

Conf. to 1 Aug. 1979

RELEASED

25. 641

4/1/79

STRATIGRAPHIC CORRELATION
BIOSTRATIGRAPHIC ZONATION

GULF MOBIL YA YA A-28

69° 17' 11" N. LAT.; 134° 35' 27" W. LONG.
NORTHWEST TERRITORIES

AUSTIN & CUMMING EXPLORATION CONSULTANTS
CALGARY, ALBERTA
MARCH, 1978

1597

C O N T E N T S

	<u>Page</u>
SUMMARY AND CONCLUSIONS.....	1
Table 1 - Summary of Zonation.....	2
Discussion of Zonation.....	3
Table 2 - Palynostratigraphic Zonation.....following	4
PALYNOSTRATIGRAPHY	
Table 3 - Palynological Zonation	
Summary.....	5
Zonation.....	5
Paleoenvironments.....	7
Ages and Correlations.....	8
MICROPALAEONTOLOGY	
Table 4 - Micropaleontological- Palynological Integration Chart	
General Remarks.....	9
Microfaunal Assemblages.....	10
References Cited.....	11
APPENDIX	
Palynological Photographs	
IN POCKET	
Palynomorph Distribution Chart	(Fig. 1)
Microfossil Distribution Chart	(Fig. 2)
Biostratigraphic Summary Log	(Fig. 3)

SUMMARY AND CONCLUSIONS
Discussion of Zonation

BY

L. W. CUMMING, P. GEOL.

GULF-MOBIL YA YA A-28SUMMARY AND CONCLUSIONS

by L. W. Cumming, P. Geol.

Biostratigraphic analysis and zonation of Gulf-Mobil Ya Ya A-28 consists of a palynostratigraphic study carried out by Dr. G. Rouse and a micropaleontological analysis by Drs. W. Braun and M. Brooke.

One hundred and thirty palynological slides, provided by Gulf Oil Canada Limited, were analyzed for microfloral content. Two hundred and seventy five micropaleontological slides, also provided by the Operator, were examined for microfaunal content.

Palynostratigraphic analysis indicates eleven distinct zones ranging in age from Lower Paleogene to Quaternary. Three Quaternary zones representing two glacial and one interglacial period, two additional Neogene and six Paleogene zones were recognized. No zone designation was assigned the three uppermost units (Quaternary). Zone designation of all other units is consistent with names used in preceding reports.

Microfossil recoveries were poor throughout the upper 5,480 feet of the well. Three microfossil assemblages were encountered. The uppermost unit (Assemblage 1?) is associated with beds identified palynologically as Quaternary. Erratic occurrences of a Cyclammina 71 and 7 assemblage, recorded through the central portion of the well (5480-8300) is associated with Upper Eocene, trailing downwards into beds identified as Lower Eocene. The presence of Cyclammina-7 in this interval is compatible with occurrences at Imp. Taglu C-42, whereas the Cyclammina 71 fauna has been associated with older beds in other wells. The lowermost assemblage (11,470-12,940 T.D.) contains a Haplophragmoides 67 and 53 combination. This assemblage is widespread in the Mackenzie Delta and appears to range from Paleocene to Lower Eocene age.

A summary of the combined palynological and micropaleontological zonation follows in Table 1. Correlative zone names used in previous reports are shown in brackets.

TABLE 1
Zonation Summary

AGE	WELL ZONE	PALYNOLOGICAL ZONE	MICROFOSSIL ASSEMBLAGE
<u>NEOGENE</u>			
Pleistocene	YY-1 (0-480')	Early Post Glacial	Assemblage 1 (0-480')
	YY-2 (480-810')	Wood/peat phase	
	YY-3 (810-1260')		
Miocene- Pliocene	YY-4 (1260-1890')	<i>Stereisporites</i> -1	
	YY-5 (1890-3090')	<i>Betula</i> -1 (<i>Laevigatosporites</i> -1- <i>periporate</i> -1)	
<u>TERTIARY</u>			
Oligocene cf. Upper Oligocene	YY-6 (3090-4930')	<i>Ericaceae</i> -1	
	YY-7 (4930-5570')	<i>Lycopodiumsporites</i> -1 (4140?-5570)	
UPPER EOCENE	YY-8 (5570-6930')	<i>Tilia</i> -1 (<i>Tetrad</i> -1)	Cyclammina 71 & 7 Fauna (5480-8300')
LOWER EOCENE	YY-9 (6930-9630')	<i>Pesavis tagluensis</i>	
	YY-10 (9630-10,530')	<i>Punctodiporites</i> -1	
PALEOCENE	YY-11 (10,620-12,940')	<i>Ctenosporites</i> <i>wolfei</i> (<i>Striadiporites</i> -1)	Haplophragmoides 67 & 53 (11,470-12,940')
			(LWC)

DISCUSSION OF ZONATION

by L. W. Cumming P.Geol.

Neogene

The Neogene in this well can be subdivided into three Quaternary zones (YY-1, YY-2 and YY-3) of probable Pleistocene age, one Miocene-Pliocene zone (YY-4) and one Miocene (YY-5) zone. This lowermost zone is tentatively considered of Lower-Middle Miocene age equivalent to the Mid-Beaufort Formation.

Weak evidence of Assemblage I microfossils is present in the upper 480 feet. However, no diagnostic material was recovered through the interval 480-5480 feet.

Paleogene

The Paleogene consists of six palynological zones ranging in age from Oligocene to Paleocene at the bottom of the well.

The two uppermost Paleogene zones (YY-6 and YY-7) are interpreted as Oligocene-U. Oligocene in age. The *Ericaceae*-1 zone YY-6 can be correlated with most wells in the area except Imp. Langley E-29 where this zone along with the underlying *Lycopodiumsporites*-1 zone appears to have been truncated by post Oligocene erosion. The *Lycopodiumsporites* zone (YY-7) is correlated with the upper half of Norris' *Tetrad* zone at Imp. Taglu C-42. This *Lycopodiumsporites* microfloral assemblage was recorded at the C-42 well, but no zone was established for this unit at that time. The base of the *Lycopodiumsporites*-1 zone at Taglu C-42 corresponds to an abrupt change in lithology. Sandstones predominate through the *Lycopodiumsporites* zone equivalent at Taglu C-42, whereas, mudstone predominates through the interval of the *Tetrad*-1 zone below the *Lycopodiumsporites*-1 microflora.

