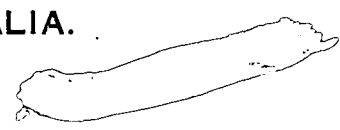


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No. 1955/115

PRELIMINARY REPORT ON THE MICROPALAEONTOLOGY AND
STRATIGRAPHY OF GIRALIA NO. 1 TEST BORE
CARNARVON BASIN, WESTERN AUSTRALIA

By I. Crespín

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Sixty-six cores out of seventy-seven taken during drilling operations and at almost complete sequence of cuttings from Giralia No. 1 Test Bore were submitted for micropalaeontological examination by West Australian Petroleum Pty. Ltd. This collection of cores from one individual bore is the most complete received for examination since the drilling campaign commenced in the Carnarvon Basin in 1953. As a result, a unique picture of the stratigraphical sequence in the Giralia area has been revealed. The first core was taken at 280-290 feet and the last one, No. 77, at 4,082-4,087 feet, and cuttings came from approximately every ten feet. Coring was continuous from 280 feet down to 390 feet, the cores being labelled Nos. 1 to 11. The present micro-examination has been based mainly on the cores but where it has been necessary to find the upward limiting depth of a lithological unit or the upward limiting depth of certain species of foraminifera, use has been made of cuttings.

Because of the hardness of the sediments in the cores from the pre-Cretaceous sequence, the preparation of the material for micro-examination involved much strenuous work. Firstly, the rock was crushed, then soaked in petrol for some time; later the residue was washed in water and dried. The result of this method has been very satisfactory, as is illustrated by the magnificent micro-faunas that have been found in Cores Nos. 12, 14 and 15 and in Cores Nos. 66 and 67.

In this preliminary report, no detailed lists of foraminifera are given. An earlier report on the foraminiferal content of Core 66 at 3,115-3,120 feet and Core 67 at 3,220-3,224 feet was given on 19/7/55. A summary of results of this micro-examination of all cores and certain cuttings from Giralia No. 1 Test Bore is attached. A few notes of elaboration regarding the stratigraphical sequence and foraminiferal assemblages are added here.

No core was taken until the bore had reached the depth of 280 feet. However, cuttings were available from the surface down to that depth. The bore commenced in the Windalia Radiolarite, fragments of the typical siltstone being present in the cuttings down to the depth of 50 feet. A few tests of arenaceous foraminifera and a few radiolaria were present. The writer is still inclined to the view that the beds of the Windalia Radiolarite are Upper Albian (Lower Cretaceous) in age rather than Cenomanian (basal Upper Cretaceous). All determinable species are characteristic of the assemblage found in the Lower Cretaceous deposits of the Great Artesian Basin. Brunnenschweiler, on available evidence of macro-fossils, commented that the fragmentary ammonites had either upper Albian or Cenomanian affinities (see Condon, 1954).

At the depth of 50 feet the bore passed into a grey siltstone; glauconitic and sideritic material is common in the siltstone from 100 feet down to 340 feet. These 290 feet of sediments are regarded as belonging to the Muderong Shale. The first core was taken at 280-290 feet and six cores numbered 1-6 were taken between that depth and 340 feet. Foraminifera and radiolaria were present throughout. Two assemblages of foraminifera were recognised, an upper one which is dominated by small calcareous species and was found in the cuttings from 50 feet down to 100 feet and a lower one which is dominated by arenaceous species and which was found in cores 1 to 6, from 280 feet down to 340 feet.

The upper assemblage consists of numerous small, well preserved species including Anomalina mawsoni Crespin, Epistomina australiensis and Valvulineria infracretacea Crespin as well as several species of the family Lagenidae and a few tests of arenaceous species. Such an assemblage of calcareous species has previously only been found in the Lower Cretaceous (Aptian) deposits of the Great Artesian Basin (Crespin, 1953, 1955) and it is suggested that as far as the foraminifera are concerned, this is the first time that a fauna of definite Lower Cretaceous age has been proved for the Muderong Shale.

