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P. R. KENLEY

THE OCCURENCE OF MARINE
CRETACEOUS SEDIMENTS IN THE
BELFAST NO. 4 BORE, PORT FAIRY

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Marine Cretaceous Sediments in the Belfast No.4 Bore,
Port Fairy

By P.R.KENLEY.

Introduction

The discovery of sediments containing marine shelly fossils including ammonites of Cretaceous age in a recent bore drilled by the Mines Department at Port Fairy greatly extends the known distribution of marine Cretaceous rocks in south-eastern Australia. The new occurrence is of ~~considerable~~ ^{considerable} interest to geologists in general and has ^{considerable} economic significance in the search for oil and underground water in Victoria. For these reasons it was thought desirable to publish a brief record of this new occurrence without delay. It is expected that detailed studies of the fossils and sediments will follow later.

Previous Work

Marine Cretaceous sediments had not been recognised in Victoria until 1955 when Baker ^{and Deflandre & Cookson} & Cookson ^{recorded} the occurrence of ^{spores and plankton} marine microflora ~~regarded as indicative~~ of an Upper Cretaceous age in samples from 5782 and 6192 feet in a bore at Nelson in the extreme south-west of the State. The lithologically uniform sandstones and occasional thin mudstones from 4500 feet to the bottom of the bore at 7305 feet were all regarded as being probably of Upper Cretaceous age.

The micro^{fossils}flora from these beds includes hystriosphærids, spores and dicotyledonous pollens (Cookson, 1953, 1956; Deflandre & Cookson, 1955; Cookson & Eisenack, 1958 and Cookson & Dettmann, 1958a); but as yet the only record of the occurrence of ^{definite} marine Animalia from Cretaceous deposits in Victoria is the somewhat doubtful record of Cyclammina from a depth of 5304 feet in this bore (Crespin, 1954, Pl.1).

Beyond Victoria the nearest point at which marine Cretaceous rocks have been recorded is at Loxton in South Australia where an impoverished microfauna of arenaceous foraminifera has been recorded from ^{a bore at depths of} 1410 and 1470 feet (Ludbrook, 1958, p.104). These rocks are regarded as being of Albian age (Cookson & Dettmann, 1958b, p.122).

The sediments at Loxton comprise dark greenish-grey glauconitic shales and dark-grey carbonaceous mudstones.

Between Loxton and Nelson Lower Cretaceous mudstones and fine-grained sandstones of lacustrine origin have been recorded from Robe, Comaum, Kanawinka, Dergholm and Killara Bluff (Cookson 1954; Cookson & Dettmann, 1958a, b; Medwell, 1954 and Kenley, 1954); but marine Cretaceous rocks are apparently lacking from a great deal of this area.

Stratigraphic Position of the Cretaceous Sediments

Bore No. 4, Parish of Belfast was drilled by the Mines Department Emisco deep well rotary rig to obtain
~~The bore was sunk by the Mines Department to obtain~~
underground water for the township of Port Fairy. ~~It was drilled~~
During drilling
~~with the Emisco deep well rotary rig and~~ lithological sampling was kept under constant geological supervision by K.J.Reed and *of the Victorian Geological Survey* R.C.Glenie. The following summary of the strata penetrated is based on the preliminary log of the bore by Reed and Glenie.

0	-	113 feet	Basalt and tachylite.
113	-	1380 "	Polyzoal marly limestone, marl and minor limestone, with occasional flint nodules. Glauconitic near base.
1380	-	1480 "	Black calcareous sandstone, and quartz sand.
1480	-	1516 "	Greenish-grey intraformational mudstone-breccia; calcareous.
1516	-	3556 "	Sand, sandstone, siltstone and dolomite.
3556	-	4550 "	Greenish-grey concretionary sandstone with some carbonaceous siltstone and sand. Contains thick-shelled molluscs and dolomitic concretions.
4550	-	4985 "	Black carbonaceous and micaceous siltstone with thin-shelled molluscs, some nacreous.
4985	-	5521 "	Mudstones and arkosic sandstones.

The basalt is of Newer Volcanic[^] (Upper Pliocene to Pleistocene) age. The polyzoal marls and marly limestones are presumably lithological equivalents of the Heytesbury Group of the Princetown area (Baker, 1953) and the Glenelg Group of the Mount Gambier Sunklands (Boutakoff and Sprigg, 1953) ~~and~~ These units ~~probably~~ range in age from Upper Oligocene to Middle Miocene. The beds from 1380 - 4550 feet probably correspond to sediments of the Wangerrip Group[^] and Knight Group[^], although they are ~~by not~~ ~~no means~~ typical of these lithological units in their type areas. The ^{Wangerrip and} Knight Groups range[^] in age from Palaeocene or Lower Eocene to Lower Oligocene[^].

The sediments in the bore from 4985 - 5521 feet show the typical lithology of the Otway Group. This group is now thought to embrace rocks of Jurassic to Lower Cretaceous age. The sediments ~~here~~ referred to as the Cretaceous[^] ^{in this paper} form an as yet unnamed formation in the depth range from 4550 - 4985 feet.

Fauna of the Cretaceous Sediments

Bore cores four inches in diameter taken in the siltstones in the depth range 4649 - 4655 feet contained numerous thin shelled microfossils and scattered nacreous shell fragments. The fauna is quite large but because of ^{original} incompleteness of the shells, crushing due to compaction of the sediments, and damage ^{caused by the} ~~suffered in~~ drilling only a few forms are determinable with any degree of certainty. The organisms so far identified are given below :-

Foraminifera - These have been separated by Dr. A. N. Carter and will be examined by him.