The *Tilia*-1 zone (YY-8) is correlated with the lower half of the *Tetrad*-1 zone at Taglu C-42 (TG-3) and the *Tetrad*-1 zone (NT-7) at Imp. Nuktak C-22. An Upper Eocene age is assigned to this unit.

At the base of the *Tilia* unit a thin mudstone sequence is evidenced by Mechanical logs and lithology. This unit has not been zoned, however, on the basis of stratigraphic position and lithological comparisons, it is suggested a correlation can be made with the *Wetzeliella* cf. *hampdenensis* zone of Imp. Langley E-29, and a thin comparable section at the top of the *Pesavis tagluensis* zone at Imp. Taglu C-42 (TG-4). However, no marine dinoflagellates were recovered from this interval to confirm this correlation. A Middle Eocene age is assigned to this interval at the Imp. Langley E-29 well.

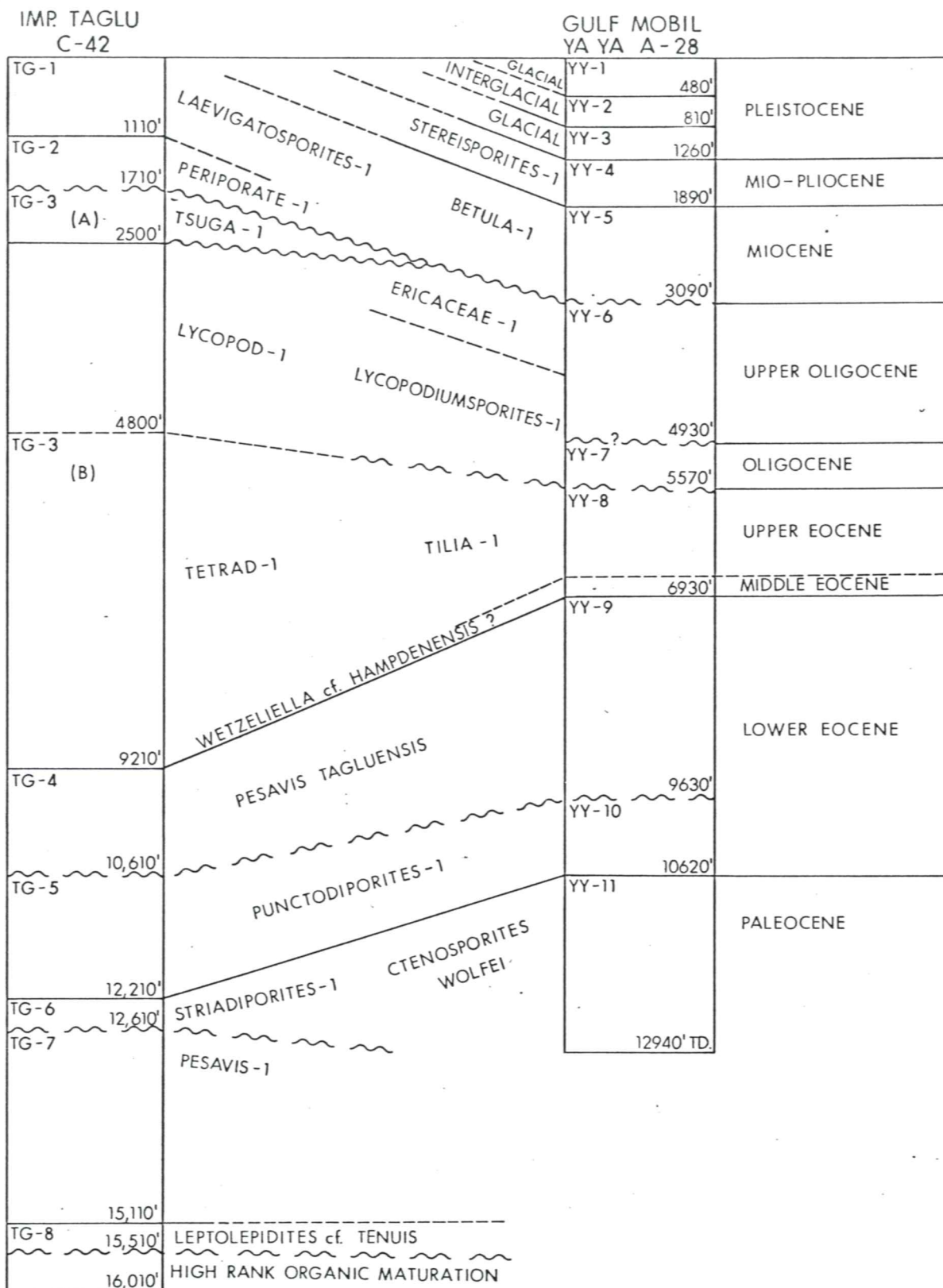
The Lower Eocene consists of two palynological zones. The upper zone, YY-9 is correlated with the *Pesavis tagluensis* zone in other wells. The presence of the fungal spore *Pesavis tagluensis* along with *Pistillipollenites mcgregorii* and other pollens indicate this

TABLE 2

PALYNOLOGICAL CROSS SECTION

NW

SE



sequence to be equivalent to TG-4 at Imp. Taglu C-42, LL-4 at Imp. Langley E-29 and AD-5 at Imp. Adgo F-28. A Lower Eocene age, based on the common presence within this assemblage of *Pistillipollenites mcgregorii*, is assigned to this and the underlying zone. Marine dinoflagellates *Wetzeliella* cf. *hampdenensis* and *Astrocysta*-1, commonly found within or immediately overlying this zone, were absent from this well. This absence may be a result of the inland position of the well where conditions were not sufficiently marine for the development of these forms. The *Punctodiporites*-1 zone represents the lowermost unit of Eocene. *Punctodiporites*-1 spores were absent at this location, but other associated flora and spores indicate a good correlation of this zone with the *Punctodiporites* zone in surrounding wells. The presence of *Tiliapollenites* flora throughout this zone indicate an age no older than Lower Eocene.

