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A Revised Palynological Report on S.P.L. No. 1. (Birkhead) Well, Great Artesian Basin, Queensland

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A REVISED PALYNOLOGICAL REPORT ON S.P.L. NO. 1 (BIRKHEAD) WELL, GREAT ARTESIAN BASIN, QUEENSLAND

by

P.R. Evans

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SUMMARY

A reappraisal of existing palynological evidence from S.P.L. No. 1 (Birkhead) Well, Queensland, with data from additional samples have led to the identification of Jurassic, Middle-Upper Triassic, Permian and (?)pre-Permian units. The Permian includes an upper division that contains a marine intercalation, probably related to the Mantuan Productus Bed. The lower Permian division compares in age with a lower part of the Grant Formation, Fitzroy Basin, W.A. Equivalents of most of the Middle Bowen Beds of the Bowen Basin seem to be missing.

INTRODUCTION

South Pacific Pty Ltd drilled S.P.L. No. 1 (Birkhead) Well to the north of Tambo, Queensland in 1957 and abandoned it as a dry hole (Geological Survey of Queensland, 1960). Originally no palaeontological division of the well section was available, but the company geologist Grissett (1957), on the basis of lithological and electric log characteristics, identified Jurassic, Triassic, Permian, Carboniferous and (?)Devonian units (see fig. 1). Webb (1960) recognized Triassic-Jurassic overlying Permo-Carboniferous. He also mentioned possible Gangamopteris or Glossopteris in the basal core (No. 5) that had been taken from "calcareous and unmetamorphosed" steeply dipping shale.

Evans (1961) summarized palynological data from selected samples and interpreted the results as a demonstration of ?Lower-Middle Triassic overlying Permian with the equivalent of the Mantuan Productus Beds below 3800 ft. The Permian-Triassic boundary was chosen at a radical change in composition between a problematic assemblage in core 4, 3600 ft and the young Permian assemblage in cuttings at 3700 ft. The author later recognized that the core 4 assemblage was in fact of basal Permian age; the young Permian assemblages below core 4 have thus been derived from cavings. Extra material[*] was therefore examined to test this probability and to check the nature of the Mesozoic section. This report outlines the new observations and the consequent revised stratigraphical interpretation of the well.

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[*] Supplied by the Geological Survey of Queensland.

OBSERVATIONS AND COMMENTS

Figure 1 illustrates the distribution of observed spores and microplankton from which the following stratigraphic divisions at Birkhead may be derived.

Jurassic

Cuttings 197, 227, 520 feet

The association of relatively common Callialasporites dampieri (6) and Inaperturopollenites turbatus (7) with rare Ischyosporites sp. (3) and Murornati sp. (4) at 197 ft is a characteristic of the Hutton Sandstone and base of the Walloon Coal Measures north of Roma. There is no significant distinction in the assemblages down to 520 ft.

Cuttings 1300, 1400 feet

The yield in both samples was low, but the relatively abundant Classopollis cf. torosus (20) at 1400 ft is also a feature of the Precipice Sandstone and the Hospital Hill/Links Sandstones of Roma (Evans, 1962).

Triassic

Cuttings 1700 - 2450 feet, core 2, 2630 - 2650 feet

Well preserved specimens were obtained from all these samples, particularly from the cuttings, and each contained common Pteruchipollenites (22) and undescribed granulate and rugulate pteridophyte spores, which are typical of the Middle-Upper Triassic of eastern Australia. The assemblage from a sample of Moolayember Formation from the Carnarvon Highway to the north of Injune was similar. Rare striate bisaccate forms were previously recorded from 1900 ft (Evans, 1961) and taken as a possible indication of Lower or perhaps Middle Triassic age. Striate bisaccate pollens have since been found throughout the Triassic of the Sydney Basin, but those of the Lower Triassic are very distinctive. The mere presence of striate forms therefore no longer denotes the position represented by this sample within the Triassic. Further work on the Moolayember Formation - Clematis Sandstone sections is required for adequate correlation.

Permian

Cuttings 2900, 3050, 3150 feet

Marsupipollenites sinuosus (31) has not been found higher than the very base of the Triassic in the lower part of the Pickanjinnie Formation at Roma where it dies out at the same time as the other typically Permian species "Cirratriradites" splendens (33). The cuttings at 2900 ft are therefore regarded as Permian in age, although heavily contaminated with cavings from the Mesozoic.

