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RECORDS.

1962/115

MICROFOSSILS ASSOCIATED WITH THE "BUNDAMBA GROUP" OF THE SURAT BASIN, QUEENSLAND

by

P.R. Evans

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CONTENTS

SUMMARY

Hystrichosphaeridea have been recovered from a number of subsurface locations in the Jurassic "Bundamba Group" of the Surat Basin. Foraminifera were associated with the Hystrichosphaeridea in U.K.A. Moonie No. 1 Well. On present knowledge of the distribution of these microfossils, the occurrences signify that at least a portion of the sediments of the "Bundamba Group" were deposited under a saline rather than a freshwater environment.

INTRODUCTION

One of the sidewall cores from A.A.O. Pickanjinnie No. 2 Well, Surat Basin (text fig. 1), which had been submitted by the company for palynological examination in February 1961, contained abundant hystrichospheres among Jurassic spores. The core had been taken from the "Bundamba Group"*. An attempt failed by the company geologists to pick the same horizon by electric log correlation and to take sidewall cores from it in A.A.O. Combarngo No. 1 Well. However, in August 1961 a shot-hole sample from the subsidized A.A.O. Injune-Wallumbilla Seismic Survey (no report yet available) yielded the same species of hystrichospheres as Pickanjinnie No. 2. In September 1961 the horizon was identified and sampled in A.A.O. Winnathoola No. 1 Well.

The recognition of hystrichospheres at localities within the "Bundamba Group" almost 80 miles apart meant that the supposition of a freshwater origin for the Bundamba Group (Bryan & Jones, 1946; Whitehouse, 1955; Hill & Denmead, 1960) could no longer be held for a part at least of the unit and that the original environment of deposition of the hystrichospherid beds was either brackish or marine in character.

Up to that point no opportunity had occurred to examine the horizon for marine microfossils other than hystrichospheres owing to the small size of sidewall cores, but, when a core from the "Bundamba Group" in U.K.A. Moonie No. 1 Well yielded in December 1961 the same species of Hystrichosphaeridea as Pickanjinnie No. 2, there was sufficient material available for the determination of the associated presence of foraminifera (Terpstra, Appendix II).

