

**PAPER 74-11**

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BIOSTRATIGRAPHIC DETERMINATIONS OF FOSSILS FROM THE SUBSURFACE OF THE NORTHWEST AND YUKON TERRITORIES

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1974



Energy, Mines and
Resources Canada

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**GEOLOGICAL SURVEY
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ABSTRACT

Identifications and age determinations are presented for fossils from 34 wells in the Yukon and the Districts of Franklin, Keewatin and Mackenzie. Ages range from Cambrian to Tertiary and are based on identifications of spores, pollen, dinoflagellates, acritarchs, conodonts, foraminifers, ostracodes, graptolites, corals, gastropods, cephalopods, pelecypods, brachiopods and trilobites.

RÉSUMÉ

Les auteurs donnent les identifications et les âges des fossiles provenant de 34 puits du Yukon et des districts de Franklin, de Keewatin et de Mackenzie. Les âges des fossiles s'étendent du Cambrien au Tertiaire et sont déterminés par les études des spores, des grains de pollen, des dinoflagellés, des acritarches, des conodontes, des foraminifères, des ostracodes, des graptolites, des coraux, des gastropodes, des céphalopodes, des pélecypodes, des brachiopodes et des trilobites.

BIOSTRATIGRAPHIC DETERMINATIONS OF FOSSILS FROM THE SUBSURFACE OF THE DISTRICTS OF FRANKLIN, KEEWATIN AND MACKENZIE AND THE YUKON TERRITORY

INTRODUCTION

The assimilation of information obtained from wells drilled in northern Canada is of prime importance to the continuing exploration of the petroleum resources of the region. Biostratigraphic dating of rocks penetrated by wells allows precise correlation of strata with rock units in other wells and with outcropping formations. It provides important age control for reconstructions of the structural configuration of the subsurface rocks and of the patterns of sedimentation during geological time.

Where possible, the fossiliferous intervals in the wells have been assigned to formations. G.R. Davies, R.W. Macqueen, W.S. MacKenzie, N.C. Meijer-Drees, A.W. Norris, A.E.H. Pedder, K.J. Roy, B.V. Sanford, H.P. Trettin, C.J. Yorath and F.G. Young, all of the Geological Survey of Canada, are responsible for these assignments. The stratigraphic frameworks have not yet been established for the intervals reported on in the remaining wells, and formational assignments are not possible. The fossils are stored in the collections of the Geological Survey of Canada in Calgary, except for some samples of conodonts that are the property of Société Nationale des Pétroles d'Aquitaine (S.N.P.A.) and are at its research laboratories at Pau, France.

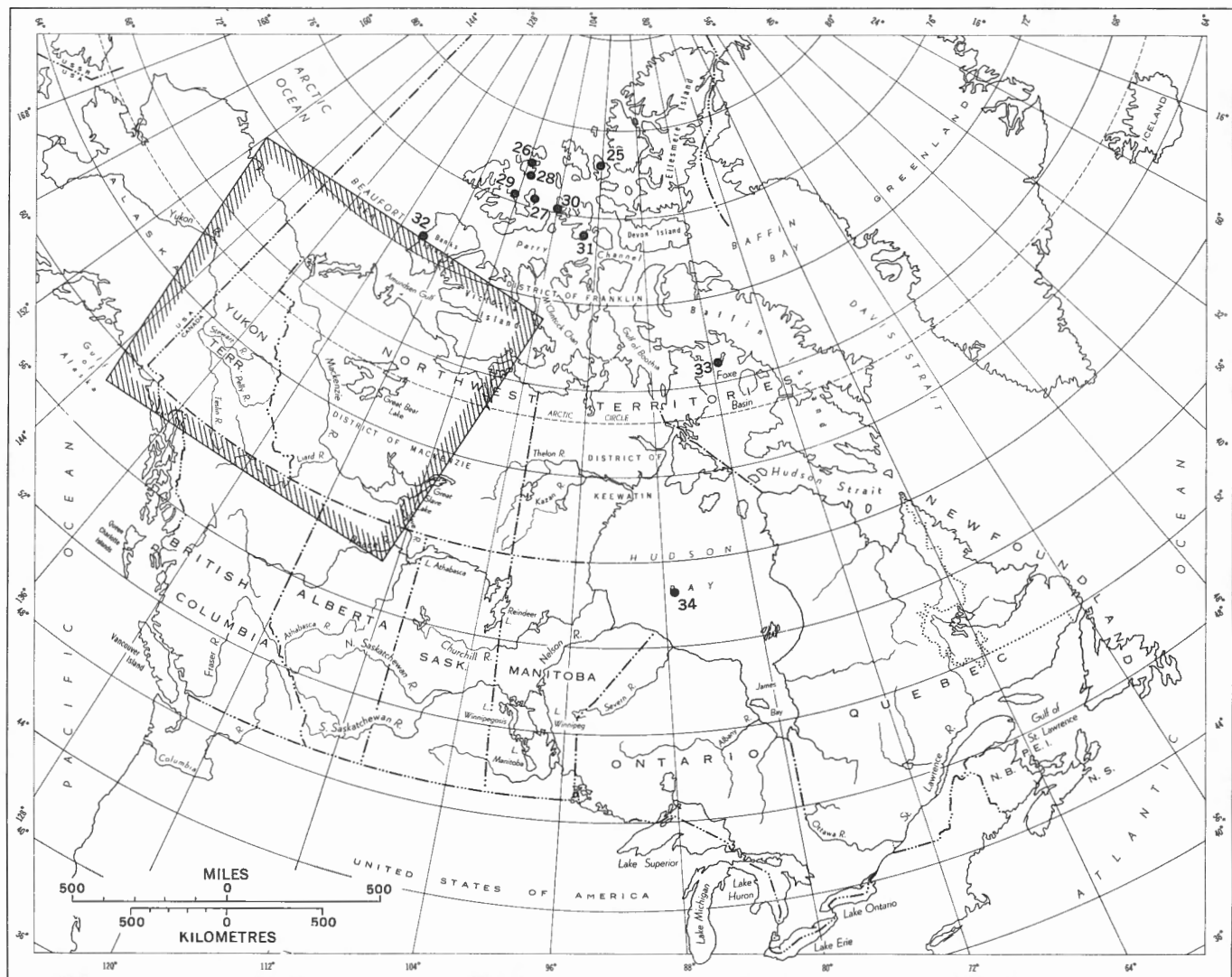
The information in this paper has been used by stratigraphers of the Institute of Sedimentary and Petroleum Geology in research on the subsurface geology of northern Canada, part of which has been abstracted to appear in editions of the Schedule of Wells published by the Department of Indian and Northern Affairs. The paper includes studies conducted by D.R. Clowser, R.E. Dunay, M.J. Fisher, P.J. Rauwerda and P.F. Sherrington of Robertson Research (North America) Ltd., by J.B. Waterhouse of the University of Toronto, and by C.R. Barnes of the University of Waterloo. S.N.P.A. kindly provided samples prepared from cuttings for examination by T.T. Uyeno. Aquitaine Company of Canada and Atlantic Refining Company similarly provided sidewall samples for examination by W.W. Brideaux. Chevron Standard Limited kindly permitted studies conducted for the company by J.B. Waterhouse to be included in the present publication.

