudotoites, P. emilioides* is relatively large (diameter up to 100 mm), has stout inner whorls, very broad middle whorls and more compressed outer whorls that are about as broad as high. Ribs sharp, fine and dense and bifurcate from sharp, well-defined tubercles. Ribs gently sinuous on flanks of shell and pass straight across the venter.

•***Zemistephanus corona*** Arkell, 1954 - **Figs 6,7** Uncommon

Shell large (diameter up to 115 mm). Inner whorls partially enveloped by outer whorls and deeply sunken because of very strong expansion of the outer whorl, which is wider than high. Uniformly ribbed with strong, widely spaced primary ribs on lower flanks. On outer whorl there are 15 large, blunt tubercles on the ribs. Secondary ribs are faint on the first half of the last whorl and fade on the second half. Suture lines are intricate and deeply incised. Rarely are large ammonites, such as this species, preserved whole. They are usually found as incomplete specimens, either because the shells were broken before they were fossilised, or they were broken up as they weathered out of the rock.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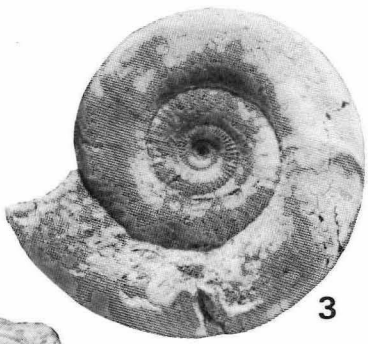
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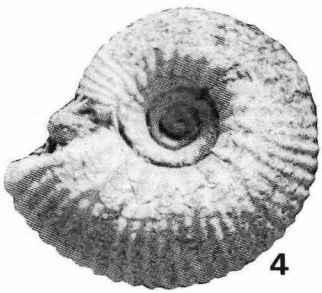
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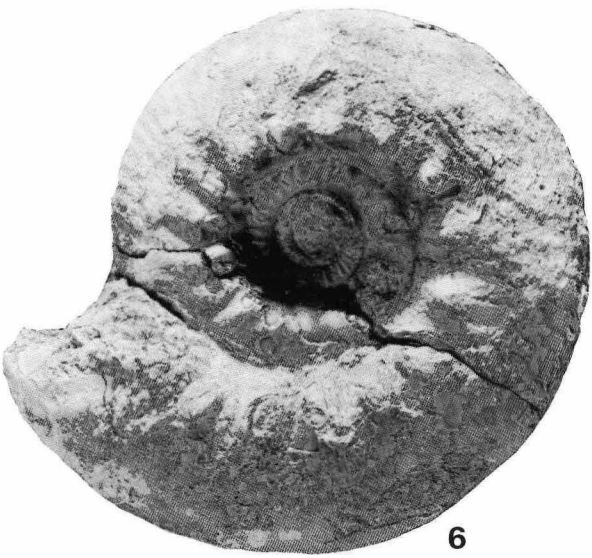
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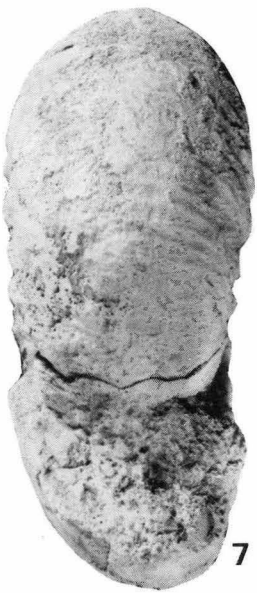
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Ammonites

BIVALVES

•***Cucullaea semistriata*** Moore, 1870 - **Figs 8,9** Common

Large shell up to 83 mm long; very variable shape. Valves of equal size. Shell surface with evenly spaced concentric ridges and faint ribs close to anterior end of large shells. Umbo not central. Ligament platform triangular with 12-15 grooves.

