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DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY

KARKARO NO. 1 STRATIGRAPHIC BOREHOLE : MICROPALAEONTOLOGICAL STUDY OF PERMIAN SECTION

by

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SUMMARY

No foraminifera or other fossils were found in the lowest part of the Mt. Toondina Beds, as identified on lithological and geophysical criteria. Immediately below the contact (990 feet) with Unit 1 (i.e. partly equivalent to and presumably continuous with the Stuart Range Beds) there are abundant arenaceous foraminifera, very low diversity and dominated by Ammodiscids. In this aspect the assemblage is new and its interpretation therefore remains uncertain. There is a decrease in specimen numbers below the uppermost 20 feet but the assemblage was found in all cuttings samples examined down to 1340 feet., i.e. throughout Unit 1. No fossils were found below Unit 1. These results are consistent in part with previous studies in the Arckaringa Sub-basin but peculiarities in faunal composition and distribution show that this "marine interval" is still more variable in biofacies than was known previously.

INTRODUCTION

S.A.G. Karkaro No.1 was drilled as a stratigraphic test at 133°46'27"E, 28°35'58"S in the Arckaringa Sub-basin. Of the 1579 ft. drilled, all but the first 230 feet. (Lower Cretaceous) was in a Permian sequence. For the sedimentary section, Gamma Ray and Neutron profiles, and the suggested stratigraphic correlation and subdivision based on these data, reference is made to Demaison (1). Demaison has classified the section in terms of the succession encountered in Cootanarina No. 1 as follows:

230-990 feet Mt. Toondina Beds.

990-1330 feet Unit 1

1330-1550 feet Unit 2

Unit 2 and Unit 1, "Carboniferous to Permian" in age according to Demaison, have in fact been dated palynologically as Lower Permian (3).

In the study reported herein, a search was made of washed residues across the Mt. Toondina/Unit 1 contact, through Unit 1 and into Unit 2. Cuttings, available at ten-foot intervals, were used mostly; also cores 2, 4 and 5.

RESULTS

(1) Cuttings 940-950 ft., 960-970 ft., 980-990ft.

No fossils found.

(2) Cuttings 990-1000ft., 1000-1010ft.

In both samples abundant foraminifera were found. Of approximately 170 and 210 specimens respectively, about 90% belong to the family Ammodiscidae. Of these in turn, most appear to be Ammovertellina glomospiroides Ludbrook although many specimens are large and not typical of this species. Tolypammina undulata Parr is present as is probably Glomospira adhaerens Parr. However, specimen-by-specimen discrimination of the various species will require more study.

Fragments of the family Astrorhizidae (Hyperammina hebdenensis Crespin, Hyperammina acicula Parr) make up the remainder.

Ammodiscus was not found, nor were the various members of the Lituolacea and the Saccamminidae known from the South Australian Permian (4,3).

(3) Cuttings 1010-1320ft., 17 samples examined. Core 2, samples from 1030ft. 6 in. and 1033ft.

The same arenaceous fauna as above was found throughout Unit 1, including the core samples. At no level is the abundance in the 990-1010 feet interval attained although there are fluctuations in specimen numbers. The fauna is dominated by Ammodiscids of the same type as above. As in other known sections, there are no faunal changes on which successional biostratigraphic units might be recognised. Specimens were found in all samples examined, but they occur sparsely between 1070 and 1120 feet and below 1270 feet. Although rotary cuttings are the only basis for dis-

tribution, it can be said that a restricted foraminiferal fauna occurs throughout Unit 1 with a distinct increase at the top. Contamination during drilling would, as at Cootanoorina, blunt this trend rather than sharpen it; also the recovery of specimens is too consistent to be ascribed to continual caving from the 990-1010 ft. interval.

(4) Cuttings 1330-1340 ft., 1380-1390ft. Core 4, 1425'6",
Core 5, sands at 1553'4" and 1560'2".

One specimen of cf. Hyperammina at 1330-1340ft., otherwise no fossils found.

DISCUSSION

The sudden appearance (down sequence) of foraminifera in some abundance below 990 ft. supports the lithological and geophysical evidence that this is the Mt. Toondina/Unit 1 contact.