The paper was compiled by B.S. Norford; similar ones have been published by the Geological Survey of Canada as Papers 70-15, 71-15 and 72-38.

WELLS STUDIED AND SHOWN ON FIGURES 1a AND 1b

<u>Locality</u>	<u>Well Name</u>	<u>Year Completed</u>	<u>Ages Reported</u>	<u>Author</u>
1	I.O.E. Nuvorak O-09	1970	Cretaceous	Chamney
2	I.O.E. Kanguk I-24	1971	Devonian(?) - Cretaceous	Chamney
3	I.O.E. Natagnak H-50	1970	Jurassic-Cretaceous	Chamney
4	I.O.E. Tuktu O-19	1971	Devonian-Jurassic	Chamney-Pedder
5	I.O.E. Mayogiak J-17	1971	Devonian-Jurassic-Cretaceous	Chamney-Pedder
6	I.O.E. Taglu G-33	1971	Tertiary	Brideaux
7	B.A.-Shell-I.O.E. Reindeer D-27	1966	Cretaceous	Brideaux

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Figure 1 (a). Locality map, shaded area shown in more detail in figure 1b

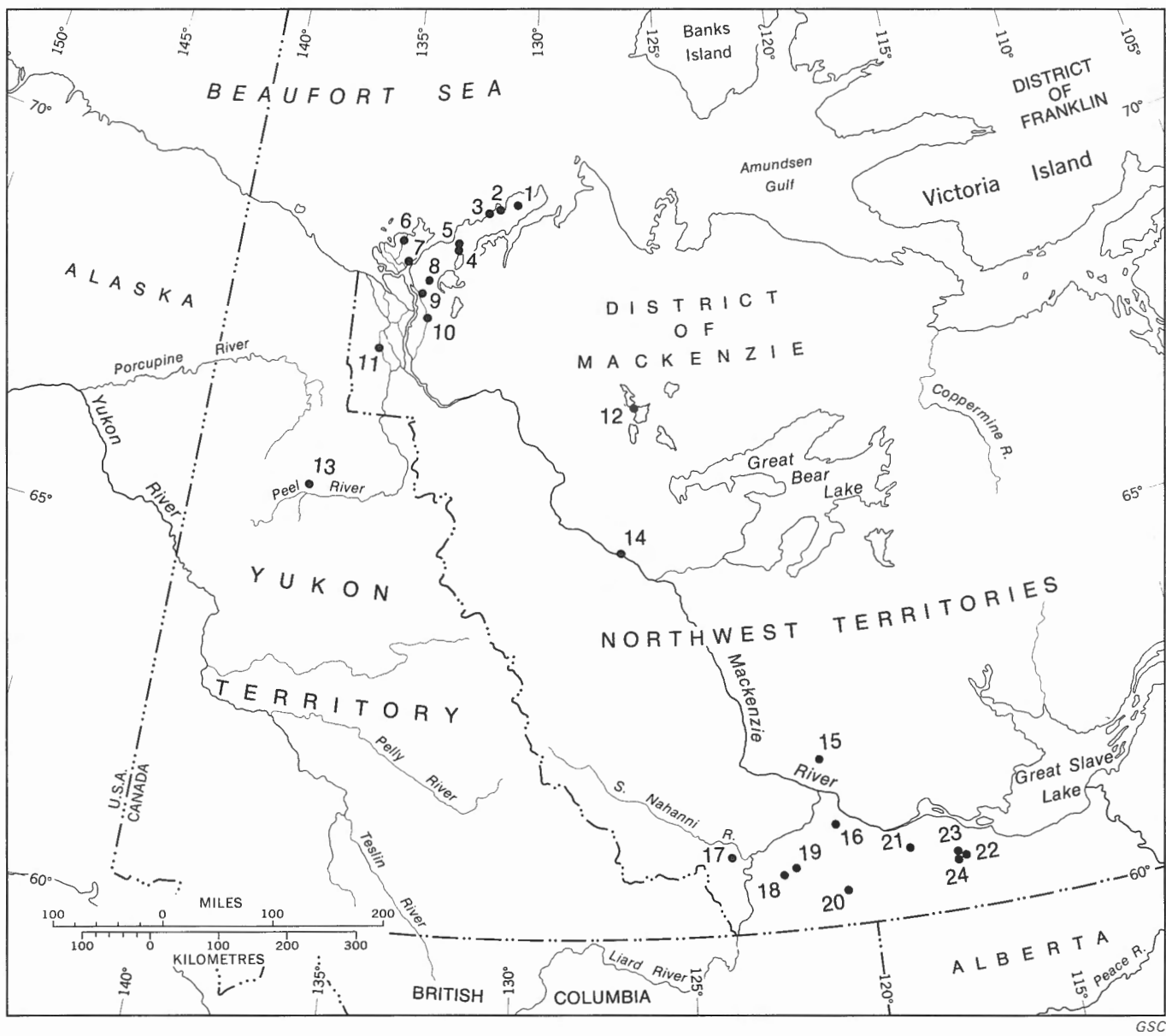


Figure 1 (b). Locality map, Yukon Territory and adjacent District of Mackenzie

Locality	Well Name	Year Completed	Ages Reported	Author
8	Gulf-Mobil East Reindeer G-04	1971	Cretaceous	Brideaux-Jeletzky
9	Gulf-Mobil East Reindeer A-01	1971	Cretaceous(?)	Brideaux
10	Amoco-Ulster-Scurry Inuvik D-54	1969	Devonian- Jurassic- Cretaceous	Chamney
11	Banff-Aquitaine-A.R.C.O. Rat Pass K-35	1970	Cretaceous	Brideaux
12	Mobil Colville E-15	1970	Cambrian	Fritz
13	Socony Mobil-W.M. Blackie No. 1. Y.T. M-59	1964	Carboniferous- Permian	Waterhouse
