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BIOSTRATIGRAPHIC ZONATION

GULF-MOBIL IKHIL I-37

68° 46' 34" N. LAT.; 134° 07' 50" W. LONG.
NORTHWEST TERRITORIES

AUSTIN & CUMMING EXPLORATION CONSULTANTS
CALGARY, ALBERTA.
FEBRUARY, 1977

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SUMMARY & CONCLUSIONS

BY

G. H. AUSTIN, P. GEOL.

GULF-MOBIL IKHIL I-37

SUMMARY AND CONCLUSIONS

Biostratigraphic analysis of Gulf-Mobil Ikhil I-37 includes a palynostratigraphic study carried out by Dr. G. Norris, and a micropaleontological investigation by Dr. W. Braun.

One hundred and forty one (141) palynomorph slides prepared by Shell Oil Canada were examined in detail, and yielded 137 spore-pollen and 70 marine species from surface to 15,350 feet. Five palynological zones were identified ranging in age from latest Paleocene or earliest Eocene, through Middle Albian, Early Albian, Aptian, Barremian and Neocomian. The lowest interval 12,750-15,350 feet was undiagnostic because of poor palynomorph recovery.

Eighty two (82) micropaleontological slides provided by the Geological Survey of Canada were analyzed in detail from 3,000 to 15,200 feet, providing very few species in the Tertiary, but a moderately diverse microfauna of Lower Cretaceous and possible Triassic age at the bottom. The microfauna supports in general the palynology, with the exception that Lower Cretaceous assemblages are identified by micropaleontology to be perhaps a stage older than that indicated by palynology. There is also a suggestion from micropaleontology that the well bottomed in Jurassic, due to the presence of Ammobaculites 273 at 15,000-15,100 feet, previously reported in a sequence of undifferentiated Mesozoic (Jurassic to Triassic in age.).

PALYNOSTRATIGRAPHIC STUDY

BY

G. NORRIS, PH.D.

TABLE 1

GULF MOBIL IKHIL 1-37
PALYNOLOGICAL ZONATION

DEPTH	ZONE		DEFINITIVE PALYNOMORPHS	ENVIRONMENT	AGE	ORG. MAT.
1000	IKH-1		STRIADIPORITES	NEAR-SHORE (1490')	LATE PALEOCENE OR EARLIEST EOCENE	3-4
2000	IKH-1 (2490')			MARINE		
3000	IKH-2		PESAVIS-1	TERRESTRIAL	PALEOCENE	4-5
4000						
5000	IKH-2 (5360')					
	IKH-3	(a) 5860'	OVIODINIUM VERRUCOSIUM	NEAR-SHORE MARINE	M. ALBIAN	
6000						
7000		(b) 7960'	HEMOCYSTODINIUM		EARLY ALBIAN	
8000		(c) 8860'	WALLODINIUM KRUTZSCH-1		APTIAN	
9000	IKH-4	(a) 10,760'	DEFLANDREA PERLUCIDA		BARREMIAN	
10,000						
11,000		(b) 12,750'	VERYHECHIUM REDUCTUM		NEOCOMIAN	
12,000						
13,000	IKH-5		TRIQUITRITES (RECYCLED ?)	TERRESTRIAL	INDETERMINATE	6-7 ?
14,000						
15,000	IKH-5 (15,350')					

GULF-MOBIL IKHIL I-37

SUMMARY

One hundred and forty one (141) samples from the subject well yielded 137 spore-pollen and 70 marine microplankton species. Paleocene (with some possible earliest Eocene) strata occupy the top 5,360 feet, the highest approximately 1500 feet being near-shore marine. A thick marine Lower Cretaceous section occurs between 5,360 feet and 12,750 feet. This includes Middle Albian, Early Albian, Aptian, Barremian and Neocomian. Below 12,750 zonation is indeterminate because of a general absence of flora.