Cuttings 3250 feet

A similarly abundant and constituted spore assemblage as those at 3050 and 3150 ft was present at 3250 ft, but, in addition, it included a swarm of hystrichospherids which had previously been identified in cuttings from 3800 ft and below. Presumably they had caved from an horizon close to the 3250 ft level. The same species occur at the base of the Latemore Formation in the Roma area, in outcrop to the south of Reid's Dome of a shaly upper division of the Catherine Sandstone (def. Hill, 1957), and in cuttings from O.S.L. 3 (Arcadia), 1800 - 1805 ft. Micrhystridium sp. 3 (48) swarms almost to the complete exclusion of other fossils at one level both in the Catherine Sandstone and at Arcadia and has a very restricted range.

Core 4, 3600 feet

The porous, calcareous sandstone of core 4 gave a low yield of a distinctive assemblage of spores. The existence of Upper Permian species in cuttings below this level led previously to the conclusion that the assemblage in the core was of Lower Triassic age. However, by comparison with assemblages present in the Grant Formation of the Fitzroy Basin, W.A. (Balme, 1962), available in the Bureau of Mineral Resources from samples of WAPET Fraser River No. 1 Well, it is now identified as Lower Permian and compares closely with assemblages present in the lower part of the Grant Formation. It is now assumed that the younger Permian fossils, e.g. Dulhuntyispora parvitholus (36) between 3700 and 4700 ft were derived from substantial cavings.

(?)Pre-Permian

Cuttings 5000-05, 5035-45 feet

Among probable contaminants from the Permian and the Triassic, these samples also contained a few spores with heavily carbonized exines (47). Some were sufficiently translucent to red light for a certain amount of their ornament to be visible, but none could be likened to known Permian species. These, and other, but rarer specimens of indeterminate species which were a dark, slightly translucent brown could not be bleached without being destroyed and would not take stain. It is possible from their state of preservation which is so different from the overlying Permian types that a significantly older section than the Permian is present. Until the specific identity of the carbonized forms is recognized, the age of these samples must remain undetermined.

STRATIGRAPHICAL CONCLUSIONS

S.P.L. No. 1 (Birkhead) Well penetrated Jurassic, Middle-Upper Triassic, late Permian, early Permian and (?)pre-Permian units. A hiatus between each probably occurred, although their positions cannot be defined with certainty due to the nature of the samples, mainly of cuttings.

The base of the Jurassic in the Roma area is sharply defined by the incoming of the Classopollis microflora at the base of the Precipice Sandstone (Evans, 1962), the basal formation of the Bundamba Group. However, no such coincidence of lithological and microfloral data is seen in the Birkhead Well. The presence of the Classopollis microflora only as high as 1400 ft, below the possible base of the Bundamba Group at 1250 ft (Webb, 1960), could be due to either diachronism of lithologies or merely to the effect of well cavings. Closer sampling of this interval is necessary to determine the exact nature of the horizon.

The difference between c. 2, 2630-50 ft and cuttings 2900 ft implies that the whole of the Lower Triassic (equivalent to the Rewan Formation of the eastern Springsure area) is missing at Birkhead.

The distinction between the higher and lower Permian units is also marked (3250-3600 ft). The Middle Bowen below the shaly upper division of the Catherine Sandstone and all older beds examined so far below the Middle Bowen in the eastern Springsure-Roma areas (e.g. O.S.L. 3 (Arcadia), O.S.L. 2 (Hutton Creek), A.A.O. Westgrove No. 1) is apparently absent at Birkhead.

The relation of this older Permian to (?)Pre-Permian is even less certain. The (?)Pre-Permian does not compare with known Western Australian Carboniferous (B.M.R. 2 (Laurel Downs), WAPET Barlee No. 1) and could be as old as the Devonian. Much would depend on a re-appraisal of the plant fragments in Birkhead core 5.

No comparitive palynological data from the Mesozoic and Palaeozoic formations that outcrop to the north-east of Birkhead are available. The ages assigned to these units have been based on scant palaeontological facts, to which the Birkhead evidence may now be added.

The nomenclature of rock units in the western Springsure Sheet area was summarized by Tweedale (1960) who listed the distinctions made by Woolley (1941) and Shell (Queensland) Development (1952) on the one hand and by Hill (1957) on the other (see Table 1).