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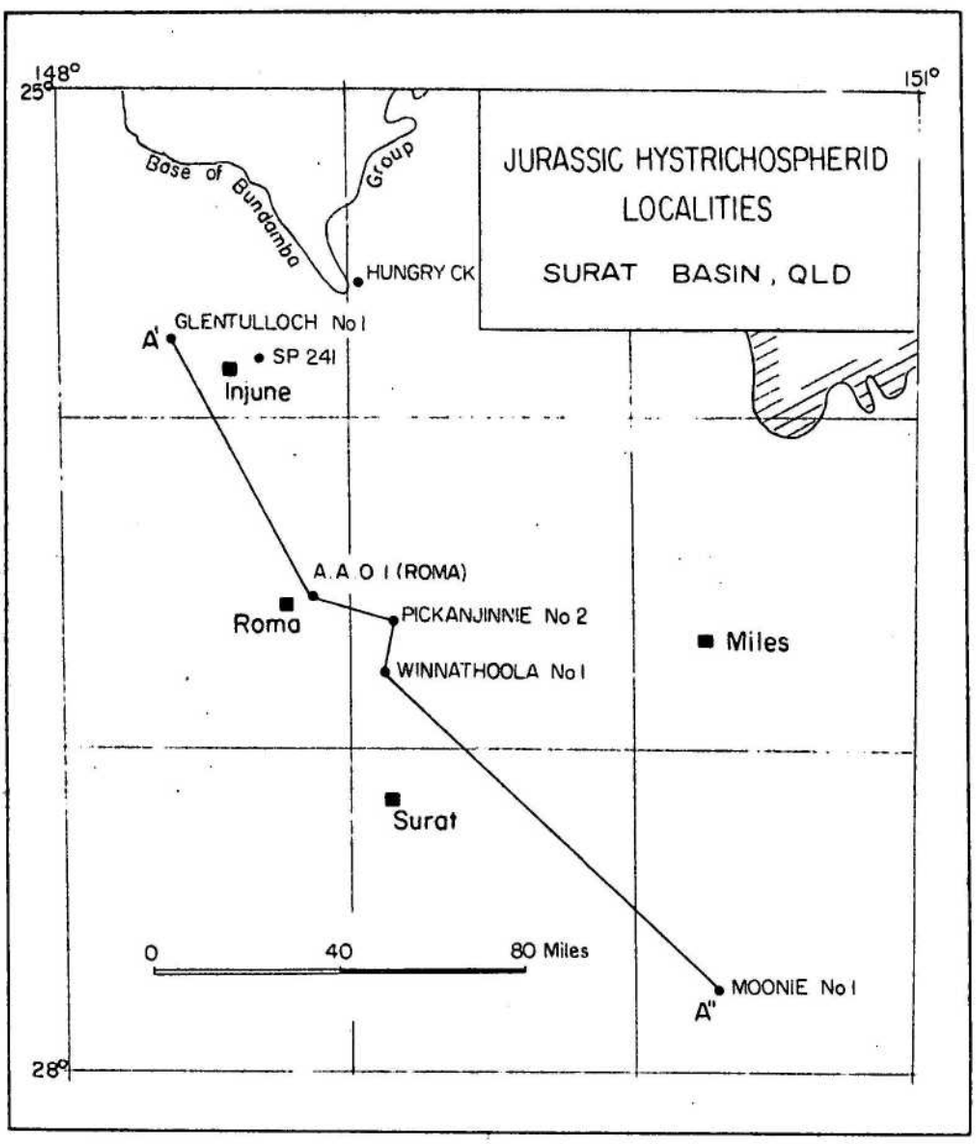
* "Bundamba" is becoming an increasingly unsatisfactory name to apply to a part of the Great Artesian Basin. At the risk of prolonging confusion, "Bundamba Group" is taken to include the Hutton Sandstone, (as in the Bundamba Series of Reeves, 1947) as it is usually not possible to distinguish this formation from the underlying Boxvale Sandstone (top of the Bundamba Group of Whitehouse, 1955) in subsurface sections.



Text fig.1. Location of the test wells, seismic shot-holes and outcrop from which hystrichospheres have been extracted. For details of section A'-A" see text fig. 2.

Subsequently cores from the Jurassic "Bundamba Group" of A.A.O. Glentulloch No. 1 and A.A.O. No. 1 (Roma) Wells and a sample from outcrop below the waterfall on Hungry Creek (34 miles north-east of Injune) of strata from either the "Bundamba Group" or older have yielded hystrichospheres.

STRATIGRAPHIC POSITION OF HYSTRICHOSPHERID BEDS

Hystrichosphaeridea bearing samples have been taken from the following localities (text fig. 1):

A.A.O. No. 1 (Roma) Well

Core at 2717 ft

Micrhystridium sp. (not sp. A).

Core at 3557 ft

Micrhystridium sp. A.

A.A.O. Glentulloch No. 1 Well

Core 4, 994 ft

Micrhystridium cf. sp. A.

A.A.O. Pickanjinnie No. 2 Well

swc 3852 ft

Micrhystridium sp. A.
Multiplicisphaeridium sp.
Veryhachium sp.

This is the most abundant occurrence of microplankton known so far in the "Bundamba Group". (13% relative to spores and pollens in a count of 136 specimens).

A.A.O. Winnathoola No. 1 Well

swc 4250 ft

Micrhystridium sp. A.
Multiplicisphaeridium sp.