The lowermost zone (YY-11) is assigned to Paleocene age. The top of this unit corresponds to the disappearance upwards of the fungal spore *Ctenosporites wolfei* (10,620 feet). This unit pre-dates the *Tiliapollenites* fauna and, therefore, is considered of Paleocene age. Correlative Paleocene beds, designated the *Striadiporites*-1 zone, are present at Imp. Taglu C-42 (TG-6), Imp. Adgo F-28 (AD-8), and Imp. Langley E-29 (LL-6). The *Ctenosporites wolfei* zone may, however, also include the *Pulcheripollenites*-1 zone (LL-7) at the Imp. Langley E-29 well.

Palynostratigraphic correlation of this well with Imp. Taglu C-42 is presented in Table 2 following.

PALYNOSTRATIGRAPHIC STUDY

BY

G. ROUSE, PH.D.

TABLE 3
PALYNOLOGICAL ZONATION

DEPTH	PALYNOLOGICAL ZONES	ENVIRONMENT	AGE	ORG. MAT.
2000	YY-1 -	GLACIAL	QUATERNARY	0-1
	YY-2 480'	INTERGLACIAL		
	YY-3 810'	GLACIAL		
	YY-4 1260'		MIOCENE-PLIOCENE	
4000	YY-5 1890'	TERRESTRIAL FOREST	MIOCENE	1
	YY-6 3090'		cf. UPPER OLIGOCENE	
	YY-7 4930'		OLIGOCENE	
	YY-8 5570'		UPPER EOCENE	
8000	YY-9 6930'	LOW FLOODPLAIN AND DELTAIC	LOWER EOCENE	2-3
	YY-10 9630'			
	YY-11 10620'			
	12940' TD.		PALEOCENE	1-3

GULF MOBIL YA YA A-28

GULF-MOBIL YA YA A-28

PALYNOSTRATIGRAPHY by Dr. G. RouseSUMMARY

One hundred and thirty samples at approximately 100 foot intervals have been processed and analyzed for palynomorphs. Palynozones, probable ages, and likely environments are shown in Table 3.

Three Quaternary, two Neogene, and six Paleogene zones have been recognized. The Quaternary-Neogene boundary occurs at ca. 1200 feet, and the Neogene-Paleogene at ca. 3100 feet. The section from 5500 to 10,530 feet includes three zones ranging from probable Upper Eocene to Lower Eocene. The Paleocene-Eocene boundary is placed at 10,530 feet below which the *Tilia* flora disappears. The presence of *Ctenosporites wolfei* below this level indicates a possible age of Paleocene from Zone YY-11. There is reasonable correlation to zones in other wells, particularly to Taglu C-42, and Nuktak C-22. Most of the sections appear non-marine, with much of it likely deltaic deposition. The colour index continues to stay remarkably light, even at depth, possibly reflecting the relatively young age, a relatively high degree of conversion into hydrocarbons, or both.

ZONATION

Zonation was obtained by plotting the palynomorphs for each depth examined; these are shown in Fig. 1, with fungal spores, aquatic cysts, and dinoflagellates grouped separately from moss and vascular plant palynomorphs. Many of the fungal spores have been given provisional generic names that are as yet unpublished; they occur in other wells, and are important correlation indices.

Zone YY-1 0-390 feet. cf. Pleistocene or early Post Glacial

This is a barren zone, with a few reworked Tertiary palynomorphs. It corresponds to an upper sandy zone that outcrops along the east bank of the East Channel of the Mackenzie River at the northernmost end of the Cariboo Hills. It possibly represents a cold outwash phase of glaciation.

Zone YY-2 480-690 feet. cf. Pleistocene wood/peat phase

This zone contains masses of coniferous wood tracheids and fungal spores. It also appears to correspond to a thick woody zone below the barren sands outcropping on the east bank of the East Channel of the Mackenzie. The same tracheid zone has been recognized in at least one other well close to Ya Ya P-53. This likely represents a warm interglacial phase in which forests developed (see Mackay, 1963, Mem. 8, Geography Branch, Mines & Technical Surveys).

Zone YY-3 810-1170 feet. cf. Pleistocene

This is another barren zone, probably representing a glacial phase that preceded the interglacial of YY-2.

Zone YY-4 1260-1800 feet. Picea-Alnus zone. cf. Mio-Pliocene

<u>Zone Indicators</u>	<u>Others</u>
<u>Picea</u> -1	<u>Laricoidites</u> -1
<u>Alnus</u> -1	<u>Pinus</u> -1
<u>Stereisporites</u> -1	
<u>Ovoidites</u> -1	

Zone YY-5 1890-2900 feet. Betula-1 zone. Miocene

<u>Zone Indicators</u>	<u>Others</u>
<u>Betula</u> -1	<u>Myrica</u> -1
<u>Pinus</u> -1	
<u>Cedrus</u> -1	
<u>Tsuga</u> -1	

Zone YY-6 3090-4850 feet. Ericaceae-1 zone. cf. Upper Oligocene

<u>Zone Indicators</u>	<u>Others</u>
<u>Ericaceae</u> -1	<u>Corylus/Carpinus</u>
<u>Polypodiisporites</u> -1	<u>Lycopodiumsporites</u>
<u>Caprifoliipites</u> <u>scabratus</u> *	<u>Toroisporis</u> -1
<u>Laevigatosporites</u> <u>discordatus</u>	<u>Wetzeliella</u> <u>homomorpha</u>
	<u>Anacolsidites</u> -1

Zone YY-7 4930-5500 feet. Lycopodiumsporites-1 zone.
Upper Eocene-Lower Oligocene

<u>Zone Indicators</u>	<u>Others</u>
<u>Lycopodiumsporites</u> -1	<u>Parviprojectus</u> -1
<u>Pterocarya</u> -1	<u>Quercus</u> -1
<u>Tiliapollenites</u> -1	
<u>Caprifoliipites</u> -1	

Zone YY-8 5570-6900 feet. Tilia-1 zone. Upper Eocene

<u>Zone Indicators</u>	<u>Others</u>
<u>Tilia</u> -1	<u>Carya</u> -2
<u>Ilex</u> -1	<u>Pterocarya</u> -1
<u>Myrica</u> -2	
<u>Tricolporopollenites</u> <u>densus</u> *	
<u>Tricolporopollenites</u> <u>scabratus</u> *	

This zone, with its characteristic indicators, correlates well with TI-3 in Titalik K-26 and the Tilia-1 (TG-3) zone in Taglu C-42.