14	Imperial Norman Wells No. 37x	1956	Devonian	Pedder
15	Husky H.B. <i>et al.</i> Willow Lake O-27A	1970	Ordovician	Norford
16	Husky H.B. <i>et al.</i> Willow Lake G-32	1970	Ordovician	Norford
17	Pan-American A-1 Mattson Creek No. 1	1961	Silurian	Norford
18	Imperial-Sun Arrowhead I-46	1961	Devonian	Pedder
19	Murphy-B.O.C. Arrowhead River No. 1	1961	Devonian	Pedder
20	Union-Pan Am. Trainor L-59	1966	Devonian	Pedder
21	Briggs Rabbit Lake No. 2	1955	Devonian	Pedder
22	Briggs N.E. Tathlina Lake No. 9	1959	Devonian	Pedder
23	Briggs N.E. Tathlina Lake No. 1	1956	Devonian	Pedder
24	Placid Chevron Kakisa J-65	1968	Devonian	Pedder
25	Panarctic Amund Central Dome H-40	1971	Triassic	Tozer
26	Elf Wilkins E-60	1971	Triassic	Tozer
27	Panarctic Drake Point N-67	1970	Triassic	Tozer
28	Elf Cape Norem A-80	1970	Triassic	Clowser-Dunay- Fisher-Rauwerda- Sherrington
29	Sun-King Resources-Panarctic Kitson R. C-71	1971	Ordovician- Silurian	Uyeno-Barnes
30	B.P. <i>et al.</i> Hotspur J-20	1971	Silurian- Devonian	McGregor-Norford- Norris-Uyeno
31	Sun-King Resources-Panarctic Allison R. N-12	1971	Silurian	Norford
32	Elf <i>et al.</i> Storkerson Bay A-15	1971	Devonian, Cretaceous, Tertiary	Hopkins-Sliter- Uyeno
33	Aquitaine <i>et al.</i> Rowley M-04	1971	Ordovician	Barnes
34	Aquitaine Hudson Walrus A-71	1969	Silurian- Devonian	Uyeno

