A GUIDE TO THE FOSSILS OF THE GINGIN CHALK

by

K. J. McNamara, D. Friend & J. A. Long

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GINGIN CHALK

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INTRODUCTION

This is a revised edition of the first guide to the fossils of Western Australia. These guides provide illustrations and simple descriptions of some of the more common fossils of Western Australia. Full descriptions are to be found in scientific journals that are generally not easily accessible. Details of these references are given on page 16. Not every fossil species that is known will be illustrated.The guide will concentrate on those fossils that are most commonly found. However, a few of the more rare, but fascinating, fossils from the Gingin Chalk, plus a few from the Molecap Greensand, will also be described and illustrated in the hope that more of these might be 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 that is not illustrated in this guide bring it into the W. A. Museum where Museum staff will help you to identify it.

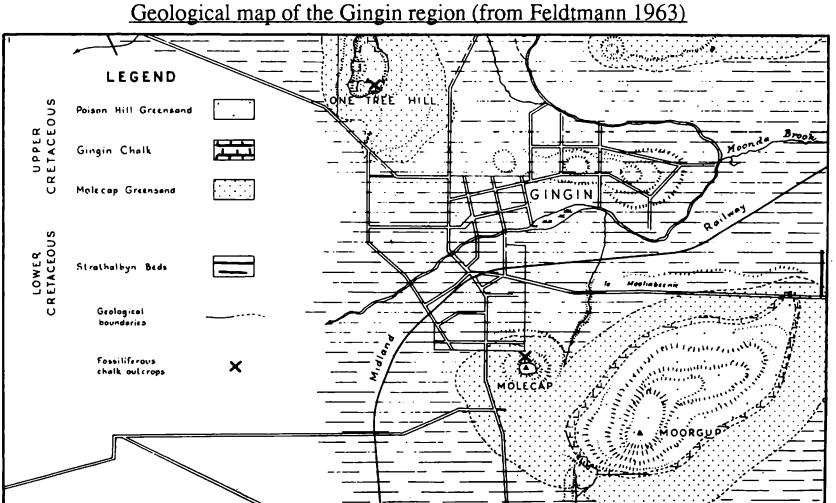
GINGIN CHALK

The Gingin Chalk, is a unit of soft, crumbly chalk. Reaching no more than 19 metres in thickness it is exposed between Gingin and Badgingarra. Similar chalk deposits are known from Western Europe, particularly England, northern France, Holland and Denmark, and the western United States. Chalk is mainly composed of the remains of calcareous algae that have internal plates known as coccoliths. Marine animals, such as small crustaceans, like copepods, are thought to have fed on these algae. After passing through the animal's gut the plates were released in their droppings, and so accumulated at the bottom of the sea. The Gingin Chalk is very fossiliferous, containing many microfossils (such as coccoliths, foraminifers and ostracodes) and macrofossils, many of which are illustrated in this guide. The most common fossils are pieces of broken shell of the giant clam *Inoceramus*.

The Gingin Chalk rests in many places on the Molecap Greensand (as in the Molecap Quarry in Gingin). It is overlain by the Poison Hill Greensand. The Molecap Greensand is a quartz sandstone that contains abundant grains of a green mineral called glauconite. In Molecap Quarry it is 11 metres thick. Two beds, each about 60 centimetres thick and rich in phosphate, occur at the top and bottom of the unit. In these beds shark teeth and bones of extinct marine reptiles, such as dinosaurs, mosasaurs, ichthyosaurs and plesiosaurs have been found

The fossils of the Gingin Chalk indicate that it is of Santonian (Late Cretaceous) age. In other words it was deposited about 85 to 80 million year ago, when a shallow warm sea covered much of the Perth Basin to the foot of the Darling Range. A similar chalk deposit, the Toolonga Calcilutite, occurs in coastal regions of the Carnarvon Basin north of Geraldton and similar fossils occur in both beds. The fossils of the Gingin Chalk are testimony to the myriad life forms, many now extinct, that swam and crawled in those seas.

Geological map of the Gingin region (from Feldtmann 1963)



SPONGES

•***Craticularia australis*** Rigby, 1983 - **Fig. 1** Uncommon

Broad, conical to vase shaped with stalk. Walls quite thin with indented rim. Outer surface covered by shallow pits 1 to 2 mm in diameter arranged in long radiating linear series like ribs. Up to 75 mm in diameter and up to 30 mm high.

•***Peronidella globosa*** (Etheridge, 1913) - **Fig. 2** Rare

Round, bushy mass studded with low mounds that have truncated tops. The mounds are closely spaced and have small openings within them. The whole sponge is small, less than 20 cm in diameter.

CORALS

•***Coelosmilia? ginginensis*** Etheridge, 1913 - **Figs 3,4** Rare

Coral small, conical, less than 15mm long. Slightly curved towards the base. Outer surface bears growth rings and ribs that extend the length of the coral. These appear in depression at top as radial ribs that do not meet in the centre.