TABLE 1

S.Q.D.+ 1952	Hill 1957	Tweedale 1960
Bundamba Series	Bundamba Group	
Cheshire Series	Moolayember Shale Clematis Sandstone Cheshire Formation	Cheshire Formation
Mantuan Downs *Productus* Bed	Mantuan *Productus* Bed	
Colinlea Series	Colinlea Formation	

\+ Shell (Queensland) Development Pty Ltd.

Shell (Queensland) Development preferred a Permian age for the Cheshire Series; Hill also restricted the Cheshire Formation to the Permian, but separated the Clematis Sandstone and Moolayember Shale as Triassic; Tweedale considered that the "Clematis Sandstone" of Hill could be traced to the Jericho area to the north-west where a *Dicroidium* (*al. Thinnfeldia*) flora was associated with *Glossopteris* and he thought, in consequence, that his Cheshire Formation was high in the Permian, possibly ranging into the Triassic.

Equivalents of the two units recognized by all authors, the Bundamba Group and the Mantuan *Productus* Bed, are identifiable at Birkhead: a "Bundamba" microflora is present possibly as low as 1400 ft; a microfauna slightly older than the Mantuan Productus Bed occurs at 3250 ft so that the suggestion made, but rejected, by Grissett (1957), that the calcareous horizons at 3030-3045 ft. are the only likely representatives of the Mantuan Productus Bed may in fact be correct. The existence at Birkhead (immediately above the Permian) of palynological correlates to the Triassic Clematis Sandstone - Moolayember Formation north of Roma would support Hill's separation of these formations from the Cheshire and possibly leave her Cheshire Formation within the Permian. To accept Tweedale's return to the original definition of the Cheshire Formation would allow the possible inclusion within the Formation of a hiatus representing an interval of non-deposition during all or part of the Lower Triassic. Tweedale's reference to a young Permian age for the continuation of the "Clematis Sandstone" into the Jericho area has no bearing on the problem as the apparent association of Glossopteris and Dicroidium (al. Thinnfeldia) at Jericho (Whitehouse, 1933) is not proven (Brunnschweiler, 1954).

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July, 1962

ADDENDUM

Since this report was compiled, Dr.N.J.de Jersey (1962) has examined a sample from S.P.L. No.1 (Birkhead) Well, core 5, 5136 - 5141 feet, that he considers to be Devonian. Consequently, beds referred to (?)pre-Permian in this report should be regarded as Devonian in age.

Reference:

de Jersey, N.J., 1962 - Palynology of a sample from Core 5, South Pacific Limited Birkhead No.1 Well. Rep.to Chief Govt Geologist, Geol.Surv.Qld, 17th August 1962 (Unpubl.)