*Microfossils marked with an asterisk are provisional names given here; they have not been formally published.

Zone YY-9 6930-9540 feet. Pesavis tagluensis zone. Lower Eocene

Zone Indicators

Pesavis tagluensis
Idiosporites-1*
Multicellaesporites-5*
Tricolporopollenites-6
Rhoiipites-6

Others

Dicellaesporites-5
Multicellaesporites-5

This zone contains a lot of palynomorphs that are recycled from the Punctodiporites-1 and Ctenosporites wolfei zones below. This is particularly noticeable in the lower interval 8820-9540.

Zone YY-10 9630-10,530 feet. Punctodiporites-Striadiporites zone.
 Lower Eocene

Zone Indicators

Striadiporites-1
Granatisporites catinus
Idiosporites-2*
Diporisorites-2

Others

Dicellaesporites-1
Tilia-2

Although Punctodiporites-1 is missing in this zone, the presence of Striadiporites-1 indicates correlation with zone TG-6 of Taglu C-42; the presence of Tilia-2 in sidewalls in this interval points to a Lower Eocene age.

Zone YY-11 10,620-12,940 feet T.D. Ctenosporites wolfei zone.
 Paleocene

Zone Indicators

Ctenosporites wolfei
Dicellaesporites-3*
Pluricellaesporites-3

Others

Bombacacidites-1
Pistillipollenites mcgregorii
Tetrocellaesporites-1*

This zone marks the upper part of Paleocene deposition based on Pistillipollenites and Bombacacidites. It correlates closely with Taglu TG-6, but appears much thicker than this latter zone.

*Microfossils marked with an asterisk are provisional names given here; they have not been formally published.

PALEOENVIRONMENTS

Most of the Ya Ya section appears to represent essentially terrestrial deposition. The only trace of marginal marine conditions is in the interval between 10,500 and 11,000 feet, and possibly also between 1170 and 1500 feet.

The upper zones between 1260 and ca. 5500 feet are dominated by spores and pollen of plants interpreted as representing forest communities of terrestrial sites. Included here are palynomorphs of conifers (pine, spruce, and hemlock); broadleaf deciduous trees such as birch, hazel, alder, and oak; and pollen of the Ericaceae.

From ca. 5500 feet to the bottom, the palynomorph assemblages change character, indicating relatively flat and marshy/swampy habitats. This is marked by a notable increase in pollen of the Taxodiaceae, and likely including the cypresses Taxodium and Glyptostrobus. Again, the lower zones contain significant numbers of fungal spores that appear to represent salt-marsh communities within delta systems such as the modern Fraser River delta.

A potentially significant feature throughout the well - particularly at depth - is the relatively light colour index of the palynomorphs. As shown in Fig. 3, the maximum colour (3-4) occurs in the interval 10,000-10,500 feet. At deeper levels, the colour lightens, suggesting a lesser degree of diagenesis into hydrocarbons. It could also be related to the relatively young (Eocene) age of the deposits, and the absence of any appreciable tectonic activity.

AGES AND CORRELATIONS

The zonation and age assignments for Ya Ya A-28 are shown in Table 3. Of major significance is the recognition of the definitive Eocene Tilia-2 down to 10,520. There are no undoubted exclusively Lower Eocene pollen below this and the Paleocene-Eocene contact is placed at the top of the Ctenosporites wolfei zone at 10,630 feet.

The relatively thick upper section is a response to the presence of what is interpreted here as a sequence of Pleistocene units (YY-1 through YY-3) overlying the late Tertiary of YY-4. This same sequence occurs near the mouth of the Mackenzie along the northern end of the Cariboo Hills, just north of Ya Ya, and is found in some of the nearby wells such as Kumac J-6.

The Lower Eocene units (YY-9 and YY-10) correlate well with similar zones in other wells, particularly with those of Taglu C-42 (Table 2). The major difference in Ya Ya is the absence of the zone indicator palynomorph Punctodiporites-1 from zone YY-10. This is probably the result of facies differences because of the more inland position of Ya Ya, and is possibly correlated with an absence of suitable habitats and/or hosts for this fungus, e.g., brackish or salt water swamps. Some support for this may be the occurrence of a very narrow Punctodiporites facies pinching out toward the south and east.

MICROPALEONTOLOGICAL STUDY

BY

DR. W. BRAUN

DR. M. BROOKE

Table 3

GULF - MOBIL

YA YA A-28

PALYNOLOGY			MICROPALAEONTOLOGY	
Zones	Environment	Age	Braun & Brooke, 1976	
YY-1 480'	GLACIAL	QUATERNARY	ASSEMBLAGE I ?	
YY-2 810'	INTERGLACIAL		480'	
YY-3 1260'	GLACIAL			
1000 YY-4 1890'	TERRESTRIAL - FOREST -	MIocene - PLIOCENE		
2000 YY-5 3090'		MIocene	no diagnostic microfossils	
4000 YY-6 4930'		UPPER OLIGOCENE ?	---- CYCLAMMINA FRGS. ?	
5000 YY-7 5570'		OLIGOCENE	5480' restricted marine	
6000 YY-8 6930'		LOW FLOODPLAIN AND DELTAIC	UPPER EOCENE	ERRATIC OCCURRENCES OF CYCLAMMINA 71 AND 7 CYCLAMMINA FAUNA ?
8000 YY-9 9630'	LOWER EOCENE		8300'	
10,000 YY-10 10620'	LOWER EOCENE		no diagnostic microfossils	
11,000 YY-11 12,940'	PALEOCENE		11,470'	
12,000 T.D.			HAPLOPHRAGMOIDES 67 AND 53 FAUNA TO T.D. marine restricted to certain extent	
13,000				

GULF-MOBIL YA YA A-28

MICROPALEONTOLOGICAL STUDY

by Drs. W. Braun & M. Brooke

GENERAL REMARKS

Two hundred and seventy-five (275) micropaleontological slides were submitted for study. They "cover" the borehole more or less evenly, but microfossils are relatively rare and badly preserved, with the exception of the basal sequences where moderately rich and better preserved microfaunas were encountered.

All microfossils that could be identified, including certain characteristic fragments were provided with species numbers, and their sequence is shown on the chart. Whenever possible, the forms were identified to generic rank or as close as possible, but no attempt has been made to search the "international" literature for identical or closely related forms.