CORRELATIONS AND IDENTIFICATIONS OF FOSSILS

Tertiary Assemblages (palynomorphs) by W.W. Brideaux

I.O.E. Taglu G-33

69°22'17.95"N, 134°53'36.74"W, figure 1b, loc. 6

Depth 3,120-9,271 ft., core,
GSC locs. C-24273 to C-24289

Figure 2 shows the distributions of taxa in
this stratigraphic interval.

age, 3,120-3,140 ft.; Oligocene
4,425-4,445 ft.; Late Eocene-Oligocene
5,374-7,644 ft.; indeterminate
8,056-8,537 ft.; Eocene
9,247-9,249 ft.; Paleocene?-Eocene
9,256-9,271 ft.; Paleocene

Comments: The occurrence of *Aciculites subparalella*
together with onagraceous pollen at depths of between
3,120 and 3,140 feet indicates an Oligocene age.
Onagraceous pollen between 4,425 and 4,445 feet sug-
gests that this sample is Late Eocene to Oligocene

in age (W.S. Hopkins, Jr., pers. com.). The angio-
sperm pollen assemblage at depths to 9,271 feet indi-
cates a Paleocene age; associated dinoflagellates and
angiosperm pollen belonging to *Aquilapollenites* are
considered to have been derived from Upper Cretaceous
(Maastrichtian) rocks.

Some cooling of the climate by Oligocene time
is suggested by the abundance of pinaceous pollen
and *Tsugaepollenites* at depths of between 3,120 and
3,140 feet. Within this interval, the sample be-
tween 3,120 and 3,125 feet is mainly coal and the
palynomorph assemblage is consistent with the restric-
ted depositional environment and provenance associated
with coal swamps: trilete and monolet psilate pte-
ridophyte spores dominate the fine fraction; cuticle
fragments and pteridophyte spores dominate the coarse
fraction; and the incidence of pinaceous pollen and
Tsugaepollenites is reduced.

Fungal elements (fruiting bodies and mycelia)

LEGEND			TAXON		PALYNOMORPHS																								
X	Present	O	10-25																										
S	Single spec.	A	25-																										
R	2-3	D	Dominant																										
F	3-10	d	Derived																										
Q	Questionable Identification																												
BIOSTRAT-IGRAPHY	G.S.C. LOCATION NUMBER	SAMPLE INTERVAL (Feet)																											
OLIGOCENE	C-24273-4	3120-3140	Aciculites subparallelia Piel	R	A	A	D	d	bisaccate pollen, Pinaceae																				
U. EOCENE-OLIGOCENE	C-24275	4425-4445	Alnipollenites verus (Potonie) Potonie	F																									
INDETERMINATE	C-24276	5374-5387	Carpinipites sp. 2	F	F	R	S	S	Ericaceae spp. (tetrads)																				
	C-24277	6797-6817	Carpinipites sp. 1	F	F	R	S	S	Ericaceae spp. (tetrads)																				
	C-24278	7470-7497	bisaccate pollen, Trassic	F	F	R	S	S	Ericaceae spp. (tetrads)																				
	C-24279	7637-7644	bisaccate pollen, Pinaceae	F	F	R	S	S	Ericaceae spp. (tetrads)																				
EOCENE	C-24280	8056-8081	Alnipollenites verus (Potonie) Potonie	F	S																								
	C-24281	8230-8244	Carpinipites sp. 1	F	S																								
	C-24283	8280-8310	Carpinipites sp. 2																										
	C-24284	8440-8442	Ericaceae spp. (tetrads)																										
	C-24287	8520-8536.8	Alnipollenites verus (Potonie) Potonie	S																									
PALEOCENE?-EOCENE	C-24288	9247.5-9249	Alnipollenites verus (Potonie) Potonie	S	F	F																							
PALEOCENE	C-24289	9256-9271	Alnipollenites verus (Potonie) Potonie																										

Figure 2. Occurrences of species in core from 14 samples from the I. O. E. Taglu G-33 well

GSC

appear in some numbers at depths of between 8,520 and 8,536.8 feet and are so abundant between 9,247.5 and 9,249 feet as to suggest a somewhat restricted depositional environment. The small amounts of derived material in these samples support this interpretation.

Devonian, Cretaceous, and Tertiary Assemblages
(palynomorphs; foraminifers; conodonts)
by William S. Hopkins, Jr., W.V. Sliter and T.T. Uyeno

Elf *et al.* Storkerson Bay A-15
72°54'00"N, 124°33'29"W, figure 1a, loc. 32

Depth 3,000-5,150 ft.,
cuttings, GSC locs.
C-24187 to C-24196,
C-24199 to C-24204,
C-24426 to C-24443,
C-25778 to C-25883

The attached stratigraphic range charts (Figs. 3a, 3b) present in summary form the results of a palynological study of 22 samples and of a micropaleontological study of 12 samples. On figure 3a are listed only those palynomorphs that have maximum stratigraphic value. Some discrepancies are present in the ages deduced from the two studies.