The second assemblage, found in the beds from 280 feet down to 380 feet, is dominated by small tests of arenaceous foraminifera, usually crushed or deflated. Species previously found in outcrops of the Muderong Shale are present and include Ammobaculites fisheri Crespin, A. minimus Crespin, Verneuilina howchini Crespin, Spiroplectammina cushmani Crespin and Textularia anacooraensis. A few radiolaria are present but chiefly as glauconitic casts. The close sampling in the Giralia No. 1 Test Bore has revealed, for the first time in the Carnarvon Basin deposits, the above stratigraphical sequence of Lower Cretaceous foraminiferal assemblages. This sequence is closely comparable with that proved by the writer during the examination of material from forty-three bores in the Great Artesian Basin of Northern New South Wales (Crespin, 1955). It is suggested here that the surface samples of Muderong Shale previously examined and which contained abundant arenaceous foraminifera represents only the lower part of the formation.

At 340 feet the bore passed into unfossiliferous sandy siltstone and glauconitic sandstone which persisted down to 370 feet. This thickness of 30 feet was covered by Cores 7, 8 and 9. These beds are referred to the Birdrong Formation.

Core 10 at 370-380 feet consists of fine sand and a coarse brown siltstone. This core probably represents the contact between the Birdrong Formation (Lower Cretaceous) above and the grey micaceous sandy siltstone of Permian age below.

Core 11 at 380-390 feet exhibits a marked lithological and micropalaeontological change from the overlying beds. The beds down to 700 feet consist of grey sandy siltstone, in places micaceous. Six cores, Nos. 11 to 16, were taken in this footage and intervals between cores were well represented by cuttings. Fragments of the characteristic Permian foraminiferal genus Hyperamminoides were present in Core 11. A rich assemblage of well preserved foraminifera occur in Core 12 at 440-450 feet, Core 14 at 560-570 feet and Core 15 at 620-630 feet and in some of the intervening

cuttings. Fronicularia woodwardi Howchin and F. parri Crespin are present as well as new species of Fronicularia. New species of Nodosaria are also present as well as Nodosaria springsurensis Crespin and N. serocoldensis Crespin. The genus Cornuspira, rare in the Palaeozoic rocks throughout the world, is represented by a new species. Cores 14 and 15 and the cuttings at 550-560 feet contain the first occurrence in the Permian of the Carnarvon Basin of what is possibly a new genus of endothyrid foraminifera which are characteristic of the Upper Palaeozoic rocks outside Australia. A definite determination of this form is awaited from Dr. M. L. Thompson, University of Kansas, an authority on endothyrid foraminifera. This assemblage of species has not been recorded from any surface samples collected from Permian localities in Western Australia.

At 700 feet the bore passed into grey to dark grey and in places brown carbonaceous siltstone and sandy siltstone, with a little mica and some lamination, which extended down to 1,545 feet. Fourteen cores, Nos. 17-28, 32 and 33 were taken over this thickness of 845 feet and cuttings covered the intervals between them. A few foraminifera including Hyperamminoides were present.

At 1,545 feet there is a distinct lithological change. From that depth down to 2930 feet, the sediments consist of grey to dark grey micaceous fine-grained quartz greywacke sandstone with a few medium-grained and coarse-grained beds with numerous thin laminae of carbonaceous material. Twenty-three cores, Nos. 35, 37, 39, 40-44, 46-52, 57-63, were taken over this interval of 1,385 feet and cuttings were collected at regular intervals between cores. No fossils were obtained from this interval.

At 2,930 feet the bore passed into dark grey to black carbonaceous sandy siltstones with a little shale, calcareous bands and some bryozoa. These beds extended down to 3,980 feet. Eleven cores, Nos. 64-68, 69-74, were taken over this thickness of 1,050 feet, and cuttings came from regular intervals. Although the lithology throughout this thickness is comparatively uniform, the beds have been divided into two units, based on microfaunal evidence. The upper unit is from 2,930 feet down to 3,400 feet and includes cores 64, 65, 66, 67 and 68. The lower unit is from 3,400 feet down to 3,980 feet and includes cores 69, 70, 71, 72, 73 and 74.