ZONATION

Zone IKH-1 (80-2490 feet)

This highly diverse zone is characterized by over 70 terrestrial species of which the following are noteworthy:

282 *Caryapollenites paleocenicus*
320 *Ulmus*-1
324 *Carpinus subtriangula*
330 *Pistillipollenites mcgregori*
370 *Tiliapollenites*-1
397 *Tiliapollenites*-3
528 *Fusiformisporites*-1
538 *Retitricolporopollenites*-2
390 *Salix*-1
392 *Granatisporites cotalis*
533 *Pluricellaesporites*-2
546 *Punctodiporites*-1
541 *Symplocoipollenites*-1
545 *Retitricolporopollenites*-3
551 *Striadiporites*-2
531 *Momipites tenuipolis*
529 *Tiliapollenites*-4
400 *Pesavis tagluensis*
555 *Ctenosporites wolfei*
525 *Typha*-1
399 *Castanea*-1
389 *Nyssapollenites*-1
396 *Tiliapollenites*-2
535 *Sapotaceae*-1
534 *Nyssapollenites*-2
536 *Retitricolporopollenites*-1
543 *periporate*-2
367 *Azolla*
524 *Ilexpollenites*-1
527 *Liliacidites*-1

391 *Striadiporites sanctaebarbarae*
557 *Nyssapollenites*-3
415 *Aquilapollenites* cf. *murus*
559 *Triprojectus echinatus*
560 *Leptolepidites tenuis*
548 *Fusiformisporites*-2

Marine species are common in this zone, particularly above 1,490 feet and include:

M258 *Operculodinium*-1
M259 *Apectodinium homomorpha*
M260 *Apectodinium hyperacantha*
M222 *Ceratiopsis*-1
M255 *Apectodinium quinquelata*
M265 *Wetzeliella articulata*
M261 *Kiselevia tenuivirgula*
M262 *Hystrichokolpoma eisenacki*
M263 *Cordosphaeridium exilimurum*
M207 *Adnatosphaeridium* cf. *vittatum*
M264 *Wetzeliella* sp. BE Brid.
M236 *Diphyes colligerum*

Zone IKH-2 (2490-5360 feet)

Characterized by the following:

556 *Pesavis*-1
332 *Pediastrum*
31 *Lycopodiumsporites austroclavatidites*
288 *Stereisporites regius* (recycled above this zone)
240 *Hazaria canadiana*
561 *Retialetes*-1
566 *Aenigmapollis*-1
552 *Stephanocolpites*-1
562 *Hamulatisporis amplus*
563 *Cycadopites scabratus*
211 *Foveosporites canalis*

Occasional marine dinoflagellates in this zone may be caved from higher horizons.

Zone IKH-3 (5360-8860 feet)

Characterized by these terrestrial and marine species:

33 *Cyathidites australis*
14 *Lycopodiumsporites marginatus*
38 *Aequitriradites spinulosus*
29 *Cicatricosisporites augustus*
13 *Alisporites grandis*
23 *Ginkgocycadophytus nitidus*
5 *Alisporites bilateralis*

6 *Cingutriletes clavus*
4 *Cicatricosisporites hallei*
179 *Cicatricosisporites* cf. *hughesi*
10 *Perinopollenites elatoides*
214 *Cirratriradites teter*
3 *Classopollis torosus*
62 *Exesipollenites tumulus*
187 *Acanthotriletes varispinosus*
9 *Cerbropollenites mesozoicus*
24 *Podocarpidites multisimus*
56 *Deltoidospora juncta*
48 *Circulina parva*
46 *Parvisaccites radiatus*
26 *Vitreisporites pallidus*
156 *Tricolpites micromunus*
8 *Cedripites cretaceus*
16 *Deltoidospora hallei*
20 *Cicatricosisporites australis*
27 *Ephedripites multicostatus*
463 *Tigrisporites reticulatus*
63 *Pilosisporites trichopapillosus*
42 *Araucariacites australis*
318 *Eucommiidites minor*
201 *Trilobosporites apiverrucatus*
227 *Cicatricosisporites* cf. *ludbrooki*
M1 *Oligosphaeridium complex*
M2 *Astrocysta cretacea*
M24 *Baltisphaeridium whitei*
M54 *Pareodinia ceratophora*
M135 *Hystrichosphaeridium recurvatum*
M151 *Ascodinium verrucosum*
M28 *Oligosphaeridium anthophorum*
M266 *Micrhystridium* sp. A Br and Mc
M267 *Cleistosphaeridium ancoriferum*
M36 *Odontochitina operculata*
M13 *Micrhystridium stellatum*
M16 *Chlamydophorella nyei*
M50 *Gardodinium eisenacki*
M275 *Canningia aspera*
M286 *Pterospermopsis helios*
M268 *Leptodinium modicum*
M269 *Oligosphaeridium*-2
M272 *Hemicystodinium* sp. CA Brid.
M205 *Lunatadinium dissolutum*
M270 *Palaeostomocystis glabella*
M274 *Hystrichosphaeridium*-1
M27 *Gardodinium elongatum*
M43 *Muderongia* sp. A Br and Mc
M4 *Odontochitina striatoperforata*
M271 *Wallodinium krutzschi*
M55 *Fromea amphora*
M209 *Pseudoceratium* cf. *nudum*
M287 *Oligosphaeridium totum*

