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EXPLORATION REPORT NO. 138

THE MICROPALAEONTOLOGY, PALYNOLOGY AND STRATIGRAPHY OF THE PANARCTIC ET AL. DRAKE POINT D-68 WELL

by

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ENCLOSURES: Biostratigraphical analysis charts, Enclosures 1 and 2.

I

INTRODUCTION

This report comprises a summary of the micropalaeontological, palynological and stratigraphical analyses carried out under Project No. RRNA/767/332 on material recovered from the interval 10,000' - 17,766' (T.D.) of the Panarctic et al. Drake Point D-68 well.

This well was drilled on the Sabine Peninsula of Melville Island in the Canadian Arctic Islands at 76° 27' 5.01" N., 108° 55' 42.70" W..

The entire stratigraphical interval studied for this report falls within the Permian in which Kazanian, ?Artinskian, Artinskian, ?Sakmarian, Sakmarian and Lower Sakmarian intervals are recognised.

A summary of the sequence penetrated in this well can be seen overleaf in Table I.

II

SUCCESSION

TABLE I

INTERVAL	THICKNESS	AGE	
10,000'+ - 10,600'	600'+	Kazanian	) Upper Permian
10,600' - 11,250'	450'	?Artinskian	) ?Lower Permian
11,250' - 14,450'	3200'	Artinskian	)
14,450' - 17,000'	2550'	?Sakmarian	)) Lower Permian
17,000' - 17,450'	450'	Sakmarian	)
17,450' - 17,766' (T.D.)	316'	Lower Sakmarian	)

N. B. The above figures are mainly based on results derived from cuttings samples and are therefore approximations only.

III

MATERIALS AND METHODS

Under Project No. RRNA/767/332, cuttings samples were examined from the interval 10,000' - 17,766' (T.D.), together with samples from cores No. 4 (10,040' - 10,085'), No. 5 (10,085' - 10,127'), No. 6 (15,345' - 15,360') and No. 7 (15,360' - 15,389'). The examination comprised both detailed palynological and micropalaeontological studies. For specific information reference should be made to the biostratigraphical analysis charts, enclosures 1 and 2.

A tentative interpretation of the environments of deposition is indicated on the biostratigraphical analysis chart and discussed in the stratigraphical remarks. The interpretation of a probable environment is based on the use of a combination of factors including the faunal and floral diversity and dominance, stratigraphical distribution, the comparison of species, genera and assemblages with analogous components in the Recent and fossil record, and the lithological characteristics of the intervals studied.

It should be realized that as the information is mainly derived from cuttings samples,only a generalized interpretation of the environment is feasible throughout the well section.

The prepared samples and recorded information are now curated in the confidential files of the Calgary laboratory of Robertson Research (North America) Limited.

IV

PERMIAN

INTERVAL 10,000' - 10,600':· Upper Permian, Kazanian

General Lithology

The top of the studied interval consists of light coloured, very fine to fine-grained sandstones and light to medium grey, micromicaceous and occasionally silty shales. The remainder of the interval consists of grey shales with minor brick red shales and subordinate grey, argillaceous siltstone beds. Cores No. 4 and 5 (10,040' - 10,127') yielded grey shales interbedded with subordinate grey siltstones and buff sandstones.

Micropalaeontology

The foraminiferal assemblages in this interval are of very low specific diversity consisting only of Ammodiscus sp. 13, Ammodiscus spp. and Hyperammina spp.. Of greater significance is the occurrence in core No. 5 at 10,110' - 10,115' of the conodont species Neogondolella aff. rosenkrantzi, a form characteristic of strata of Guadalupian (= Kazanian) age.

Palynology

Samples from this interval yielded diverse and well-preserved assemblages dominated by striate bisaccate pollen grains typical of the Lower Triassic but the frequent presence of Vittatina specimens indicates an Upper Permian age.