•***Oxytoma decemcostata*** Whitehouse, 1924 - **Fig. 10** Common

Delicate shell up to 45 mm high. Valves of very different sizes. Right valve small and flat. Left valve inflated with 9-11 very strong ribs interspersed with many fine ribs. One large ear developed from umbo.

•***Plagiostoma championi*** Skwarko, 1974 - **Fig. 11** Uncommon

Inflated shell up to 43 mm high with two ears of unequal size, anterior slightly shorter than posterior. Umbo slightly off centre. Fine concentric striae over entire shell. Few fine radial ribs near margins.

•***"Chlamys" enantyi*** Skwarko, 1974 - **Figs 12,13** Uncommon

Gently convex, ovoid shell up to 47 mm high. Has two ears on each valve, but these are often broken off (**13**). Ornamented with up to 30 radiating ribs.

•***Pseudolimea duplicata*** (J. de C. Sowerby, 1827) - **Fig. 14** Uncommon

Small shell up to 20 mm long. Shell inflated with pointed umbo and short ears. Ornamentation of 20 coarse radiating ribs that are angular in cross section, with a few thin intervening minor ribs. Species also occurs in India and England.

•***Modiolus maitlandi*** Etheridge, 1910 - **Fig. 15** Uncommon

Large, inflated shell up to 100 mm long. Mussel-shaped and elongate. Upper margin straight for three-quarters shell length. Lower margin gently concave. Ornamented by fine concentric ribs.

•***Camptonectes greenoughi*** Skwarko, 1974 - **Fig. 16** Rare

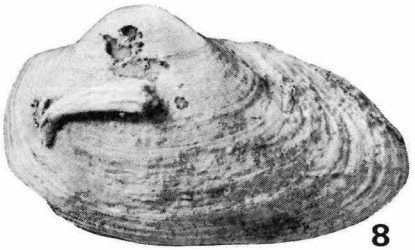
Gently convex, delicate shell up to 50 mm high. Straight margins near umbo. Ears of unequal size. Many faint, fine, diverging ribs.

•***Gresslya sanfordii*** (Moore, 1870) - **Fig. 17** Common

Large, elongate shell up to 80 mm long. Valves of different sizes. Shell inflated with weak umbo. Shell gapes at both anterior and posterior ends. Ornamentation of characteristic concentric growth ridges and very fine radial microsculpture, with fine, radial pustules on well-preserved specimens.

•***Camptonectes waggrakinensis*** Skwarko, 1974 - **Fig. 18** Common

Very large, almost circular shell up to 150 mm in diameter. Left valve convex. Right nearly flat. Both valves lack regular ornamentation and are smooth or bear irregular growth lines or ridges. Anterior ear long and prominent, with straight margin. Posterior ear as long, but less prominent.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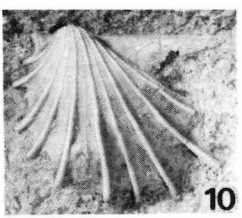
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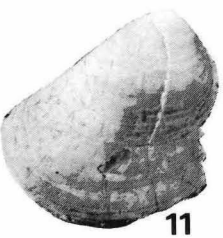
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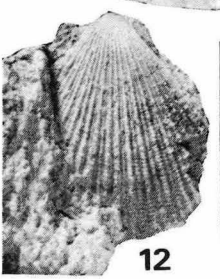
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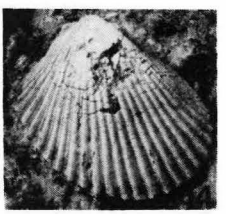


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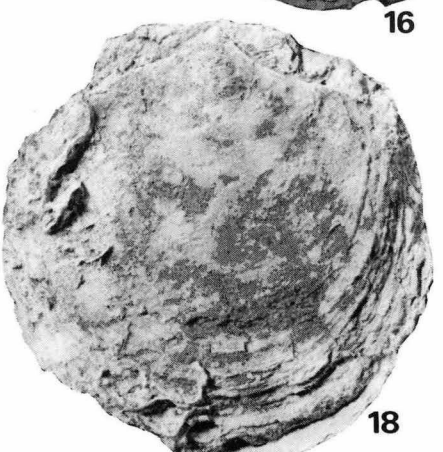
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Bivalves