BRACHIOPODS

•***Bouchardiella cretacea*** (Etheridge, 1913) - **Figs 5,6** Common

Shell small, ovoid-pentagonal; about 5 mm long. Both valves gently convex, smooth. Margin between shells gently curved. Beak of shell short and straight with small opening (foramen) at top.

•***Gisilina ovata*** (Etheridge, 1913) - **Figs 7,8** Uncommon

Shell very small, about 2-3 mm. Nearly as wide as long; oval, with two gently convex valves. Sculpture of a few simple ribs.

•***Burmirhynchia*** **sp. - Figs 9,10** Uncommon

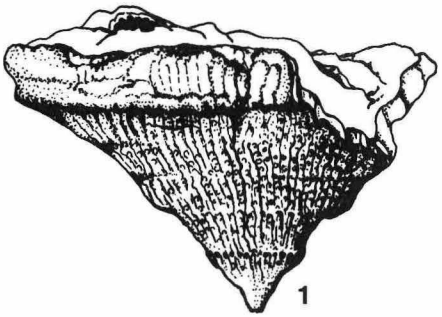
Shell small, up to 10 mm long; pentagonal in outline. Pointed beak with quite large foramen. Both valves moderately convex and covered by up to 18 prominent radial ribs. Margin between shells quite strongly folded in larger shells.

•***Kingena mesembrina*** (Etheridge, 1913) - **Figs 11,12** Common

Shell up to 18mm long, slightly narrower than long and width half length. Elongate-oval shells gently convex. Junction of valves gently curved. Hinge area of valves short with a large opening (foramen). Valves lack ribs, but granulate.

•***Inopinatarcula acanthodes*** (Etheridge, 1913) - **Figs 13,14** Common

Shell large, up to 30 mm long and as wide as long. Small shells with both valves strongly convex. In larger shells a very pronounced fold develops in both valves producing strongly arched margin. Many fine ribs on valves. Foramen very small.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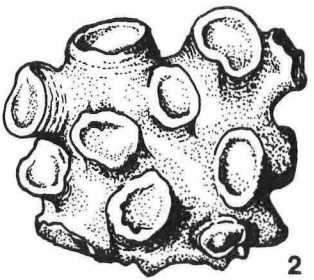
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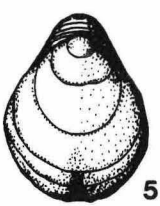
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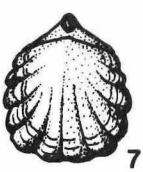
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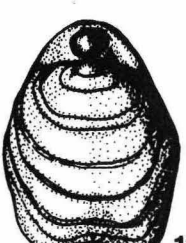
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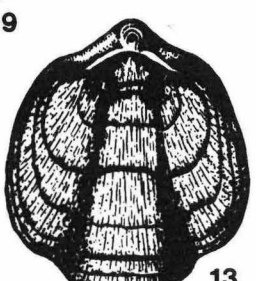
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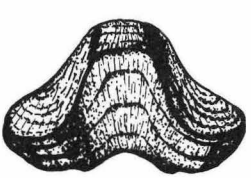
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BIVALVES

•***Camptonectes ellipticus*** Etheridge, 1913 - **Fig. 15** Rare

Ovate shell (22 mm) hinge line half shell width. Anterior ear larger than posterior. Outer margin truncate with fine ribs. Shell sculpture of numerous very fine ribs.

•***Chlamys ginginensis*** Feldtmann, 1951 - **Fig. 16** Common

Small shell (17 mm), thin, oval. Ears moderate size, unequal. Hinge line slightly curved. Covered by14-16 strong radial ribs.

•***Chlamys subtilis*** Feldtmann, 1951 - **Fig. 17** Uncommon

Small shell (18 mm), thin, oval, with straight dorsal margin. Ears moderate size, unequal. Hinge line straight. Ornamentation of 60-70 very fine, thread-like ribs.

•***Cteniopleurium subreticulatus*** Feldtmann, 1951 - **Fig. 18** Rare

Thin scallop shell up to 30 mm long; thickens towards margins. Umbo sharp. Hinge straight. Ears moderately large, anterior slightly larger than posterior. Outer ornament of many very fine threads and a few concentric growth lines.

•***Spondylus ginginensis*** Feldtmann, 1963 - **Fig. 19** Rare

Shell up to 45 mm long; ovate, longer than wide. Right valve very inflated, more than left valve. Attachment area on right valve, often showing as a gap between the two valves. Ornamented by 70 to 80 fine, evenly spaced radial threads.

•***Anomia fragilis*** Feldtmann, 1963 - **Figs 20,21** Common

Shell small (10 mm), fragile; subcircular with thin outer flange. Hinge very narrow. Ornamentation of irregular, overlapping concentric layers. Inside of shells with quite large, well-defined muscle scar.

•***Gryphaeostrea variabilis*** (Feldtmann, 1963) - **Figs 22,23** Common

Shell small (13 mm), thin, ovate. Left valve strongly inflated, smooth and larger than right valve which is flat to concave. Umbo hood-shaped on left valve. Smaller right valve ornamented with 7-9 evenly spaced growth rings.