The striate bisaccate assemblage is dominated by Protohaploxypinus jacobii and also includes P. samoilovichii, Taeniaesporites albertae, T. gracilis, T. hexagonalis, T. novimundi and Striatoabietites richterii. Other taxa present include Klausipollenites shaubergerii, Vitreisporites pallidus, Equisetosporites multistriatus, E. steevesii, Aculeisporites variabilis and Cycadopites spp.. Acritarchs are rare and poorly preserved.

INTERVAL 10,600' - 11,250': ?Lower Permian, ?Artinskian

General Lithology

This interval consists entirely of dark grey and dark brown, very argillaceous siltstones that are slightly calcareous in part. The siltstones grade in part into dark grey to black, very silty, carbonaceous shales between 10,720' and 10,860'.

Micropalaeontology

The only microfauna recovered from this interval consists of indeterminate species of Hyperammina, and a single occurrence of Nodosinella sp. at 11,050'.

Palynology

The rich assemblages of the Kazanian are replaced in the upper part of this interval by sparse and poorly preserved assemblages in which Vittatina spp. and Weylandites striatus are the most noticeable forms. Also present are indeterminate species of Vestigisporites and Falcisporites with a few specimens of Veryhachium and Micrhystridium. The assemblages are too poor to be dated with confidence but the lack of striate bisaccate pollen with the frequent occurrence of the Vittatina/Weylandites

group suggests a Lower Permian rather than Upper Permian age.

INTERVAL 11,250' - 14,450': Lower Permian, Artinskian

General Lithology

The top of this interval, 11,250' - 11,420',consists of a dark grey silty shale, grading in part to an argillaceous siltstone. The shale is underlain from 11,420' - 12,200' by dark grey argillaceous siltstones which grade into silty shales between 11,500' and 11,700', and below 12,070'. The remainder of the interval consists of dark grey to black, blocky to slightly fissile shales which are slightly silty in the upper part (down to 12,800').

Micropalaeontology

The top of this interval is marked by the distinct highest occurrence of a foraminiferal fauna of Lower Permian aspect. Species recorded include Hyperammina sp. 3 (abundant), Nodosinella sp. 1 and 2, Ammodiscus sp. 4 and 14, Thuramminoides sphaeroidalis and Lunucammina spp.. This assemblage persists with little change down to 12,750', below which there is a gradual, but persistent, increase in the specific variety of the assemblage. These additional species include, in order of their highest occurrence, Hippocrepina spp., Glomospira spp., Textularia spp., Ammodiscus sp. 15, Verneuilinoides? sp. 6, ?Endothyra spp., Glomospirella spp., Lunucammina aff. triangularis, Glomospirella sp. 11, Textularia sp. 5, Glomospira sp. 15, Tetrataxis sp. 1, Thurammina sp. 1, Glomospira sp. 14 and Glomospirella sp. 12, most of which occur commonly or in abundance.

The conodont species Neogondolella idahoensis was recorded at 12,750' and 12,900', and also questionably occurs at 12,950' and 13;850'. The species is an index form for the middle to upper Leonardian (= Artinskian).

Palynology

Assemblages in this interval continue to be poorly preserved and to lack diversity. The Lower Permian influence noted in the interval above becomes more convincing with Vittatina and related forms being the more noticeable taxa accompanied by Alisporites sp., Conbaculatisporites sp., Falcisporites zapfei, Platysaccus papilionis, Klausipollenites sp., Nuskoisporites sp. and a possible specimen of Potonieisporites.

Striate bisaccate forms also occur (due to caving in part) and include Prothaploxypinus jacobii, P. samoilovichii and a few specimens of Striatoibietites richterii, Taeniaesporites sp., and Protohaploxypinus sp.

Klausipollenites schaubergerii and Kraeuselisporites apiculatus are minor constituents which range into the Upper Permian. Specimens of Micrhystridium and Veryhachium are often present but in small numbers.