BIVALVES

•***Lopha marshii*** (J. Sowerby, 1812) - **Fig. 19,20** Common

Shell moderately large, up to 80 mm high. Often occurs in clusters. Very variable in shape. Umbo usually pointed, but may be rounded. Left valve usually convex, while right valve is flat or rarely concave. Ornamentation of 9-13 coarse V-shaped ribs with deep intervening spaces. Interior of valves with large circular muscle scars. The Newmarracarra specimens are refered to a separate subspecies, *L. marshii australiensis*. Another subspecies, *L. m. newmarracarrensis*, with more elevated muscle scar and deeper, closer spaced ribs has been recognised.

•***Amphiodonta tholiformis*** (Etheridge, 1910) - **Figs 21,22** Common

Irregular shaped shell up to 40 mm across and 20 mm high. Left valve inflated, thick and ridged.Very variable in shape. Bears deep, fairly large circular muscle scar. Right valve thin and flat. Slightly smaller than left valve. Muscle scar on inside shallow and irregularly circular. Ornament of ridged, irregular, concentric growth lines.

•***Ctenostreon pectiniformis*** (Schlotheim, 1812) - **Figs 23** Uncommon

Large shell up to 130 mm high. Suborbicular, vertically elongate and equivalved. Umbo central. Anterior ear usually small. Posterior ear is triangular and of variable size. 9 to 15 round or sharp-crested radial ribs that gradually increase in thickness away from the umbo.Those in front lean to the front, those to the back lean in that direction. Ribs may extend beyond shell margin. Broad, flat hinge area. Large muscle scar on inside of shell.

•***Meleagrinella sinuata*** (Teichert, 1940) - **Fig. 24** Common

Shell subcircular , convex, very thin and up to 25 mm long. Anterior ear very short, but posterior well developed. Ribs much stronger on left valve and more densely concentrated than on right valve. Bears up to 85 primary and secondary ribs, the two separating one-third of the distance from the umbo to the margin.