The base of Unit 1 at 1330 ft., also well marked lithologically and geophysically and distinct in washed residues, marks the lower limit of foraminifera.

The Karkaro section accordingly provides further confirmation of the broad, three-fold division of the Permian in the Arckaringa-Boorthanna tectonic regime, with Unit 1, including almost all the palaeontological evidence for marine conditions, between the coarse, poorly sorted but sometimes graded beds below and the Mt. Toondina Beds above. In detail, however, correlations are not possible as yet. The 990-1330ft. interval in Karkaro obviously is equivalent broadly to the Stuart Range Beds (4), as in Unit 1 elsewhere, but the Karkaro section is distinct in two respects.

(a) The sudden disappearance (up section) of a foraminiferal fauna with abundant specimens at the base of the Mt. Toondina Beds, as identified on other criteria (1), was not known previously. In Lake Phillipson Bore (5)the Stuart Range Beds as defined (4) contain foraminifera only in the lowest 88 ft. of the 1613 ft. section; in Stuart Range No. 3 foraminifera disappear more than 100 ft. below the identified contact (4, 6); and in Cootanoorina No.1, the other example of a very sudden faunal cut-off, this happens for other reasons 500 ft. below the Mt. Toondina Beds (3).

(b) In lacking Lituolids and Saccamminids, in the high specimen numbers and low diversity, and in the great dominance of Ammovertellina glomospiroides, the Karkaro fauna is quite unlike the others. It is closer to the assemblage at 500-530 ft. in the Minlaton Bore (7) but even this is relatively diverse.

Low foraminiferal diversity and high dominance indicates marginal marine conditions; the environment at Karkaro apparently remaind "less marine" than the "most marine" intervals at Stuart Range and Cootanoorina. Further, "marginal marine" implies considerable lateral variation in environment, and this is clearly eivdent now within what is identified as Stuart Range Beds or Unit 1 (irrespective of certain necessary boundary adjustments). That is, a unity of biofacies is discernable on the basis of a restricted marine-type fauna, but this unity is lacking at a more detailed level. A small change in sediment influx or in salinity would alter the delicate environmental balance and the fauna could change or disappear. The change at the top of Unit 1 at Karkaro may well be from marginal marine to nonmarine, but could also be a stronger "continental imprint" on a marine situation with nonmarine conditions developing later. In either case the regressive trend is evident and postulation of a hiatus, as invoked in channel scouring at Mt. Furner (1), is not necessary here. The final disappearance of the marginal marine environmental complex can hardly be assumed to have significance in time correlation. The Unit 1/Mt. Toondina contact probably is older at Karkaro than at Cootanoorina and in the other sections known except Mt. Furner. Study of the Mt. Furner and Wallira sections is in progress.

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REFERENCES

(1) DEMAISON, G., 1969. Stratigraphic drilling in Arckaringa Sub-basin Quart. Geol. Notes. Geol. Surv. S.Aust. 31 (in press).

(2) WOPFNER, H. and ALLCHURCH, P.D., 1967. Devonian sediments enhance petroleum potential of Arckaringa Sub-basin. Australas. Oil Gas. J. 14 (3): 18-32.

(3) HARRIS, W.K. and McGOWRAN, B., 1968. S.A.G. Cootanoorina No.1 Well: Upper Palaeozoic and Lower Cretaceous Micropalaeontology. Rept. Geol. Surv. S.Aust., G.S. 3895, Pal. Rep. 1/68. (Unpub.)

(4) LUDBROOK, N.H., 1967. Permian deposits of South Australia and their fauna. Trans. R. Soc. S.Aust., 91: 65-92.

(5) LUDBROOK, N.H., 1961. Permian to Cretaceous subsurface stratigraphy between Lake Phillipson and the Peake and Denison Ranges, South Australia. Ibid. 85: 67-80.

(6) LUDBROOK, N.H., 1967. Stuart Range No. 3 bore, Coober Pedy: stratigraphy and micropalaeontology. Min. Rev. Adelaide 122: 28-32.

(7) LUDBROOK, N.H., 1965. Minlaton and Stansbury Stratigraphic bores. Appendix to CRAWFORD, A.R., The Geology of Yorke Peninsula. Bull. Geol. Surv. S.Aust., 39: 83-96.