INTERVAL 14,450' - 17,000': Lower Permian, ?Sakmarian

General Lithology

Dark grey to black, blocky or slightly fissile shales persist down to 15,270' where they pass down into medium grey, very fine-grained, subangular, argillaceous sandstones. The sediments are intruded between 15,360' and 15,645' by a granodiorite sill, the overlying sandstones and underlying shales having been strongly metamorphosed adjacent to the intrusion. The interval, 15,645' - 16,780', again consists essentially of

dark grey and black shales, with grey, fine-grained sandstone stringers between 15,700' and 15,860', and again from 16,650' to 16,700'. Thin limestone beds also occur between 16,520' and 16,630'. The shales are intruded by a second granodiorite sill between 16,023' and 16,230', the country rock again having been thermally metamorphosed.

The base of the interval, 16,780' - 17,000', consists of cream and grey-brown argillaceous or sandy limestones with dark grey and black shales which become less common with depth. A thin, light grey, fine-grained sandstone occurs at 16,830'.

Core No. 6 (15,345' - 15,360') consists entirely of medium grey, very fine to fine-grained sandstone that persists into core No. 7 (15,360' - 15,389') down to 15,361.5' where the sandstone is intruded by a granodiorite sill.

Micropalaeontology

The foraminiferal assemblage described in the previous interval persists here in equal abundance and increasing diversity down to 15,350'. Species having their highest occurrence in this interval include Thurammina sp. 2, Spiroplectammina sp. 1, Ammobaculites? sp. 18, Endothyra sp. 1, Glomospirella sp. 15, Endothyra sp. 2 and Spiroplectammina sp. 2. From 15,350' to the base of the interval, the foraminiferal assemblage persists more or less unchanged, although an abundance of brachiopod spines was noted between 15,850' and 15,900'.

The interval is tentatively ascribed to the Sakmarian stage on the basis of the general nature of the foraminiferal assemblages, and more specifically on the occurrences of the conodont species Neogondolella bisselli at 14,500' and 14,850', which is an index species for the Wolfcampian (= Sakmarian) stage.

Palynology

Assemblages in this interval are extremely poorly preserved (due in part ot the effects of intrusive igneous activity) and many preparations proved to be barren. Vittatina, with the morphologically related genus Weylandites, is the most persistent genus. The rest of the assemblages are comprised of barely recognisable pollen and spores and include Alisporites toralis, A. sp., Platysaccus sp., Klausipollenites sp., Protohaploxypinus sp., Falcisporites zapfei, Vestigisporites sp., Cycadopites sp., Nuskoisporites sp. and Raistrickia sp.

Specimens of Micrhystridium and Veryhachium were also present in small numbers throughout and scolecodonts were recovered from the the 15,000' - 15,090' interval.

INTERVAL 17,000' - 17,450': Lower Permian, Sakmarian

General Lithology

This interval consists of alternating beds of cream and brown, argillaceous, sandy or cryptocrystalline limestones and dark grey or black shales which may be, in part, slightly calcareous, dolomitic or pyritic, the limestones being the dominant lithology. Thin, white to light grey, very fine-grained sandstones were also recorded between 17,370' and 17,410'.

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STRATIGRAPHICAL REMARKS

From 17,766' (T.D.) to 16,780', the Panarctic et al. Drake Point D-68 well was in limestones and shales with minor sandstones, here correlated with the Belcher Channel Formation and dated on the basis of foraminifera and ostracoda as being of Lower Permian, Lower Sakmarian (17,766' T.D. - 17,450'), Sakmarian (17,450' - 17,000') and ?Sakmarian (17,000' - 16,780') age. The nature of the sediments, together with the abundant microfauna of foraminifera, ostracoda, bryozoa and brachiopod remains, indicates deposition under shallow marine conditions.

The Belcher Channel Formation is overlain at 16,780' by a thick series of grey and black shales, with occasional sandstone beds, that become increasingly silty above 12,550', with thick siltstone units occurring at 12,160' - 11,420' and 11,230' - 10,550'. No attempt has been made to apply formation names to this series of essentially basinal deposits, as described formations from the Melville Island region only involve marginal sediments. They are in part, however, equivalent to the Hare Fiord and Van Hauen Formations of Axel Heiberg and Ellesmere Islands in the northeastern part of the Sverdrup Basin.