M273 *Pterodinium verrucosum*
M42 *Pterospermopsis australis*
M288 *Apteodinium*-1
M20 *Tanyosphaeridium* sp.
M238 *Gonyaulacysta orthoceras*
M154 *Pseudoceratium explolitum*
M35 *Broomea jaegeri*
M94 *Hystrichosphaeridium stellatum*
M155 *Hystrichosphaeridium* cf. *recurvatum*
M276 *Gonyaulacysta helicoidea*
M277 *Oligosphaeridium irregulare*
M278 *Dictyopyxidea imperfecta*
M284 *Hystrichosphaera*-1

Zone IKH-4 (8860-12,750 feet)

60 *Rouseisporites reticulatus*
39 *Foraminisporites wonthaggiensis*
61 *Eucommiidites troedssoni*
202 *Cicatricosisporites* cf. *potomacensis*
77 *Contignisporites cooksoni*
18 *Tigrisporites scurrandus*
50 *Coronatispora valdensis*
313 *Trilobosporites perverulentus*
565 *Cooksonites variabilis*
564 *Pilosisporites* cf. *notensis*
163 *Appendicisporites matesovai*
89 *Foraminisporis assymetricus*
55 *Appendicisporites jansonii*
30 *Phyllocladidites inchoatus*
49 *Converrucosisporites variverrucuatus*
43 *Klukisporites pseudoreticulatus*
M279 *Deflandrea perlucida*
M23 *Cleistosphaeridium polypes*
M156 *Microdinium opacum*
M280 *Rhombodella*-1
M74 *Micrhystridium varispinosum*
M15 *Leiofusa jurassica*
M18 *Cyclonephelium distinctum*
M281 *Canningia ringnesi*
M282 *Pseudoceratium*-1
M29 *Hystrichosphaera cingulata*
M283 *Cyclonephelium compactum*
M285 *Imbatodinium*-1
M7 *Hystrichosphaeridium cooksoni*
M47 *Veryhachium reductum*

Zone IKH-5 (12,750-15,350 feet)

Essentially a barren zone with the presence of one possible recycled species of

523 *Triquitrites* sp. indet.

PALEOENVIRONMENTS

Near-shore marine intervals marked by diverse dinoflagellate floras and associates spore-pollen assemblages occur in the following intervals:

80-1,490 feet
2,380 feet
5,360-12,650 feet

The remainder of the section represents continental conditions of deposition.

AGE AND CORRELATION

Zone IKH-1 Late Paleocene to Early Eocene

This zone contains very rich spore-pollen floras with species characterizing the Paleogene in other wells. The presence of 528 *Fusiformisporites*-1, 546 *Punctodiporites*-1, and 551 *Striadiporites*-2 indicates a correlation with the *Striadiporites* zone in other wells, e.g., AD-8, TG-6, LL-4 and RB-2.