•***Atreta glauerti*** (Feldtmann, 1963) - **Figs 24,25** Very common

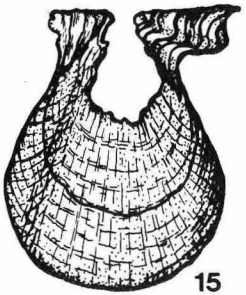
Shell small (10 mm), obliquely ovate. Right valve larger than left; strongly inflated, except at flat attachment site at umbo. Shell much thicker at margin. Fine ribs (up to 40) present or absent. Left valve circular, nearly flat, with no ribs.

•***Pycnodonte vesiculare*** (Lamarck, 1806) - **Fig. 26** Very common

Shell very variable in shape; up to 60 mm long; thick. Irregular, usually longer than high. Shape influenced by attachment site. Right valve concave, smaller and thinner than left which is globose and very inflated. External surface smooth.

•***Ostrea philbeyi*** (Feldtmann, 1963) - **Figs 27,28** Common

Shells quite large (38 mm), thick, ovate, slightly oblique. Valves of similar size. Left valve slightly inflated, right nearly flat. External shell rough, with closely spaced irregular growth lines. Internally shell with large muscle scar.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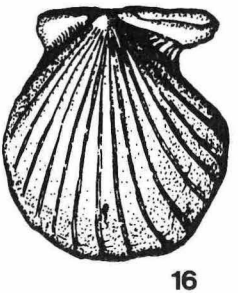
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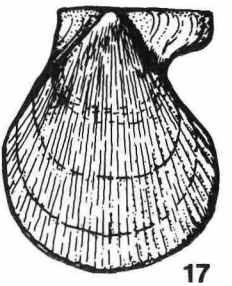
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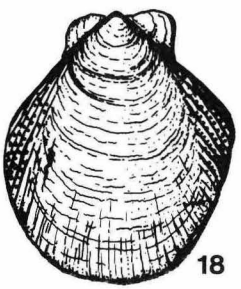
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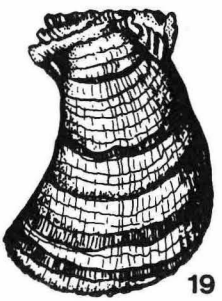
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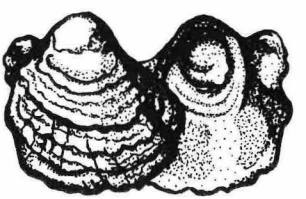
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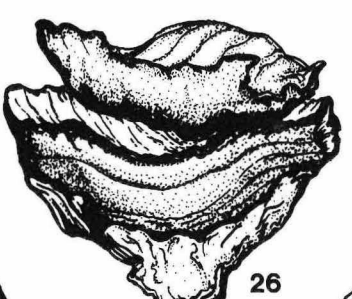
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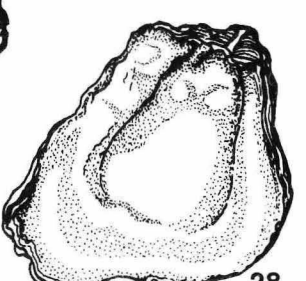
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ECHINOIDS

•***Goniocidaris comptoni*** (Glauert, 1923) - **Fig. 29** Uncommon

Small sea urchin (18 mm long) with five columns of offset, paired, large plates each largely covered by a prominent tubercle, surrounded by a circle of much smaller tubercles. Remainder covered by coarsely granular tubercles. These five tuberculate columns (interambulacra) separated by five much narrower, wavy paired columns, consisting of numerous small plates each pierced by a pair of pores. Usually only single large tubercle-bearing interambulacral plates are found.

•**Echinoid spines - Fig.30** Common

Very variable in appearance, with seven types having been recognised. Up to 40 mm long, parallel-sided or sometimes wider at mid-length. Covered by granular tubercles, which if large enough appear as prominent denticles. Often arranged in rows; if closely spaced, granules coalesce as fine, longitudinal ridges.

•***Hemiaster*** **sp. - Fig. 31** Rare

Very fragile heart urchin up to 60 mm long. Usually very distorted. Shell nearly spherical and globose. Five short, sunken, double rows of pore pairs (petals) on upper surface. Posterior pair shortest. Thin band (fasciole) connects ends of paired petals. Shell covered by many tiny tubercles giving surface a granular appearance. Lower surface with mouth near front and anus on posterior surface.

AMMONITES

•***Eupachydiscus*** **sp. - Figs 32,33** Uncommon

Large ammonite (diameter 120 mm), usually found as incomplete fragments. Whorl section inflated; almost round in later whorls. Early whorls with narrow, widely spaced ribs arising in pairs from tubercles. Middle whorls coarse, spaced ribs appear which strengthen on last whorl. Ribs generally curve forward but nearly transverse across the venter. Later whorls envelope two-thirds of earlier whorls. Suture line very intricate (Fig. 34).