The shales are intruded at 16,230' - 16,023' and 15,645' - 15,361' by thick granodiorite sills, which may explain the poor preservation of the palynofloras over most of the interval. Rich foraminiferal assemblages were, however, recovered up to 11,200', above which they become scarce,

perhaps suggesting regressive conditions at the top of the studied section. The palynofloras give a tentative Lower Permian dating for the section below 10,600', although the microfaunas and especially the conodonts, permit a further subdivision into ?Sakmarian (16,780' - 14,450') and Artinskian (14,450' - 11,250') stages, leaving the interval 11,250' - 10,600' as questionable Artinskian.

The remaining interval of the studied section, 10,600' - 10,000', is ascribed to the Upper Permian, Kazanian stage on the basis of palynology, supported by the presence in core No. 5 of a conodont of Kazanian age.

VI

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PANARCTIC DRAKE POINT D-68

10,000' - 17,766' T.D.

All magnifications X500 unless otherwise stated

PLATE 1

1.	Aculeisporites variabilis)	10,140' - 10,190'	Proximal
2.	Aculeisporites variabilis)	10,140' - 10,190'	Distal
3.	Aculeisporites variabilis	10,300' - 10,390'	
4.	Aculeisporites variabilis	10,400' - 10,490'	
5.	Kraeuselisporites apiculatus	10,600' - 10,690'	
6.	cf. Acanthotriletes sp. (?reworked)	10,300' - 10,390'	
7.	Verrucosisporites sp.	10,200' - 10,290'	
8.	Proprisporites pocockii	10,200' - 10,290'	
9.	Cycadopites cf. glaber	10,200' - 10,290'	
10.	Equisetosporites steevesii	10,140' - 10,190'	
11.	Equisetosporites multistriatus	10,140' - 10,190'	
12.	Vitreisporites pallidus	Core 5, 10,110' - 10,115'	

PLATE 2

1.	Klausipollenites scheubergerii)	10,300' - 10,390'
2.	Klausipollenites schaubergerii)	10,300' - 10,390'
3.	Klausipollenites schaubergerii	Core 5, 10,100' - 10,105'
4.	Taeniaesporites novimundi	10,140' - 10,190'
5.	Taeniaesporites novimundi	10,140' - 10,190'
6.	Taeniaesporites novimundi	10,140' - 10,190'
7.	Taeniaesporites novimundi	10,300' - 10,390'
8.	Taeniaesporites albertae	10,140' - 10,190'
9.	Taeniaesporites hexagonalis	10,140' - 10,190'
10.	Taeniaesporites gracilis	10,400' - 10,490'
11.	Protohaploxypinus jacobii	10,300' - 10,390'
12.	Protohaploxypinus samoilovichii	10,300' - 10,390'

PLATE 3

1.	Protohaploxypinus samoilovichii	10,300' - 10,390'
2.	Striatoabietites richterii	10,140' - 10,190'
3.	Striatoabietites richterii	Core 5, 10,090' - 10,095' (X250)
4.	Vittatina saccifer	10,200' - 10,290'
5.	Veryhachium sp.	10,500' - 10,590'
6.	Micrhystridium sp.	10,500' - 10,590'
7.	Veryhachium ?irregulare	10,140' - 10,190' (phase contrast)
8,11.	Weylandites striatus	10,810' - 10,390', 11,600' - 11,690'
9.	Protohaploxypinus cf. jacobii	11,300' - 11,390'
10.	Platysaccus papilionis	11,500' - 11,590'
12.	Klausipollenites schaubergerii	12,000' - 12,090'

PLATE 4

1.	Krauselisporites apiculatus	12,000' - 12,090'
2.	Platysaccus papilionis	12,600' - 12,690'
3.	Micrhystridium stellatum (transition to Veryhachium? irregulare)	11,200' - 11,290'
4.	Micrhystridium sp.	11,300' - 11,390'
5.	Veryhachium sp.	11,800' - 11,890'
6.	Micrhystridium sp.	13,400' - 13,490'
7.	Micrhystridium sp.	15,800' - 15,890'
8.	Vestigisporites sp.	15,800' - 15,890'
9.	Vittatina lata	16,900' - 16,990'
10.	Vittatina cf. saccifer	17,200' - 17,290'
11.	Vittatina cf. saccifer	17,200' - 17,290'
12.	Weylandites striatus	17,300' - 17,390'
13.	Potonieisporites novicus	17,300' - 17,390'