The upper part of Zone IKH-1 (above 860 feet) contains an assemblage of *Wetzeliella* species previously reported by Brideaux (1976) from the Lower to Middle Eocene Reindeer Formation at 900-1,000 feet in Gulf Mobil Parsons N-10: M259 *Wetzeliella (Apectodinium) homomorpha*, M260 *Wetzeliella (Apectodinium) hyperacantha*, M255 *Wetzeliella (Apectodinium) quinguelata*, and M265 *Wetzeliella articulata*. According to Costa and Downie(1976) *Wetzeliella (Apectodinium) hyperacantha* occurs at and is limited to the extreme top of the Paleocene. This upper interval also contains the following dinoflagellates with ranges elsewhere (Eaton, 1976) as indicated:

M261 *Kiselevia tenuivirgula* Lower-Middle Eocene
M262 *Hystrichokolpoma eisenacki* Lower-Upper Eocene
M263 *Cordosphaeridium exilimurum* Lower-Upper Eocene

Between 1,190 feet and 2,380 feet the presence of M264 *Wetzeliella* sp. BE allows a correlation with the interval 1000-1290 feet in Gulf Mobil Parsons N-10 dated by Brideaux as early Eocene.

The balance of evidence favours a latest Paleocene or earliest Eocene age for this interval.

Zone IKH-2 Paleocene

556 *Pesavis*-1 occurs sporadically in this interval indicating a correlation with the *Pesavis*-1 zone (Lower Paleogene) in other wells, e.g., TI-7, TG-7, LL-6.

228 *Stereisporites regius* and 240 *Hazaria canadiana* are common in this zone and both have been reported previously (Paleo Services reports) fromthe IOE Nuvorak O-09 well between 1,986 feet (core) and 2,500 feet, the interval being dated as no older than Maestrichtian, due to the presence of 289 *Wodehousia spinata* in core at 1,986 feet. The latter species ranges into the Paleocene in Siberia and also into the Paleocene Ravenscrag Formation in the southern Canadian Plains (Dr. D. M. Jarzen, National Nuseum of Natural Sciences, Ottawa, pers. comm., October 1976). The presence of 562 *Hamulatisporis amplus* and 560 *Leptolepidites tenuis* in this interval also indicates a Maestrichtian or Paleocene age by comparison with palynofloras from South Dakota. A Paleocene age is favoured for this zone due to the lack of many typical Maestrichtian species and the presence of probable Paleocene beneath correlative intervals in Taglu C-42 and Titalik K-26, although the question of the limits of the Cretaceous-Tertiary boundary as recognized palynologically in this area is far from settled.

Zone IKH-3 and IKH-4 Middle Albian-Neocomian

These two zones will be discussed together. They serve as useful biostratigraphic zones in this well, but detailed scrutiny of the relationships of component species indicates that massive caving of Albian shale (probably from the upper part of Zone 3) has contaminated severely the underlying interval. The discussion below gives reasons for favouring the following age assignments:

IKH-3	(a)	5360-5760 feet.	Middle Albian
	(b)	5860-7960 feet.	Early Albian
	(c)	7960-8860 feet.	?Aptian
IKH-4	(a)	8860-10,760 ft.	Barremian
	(b)	10760-12,450 ft.	Neocomian

An initial assessment of IKH-3 and IKH-4 indicates a Middle Albian age for these intervals based on the presence of the following species with restricted ranges as indicated:

29 *Cicatricosisporites augustus* Middle-Upper Albian
463 *Tigrisporites reticulatus* Middle Albian-Lower Cenomanian
63 *Pilosisporites trichopapillosus* Berriasian-Middle Albian
201 *Trilobosporites apiverrucatus* Upper Jurassic-Albian
M266 *Micrhystridium* sp. *A* Lower-Middle Albian
M50 *Gardodinium eisenacki* Hauterivian-Upper Albian
M275 *Canningia aspera* Middle Albian
M268 *Leptodinium modicum* Lower to Middle Albian
M205 *Lunatodinium dissolutum* Valanginian-Middle Albian
M27 *Gardidinium elongatum* Middle Albian
M273 *Pterodinium verrucosum* Middle Albian
M20 *Tanyosphaeridium* sp. *A* Middle-Upper Albian
M154 *Pseudoceratium expolitum* Middle-Upper Albian
M277 *Oligosphaeridium irregulare* Lower-Middle Albian
M278 *Dictyopyxidea imperfecta* Lower-Middle Albian
60 *Rouseisporites reticulatus* Barremian-Middle Albian
18 *Tigrisporites scurrandus* Middle-Upper Albian
313 *Trilobosporites perverulatenus*