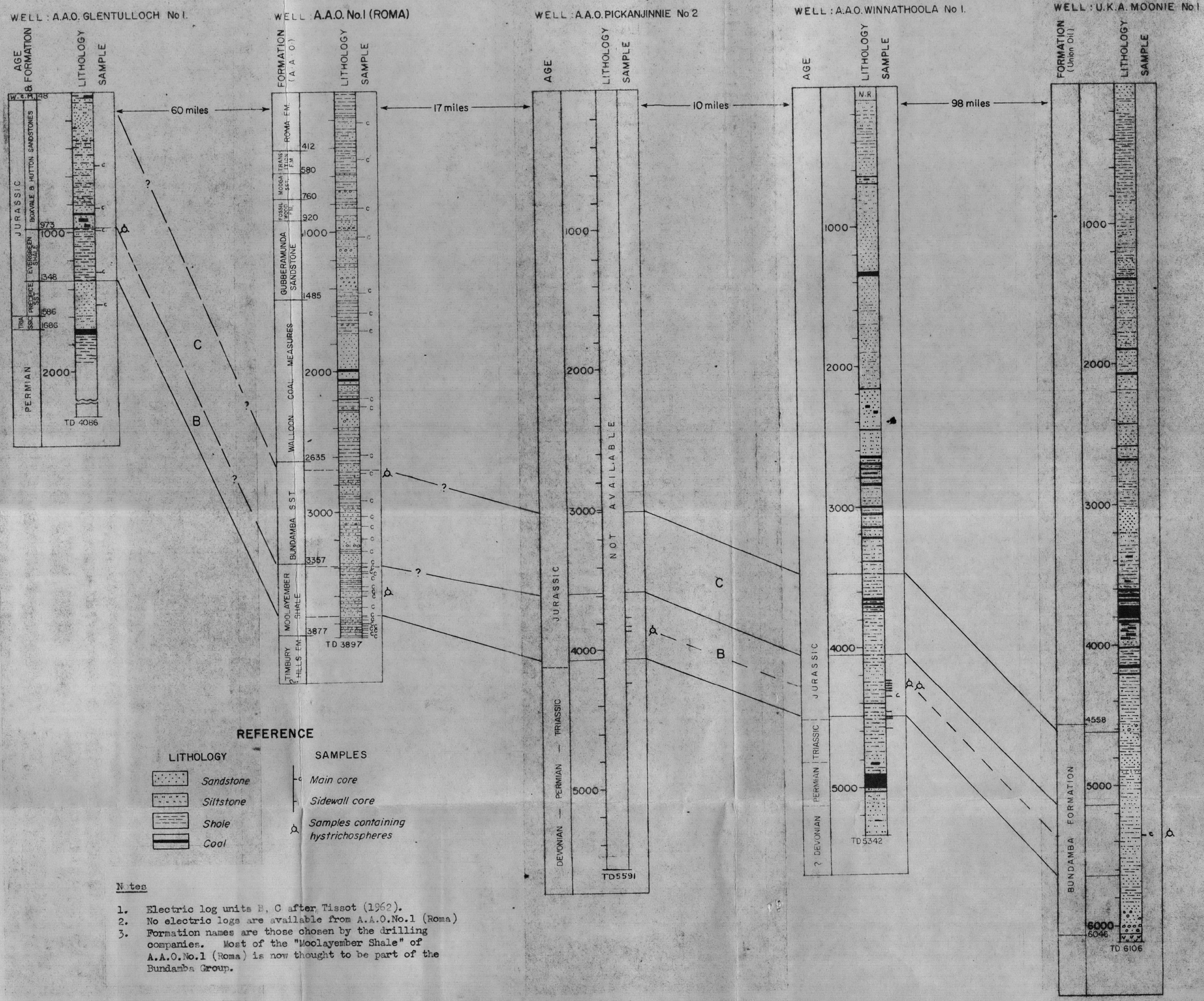
swc 4266 ft

Micrhystridium sp. A.