PLATE 1

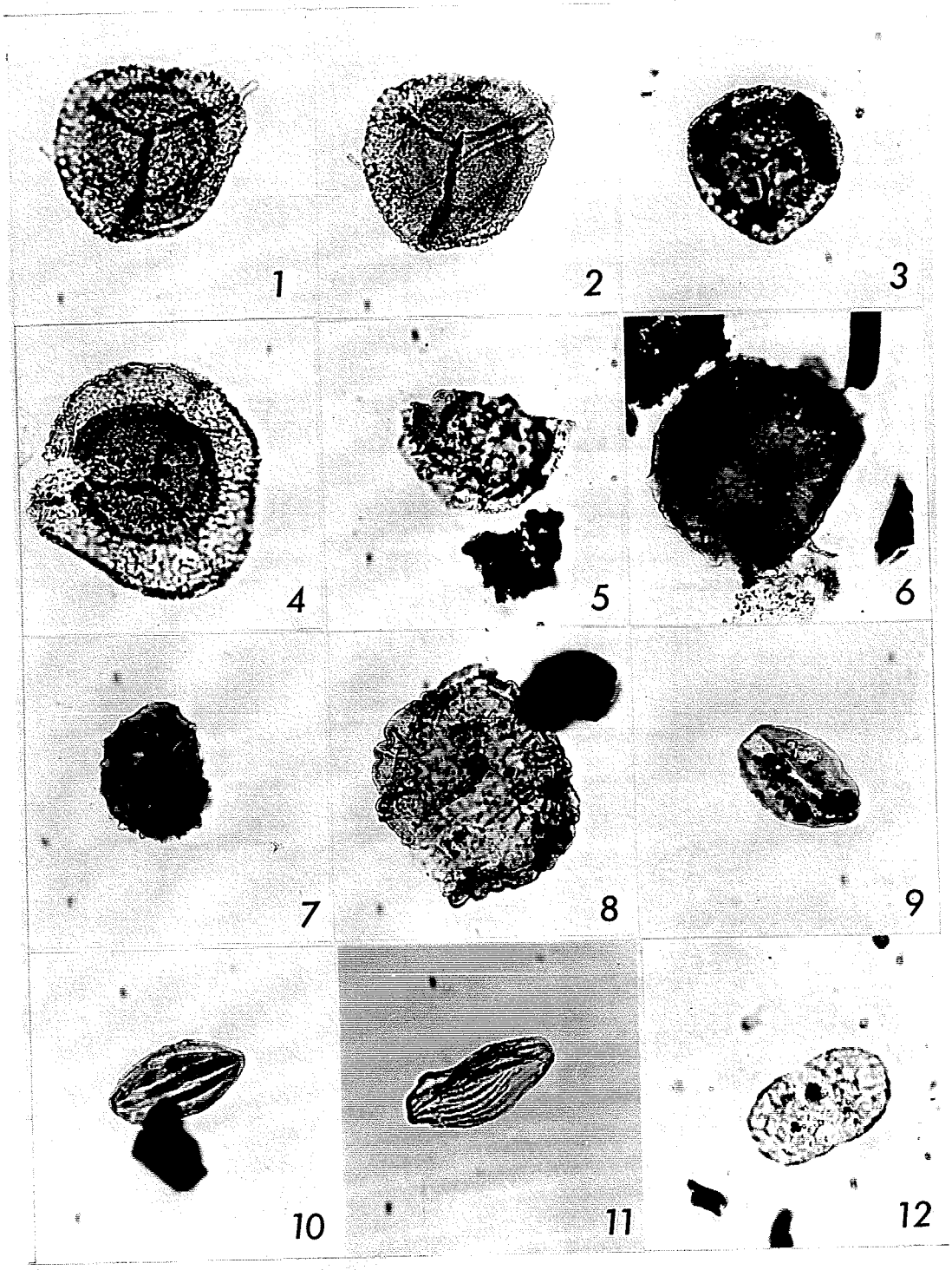