The micropaleontological data are plotted from "top to bottom", a standard procedure in subsurface studies. First occurrences are used to delineate the upper boundary of a faunal complex, although, in reality, these are last occurrences. Lower boundaries are hard to define without the results from core samples, but the "trailing" of specimens through the Ya Ya borehole seem to be not too bothersome.

The usefulness as time indicators of the microfauna recovered is very limited, in fact it is non-existent. The lack of planktonic forms, the endemic nature of many of the benthonic forms discovered, the sporadic and erratic occurrence of the fauna being restricted essentially to a few marine intervals in an essentially terrestrial-deltaic sequence make it extremely hazardous to tie the microfauna into a proper time framework. The microfaunal assemblages are for this reason simply traced by number or name, without any age connotation attached. They can be used as such readily in correlation from one borehole to the other, provided the fauna, or part of it, is the same. Any references to stage and ages that are used are those adopted from palynological studies, and the micropaleontological data are summarized in a table with the palynological ones shown alongside (Table 4).

MICROFAUNAL ASSEMBLAGES

There are some indicators, however weak, of the presence of an impoverished Assemblage I-Fauna in the upper 400 feet of the borehole. This faunal unit is followed by a variety of forms, all erratically distributed and few in number, and that in themselves are not diagnostic. Many specimens seem to be abraded and thus possibly reworked, and others are most likely not in place. For this reason, no faunal unit is discriminated between level 400 and about 5500 of the section.

CYCLAMMINA 71-7 Fauna ?

A few fragments reminiscent of Cyclamminas appear about the 4,000 foot level. The specimens are too poorly preserved to be identified with any degree of certainty, but at around 5500 feet, Cyclammina 71 was identified, with specimens trailing-down to about 8300 feet. In other boreholes, this species occurs more abundantly; the rarity of this form at Ya Ya A-28 could be attributed to poorer and very marginal living conditions at the time of deposition, or it may reflect on incomplete disintegration and picking of the micro-samples. However, there is another worrisome find: the association of Cyclammina 7. Admittedly, only a very few and badly preserved specimens were found present in the slides, not enough to make a firm identification but enough to raise suspicions, for Cyclammina 7 was found to date in younger sequences and not associated with Cyclammina 70-71, the arctica-borealis complex. At Taglu C-42 where both species were recovered, Cyclammina 7 occurs in a sequence assigned an Upper Eocene (Oligocene) age by Norris (TG-3 zone, lower third), whereas Cyclammina 71 appeared about 6,000 feet lower in the borehole and in the TG-8 zone of Lower Paleogene age.

According to the palynological zonation, the Cyclammina - Fauna would span the lowermost part of the YY-7 zone of Oligocene age, and continue to and through YY-8 and into the YY-9 zone considered to be Lower Eocene. These age placements would not be incompatible with the occurrences of Cyclamminas in other wells; but if the presence of species 7 could be confirmed, its mixture with the 71 - Fauna poses some problems for it may indicate that a part of the section is missing, and that both faunas occur "accidentally" in such close proximity. However, the section used as yardstick - Taglu C-42 - may not be a typical one either and, therefore, the comparison not conclusive.

In view of the poor recovery and poor state of preservation of the Cyclamminas recovered, no firm answer can be given at this stage.

Another undiagnostic unit follows, containing only very few and widely scattered specimens or fragments that most likely are not in place. Close to the bottom of the borehole, however, a relatively rich faunal interval was "tapped".

HAPLOPHRAGMOIDES 67-53 Fauna

At about 11,400 feet, Haplophragmoides 67 and even more abundantly Haplophragmoides 53 appear, followed at about 12,600 feet to total depth at 12,940 feet by a number of other characteristic species that belong to this fauna. The same assemblage was encountered at Langley E-29, where Haplophragmoides 67 appears first and is followed downhole by the characteristic 53 species. This discrepancy may be explained in two ways: either by environmental differences or by postulating truncation of the upper sequence of the Haplophragmoides 67-53 complex due to an unconformity.

The sequence with the Haplophragmoides 67-53 complex was penetrated only in its uppermost part where drilling stopped. It would span the palynological zone YY-11 of Paleocene age - an age assignment compatible with the revised placement at Langley E-29.

The Haplophragmoides 67 - Fauna is widespread in the Mackenzie Delta region. It seems to be equivalent to the Haplophragmoides 4106 - Zone of Staplin et al. that they trace in their cross-section from Taglu C-42 and Ya Ya P-53 in the lower part of their Paleogene. Chamney's unit 3 or his Haplophragmoides G 21 horizon seem to be identical too, and his unit 6 of the Reindeer D-27 borehole is the same; however, he considers these horizons to be of Paleocene (? Eocene) to Maestrichtian age.

As most other Tertiary microfaunas of the Mackenzie Delta region, the Cyclammina - Faunas and the Haplophragmoides 67-53 complex are either monotypic or of low diversity, indicating minor influences in an otherwise terrestrial-deltaic setting.

References Cited:

- Chamney, T.P., 1973: Tuktoyaktuk Peninsula Tertiary and Mesozoic Biostratigraphy Correlations; Geol. Surv. Can., Paper 73-1, part B, 171-179, 3 figs., 1 table.
- Staplin, F.L. et al.: Tertiary Biostratigraphy, Mackenzie Delta Region, Canada; copy of manuscript of a joint oral presentation to C.S.P.G. by paleontological staffs of Gulf-Imperial-and Mobil Oil Canada. In press.