565 *Cooksonites variabilis* Barremian to Middle Albian
163 *Appendicisporites matesovai* Middle Albian-Cenomanian
89 *Foraminisporis asymmetricus* Aptian-Middle Albian
55 *Appendicisporites jansonii* Barremian-Upper Albian
30 *Phyllocladidites inchoatus* Middle Albian-Cenomanian
M23 *Cleistosphaeridium polypes* Aptian-Cenomanian
M281 *Canningia ringnesi* Middle Albian-Cenomanian
M282 *Pseudoceratium*-1
M283 *Cyclonephelium compactum* Albian-Cenomanian

M151 *Ovoidinium verrucosum* and M270 *Palaeostomocystis glabella*, however, occur within 500 feet of the Paleocene unconformity and have published ranges in North America of Upper Albian and higher. The bulk of the species, however, favour Middle Albian for the section immediately beneath the Paleocene unconformity.

The persistent presence of M272 *Hemicystodinium* sp. CA (Aptian-Lower Albian) at 5,860 feet and lower, however, suggests lower Albian below this horizon. M43 *Muderongia* sp. A at 6,060 feet is reported elsewhere in Aptian-?Lower Albian (Brideaux 1976). The single occurrence of M272 *Wallodinium krutzschi* (Hauterivian-Upper Barremian) at 6,060 feet is possibly the result of recycling, since its main range is much lower. Species of Alisporites become common to abundant elements in this interval but have little biostratigraphic significance.

M272 *Wallodinium krutzschi* occurs at 8,460 feet (the higher occurrence is interpreted as recycled). Its range is reported to be Hauterivian-Barremian, although Brideaux (1976) has recently reported its occurrence in a possible Albian interval in Gulf-Mobil Parsons N-10. Species in this interval also occurring in the subject well include:

M272 *Hemicystodinium* sp. *CA*
M278 *Dictyopyxidea imperfecta*
M275 *Canningia aspera*
M43 *Muderongia* sp. *A*
M35 *Broomea jaegeri*
M50 *Gardodinium eisenacki*
M28 *Oligosphaeridium anthophorum*
M205 *Lunatodinium dissolutum*

These species co-occur below 7,960 feet, possibly indicating an Aptian age.

The well-defined top of M279 *Deflandrea perlucida* (Upper Barremian) at 8,860 feet strongly suggests the presence of Barremian below this horizon. The base of the Barremian interval is difficult to define due to continued Barremian-Albian cavings obscuring indigenous species. M279 *Deflandrea perlucida* and 60 *Rousesporites reticulatus* are common to approximately 10,660 feet indicating the base of the Barremian possibly near this horizon.

Ill-defined Neocomian below this horizon is suggested by rare scattered occurrences of the following species to 12,450 feet:

M47 *Veryhachium reductum*
564 *Pilosisporites notensis*
49 *Converrucosisporites variverrucatus*
43 *Klukisporites pseudoreticulatus*

Zone IKH-5 Indeterminate

The presence of an indeterminate species of *Triquitrites* in this zone is possibly due to recycling. The poor palynofloras are possibly the result of a facies change eliminating most species. The interval is probably Mesozoic to judge from the scattered species present. These could, however, be due to caving from the overlying Cretaceous.

ORGANIC MATURATION

There is a steady increase of organic maturation levels from 3 at the top of the well to 5 at the base of the Cretaceous.