PLATE 2

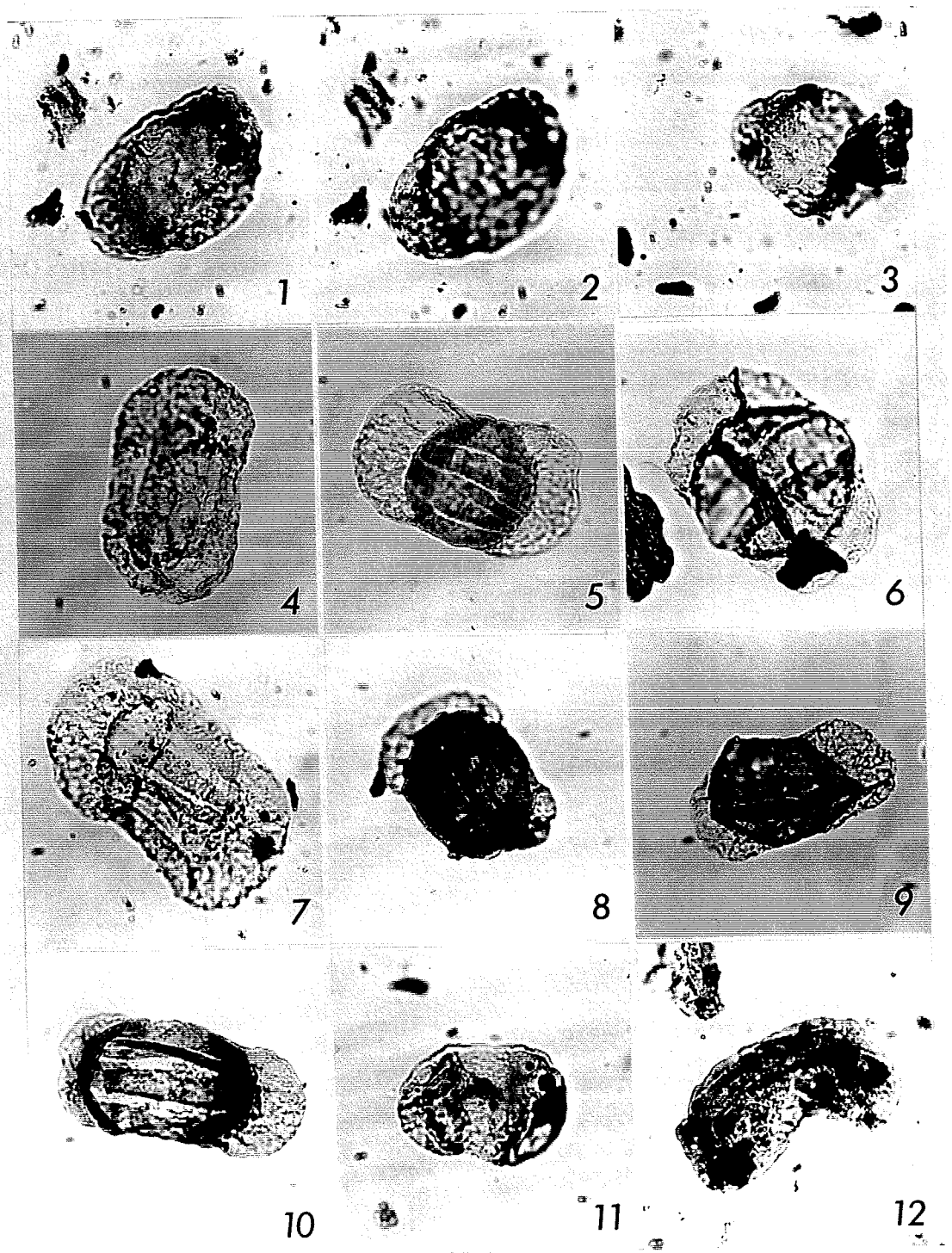

PLATE 3