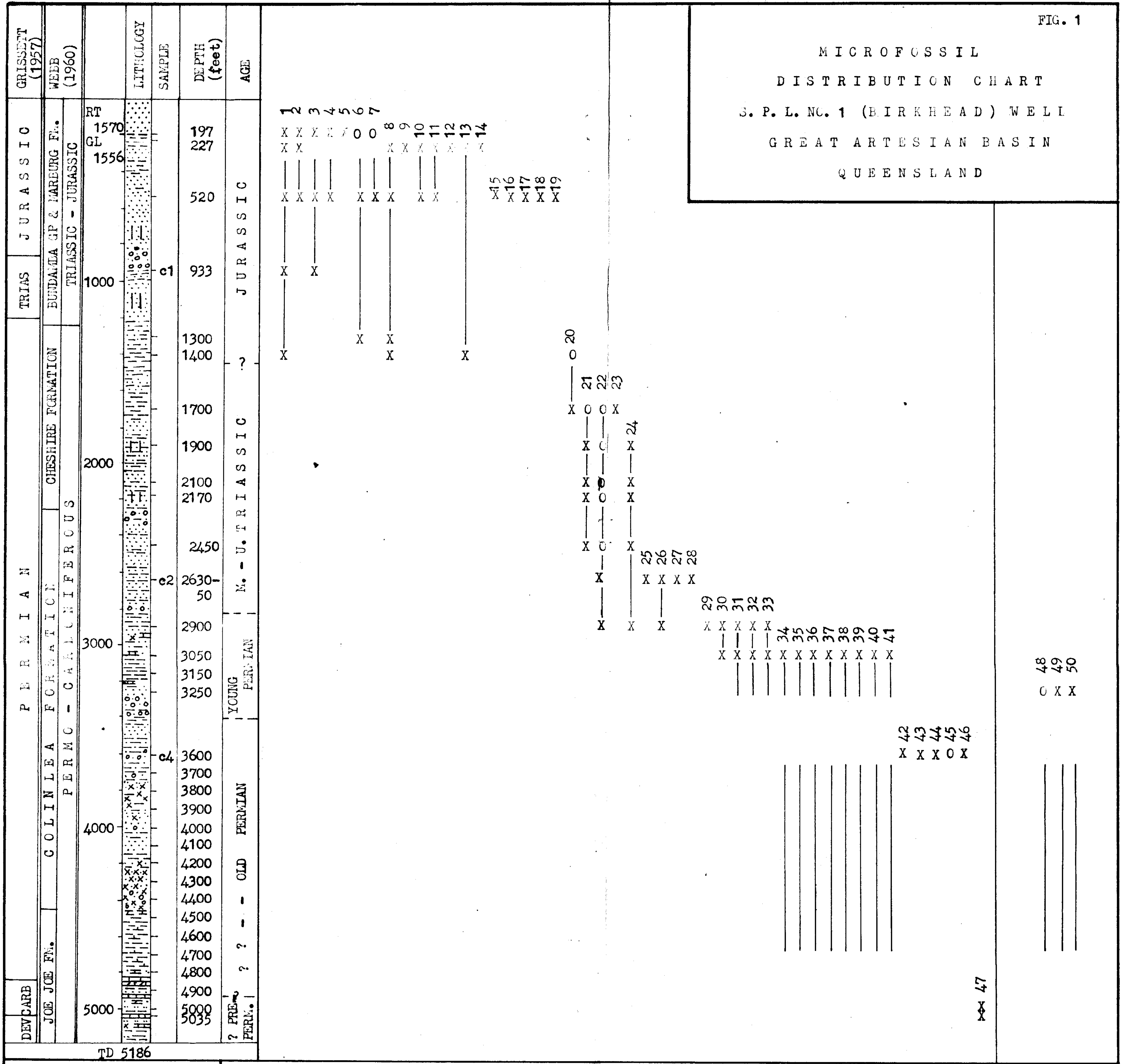
FIG. 1

MICROFOSSIL DISTRIBUTION CHART

S. P. L. NO. 1 (BIRKHEAD) WELL

GREAT ARTESIAN BASIN

QUEENSLAND



REFERENCE

▤ Shale
▤ Siltstone
▤ Sandstone
▤ Conglomerate
▤ Limestone
▤ Dolomite
▤ Carbonaceous
▤ Volcanic

c Core
Cuttings

X Spores present
O Spores common
| Spores in cavings

SPORES

1 Cyathidites sp.
2 Baculatisporites cf. comaumensis
3 Ischyosporites sp.
4 Murornati sp.
5 Lycopodiumsporites austroclavidites
6 Callialasporites dampieri
7 Inaperturopollenites turbatus
8 Bisaccate (Podocarpidites types) spp.
9 Sphagnumsporites australis
10 Lycopodiumsporites sp.
11 Perinotriliti sp.
12 Distalanulisporites sp.
13 Inaperturopollenites cf. reedi
14 Callialasporites segmentus
15 Concavisporites sp.
16 Lycopodiumsporites cf. rosewoodensis
17 "Annulispora" folliculosa
18 "Cirratriradites" sp.1
19 Cingulatisporites granulatus
20 Classopollis cf. torosus
21 Granulatisporites spp.
22 ~~Pteruchipollenites spp.~~
23 Ginkocycadophytus sp.
24 Murornati (rugulate) sp.
25 Cartonipollenites sp.
26 Leiotriletes directus
27 Apiculati (acanthine & verrucate) spp.
28 aff. "Annulispora"
29 Striatiti indet.
30 25A de Jersey 1946
31 Marsupipollenites sinuosus
32 Protosacculina multistriatus
33 "Cirratriradites"splendens
34 Acanthotriletes ericianus
35 Acanthotriletes tereteangulatus
36 Dulhuntyispora parvitholus
37 Lunatisporites limpidus
38 Lunatisporites amplus
39 Striatopodocarpidites fusus
40 Vesicaspora ovatus
41 Marsupipollenites triradiatus striatus
42 Nuskoisporites triangularis
43 Vestigisporites sp.
44 "Cirratriradites" sp.
45 Apiculati (baculate) sp.
46 Laevigati sp.
47 Carbonized spores indet.

MICROPLANKTON

48 Micrhystridium sp.3
49 Micrhystridium sp.5
50 Veryhachium sp.2

To accompany Re. 1962/139