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MICROPALEONTOLOGICAL STUDY

BY

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TABLE 1
GULF MOBIL

IKHIL I-37

PALYNOLOGY Norris, 1976			MICROPALEONTOLOGY Braun & Brooke, 1976	
Zones	Environment	Age		
IKH-1 (1490' – 2490')	near-shore marine	latest PALEOCENE or earliest EOCENE	no diagnostic microfauna	
IKH-2 (2490' – 5360')	marine / terrestrial	PALEOCENE	4625' ± 15' CYCLAMMINA 7! FAUNA	restricted marine
IKH-3 (a) (5860' – 7960')	near-shore marine	MIDDLE ALBIAN	5250' ± 50' radiolarian fauna?	
IKH-3 (b) (7960' – 8860')		EARLY ALBIAN	5950 ± 50' LOWER CRETACEOUS ASSEMBLAGE II	marine shallow-water
IKH-3 (c)		APTIAN		boreal fauna
IKH-4 (a) (10,760' – 12,750')		BARREMIAN	9650 ± 50' LOWER CRETACEOUS ASSEMBLAGE III ?	restricted to certain extent
IKH-4 (b)		NEOCOMIAN	11,000'	
IKH-5 (15, 350')	terrestrial	INDETERMINATE	not diagnostic ◄ Ammobaculites 273	

2000 – 4000 – 6000 – 8000 – 10,000 – 12,000 – 14,000 – 16,000

GULF-MOBIL IKHIL I-37

SUMMARY OF MICROPALEONTOLOGICAL STUDY

General Remarks

Eighty-two (82) micropaleontological slides were submitted for study covering a section from 3,000 feet to 15,200 feet of the borehole. The Tertiary sequences penetrated contained very few species, but a moderately diverse Lower Cretaceous (to Jurassic?) microfauna of more open-marine, shallow-water origin was encountered below the 6,000 foot level and extending to about 11,000 feet.

All microfossils that could be identified, including certain characteristic fragments were provided with species numbers, and their sequence and relative abundance is shown on the accompanying chart. Whenever possible, the forms were identified to generic rank or as close as possible, but no attempts have been made to search the 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. The lower boundaries are difficult to define without the results from core samples, and the base of the faunal unit is usually drawn where a drop in occurrence of many forms is evident.

Microfaunal Assemblages

The samples spanning the interval from 3,000 feet to about 4,600 feet contain undiagnostic fragments only, some of questionable foraminiferal or even fossil origin. They are useless not only for correlation or identification of ages, but also as indicators of paleo-environments.

Cyclammina 71 - Fauna

Many specimens of the characteristic *Cyclammina* 71 appear in sample 4610-4640 feet and continue to 5250 ±50'. They occur within the basal part of the palynological Zone IKH-2 of Paleocene age.

The *Cyclammina* 71-Fauna is relatively widespread in the Mackenzie Delta region, and it is referred in literature as the *arctica-borealis* complex. It was traced by Staplin and co-workers from the base of the Taglu C-42 borehole to about the 9,000 foot level at Reindeer D-27 from where Petracca and Chamney report the same species. The unit, therefore, seems to be equivalent to Chamney's 11 B unit of Reindeer, or his Middle *Cyclammina* (vitreous) horizon.

Chamney considers the Lower to Upper Cyclammina sequence to represent a Danian age "inferring more indicators of Maestrichtian than Paleocene age". Staplin, however, considers the arctica-borealis complex to be of "probable Eocene age", a placement more compatible with our experience. Petracca too argues for a Tertiary age of these faunas.

Cyclammina 71 was found to date during the course of our studies in the following borehole sequences dated to be of Paleocene age at Kugpik O-13, Taglu C-42, Titalik K-26, and Unak B-11. It was found within sequences dated to be of Middle to Lower Eocene age at Ikattok J-17, but a re-evaluation of the palynological results is under way to confirm or correct this age placement. However, the same species was found also in quite an unusual combination with "Cyclammina" 7 (Haplophragmoides 504 of Staplin) at Pullen E-17, Umiak J-37, and Ya Ya A-28, in sequences dated to be of Middle to Upper Eocene age - one half to one full stage higher than its "normal" occurrence.