•***Astarte tibraddeni*** Skwarko, 1974 - **Figs 25** Common

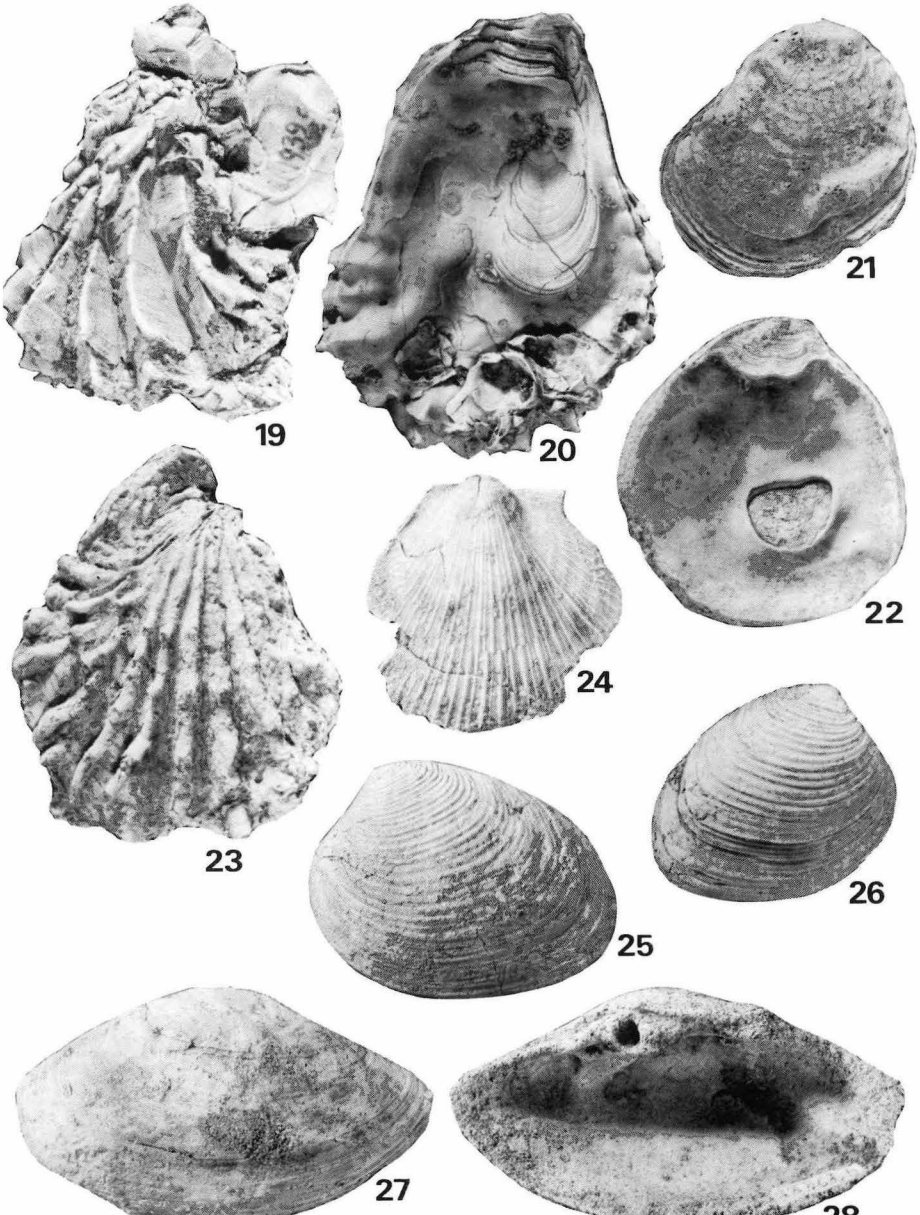
Shell robust, thick-walled and up to 35 mm high. Moderately well inflated. Umbo pointed and not centrally positioned. Concentric ribbing covers entire external surface of shell. Consists of regularly alternating narrow ribs and interspaces, both of which are more closely spaced towards the umbo.

•***Astarte cliftoni*** Moore, 1870 - **Fig. 26** Common

Shell similar to *Astarte tibraddeni*, but generally smaller, with a more flattened, pointed umbo and more widely spaced growth lines.

•***Tancredia sandspringi*** Skwarko, 1974 - **Figs 27,28** Uncommon

Moderately large, inflated shell up to 74 mm long and 40 mm high. Thick-shelled; pointed toward the front. Umbo depressed. Posterior gape wide. Margins nearly straight near umbo. Shell with irregular concentric growth lines.



Bivalves

BIVALVES

•***Trigonia moorei*** Lycett, 1870 - **Figs 29,30** Very common

Very distinctive shell up to 65 mm high. Moderately convex and thick. Roughly triangular in shape with two curving margins, and one nearly straight margin. Deep, gently curving groove runs from umbo to margin. To one side of this are a number of shallower, parallel grooves and ridges. These are crossed by about 50 irregular concentric ridges which, where they cross the radial ribs, give a beaded appearance. On other side of the main radial groove more widely spaced concentric ribs. Interior of shell with prominent teeth near the umbo.

GASTROPODS

•**Undescribed gastropod - Fig. 31** Uncommon

Shell up to 20 mm high. Spire of five convex volutions. Ornament of widely spaced, sinuous longitudinal ribs and more numerous, finer closer-spaced transverse ribs.

•**Undescribed nerineid - Fig. 32** Uncommon

Shell up to 15 mm long; very narrow and high-spired, tapering evenly. Up to 11 volutions, each separated by narrow suture, and lacking ornament.