The upper unit contains a rich assemblage of foraminifera together with crinoid ossicles, bryozoa and ostracoda. This rich fauna was present chiefly in Core 66 at 3,115 to 3,120 feet and Core 67 at 3,220-3,224 feet. It contains many species of foraminifera well known in the Callytharra Formation such as Calcitornella stephensi (Howchin), Trepeilopsis grandis (Cushman and Waters), Hemigordius schlumbergeri Howchin, Geinitzina triangularis Chapman and Howchin and Nodosaria irwinensis Howchin. New species of Geinitzina, Fronicularia and Nodosaria are present as well as a new genus, Tetrataxis conica Ehrenberg, a well known Carboniferous species, is represented by several well preserved specimens. However, the most important discovery in this assemblage is that of a minute form possibly referable to the fusuline genus Pseudostaffella, of which at least 90 tests have been found. Dr. M. L. Thompson, who first described that genus in 1942, is assisting the writer in the study of this form. Further news of his opinions should be available shortly. However, it is of considerable importance that the assemblage of species found in Cores 66 and 67 has not been found in surface material in the Carnarvon Basin nor elsewhere in Western Australia. The available foraminiferal evidence would seem to indicate that these beds are older than the Artinskian age generally accepted for the Callytharra Formation. As

the Lyons Group, which underlies the Callytharra Formation and also these beds, is generally regarded as of Sakmarian age, the alternative explanation of an extended range of the foraminifera must be considered.

The beds from 3,400 feet down to 3,980 feet although of the same general lithology as the unit described above, contained few foraminifera. Hyperamminoides was recorded. Core 73 at 3,820-3,825 feet consisted of a hard grey crystalline bryozoal calcarenite. The bryozoa was too altered for determination.

Core 75 at 3,980-3,985 feet and cuttings down to 4,035 feet consist of a siltstone with calcite and a little pyrite. It probably represents a formation between the above beds which may be the equivalent of the Callytharra Formation and the underlying Lyons Group.

At 4,035 feet the lithology changes again and from that depth down to the base of the bore at 4,087 feet, the beds consist of grey siltstone of tillitic texture. Two cores Nos. 76 and 77 were taken at 4,035-4,040 feet and 4,082-4,087 feet respectively. This lithology is most probably referable to the Lyons Group.

References

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APPENDIX

NOTES ON MACRO-FOSSILS

by J. M. Dickins

The few macro-fossils that were available in the cores from the pre-Cretaceous rocks were examined and the following determinations made:

Core No. 33 - 1540-1545 feet

Fragment of large pelecypod. The shell is composed of prisms just visible to the naked eye. The genus is not determinable.

Core No. 64 - 2930-2935 feet

Pelecypoda - Nuculana sp.
Crinoid ossicles

This species of Nuculana is not referable to any known from the Carnarvon Basin.

Core No. 66 - 3115-3120 feet (Pseudostaffella horizon)

Bryozoa: Fragments covered with a film of fine mud so that their structures are not visible.

Crinoid ossicles

Brachiopoda: (examined by Mr. G. A. Thomas)

Athyridae gen indet.

Cancrinella sp.

Dielasma sp. indet.

Spiroferacea gen. et sp. indeterminate

Pelecypoda:

Astartila sp. nov. (Shells of this type are known from Carboniferous and Permian rocks. This species is not comparable with any known from Western Australia. Astartila is not known from the Callytharra Formation.

Core No. 67 - 3220-3224 feet (also? Pseudostaffella horizon)

Bryozoa

Brachiopoda:

Cleiothyridina? sp.

Dielasma? sp.