APPENDIX

PALYNOLOGICAL PHOTOGRAPHS

APPENDIX

PALYNOLOGICAL PHOTOGRAPHS

(Plate numbering corresponds
to sequential numbering of
Austin & Cumming Arctic Flora
Photographic Library)

GULF MOBIL YAYA A-28

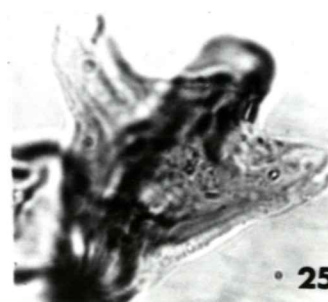
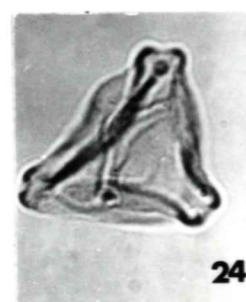
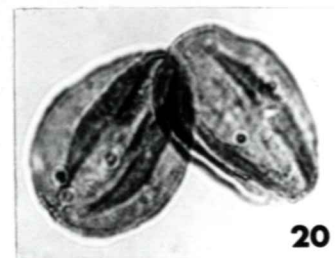
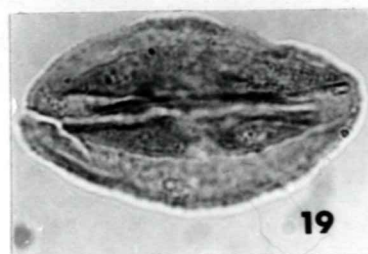
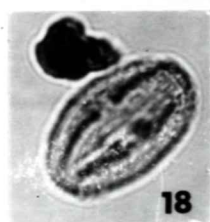
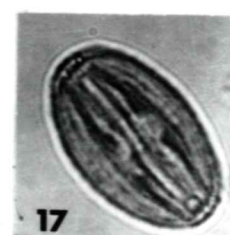
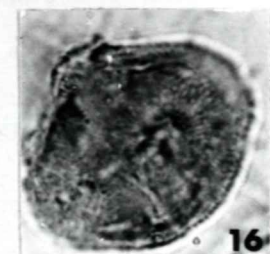
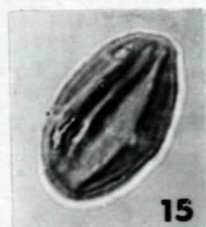
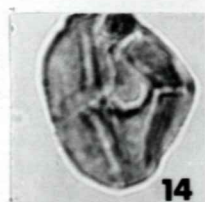
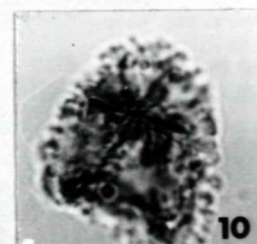
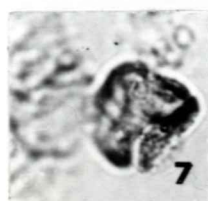
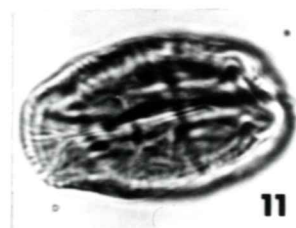
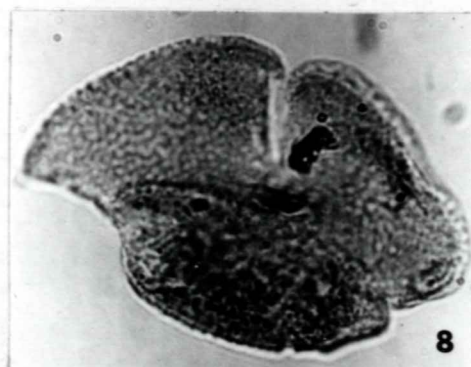
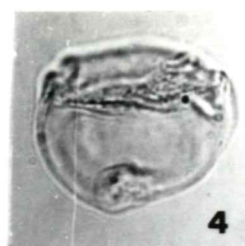
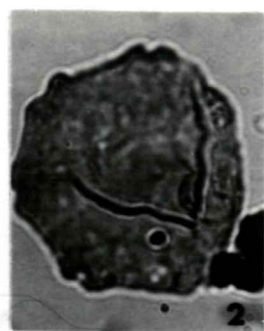
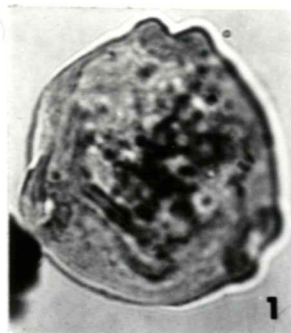
Magnification X1000 except where indicated.

PLATE 36

1. *Myrica*-2
2. *Pterocarya*-1
3. *Alnus*-2
4. cf. *Prosopis*-
5. cf. *Dorstenia*-
6. *Tricolpites*-1
7. *Tricolpites*-1
8. *Tricolpopollenites densus**
9. *Tricolpopollenites*-2
10. *Ilex*-1
11. *Aesculiidites*-1
12. cf. *tetracolporate*-1
- 13.-14. *Rhoiipites*-6
15. *Tricolporopollenites*-6
16. *Caprifoliipites reticulatus**
17. *Caprifoliipites scabratus**
18. *Caprifoliipites*-2
19. *Caprifoliipites ellipticus**
20. *Tricolporopollenites scabratus**
21. *Tricolporopollenites*-6
22. *Tricolporopollenites*-9
23. *Castanea*-1
24. ? *Gorhanipollis*-1
25. *Parviprojectus*-1

*N.B.: Those names with an asterisk have not been published in the literature. They are used here in a provisional capacity only.