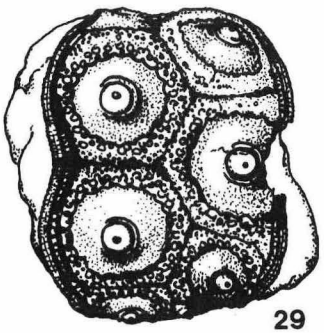
•***Neopuzosia*** **sp. - Fig. 34** Uncommon

Very large ammonite (diameter of about 350 mm). Shell moderately compressed with gently convex flanks. Ribs gently curving and quite pronounced. No tubercles present. Later whorls envelope at least two-thirds of earlier whorls.

WORMS

• ***"Tubulostium" pyramidale*** Etheridge, 1913 - **Fig. 35** Uncommon

Very small snail-like worm tube, less than 4 mm long. Very elongate, with two to four whorls in regular spiral. Last whorl always much larger than the upper.



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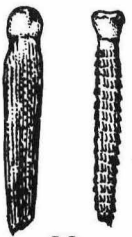

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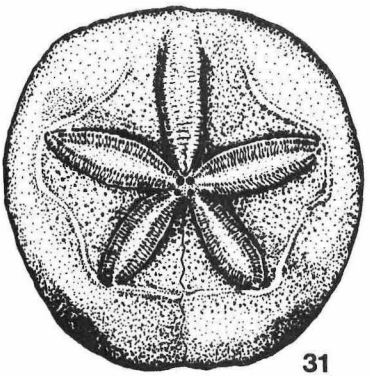

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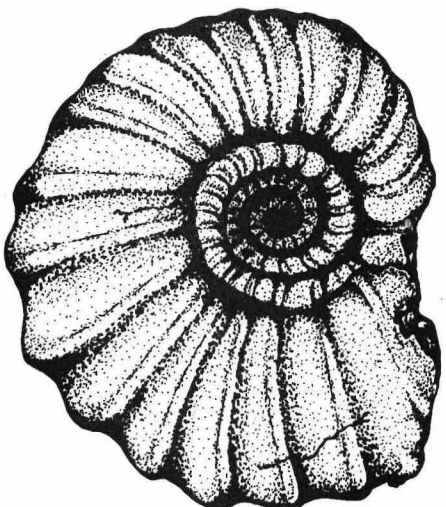

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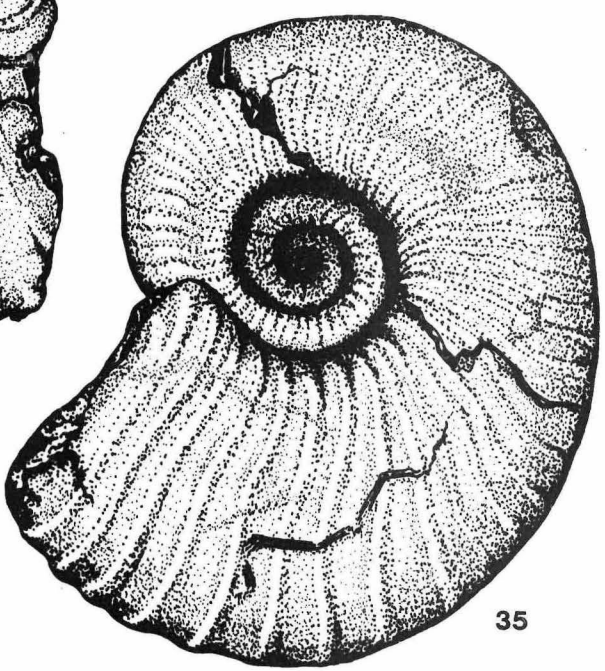

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WORMS

•***Rotularia gregaria*** (Etheridge, 1913) - **Figs 36,37** Common

Worm tube generally 15 mm in diameter; conically spiralled with about three whorls. In well-preserved specimens last section of tube straightens and extends tangentially to last whorl. Growth lines well developed on tube.

CRUSTACEANS

•***Neoscalpellum glauerti*** (Withers, 1926) - **Fig. 38** Rare

Small barnacle found as isolated elements up to 23 mm long. Tergum with two processes, one two-thirds the length of the other. Longer process with sharp longitudinal ridge; other process flat.

•***Calantica ginginensis*** (Etheridge, 1913) - **Fig. 39** Uncommon

Valves weakly striated and thin. Carina is a long, thin valve up to 22 mm long. Bears weak longitudinal ridge. Scutum is triangular.

•***Pollicipes aboriginalis*** (Buckeridge, 1983) - **Figs 40,41** Uncommon

Large barnacle with convex scutum up to 50 mm long. One margin less than half length of other. Difference accentuated in larger specimens. Scutum thick, with ridge present on concave surface close to entire margin. Flat platform near apex.

PROBLEMATICA

•***Waiparaconus zelandicus*** (Withers, 1951) - **Fig. 42** Uncommon

Large (up to100 mm) cornucopia-shaped; very thick-walled, with internal striations. Outer surface with very irregular growth lines with root-like protuberances near narrower end of tube, where they become dense. Flat, laminate apex.