Conclusions

The brachiopoda from Cores Nos. 66 and 67 are in some cases too fragmentary for generic determination. They indicate only that the rocks are of Carboniferous or Permian age.

The two pelecypoda, Nuculana sp. and Astartila sp. nov., although represented only by single specimens are well preserved. Forms of these types occur in Carboniferous and Permian rocks but these two species are not referable to any forms known from the Permian of Western Australia. Bryozoa are plentiful and may be useful for correlation if internal structures are preserved.

SUMMARY OF RESULTS OF MICROPALAEONTOLOGICAL EXAMINATION OF CORES AND CUTTINGS FROM GIRALIA NO. 1 TEST BORE

Cores and/or Cuttings	Thickness of Formational Unit	Lithology	Microfauna Content	Probable Equivalent Formation in Carnarvon Basin	Age
Cuttings	0'-50'	Green radiolarite	A few crushed arenaceous foraminifera, radiolaria	Windalia Radiolarite	Lower Cretaceous (Upper Albian)
Cores 1, 2, 3, 4, 5, 6 and cuttings	50'-340'	Grey siltstone, partly glauconitic, sideritic, micaceous	(a) numerous small calcareous foraminifera, <u>Anomalina mawsoni</u> , <u>Epistomina australiensis</u> , <u>Valvulineria infracretacea</u> , many <u>Lagenidae</u> , few arenaceous species. Radiolaria (b) numerous crushed arenaceous foraminifera, <u>Ammonobaculites fisheri</u> , <u>A. Minimus</u> , <u>Verneuilina howchini</u> , <u>Spiroplectammina cushmani</u> , <u>Textularia anacooraensis</u> , Radiolaria	Muderong Shale	Lower Cretaceous (Aptian)
Cores 7, 8, 9	340'-370'	Sandy siltstone at top; glauconitic sandstone	No microfossils	Birdrong Formation	Lower Cretaceous
Core 10	370'-380'	Fine sand and coarse brown siltstone	No microfossils	Contact	
Cores 11, 12, 13, 14, 15, 16 and cuttings	380'-700'	Grey sandy siltstone sometimes micaceous	Numerous foraminifera <u>Fronicularia woodwardi</u> , <u>F. parri</u> , new species of <u>Nodosaria</u> , <u>Fronicularia</u> and <u>Cornuspira</u> ; also new endothyrid genus, ostracoda	? Byro Group	Lower Permian
Cores 17-20, 21-28, 32, 33, and cuttings	700'-1545'	Grey to dark grey, sometimes brown, carbonaceous siltstone and sandy siltstone, sometimes laminated	Few foraminifera fragments of <u>Hyperamminoides</u>		
Cores 35, 37, 39, 40-44, 46-53, 57-63 and cuttings	1545'-2930'	Grey micaceous fine-grained quartz greywacke with fine bands of carbonaceous material	No microfossils		
(a) Cores 64, 65, 66, 67, 68 and cuttings	2930'-3400'	Dark grey to black carbonaceous sandy siltstone with coquinooid laminae	Rich foraminiferal assemblage. <u>Calcitornella stephensi</u> , <u>Nodosaria irwinensis</u> , new species of <u>Nodosaria</u> , <u>Fronicularia</u> , <u>Geinitzina triangularis</u> , <u>Geinitzina</u> sp. nov., <u>Tetartaxis conica</u> , new genus? <u>Pseudostaffella</u> , Bryozoa, ostracoda	? Callytharra Formation	
(b) Cores 69, 70, 71-74 and cuttings	3400'-3980'	Dark grey to black carbonaceous siltstone with crystalline bryozoal limestone in Core 73 thin bands of shale	Foraminifera, rare fragments of <u>Hyperamminoides</u> , bryozoa		
Core 75 and cuttings	3980'-4035'	Siltstone with calcite & pyrite	No microfossils		
Cores 76, 77 and cuttings	4035'-4087'	Grey sandy siltstone, tillitic	No microfossils	Lyons Group	?