PLATE 36



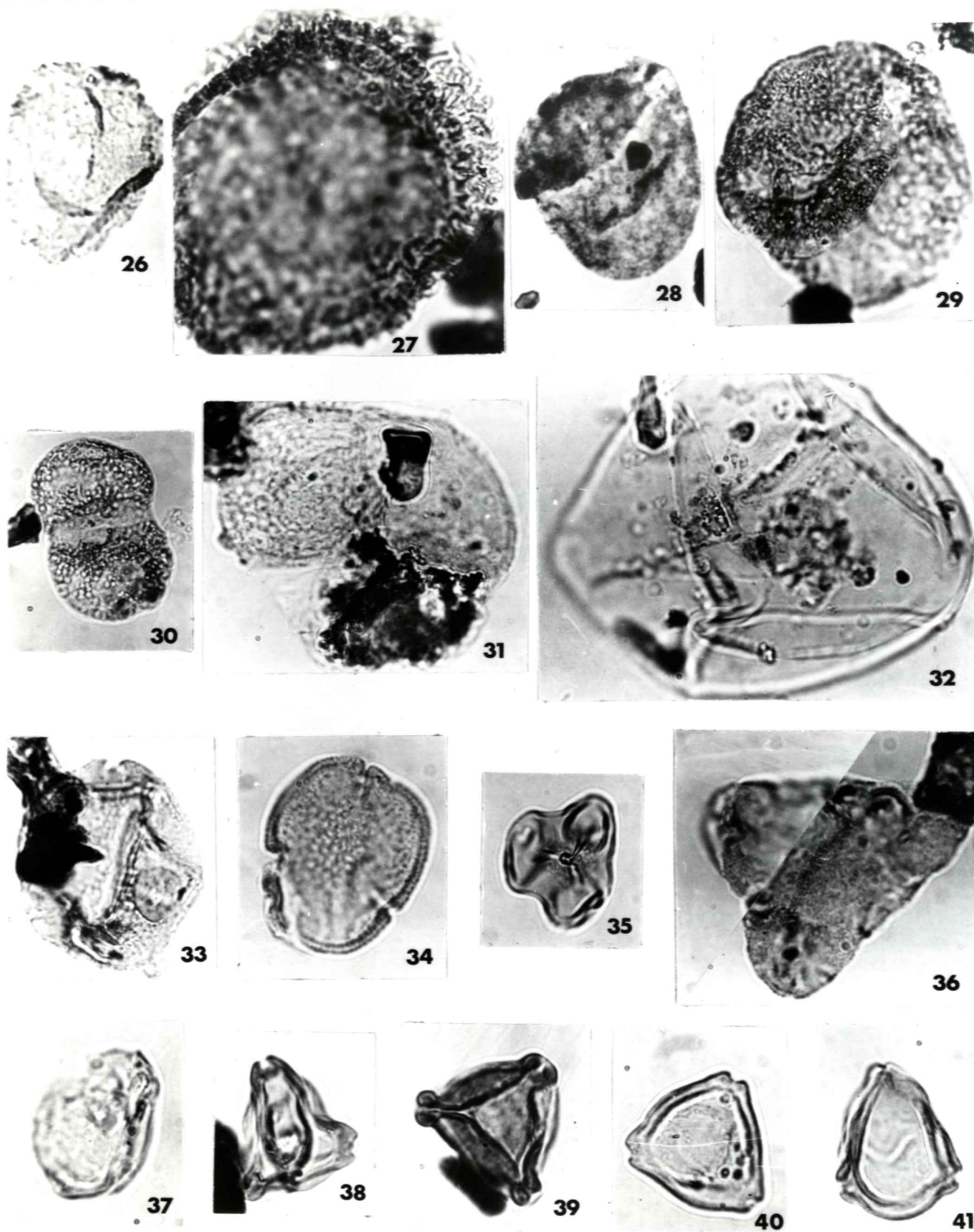
GULF MOBIL YAYA A-28

Magnification X1000 except where indicated.

PLATE 37

- 26. *Tsuga*-2 (X500)
- 27. *Tsuga*-2 (X1000)
- 28. cf. *Keteleeria*-1 (X500)
- 29. *Cedrus*-1
- 30. *Pinus*-1
- 31. *Picea*-2
- 32. *Laricoidites*-2
- 33. *Tiliapollenites*-4
- 34. *Bombacacidites*-1
- 35. *Anacolsidites*-1
- 36. *Anacolsidites*-2
- 37. *Gramineae*-1
- 38-39. *Paraalnipollenites*-2
- 40-41. *Myrica*-1

PLATE 37



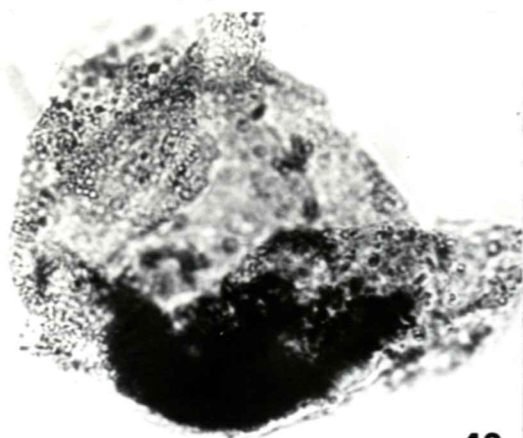
GULF MOBIL YAYA A-28

Magnification X1000 except where indicated.

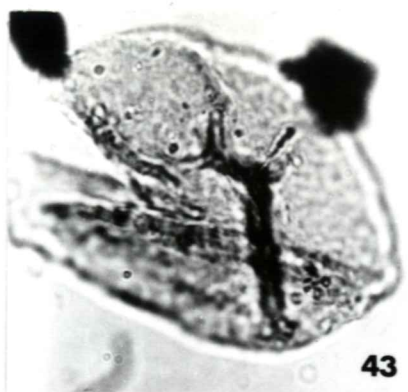
PLATE 38

- 42. *Cedrus*-2
- 43. *Sequoiapollenites*-1
- 44. *Stereisporites*-3
- 45. *Toroisporis*-1
- 46. *Lycopodiumsporites*-1
- 47. *Deltoidospora diaphana*
- 48. *Polypodiisporites*-1
- 49. *Deflandrea* cf. *eocenica*
- 50. *Gonyaulacysta*-4
- 51. *Diconodinium*-7
- 52. *Deflandrea*-4 (X500)
- 53. cf. *Spinidinium microceratium*
- 54. *Cyclonephelium*-4
- 55. *Multicellaesporites*-7