ages: Palynology	Micropaleontology
3,000-3,400 ft.: Tertiary	
3,500-4,700 ft.: Late Cretaceous, Maastrichtian	3,600-3,800 ft.: Cretaceous (?) 3,800-4,000 ft.: Late Cretaceous, Campanian 4,000-4,100 ft.: Late Cretaceous, Campanian/Turonian 4,100-4,400 ft.: Late Cretaceous, Turonian 4,400-4,600 ft.: Early Cretaceous, Middle to Late Albian
4,700-5,000 ft.: Late Cretaceous, Campanian	4,600-5,100 ft.: Early Cretaceous, Middle Albian
5,000-5,150 ft.: Early Cretaceous Albian	5,100-5,150 ft.: Early Cretaceous, Early to Middle Albian

Comments (W.S.H.): The quality of the samples ranged from good to barren with the majority being fair to indifferent. Contamination was severe with Tertiary palynomorphs being abundant to the bottom of the examined section. As in any analysis of well cuttings, only the initial occurrence has any real stratigraphic significance.

The indicated ages must be considered as tentative and the boundaries between age assignments approximate. Most diagnostic forms are uncommon, and their true first appearance may be farther up the hole than indicated.

The last three listed species are found, to my knowledge, only in Albian rocks.

Comments (W.V.S.): The foraminifers listed represent in general the most diagnostic species recovered. Diversity, abundance and better preserved specimens increase downhole. Downhole contamination was particularly noticeable in the upper portion of the well. Between 3,800 and 4,000 feet, a distinctive Campanian *Haplophragmoides-Ammodiscus* fauna occurs equivalent to that in the Schrader Bluff Formation of Alaska and the Belly River Group of Alberta. From 4,000 to 4,400 feet the calcareous and agglutinated species indicate correlation with Turonian sections in Alaska and Alberta. The characteristic Albian assemblages begin at 4,400 feet and consist of a downhole succession of early, middle and late faunal equivalents to those in the Torok, Topagoruk and Grandstand Formations of Alaska and the Clearwater, Joli Fou and Ashville Formations of the Western Interior.

Depth 6,446-6,474 ft., core,
GSC loc. C-23944

Ozarkodina n. sp. A of McGregor and Uyeno,
1972 P (7), O₁ (3), N (2), A₁ (1),
A₂ (1), A₃ (1)
Panderodus spp. (sensu formae) (74)
Scolopodus sp. (sensu formae) (1)
indet. simple cone (M₂ element) (1)
age: late Early Devonian, late Emsian

Comments (T.T.U.): The figures in brackets indicate numbers of specimens recovered. *Ozarkodina* n. sp. A occurs in the upper part of the Stuart Bay Formation at Young Inlet and in the Eids Formation at Twilight Creek, both on Bathurst Island (Uyeno *in* McGregor and Uyeno, 1972). At these localities it occurs with *Polygnathus perbonus* (Philip) which is a late Emsian indicator. The P elements of this species also have been noted from the Gossage Formation at Powell Creek in the Mackenzie Mountains, west of Norman wells (Uyeno *in* Lenz and Pedder, 1972).

Cretaceous Assemblages (palynomorphs and molluscs)
by W.W. Brideaux and J.A. Jeletzky

Gulf-Mobil E. Reindeer G-04
68°53'15.94"N, 133°46'03.28"W, figure 1b, loc. 8

Depth 6,276 ft., core,
GSC loc. 87570

Sonneratia (sensu lato) n. sp. either
closely allied to or specifically
identical with ?*Sonneratia* (sensu
lato) n. sp. A of Jeletzky (1964, Pl.
XXIII, figs. 1A-1C, p. 74).
age: Early Albian

Comments (J.A.J.): Zone of ?*Sonneratia* (sensu lato) n. sp. A and equivalent to either the upper part of *Leymeriella tardefurcata* Zone or the lower part of *Douvilleiceras mammillatum* Zone of the European Lower Albian. The Canadian ?*Sonneratia* (sensu lato) n. sp. A Zone is older than any part of the generalized upper Lower Albian Zone of *Beudanticeras affine* and *Arthropites* (= *Lemuroceras auctorum*) spp.

Zone of central and arctic Canada. As far as is known, *?Sonneratia* (sensu lato) n. sp. A zone is the oldest Albian zone in Canada and may or may not follow immediately the Aptian *Tropaeum australe* and *Aucellina aptiensis-caucasica* Zone (see Jeletzky, 1964, Table 1). The *Cleoniceras* cf. *C. subbaylei* Zone (see Jeletzky, 1964, Table 1) was found more recently to be a faunal facies of the generalized *Beudanticeras affine* and *Arcthoplites* spp. Zone. The complete upper Aptian-Lower Albian sections studied recently in the western Richardson Mountains and Cache Creek-Fish River area indicate that basal beds of the *?Sonneratia* (sensu lato) n. sp. A Zone form the basal part of the Albian shale-siltstone division closely above the top of the upper sandstone division of Jeletzky (1958, 1960, 1961). They are separated from the topmost beds of the *Tropaeum australe-Aucellina aptiensis-caucasica* Zone by some 150 to 200 feet of marine siltstones and shales (placed into the Albian shale-siltstone division) which have not yielded diagnostic macrofossils and thus could belong to either zone.