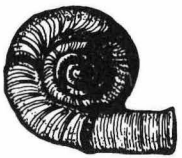
CRINOIDS

•***Marsupites testudinarius*** (Schlotheim, 1820) - **Fig. 43** Common

Cup 60 mm in diameter, consisting of 16 large, thin, equal-sized, gently convex roughly hexagonal plates. Usually smooth, but occasionally ornamented with radiating ridges. Free-swimming form. Usually found as isolated plates.

•***Uintacrinus socialis*** Grinnell, 1876 - **Figs 44,45** Common

Cup about 50 mm in diameter, consisting of many small irregular-shaped plates, thick in the middle, thinner at the edges. Gradual transition from cup to arms. Plates with regular edges and almost smooth. Usually found as isolated plates. Found in beds immediately below those containing *Marsupites*.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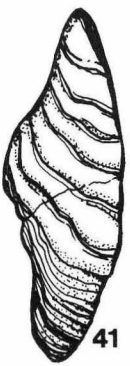
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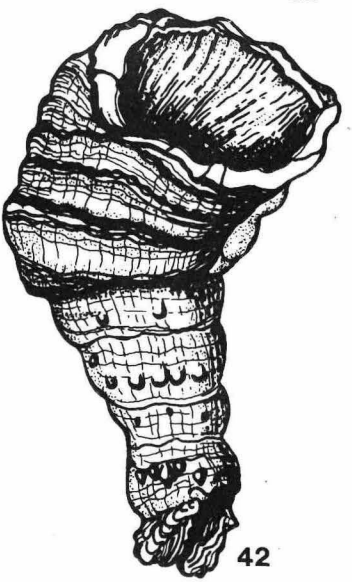
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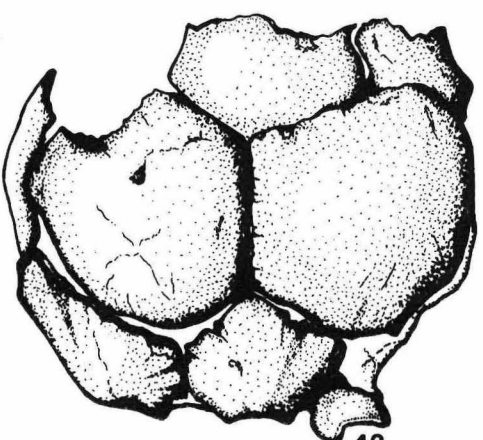
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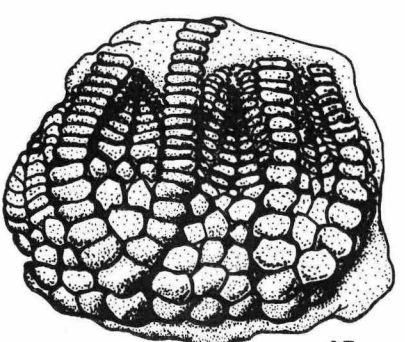
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FISHES

•***Notorhynchus aptiensis*** (Pictet, 1864) - **Fig. 46** Rare

Small shark teeth (to 10 mm) with 4 large cusps on lower tooth. Largest have a few serrations near base. Upper with 1 or 2 cusps. Molecap Greensand.

•***Hexanchus microdon*** (Agassiz, 1843) - **Fig. 47** Rare

Small shark (to 10 mm) with up to 8 inclined cusps. Main cusp with small serrations. Root deep, about same height as main cusp. Molecap Greensand.

•***Squalicorax kaupi*** (Agassiz, 1843) - **Fig. 48** Very rare

Small shark teeth (to 10 mm) having main crown with many fine serrations. Anterior cutting edge strongly convex, posterior edge notched. Gingin Chalk.

•***?Centrophoroides*** **sp.** (Davis, 1887) - **Figs 49,50** Very rare

Small shark teeth (under 4 mm) with long, strongly recurved main cusp and well-rounded, smaller secondary cusp. The root thins to base. Molecap Greensand.

•***Squatina*** **sp.** (Dumeril, 1906) - **Figs 51,52** Very rare

Small shark teeth (under 6 mm) wider than high with narrow central cusp and flat base. Root nearly triangular in outline. Molecap Greensand.

•***Carcharias*** **sp.** (Rafinesque, 1810) - **Figs 53, 54, 55** Common

Narrow, high, striated shark teeth up to 20 mm high with widely forked root and a pair of small basal denticles on either side of main cusp. Chalk and greensand.

•***Cretoxyrhina mantelli*** (Agassiz, 1843) - **Figs 57,58** Rare

Large shark teeth (up to 30 mm wide); broad-based and triangular in outline, with gently arched root. Tooth smooth, and not serrated. Chalk and greensand.

•***Paraorthacodus*** **sp.** (Gluckman, 1957) - **Figs 59,60** Rare

Small striated shark teeth (to 10 mm high) with wide root having many notches. Main cusp flanked by two or three lateral cusps. Molecap Greensand.