Text fig. 2

HYSTRICHOSPHERID HORIZONS, SURAT BASIN

SECTION A'– A'' GLENTULLOCH No 1 - MOONIE No 1



REFERENCE

LITHOLOGY

- Sandstone
- Siltstone
- Shale
- Coal

SAMPLES

- Main core
- Sidewall core
- Samples containing hystrichospheres

Notes

1. Electric log units B, C after Tissot (1962).
2. No electric logs are available from A.A.O.No.1 (Roma)
3. Formation names are those chosen by the drilling companies. Most of the "Moolayember Shale" of A.A.O.No.1 (Roma) is now thought to be part of the Bundamba Group.

Bureau of Mineral Resources, Geology and Geophysics May 1962

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M(S)/6

U.K.A. Moonie No. 1 Well

Core 4. Three samples from the core were examined: from 5353 ft 3 in. - 7 in.; 5354 ft 1 in. - 3 in.; 5354 ft 7 in. - 10 in. Only the lowest piece contained microplankton. It is probably significant that foraminifera were also found only at this depth. (Appendix II).

Injune - Wallumbilla Seismic Survey Traverse Injune - Scott Creek,

SP241 bottom of hole sample, depth 95 ft

Micrhystridium sp.
Multiplicisphaeridium sp.

Outcrop at the base of the waterfall on Hungry Creek, (Taroom 4-mile, G55/8; 182817) 34 miles north-east of Injune. (Coll. Mines Administration Pty Ltd).

Veryhachium sp.
Micrhystridium sp.

The section of text fig. 2 demonstrates the position of each fossiliferous horizon in the well sections relative to electric log correlations (Tissot, 1962), which closely follow palynological horizons. At least three horizons containing hystrichospheres are present in the area although only the middle one is known at more than one locality. Combined, they cover a major proportion of the "Bundamba Group" and possibly most of the Moolayember Shale and Clematis Sandstone.

The three horizons are located:

(i) in the Triassic* at Hungry Creek either in the base of the Precipice Sandstone or possibly in strata as old as the Clematis Sandstone.

(ii) in the Jurassic* of Moonie No. 1, Pickanjinnie No. 2, Winnathoola No. 1, A.A.O. No. 1 (Roma), Injune SP241, Glentulloch No. 1 (close to the first appearance of Callialasporites spp. and in the Evergreen Shale).

(iii) in the Jurassic of A.A.O. No. 1 (Roma) close to the top of the "Bundamba Group".

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* The full reasons for these age determinations are not supplied as they will be given in other papers, but the Triassic age of the Hungry Creek outcrop is determined principally on the abundant "Pteruchipollenites" which characterize the Middle-Upper Triassic of eastern Australia. The Jurassic age of the other samples is determined by the presence of Lycopodiumsporites spp., Podocarpidites spp., Cyathidites spp. and Classopollis (typically abundant, although it reaches its acme in the underlying Precipice Sandstone = Hospital Hill Links Sandstone).

The correct stratigraphic position of the oldest hystrichospherid horizon (i) is still debatable. Reeves (1947) mapped the outcrop at Hungry Creek as Bundamba Sandstone (= Precipice Sandstone, Whitehouse, 1955). The palynological determination of a Jurassic age for probably all of the Precipice Sandstone in Glentulloch No. 1 means that this Triassic outcrop must be in either an older part of the "Bundamba Group" than is present at Glentulloch No. 1 or within an older formation. S. Derrington of Mines Administration Pty Ltd (pers. comm.) who submitted the sample for examination and the author consider from aerial photographs that the outcrop is probably no younger than basal Precipice Sandstone. Reeves (1947) mapped the Carnarvon (= Clematis) Sandstone immediately under the Precipice Sandstone 2½ miles to the west of Hungry Creek - the Moolayember Shale that intervenes elsewhere is not present - and it is possible that the sample is from an inlier of the Clematis Sandstone. Careful mapping and sample collection in the area is required to resolve this problem, but the fact remains that a Triassic locality which is definitely older than the bulk of the known "Bundamba Group" and yet in close association with the group contains microplankton.