Depth 9,580-9,590 ft., core,
GSC loc. C-22382

plant debris (dominant)
derived Devonian and Carboniferous spores
bisaccate grains
Cicatricosisporites australiensis
(Cookson) Potonié
Lycopodiumsporites austroclavatidites
(Cookson) Potonié
age: Mesozoic, latest Jurassic to Early
Cretaceous, probably Early Cretaceous

Depth 9,590-9,605 ft., core,
GSC loc. C-22383

plant debris (dominant)
derived Devonian and Carboniferous spores
bisaccate grains
Distaltriangulisporites perplexus
(Singh) Singh
Cicatricosisporites spp.
Deltoidospora spp.
age: Mesozoic, Cretaceous,
Early Cretaceous.

Cretaceous Assemblages (palynomorphs)
by W.W. Brideaux

Gulf Mobil East Reindeer A-01
68°40'13"N, 134°00'30"W, figure 1b, loc. 9

Depth 9,532-9,543 ft., core,
GSC loc. C-26137

carbonized plant and organic debris
undetermined spore?-like objects
Cicatricosisporites spp. (3 specimens)
Alisporites sp.
Vitreisporites sp.
Distaltriangulisporites? sp.
age: Tithonian-Early Cretaceous.

B.A.-Shell-I.O.E. Reindeer D-27
69°06'05"N, 134°36'54"W, figure 1b, loc. 7
(note GSC Papers 70-30, 72-38, p. 16)

Depth 9,573-9,680 ft., core,
GSC loc. C-11114

Triassic bisaccate grain, recycled
Paleozoic spores, recycled
numerous nondescript bisaccate grains
plant fragments and debris
Deltoidospora sp.
?Palaeostomocystis fragilis Cookson and Eisenack (1 specimen, poorly preserved)
age: possibly post-Neocomian-Late Cretaceous

Comments: The age determination is based on the known literature range of *Palaeostomocystis fragilis*. The confidence of this determination must be viewed in the light of the one poorly preserved specimen doubtfully attributed to that species. I personally regard it as little more than a reasonable guess.

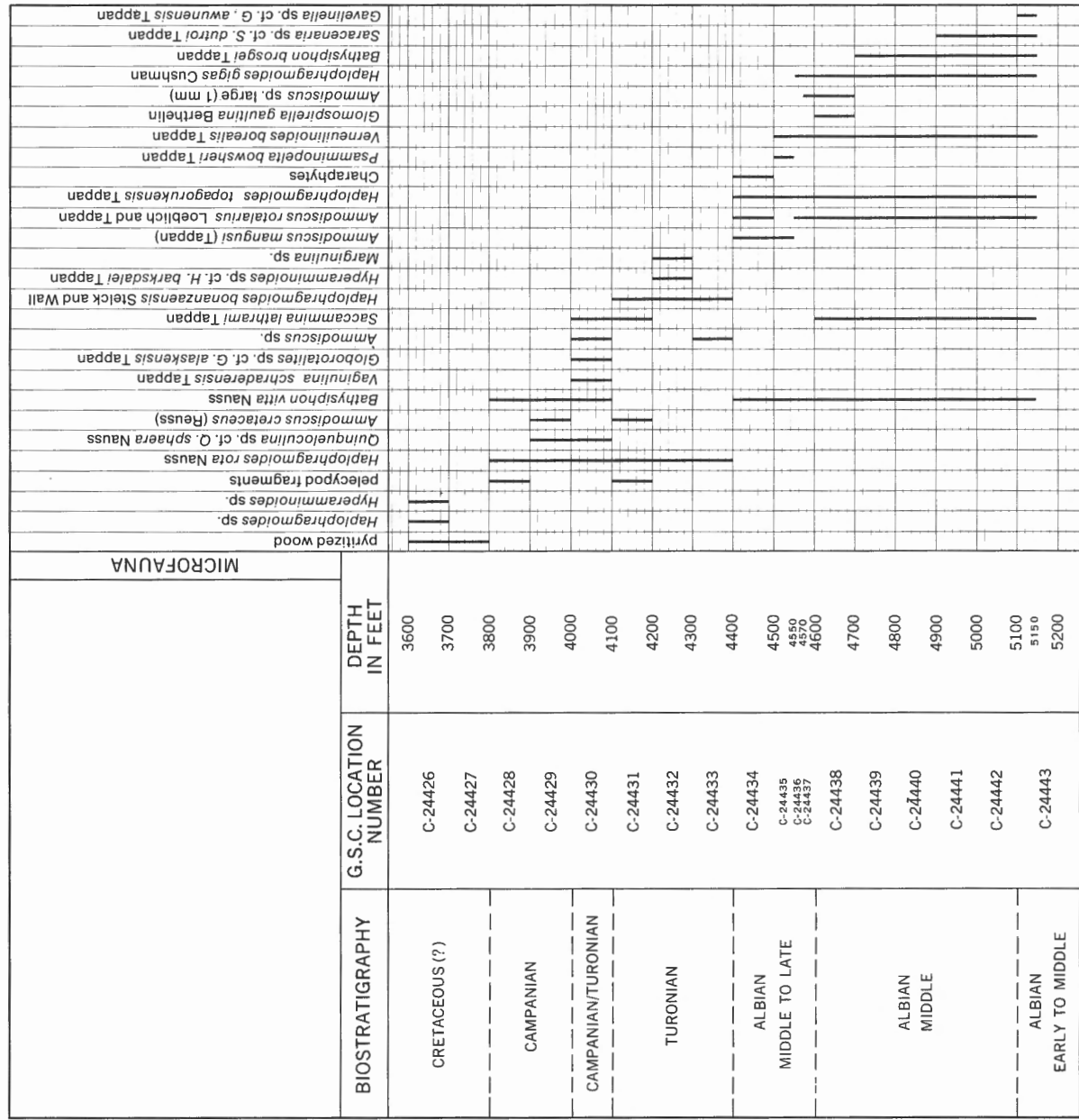
Banff-Aquitaine-A.R.C.O. Rat Pass K-35
67°54'42.55"N, 135°21'56.83"W, figure 1b, loc. 11