For the time being and until more is known about the overall range of this characteristic species, the following "rule of thumb" may be applied: the Cyclammina 71-Fauna seems to occur foremost in sequences of Paleocene age but may extend into Middle Eocene ones. In those cases where it is associated with "Cyclammina" 7 or other diagnostic species of Upper Eocene or younger ages, the possibility should be considered that the 71-specimens (and possibly others) are re-worked forms. Thus the age assignment should not be based on the occurrence of Cyclammina 71 but rather on the other diagnostic species associated, such as "Cyclammina" 7. In other cases, however, the reverse situation may have to be considered: that "Cyclammina" 7 or other species are up-hole contaminants! Affirmation of the age, therefore, by palynological means is essential.

Lower Cretaceous Assemblages

Pending the outcome of comprehensive studies of the Jurassic to Lower Cretaceous microfaunas of western Canada presently undertaken in our laboratory, and pending the integration of results obtained with published data, the Lower Cretaceous to Jurassic microfaunal assemblages are informally grouped into 4 faunal units: Assemblages I to IV in descending order. Assemblage III may span the Jurassic-Cretaceous boundary, and the reference sections used are Roland Bay L-41 in which a very rich and nearly continuous microfaunal succession is present, and Unak B-11 from which a rather detailed palynological zonation is available. In order not to confuse these faunal units with Assemblages I and II of Neogene and Late Tertiary age, the prefix Lower Cretaceous and Jurassic is used.

Radiolarian fauna ?

In between the Cyclammina 71-Fauna of Paleocene age and the relatively richly diversified Lower Cretaceous Assemblage II is an interval from 5,250 feet to 5,950 feet, approximately 700 feet thick, in which no diagnostic microfossils occur except for fragments of bones and teeth and possibly radiolarians, aside of pyrite and other mineral fragments. This sequence is reminiscent of that encountered at Kugpik 0-13 where the Cyclammina 71-Fauna is followed downsection first by a bone-bed interval and then by the Radiolarian 1 to 3 - Fauna. At Kugpik, this radiolarian fauna was considered to be of Middle Albian age and to be equivalent to Chamney's Radiolarian 9 unit of his "Bentonite Shale zone". However, at Kugpik, the radiolarians and bone fragments are much more numerous, and they occur in a distinctly radioactive black shale zone, in contrast to the Ikhil borehole where no such lithology is present, and where only a very few fragments of these fossil remains were found in the samples submitted for study.

For these reasons, no formal unit is established and only attention drawn to the possibility that a Middle Albian unit may be present. This would not be inconsistent either with the placement of the Paleocene-Middle Albian boundary by Norris at 5,360 feet.

Lower Cretaceous Assemblage II

With sample 5900-6,000 feet, such diagnostic species of the Lower Cretaceous Assemblage II appear as polymorphinid 114-222, or in particular Globobolivina 166, among many undiagnostic forms and fragments, and calcareous species of late Tertiary to Neogene age. The index species mentioned were found also at about 3,000 feet in Unak B-11 where they are associated with forms belonging to the lower sub-assemblage of Assemblage II. This would mean that not only is the Middle Albian Assemblage I missing entirely at Ikhil, but also the upper part of Assemblage II, and that the fossiliferous interval starts with a fauna of Lower Albian-Aptian-Barremian age, most likely Aptian.

The first appearance of Haplophragmoides 294 and Textularia 8 at about the 8200 foot level at Ikhil is reminiscent of the same minor faunal break within the lower Assemblage II at Unak at about 3400 feet.

Assemblage II spans the palynological zones U-5 and upper part of U-6 at Unak B-11 which are considered to be of Lower Albian-Aptian and Barremian-Hauterivian age respectively. In turn, Assemblage I of Unak and Roland Bay would be mainly Middle Albian in age. However, there are discrepancies with respect to the palynological zonation established for the Ikhil borehole by Norris, which shows an early Albian to Aptian age.

The correlation of Assemblage II from Ikhil to Unak and to Roland Bay is based on a number of diagnostic microfossil species although, admittedly, the fauna is most varied and abundant in the northwesterly direction at Roland Bay, moderately diversified at Unak, and it becomes distinctly impoverished in a southeasterly direction, indicating that restrictive conditions were more strongly developed in the Ikhil region at the time of deposition as they were at Unak. Still, enough species are left at Ikhil to suggest correlation with some confidence. Using, therefore, the Unak section as yardstick, it may be summarized that it is most unlikely that a Middle Albian microfossil unit is present at Ikhil, except possibly for the questionable radiolarian interval, and that the youngest Early Cretaceous forms are somewhat of Aptian age.