•***Bathrotomaria greenoughensis*** (Etheridge, 1910) - **Fig. 33** Uncommon

Shell conical, up to 15 mm high, with six stepped whorls. Lower part of whorl steeply inclined, upper part nearly horizontal. Prominent spiral sculpture.

•***Otostoma*** **? sp. - Fig. 34** Uncommon

Shell small, 5 mm long. Initial part of the shell very tightly coiled, opening out into large, weakly coiled outer whorl. Ornament of very coarse transverse ribs.

BRACHIOPODS

•***Burmirhynchia*** **sp. - Figs 35,36** Common

Small shell, less than 15 mm high, with prominent umbo. Ornamented by small number of sharp, well developed ribs. Pronounced fold in shell margin and accompanying broad, shallow depression on one valve and broad ridge on other.

BELEMNITES

•***Belemnopsis*** **cf** ***bessinus*** (d'Orbigny , 1842) - **Figs 37,38** Common

Guard long and slender, up to 70 mm long, with a prominent deep groove.

ECHINOIDS

•**Echinoid spine - Figs. 39** Rare

Less than 30 mm long; thin and delicate with rows of tiny tubercles along length.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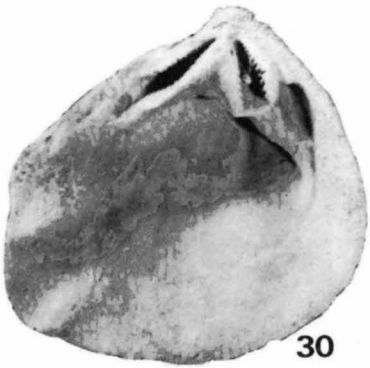
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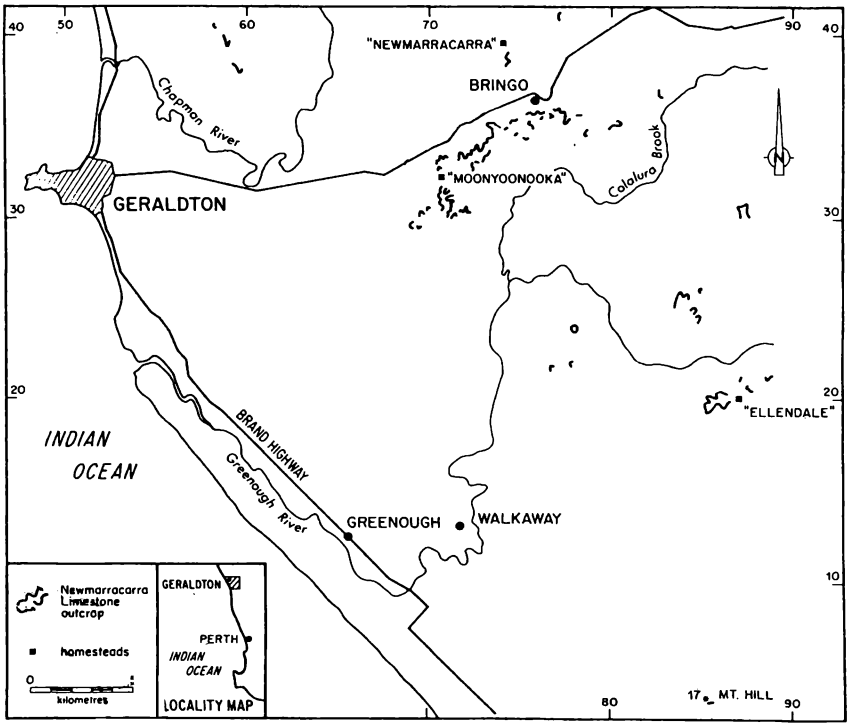
Bivalves, gastropods, brachiopods, belemnites, echinoids



Map showing main localities of Newmarracarra Limestone (from Hall, 1989)