Depth 70-2,325 ft., cuttings
and sidewall cores,
GSC locs. C-12582 to C-12641

Figure 4 shows the distribution of taxa in this stratigraphic interval
age, 70-1,090 ft.: Albian (Early and Middle Albian)
1,130-1,180 ft.: Aptian?-Albian (Early Albian)
1,210-1,360 ft.: Barremian-Aptian?
1,380-1,530 ft.: Neocomian, probably Hauterivian
1,550-1,690 ft.: Neocomian, probably pre-Hauterivian
1,710-1,930 ft.: Neocomian, pre-Hauterivian
1,930-2,325 ft.: indeterminate but possibly ?Late Jurassic-Early Cretaceous in part

Comments: Productive samples yielded variably preserved assemblages of spores, pollen, dinoflagellates and acritarchs of Early Cretaceous age. A significant portion of the residue consisted of derived spores and pollen of Paleozoic and ?Early Triassic age. Assemblages were dominated by marine elements (dinoflagellates and, to a lesser extent, acritarchs); spores and pollen were significant components of the assemblages only in the medial portion of the sampled interval (approximately 940 to 1,030 feet).

Geological ages of strata penetrated in the Rat Pass K-35 well are based mainly on an analysis of the dinoflagellate assemblages. Spore and pollen assemblages contribute minor impact to age determinations because most of the species are long ranging and of little significance in refined dating. The occurrences of species thought to be of value in age determination are plotted on figure 4. These biostratigraphically significant species and genera comprise 86 dinoflagellate entities and 21 spore and pollen entities selected from a total assemblage of approximately 110 dinoflagellates and acritarchs and 65 spore and pollen species. These species permit



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Figure 3 (b). Occurrences of species in cuttings from 18 samples from the Elf et al. Storkerson Bay A-15 well

the recognition of six biostratigraphic divisions.

In assessing the geological age of the strata in the well, greatest reliance has been placed on the first appearance in the well of a species. Caving of material downhole and the possible contamination of sidewall cores by drilling mud make assessment of the final appearance of a species in the well difficult.

Age determination was complicated by the occurrence of many species which were either previously undescribed, or for which there were no reliable published ranges. Ranges of published species were supplemented by data from work in progress at other localities in and east of the Mackenzie Delta region.

Age Determinations: Albian Division - 70 to 1,090 feet. Because no diagnostic Late Albian pollen, spore and dinoflagellate species are present, this interval is probably of Early and Middle Albian age. The following dinoflagellate species are present:

Oligosphaeridium cf. *O. irregulare* (Pocock)
Davey and Williams*
Oligosphaeridium complex (White) Davey and Williams
Lunatadinium dissolutum Brideaux and McIntyre*
Hystriosphæridium cf. *H. recurvatum* polypes
Cookson and Eisenack
Deflandrea cf. *D. perlucida* Alberti
Cyclonephelium distinctum Cookson and Eisenack
"Broomea" *jaegeri* Alberti
Oligosphaeridium pulcherrimum (Deflandre and Cookson) Davey and Williams
Dingodinium cerviculum Cookson and Eisenack
Gardodinium eisenacki Alberti
Fromea amphora Cookson and Eisenack
Oligosphaeridium anthophorum (Cookson and Eisenack) Davey and Williams
O. sp. cf. O. albertense (Pocock) Davey and Williams*
Microdinium opacum Brideaux
Hystriocholpoma ferox (Deflandre)
Palaeostomocystis fragilis Cookson and Eisenack
Oligosphaeridium? sp. A. of Brideaux, 1971
Hystriosphæridium sp. A. of Brideaux, 1971
Hystriosphæridium cylindratum Brideaux

and 41 other species, including many considered new.