The middle horizon (ii) is mainly represented by a thin band (16 - 50 ft thick at Winnathoola) within electric log unit B. This follows closely to electric log correlations between Pickanjinnie and Moonie, but no adequate comparison with A.A.O. No. 1 (Roma) (no logs available) and Glentulloch No. 1 (correlation not completely certain) is possible other than to say that unit B is still the hystrichospherid unit.

DISCUSSION

The sediments of the Great Artesian Basin between the Permian Middle Bowen Beds and the Lower Cretaceous Transition Beds of the Blythesdale Group were thought to be the product of extensive downwarping in Triassic and Jurassic times with the formation of large freshwater lakes (Whitehouse, 1955). The presence of hystrichospherids and arenaceous foraminifera in the "Bundamba Group" alters this concept.

Hystrichospherids are common in epicontinental deposits and invariably occur in Australia where other marine fossils are known to exist. However, the question remains whether their presence is always sufficient to indicate that the environment of deposition was fully marine. Variations in abundance and in morphology of particular species have been used to indicate which off-shore zone is represented (e.g. Hoffmeister, 1960; Sarjeant, 1961; Staplin, 1961). The only abundance measurements which could be made on the Surat Basin forms were relative to the proportion of spores and pollens also in samples; these may bear no relation to the number of specimens per gram of sample which would be a significant figure. However, because approximately similar weights of samples are normally used in the standard palynological extraction technique employed in the Bureau of Mineral Resources, the fact that this relative abundance (13% in Pickanjinnie No. 2), compares favourably with abundances

measured in many parts of the marine Permian and Lower Cretaceous*, is a reasonable indication that fully marine conditions may have been briefly developed at certain horizons and localities in the "Bundamba Group". The presence of foraminifera at Moonie No. 1 strongly supports this reasoning.

The sheet like nature of the "Bundamba Group" below surface and the constant stratigraphical position of the middle hystrichospherid horizon gives no indication of the direction of possible open marine connections. Perhaps a plot of the hystrichospherid contents of well sections to be drilled in the future in the basin may provide a lead.

If marine conditions extended, although intermittently, over the great area of the Surat Basin which these results imply, parts of the "Bundamba Group" and Clematis Sandstone - Moolayember Shale might be classified as a source of hydrocarbons. The close association of these source beds to the main reservoirs in the equivalent of the Precipice Sandstone (Hospital Hill/ Links Sandstones of A.A.O. (Derrington, 1960), part of the lower member of the Bundamba Formation of Union Oil (staff of Union Oil Development Corporation, 1962)) could signify that the hydrocarbons of the Surat Basin are of Mesozoic origin.

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* A maximum of 9% was counted in part of the Roma Formation of W.O.L. No. 3 (Warbreccan) where much of the Tambo Formation has less than 1%.

APPENDIX I

BRIEF DESCRIPTION OF HYSTRICHOSPHAERIDEA

No formal nomenclature is proposed in this paper as the format of presentation cannot be recognized under the international rules. Further, the present lack of information on possible comparisons with published Mesozoic types makes the descriptions incomplete; these data will be supplied at a later time.

MULTIPLICISPHAERIDIUM Staplin 1961

Multiplicisphaeridium sp.

Plate I, Figure 1, 2, 4.

Description

Vesicle outline globular, polygonal; wall thin, drawn out into processes developed at apices; body diameter approx. 15 microns, 6 - 7 processes in equatorial section; slender, straight, 5 - 8 microns long, closed at apices and each splitting into 2 - 4 secondary processes. Filamentous tertiary growths also occur.

Variations

Only stumps of secondary processes may develop (fig. 2). Somewhat smaller forms (SP 241) have more robust primary processes with considerable growth of secondary filaments..

Occurrence

Pickanjinnie No. 2, swc 3852 ft; Injune SP 241; Moonie No. 1, c.4, 5354 ft 7 in. - 10 in.

MICRHYSTRIDIUM Deflandre 1937 emend. Staplin 1961

Micrystridium sp. A.