•***Protosphyraena*** **sp.** - **Fig. 61** Rare

Simple, high, sharp, laterally compressed teleost teeth up 20 mm high that lack a true root and are set in bits of bone from the jaws. Molecap Greensand.

•***Cretolamna appendiculata*** (Agassiz, 1843) - **Figs 62, 63** Uncommon

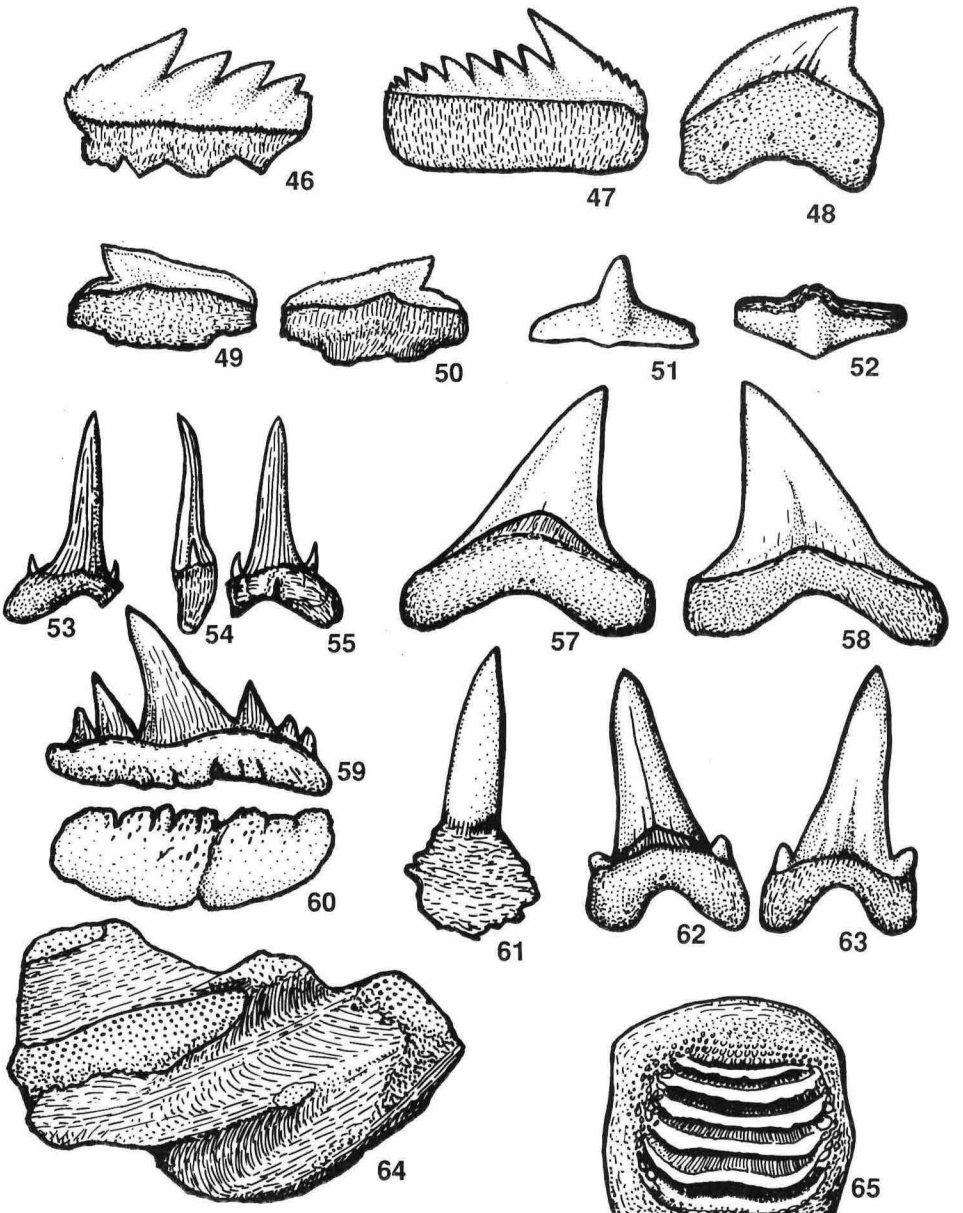
Large, smooth shark teeth (to 30 mm high) with narrow, high central cusps and smaller lateral basal denticles. Root strongly forked. Chalk and greensand.

•***Edaphodon*** **cf.** ***eyrensis*** (Long, 1985) - **Fig 64** Very rare

Large (50 mm) crushing mandibular toothplate of chimaerid. Crushing surfaces with tubular dentine, the rest of bone-like material. Molecap Greensand.

•***Ptychodus*** **sp.** - **Fig. 65** Very rare

Large (40 mm) crushing shark toothplates. Central arched region with parallel rows of ridges and grooves, surrounded by small warts of enamel. ?Gingin Chalk.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DINOSAURS

•Dinosaur bone - Figs 66-68 Very rare

So far only one dinosaur bone has been found, a probable toe bone from a theropod dinosaur (carnivorous biped). The specimen is about 40 mm long and was found by geology student Mark Green in 1992. It came from the Molecap Greensand.