Pelecypoda - Several genera and species are represented, all of small, thin-shelled types, but none have as yet been identified. Inoceramus fragments which frequently form a conspicuous constituent of Cretaceous sediments have not been found.

Scaphopoda - Occasional specimens occur ^{in the samples} ~~including one~~ ~~species with longitudinal striation resembling Dentalium~~. There include at least one species with a longitudinally striated test.

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Gasteropoda - Two small Rissoid gasteropods are present. One of these bears clathrate ornament and is referable to the genus Merelina Iredale (recorded range Upper Oligocene to Recent). This is one of the most common fossils in the sediments. The other Rissoid, a smooth form, is represented by only one shell. It resembles living species of the genus Rissopsis Garrett.

A small Ringiculid shell which may be referred to the Cretaceous genus Eriptycha Meek is also fairly common. Its closest relations are with the New Zealand Senonian form E. punamutica Wilckens.

Pteropoda - ^{Occasional} Some small, smooth, thin-shelled imperforate conical shells thought to be pteropods are present.

Ammonoidea - At least five genera of ammonites are present, all represented by crushed incomplete shells, some showing nacreous preservation. ~~Most shells have suffered damage during drilling.~~

Only two specimens are sufficiently well preserved or complete to allow reliable identification to be made at even family level. One of these is a large, smooth, discoidal rather involute form with steeply inclined umbilical shoulders and sutures with deep, frilled, bifid saddles and lobes and numerous sutural elements. ^{Vic.} (Geol. Surv. Mus. Reg. Nos. 57520 - 57522). This form is referable to the family Placenticeridae Hyatt (Range Upper Albian - Maestrichtian) or the sub-family Cleoniceratinae Whitehouse (Range Upper Aptian - Middle Albianⁿ). The absence of the venter makes a more precise determination difficult, but the closest affinities of the shell appear to be with the smooth, more discoidal Upper Cretaceous members of the Placenticeridae.

Part of the body chamber of a large smooth discoidal ammonite exhibiting gently sinuous constrictions on the test (Reg. Nos. 57515 - 57516) ^{also belong to this species, but this uncertain.} may ^A belong to the same or another genus.

The other reasonably complete shell is a medium-sized moderately evolute conch with apparently rectangular whorl section and tubercles on the umbilical shoulders. ^{The specimen consists of} ~~This form is~~ represented by several fragments of one individual (Reg. Nos. 57515 - 57519), ^{in which} the venter of this shell is also incomplete.

This form has closest relationships with the Acanthoceratidae (Range Lower Cenomanian to Upper Turonian).

Annelida - Planispirally coiled annelid tubes referable to Tubulostium Stoliczka or Spirulaea Bronn are the most abundant invertebrate remains in the sediments. The tubes occur both isolated and attached to shells.

Of the described species the Port Fairy form bears the closest resemblance to Tubulostium discoideum Stoliczka from the Otatooor Formation (Cenomanian) of India (Stoliczka 1868).

Echinoidea - Several fragments of a single crushed echinoid have been found.

Pisces - Well preserved fish scales are abundant throughout the siltstones and occasional fish bones and teeth are also present. Representative specimens of the fish remains have been sent for examination to Dr. Errol I. White, Keeper of Fishes, British Museum of Natural History.

Plantae - Small plant fragments are present in several samples. The microflora is being examined by J.G. Douglas.

Trails - Trails or burrows ("fucoidal markings") of mud burrowing or mud-eating organisms, probably polychaete worms, are abundant throughout the sediments.

Age of Fauna

Despite the striking lithological resemblance of these sediments to the siltstones of the Roma (Aptian) and Tambo (Albian) Formations (Personal communication Dr. R.O. Brunnschweiler and L.S. McEachern) none of the fossils recognised have been described from the Cretaceous of the Great Artesian Basin. The faunas of the Western Australian Cretaceous also appear to be quite distinct.

The fossils in the core from 4649 - 4655 feet undoubtedly indicate a Cretaceous age, but more precise dating is difficult from the present evidence. The similarity of the Port Fairy Eriptycha and Tubulostium to described Upper Cretaceous forms and the distinctly Upper Cretaceous aspect of the better preserved ammonites ^{favours} ~~lend me to suggest~~ an Upper Cretaceous age for the deposits cored.

The sediments in the depth range 4550 - 4985 feet which on the basis of chippings screened from the drill sludge are of identical lithology to the core, are assumed to be of the same general age.

Remarks

The fauna is marked by a variety of nektonic, planktonic and benthonic organisms in which small thin-shelled forms are predominant. The association of this varied fauna with pyrites and abundant carbonaceous material in the sediments ^{is unusual} ~~indicates some~~ peculiarity of sedimentary environment, ^{and is thought to indicate some peculiarity of the sedimentary environment.} the nature of which has not yet been established.

R.C.Glenie and K.J.Reed have drawn the attention of the writer to the occurrence of lithologically similar rocks in the lower part of the Portland No.5 bore. ^{the existence of this} It is important that this possible link between the Nelson and Port Fairy occurrences of marine Upper (?) Cretaceous rocks should be confirmed or disproved.

To gain a better understanding of the distribution of the Cretaceous sediments and the structure of the sedimentary basins in Western Victoria.

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