Plate I, figure 7, 10, 11

Description

Vesicle outline circular, diameter about 20 microns, tending to be polygonal where bases of processes develop. Processes simple, with sub-parallel sides, closed ends, 3 - 5 microns long, 2 - 5 microns apart at their bases in an approximately hexagonal arrangement. No secondary process development.

Occurrence

Pickanjinnie No. 2, swc 3852 ft; Winnathoola No. 1 4250 ft, 4266 ft; Moonie No. 1, c.4 5354 ft 7 in. - 10 in.; A.A.O.1.(Roma) 3557 ft.

VERYHACHIUM Deunff 1954

Veryhachium sp. A.

Plate I, figure 3, 5, 6

Description

Vesicle inflated tetrahedron with a simple process at each apex. Wall thin, body width about 12 microns. Processes simple, tapering from base, 8 - 15 microns long. One process of a specimen from Moonie No. 1 (Pl. I, fig. 6) was bifurcated at its tip.

Occurrence

Pickanjinnie No. 2 swc 3852 ft; Moonie No. 1, c.4, 5354 ft 7 in. - 10 in.

APPENDIX II

MICROPALAEONTOLOGICAL EXAMINATION OF SAMPLES FROM MOONIE NO. 1 WELL, QUEENSLAND

by

G.R.J. Terpstra

Three samples from core No. 4 from Moonie No. 1 Well taken from 5352 ft 3 in. - 5352 ft 7 in., 5354 ft 1 in. - 5354 ft 3 in. and 5354 ft 7 in. - 5354 ft 10 in. have been examined for microfossils. That from 5354 ft 7 in. - 5354 ft 10 in. - a brown grey siltstone - yielded Foraminifera. The specimens, however, ere coated and at first were hardly distinguishable from the washed residue. However, rewashing and repicking resulted in the separation of several specimens of Ammobaculites, Bathysiphon, Haplophragmoides and Textularia. The specimens illustrated (Pl. I) belong to Ammobaculites (fig. 9) and Textularia (figs. 12 and 13). No attempt has been made so far to identify them specifically as the material is rather crushed and specific details are concealed by the preservation. The assemblage of microfossils however is evidence of the possibly shallow-marine nature of the sediments in which they occur.

REFERENCES

BRYAN, W.H. & JONES, O.A., 1946 - The geological history of Queensland. A stratigraphic outline. Dept. Univ. Qld. Papers, 2 (N.S.) (12) for 1945.

DEFLANDRE, G., 1937 - Microfossiles des silex crétaces. II. Flagelles incertae sedis, hystrichosphaerides, sarconides, organismes divers. Ann. Pal. 26, 51-103.

DERRINGTON, S.S., 1960 - Well Completion Report: A.A.O. Pickanjinnie No. 1 Queensland, Mines Administration Pty Ltd. (unpubl.).

DEUNFF, J., 1954 - Veryhachium, genre nouveaux d'Hystrichospheres du Primaire. C.R. Soc. geol. Fr., 13, 305 - 306.

HILL, D. & DENMEAD, A.K., 1960 - The geology of Queensland. J. Geol. Soc. Aust., 7.

HOFFMEISTER, W.S., 1960 - Palynology has important role in oil exploration. World Oil, 150(5), 101 - 104.

REEVES, F., 1947 - Geology of the Roma district, Queensland, Australia. B.A.A.P.G. 31 (8), 1341-1371.

SARJEANT, W.A.S., 1961 - The hystrichospheres, a review and discussion. Grana Palynologica 2 (3) 101-111.

STAFF OF UNION OIL DEVELOPMENT CORPORATION, 1962 - Well completion report No. 1. Union-Kern-A.O.G. Cabawin No. 1 (unpubl.).

STAPLIN, F.L., 1961 - Reef controlled distribution of Devonian microplankton in Alberta. Palaeontology, 4 (3), 392-424.