PLATE 38



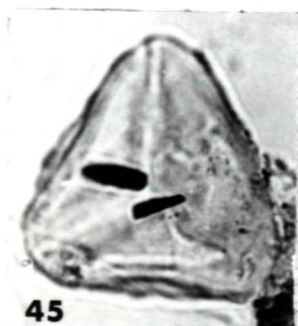
42



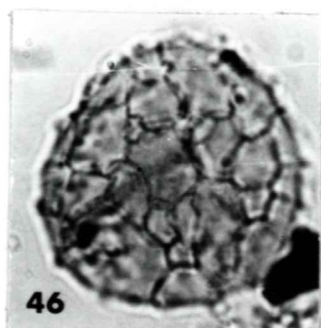
43



44



45



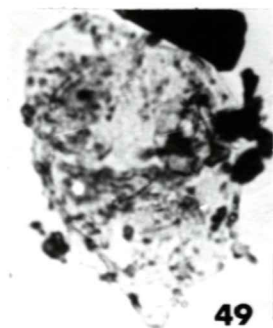
46



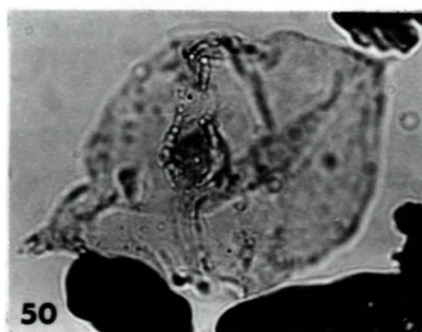
47



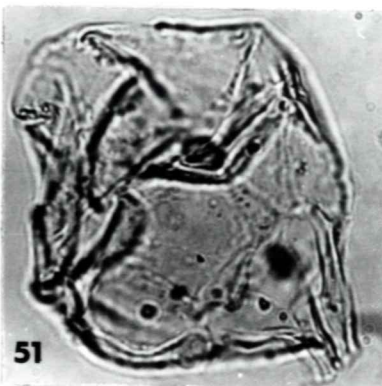
48



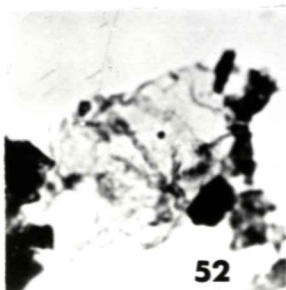
49



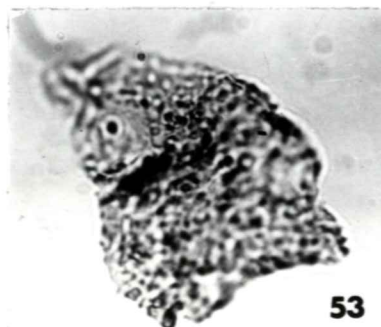
50



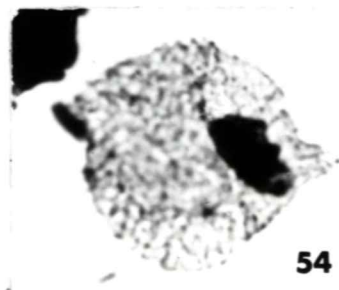
51



52



53



54



55

GULF MOBIL YAYA A-28

Magnification X1000 except where indicated.

PLATE 39

- 56-57. *Ctenosporites*-2
- 58. *Clusterisporites*-2*
- 59. *Idiosporites*-4*
- 60-62. *Disporisporites*-6*
- 63. *Tetracellaesporites*-2*
- 64. *Dicellaesporites*-5*
- 65. *Dicellaesporites*-6*
- 66-67. *Granatisporites*-3
- 68. *Multicellaesporites*-2*
- 69. *Multicellaesporites*-2*
- 70. *Multicellaesporites*-8*
- 71. *Dicellaesporites*-6

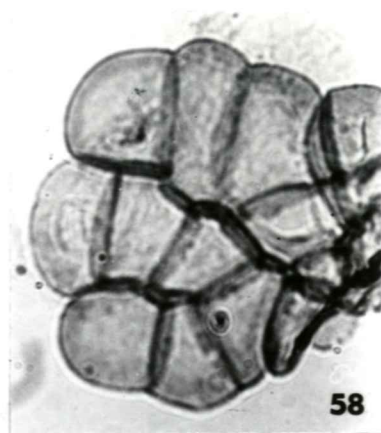
*N.B.: Those names with an asterisk have not
been published in the literature.
They are used here in a provisional
capacity only.



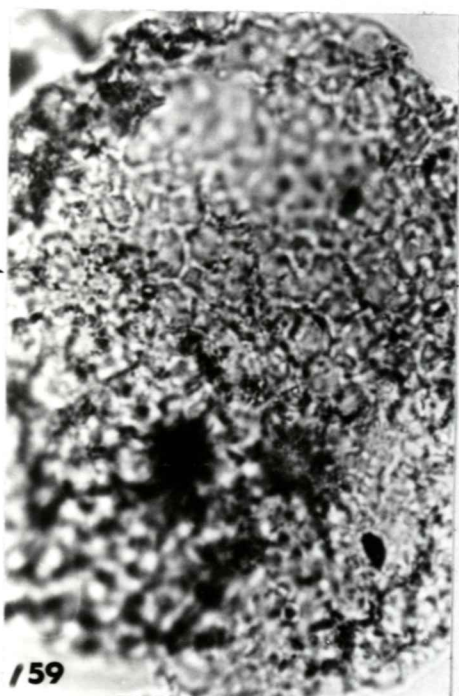
56



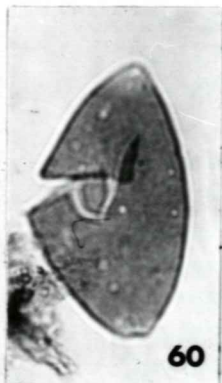
57



58



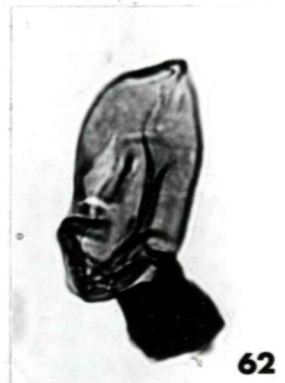
59



60



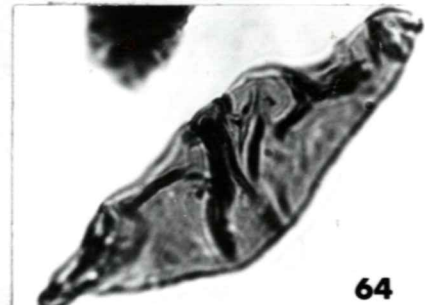
61



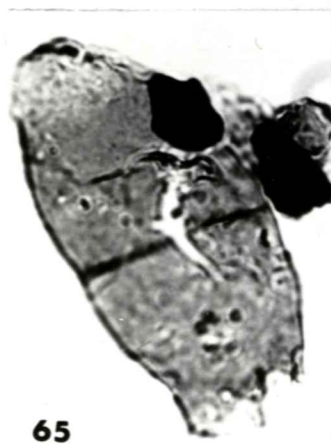
62



63



64



65



66



67



68



69



70



71