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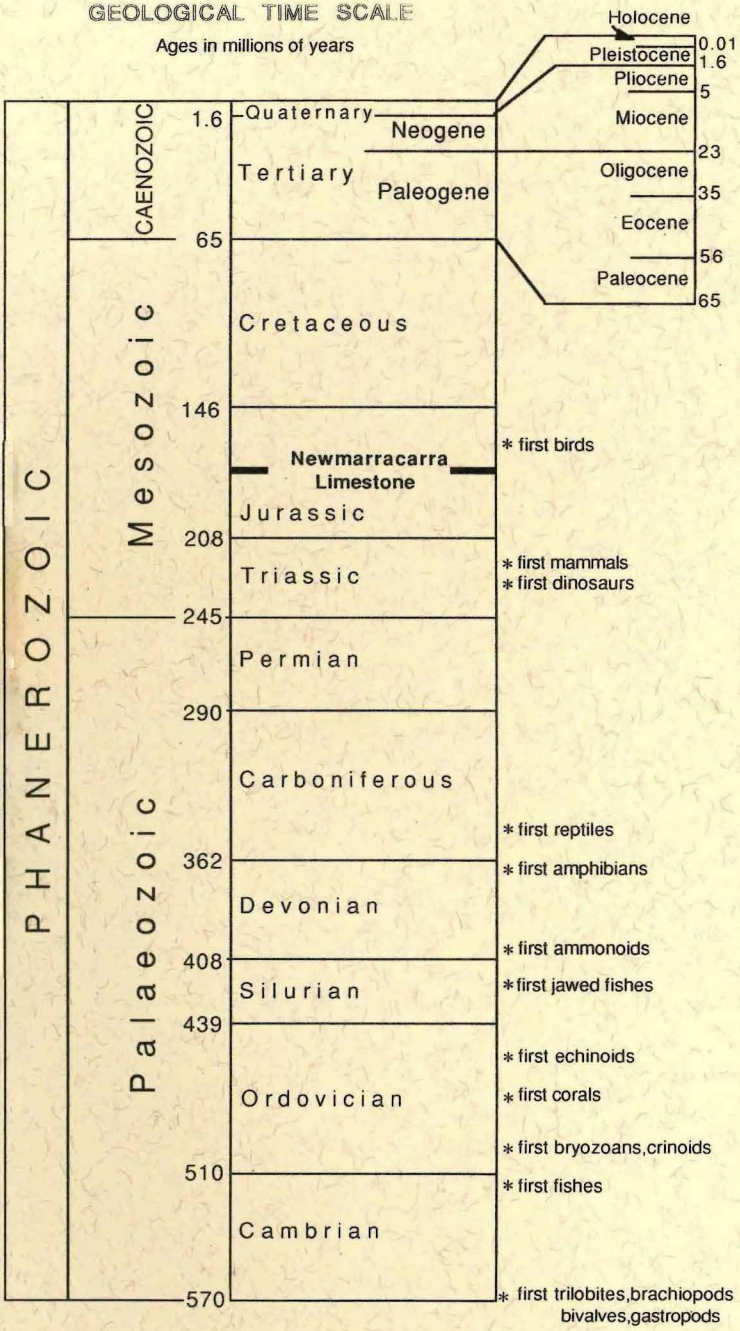
GEOLOGICAL TIME SCALE
Ages in millions of years
PHANEROZOIC
CAENOZOIC
Mesozoic
Palaeozoic
1.6
65
146
208
245
290
362
408
439
510
570
Quaternary
Tertiary
Neogene
Paleogene
Cretaceous
Newmarracarra Limestone
Jurassic
Triassic
Permian
Carboniferous
Devonian
Silurian
Ordovician
Cambrian
Holocene
Pleistocene
Pliocene
Miocene
Oligocene
Eocene
Paleocene
0.01
1.6
5
23
35
56
65
* first birds
* first mammals
* first dinosaurs
* first reptiles
* first amphibians
* first ammonoids
* first jawed fishes
* first echinoids
* first corals
* first bryozoans,crinoids
* first fishes
* first trilobites,brachiopods
bivalves,gastropods

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