MOSASAURS

•Mosasaur bone - Fig. 69 Very rare

Three bones of sea-going varanid reptiles, called mosasaurs, have been found in the Molecap Greensand. Shown here is an ulna (arm bone, about 50 mm long). Bones such as these are hard to identify and can often only be done with accuracy by expert palaeontologists who have worked on them for many years.

ICHTHYOSAURS

•Ichthyosaur or plesiosaur tooth - Figs 70,71 Rare

Isolated conical teeth having weakly striated outer surfaces could belong to either ichthyosaurs (dolphin-like marine reptiles) or plesiosaurs (long or short-necked aquatic reptiles propelled by powerful flippers). These have only been found in the Molecap Greensand.

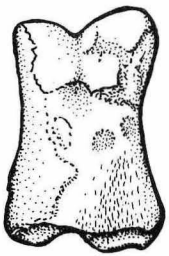
•Ichthyosaur vertebra - Figs 72,73 Rare

Large flat, rounded vertebrae (up to 90 mm or more in diameter) which rapidly thin towards the middle. These differ from shark vertebrae as, like other reptile bones, they have bone cell spaces. These have only been found in the Molecap Greensand, and as such represent the last known ichthyosaur remains from anywhere in the world.

PLESIOSAURS

•Plesiosaur vertebra - Figs 74,75 Rare

Large thick, spool-shaped vertebrae (120 mm or more in diameter) with weakly concave faces. Twin holes (nutritive foramina) are visible in ventral (underneath) view (75). These have only been found in the Molecap Greensand and indicate the existence at this time in Western Australian seas of very large plesiosaurs 12 to 15 metres in length.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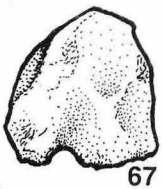
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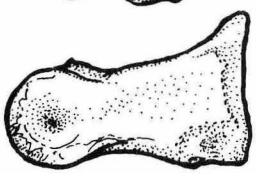
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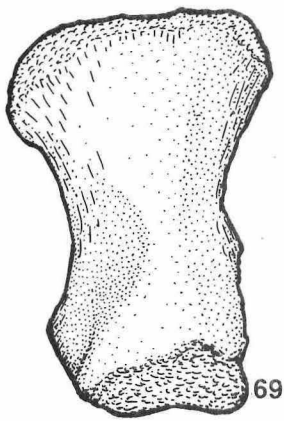
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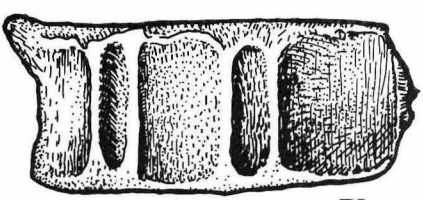
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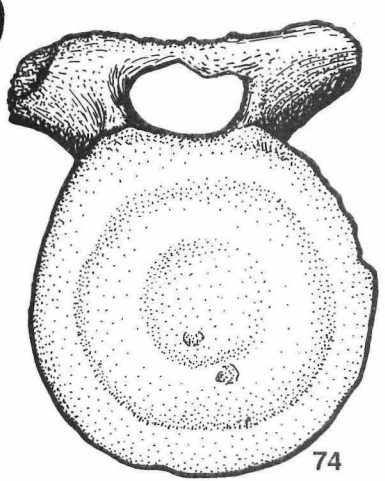
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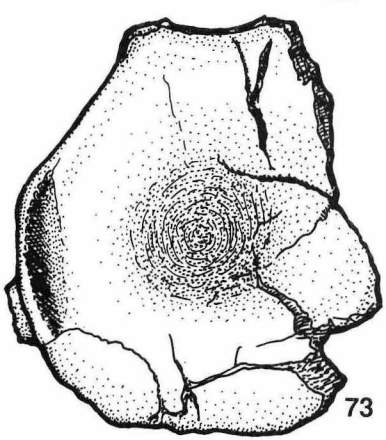
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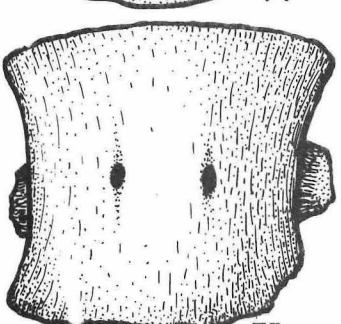
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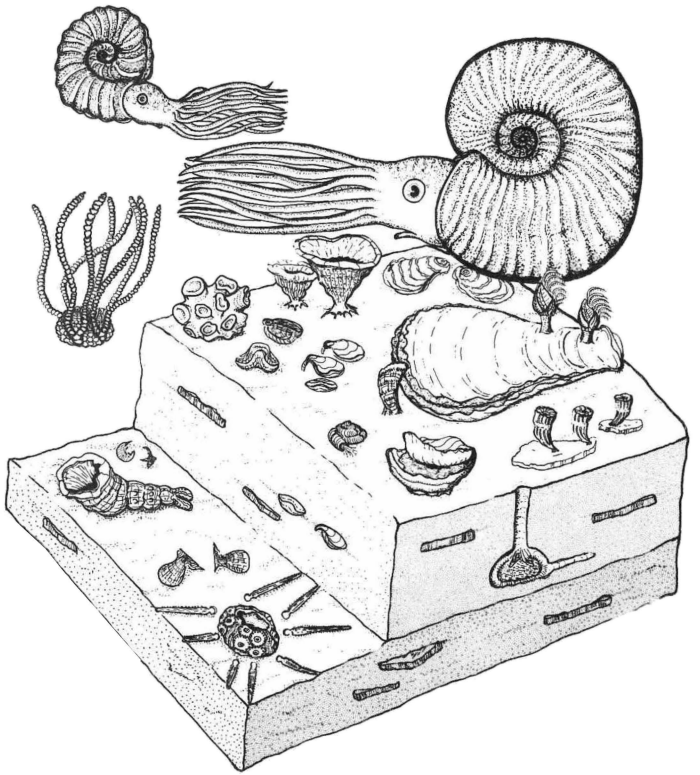