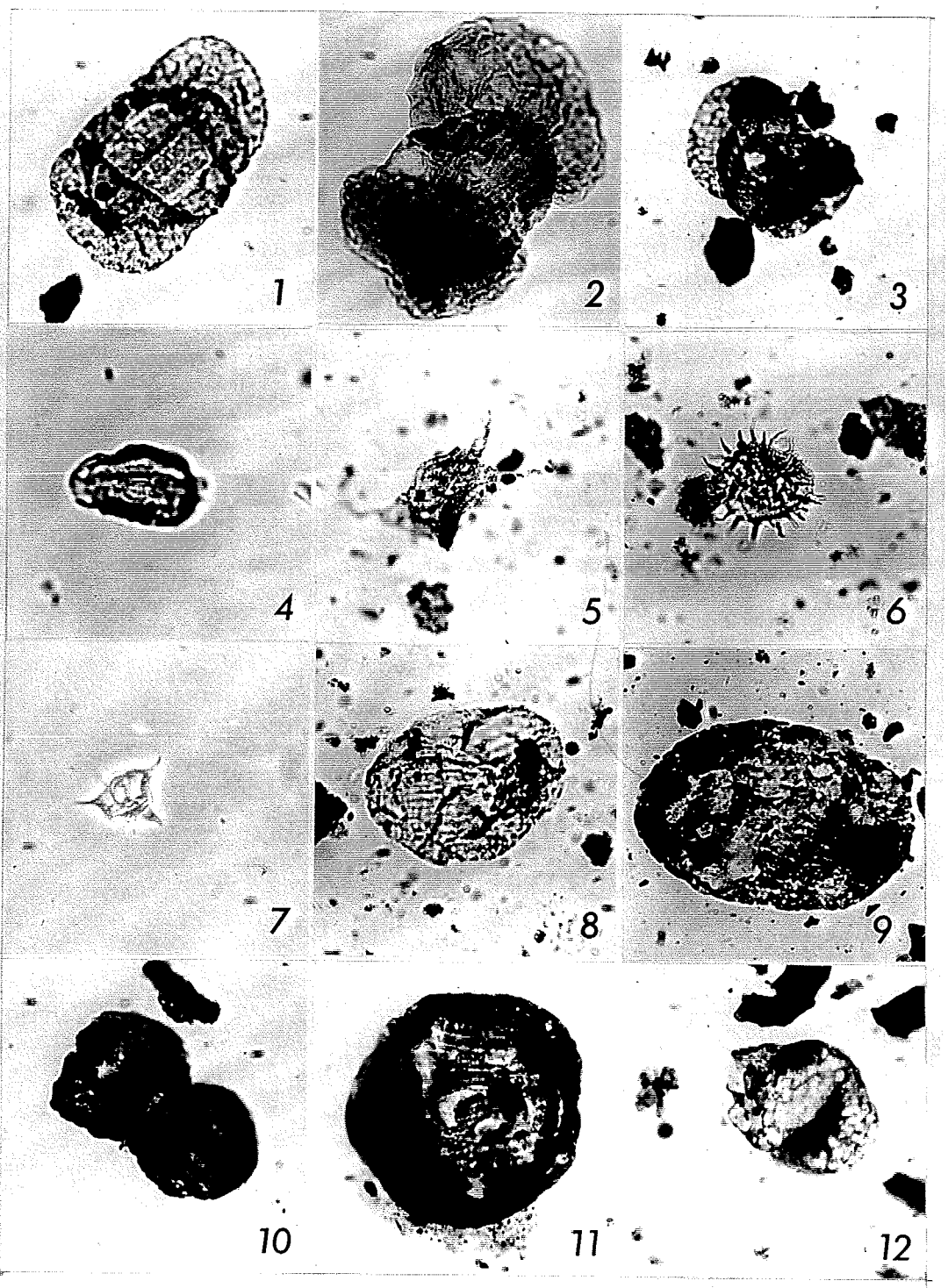

PLATE 4