TISSOT, B., 1962 - Correlation of recent bores in the Roma area. I.F.P. Mission in Aust. Sed. Basins Study Gp. Prog. Rep. 3, Feb. 1962 (unpubl.).

WHITEHOUSE, F.W., 1955 - The geology of the Queensland portion of the Great Australian Artesian Basin. App. G to Artesian water supplies in Queensland, Dept. Co-ord.-Gen. Publ. Works, Qld. (for 1954).

PLATE I.

Multiplicisphaeridium sp.

Figures 1, 2, 4. A.A.O. Pickanjinnie No.2 swc 3852 feet. MFP 1212-1 *

Micrhystridium sp.

Figure 7, U.K.A. Moonie No.1, c.4, 5354 feet 7 in. - 10 in. MFO 1757 - 1.

Figures 10,11. A.A.O. Winnathoola No.1, swc 4250 feet MFP 1656 - 1.

Veryhachium sp. A.

Figure 3. A.A.O. Winnathoola No.1, swc 4250 feet. MFP 1656 - 1.

Figure 5. A.A.O. Pickanjinnie No.2, swc.3852 feet. MFP 1212 - 1.

Figure 6. U.K.A. Moonie No.1, c.4, 5354 feet 7 in. - 10 in. MFP 1757 - 1.

Veryhachium sp.

Figure 8, Outcrop Hungry Creek waterfall, MFP 1265 - 4.

Ammobaculites sp.

Figure 9, U.K.A. Moonie No.1, c.4, 5354 feet 7 in. - 10 in.

Textularia sp.

Figures 12, 13. U.K.A. Moonie No.1, c.4, 5354 feet 7 in. - 10 in.

Magnification

Figures 1 - 3, 5 - 8, 10, 11, approx. 1250 x.
Figure 4, approx. 2800 x.
Figures 9, 12, 13, approx. 40 x.
Figures 1, 4 - 7, 10, were taken with phase contrast illumination;
Figures 2, 3, 8, 11, with bright field; and
Figures 9, 12, 13, with incident light, the specimens immersed in glycerol.

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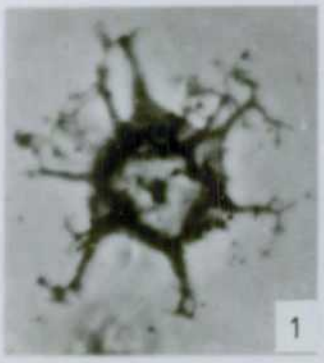
* Registered slide number in Bureau of Mineral Resources Palynology Laboratory collection.

PLATE 1.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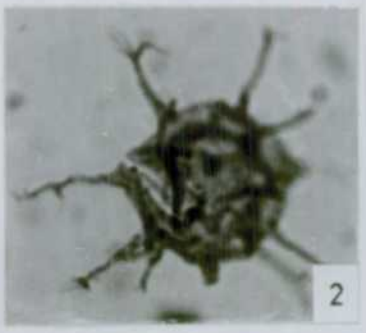
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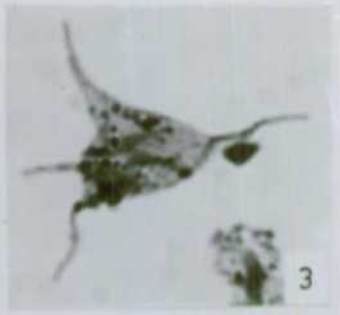
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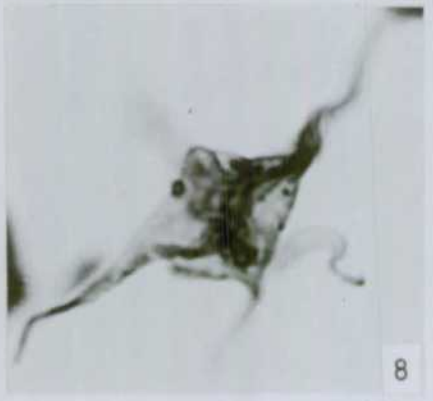
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