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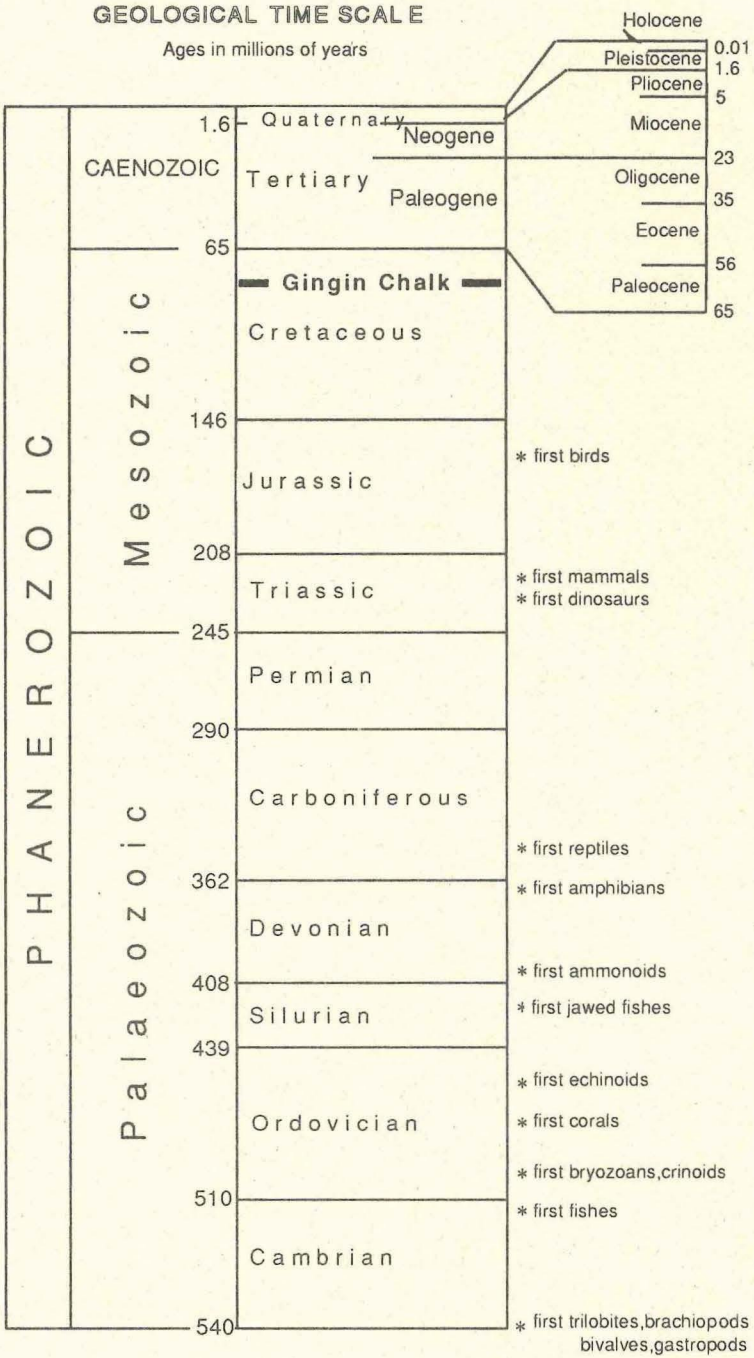
GEOLOGICAL TIME SCALE
Ages in millions of years
PHANEROZOIC
CAENOZOIC
Mesozoic
Palaeozoic
Quaternary
Tertiary
Neogene
Paleogene
Holocene
Pleistocene
Pliocene
Miocene
Oligocene
Eocene
Paleocene
0.01
1.6
5
23
35
56
65
1.6
65
Gingin Chalk
Cretaceous
146
Jurassic
208
Triassic
245
Permian
290
Carboniferous
362
Devonian
408
Silurian
439
Ordovician
510
Cambrian
540
* 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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