Lower Cretaceous (to Jurassic?) Assemblage III?

The appearance of some questionable specimens of Haplophragmoides 141 in sample 9600-9700 feet may signal the presence of the Lower Cretaceous Assemblage III. This poorly fossiliferous interval continues to about 11,000 feet, but none of the other zonal indicators present at Unak and Roland Bay were found in the Ikhil section, indicating severely restricted conditions. For these reasons, the microfaunal zone is only tentatively recognized.

This questionable faunal unit falls within sequences considered to be of Barremian age by Norris, but Assemblage III at Unak spans sequences dated by Rouse to span an interval between the Lower Hauterivian to Valanginian and possibly extending into the Cretaceous-Jurassic boundary sequences.

Ammobaculites 273

The last fossiliferous sample (15,000-15,100 feet) of the Ikhill borehole contained a specimen of Ammobaculites 273, among a few other Foraminifera. The interval above, from about 11,000 feet contains a few specimens and fragments only which cannot be related to any particular faunal assemblage. However, Ammobaculites 273 was also found at the base of the Unak B-11 borehole and in the uppermost part of the palynological Zone U-11 of undifferentiated Mesozoic age (Triassic to Early Jurassic). At Ikhil, it occurs in an interval considered by Norris to be of indeterminate age, as there are no microfaunal indicators in the samples submitted for study to support such an age determination.

Not enough specimens were found to warrant the creation of an independent faunal zone, or recognize it as part of a distinct assemblage. Maybe the occurrence in both boreholes is purely incidental; but Ammobaculites 273 may prove eventually useful in correlation.

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PALYNOMORPH PHOTOGRAPHIC PLATES

GULF-MOBIL IKHIL I-37

GULF MOBIL IKHILL I-37

All figures 750x*. Scale in top left is 100um*.

PLATE 43

66	536	*Retitricolporopollenites*-1
67-69	538	*Retitricolporopollenites*-2
70-73	534	*Nyssapollenites*-2
74	397	*Tiliapollenites*-3
75	389	*Nyssapollenites*-1
76-77	557	*Nyssapollenites*-3
78-79	330	*Pistillipollenites mcgregorii*
80	531	*Momipites tenuipolis*
81-82	566	*Aenigmapollis*-1
83	541	*Symplocoipollenites*-1
84	529	*Tiliapollenites*-4
85	552	*Stepanocolporites*-1
86-87	543	*Periporate*-2
88	558	*Aquilapollenites* cf. *granulatus*
89-94	559	*Triprojectus echinatus*

*Except Fig. 133 which is approximately 350x.

GULF MOBIL IKHILL I-37

All figures 750x*. Scale in top left is 100um*.

PLATE 44

95	M55	*Fromea amphora*
96-97	M270	*Palaeostomocystis glabella*
98-99	M271	*Wallodinium krutzschi*
100-103	M205	*Lunatodinium dissolutum*
104-108	M272	*Hemicystodinium* sp. CA

*Except Fig. 133 which is approximately 350x.

GULF MOBIL IKHILL I-37

All figures 750x*. Scale in top left is 100um*.

PLATE 50

147	M264	*Wetzeliella* sp. BE
148-150	M265	*Wetzeliella articulata*
151-152	M260	*Wetzeliella hyperacantha (Apectodinium hyperacantha)*

*Except Fig. 133.

GULF MOBIL IKHILL I-37

All figures 750x*. Scale in top left is 100um*.

PLATE 54

185-187	M258	*Operculodinium*-1
188-189	M269	*Oligosphaeridium*-2
190	M20	*Tanyosphaeridium* sp.
191	M269	*Oligosphaeridium*-2
192	M287	*Oligosphaeridium totum*
193-194	M262	*Hystrichokolpona eisenacki*

*Except Fig. 133.