Spore and pollen species present in this interval include:

Rouseisporites (*Triporoletes*) *reticulatus*
Pocock*
Rouseisporites (*Triporoletes*) *laevigatus*
Pocock*
Rouseisporites (*Triporoletes*) sp. A.
Cicatricosisporites australiensis (Cookson)
Potonié
C. augustus Singh
C. hughesi Dettmann
C. pseudotripartitus (Bolkhovitina) Dettmann
Reticulisporites elongatus Singh
Pilosporites verus Delcourt and Sprumont*
Peromonolites peroreticulatus Brenner non Levet-Carette
Tigrisporites scurrandus Norris
Coronatisporites valdensis (Couper) Dettmann
Trilobosporites minor Pocock*

Those species marked by asterisks are not known to range into rocks younger than Middle Albian.

Aptian?-Albian Division - 1,130 to 1,180 feet. Dinoflagellate species making their appearance in this interval include:

Operculodinium sp. A.*
Tenua hystrix Eisenack
Oligosphaeridium totum var. *totum* Brideaux*
Oligosphaeridium? sp. B. of Brideaux, 1971
Prolisosphaeridium sp. A.
Imbatodinium sp. A.
Seriniodinium sp. A. (in part *S. apatulum*
Cookson and Eisenack)

and eight other species.

Coronifera oceanica Cookson and Eisenack appears only in this interval, and the following species, among others, make what is interpreted as a final appearance:

Oligosphaeridium cf. *O. irregulare* (Pocock)
Davey and Williams*
Systematophora sp. A.
Fromea amphora Cookson and Eisenack*
*Oligosphaeridium anthophorum** (Cookson and Eisenack) Davey and Williams
*Hystriocholpoma ferox** (Deflandre)
Oligosphaeridium? sp. A.* of Brideaux, 1971
*Oligosphaeridium pulcherrimum** (Deflandre and Cookson) Davey and Williams

*Tigrisporites scurrandus** Norris, makes its final appearance at 1,130 feet in this interval. Those species marked by asterisks are not known to occur in strata older than Aptian or Early Albian.

Barremian?-Aptian Division - 1,210 to 1,360 feet. Two dinoflagellate species, *Sirmiodinium grossi* Alberti and *Pseudoceratium? nudum* Gocht first appear in this interval. The following dinoflagellate species make their last appearance:

Deflandrea cf. *D. perlucida* Alberti
Oligosphaeridium sp. E. (aff. *Hystriosphæridium asterigium* Gocht)
Gonyaulacysta helicoidea Eisenack and Cookson

Deflandrea cf. *D. perlucida* and *G. helicoidea* have not been recorded from strata older than Barremian.

Neocomian I (?Hauterivian) Division - 1,380 to 1,530 feet. Strata assigned to this division are probably no older than and possibly of Hauterivian age. Dinoflagellate species making their first appearance in this interval include:

Leptodinium sp. B
Leptodinium sp. C
Cleistosphaeridium? sp. F.

Dinoflagellate species which apparently make their final appearance include:

Dictyopyxidina sp. A.
Gardodinium eisenacki Alberti*
Operculodinium sp. A.
Pseudoceratium? nudum Gocht*
Wallodinium sp. cf. *W. krutzschii** (Alberti)
Loeblich and Loeblich
Leptodinium sp. A, B, C and D

Of the spores and pollen, *Trilobosporites minor* Pocock makes its final appearance in this well. Species marked with asterisks are not known to occur in strata older than Hauterivian.

Neocomian II (probably pre-Hauterivian) - 1,550 to 1,690 feet. Two new dinoflagellate species occur in a sidewall core at 1,600 feet, *Systematophora*? sp. C. and *Cleistosphaeridium*? sp. G. Dinoflagellate species considered to make their final appearance in the section include:

Oligosphaeridium complex (White) Davey and Williams
"Doidyx" sp. A.
Cyclonephelium distinctum Cookson and Eisenack
Tenua sp. C.

A trilete spore species, *Rogalskiasporites cicatricosus* (Rogalska) Danzé-Corsin and Laveine, occurs at 1,620-1,630 feet.

Neocomian III (Berriasian-Valanginian?) - 1,710 to at least 1,930 feet (last productive sample at 1,920 - 1,930 feet). Species of dinoflagellates first appearing in this interval include:

Pareodinia? sp. A.
Gonyaulacysta spp. E, F and G
"proximo-chorate" type A
"apiculate acritarch" type A

Sirmiodinium grossi Alberti and *Seriniodinium* sp. A (in part *S. apatulum* Cookson and Eisenack) make final appearances at 1,710 feet and 1,765 feet, respectively. One spore species, *Tigrisporites* sp. A, is restricted to this interval.

Other observations: Influxes of long-ranging species occur at various depths in the Rat Pass K-35 well, between 300 and 370 feet, at 945 feet, and at 1,025 feet. Many long-ranging species disappear from the section at 1,325 feet and at 1,710 feet. One possible interpretation is that such events, because they are unrelated to the well-defined changes in geological age, indicate the presence of unconformities. However, no marked changes in lithology occur in these depths, except at 1,710 feet where the dominant rock type changes from shale to sandstone. Furthermore, other occurrences at 945 feet and 1,025 feet coincide with the availability of sidewall core samples. The type of sample may be influencing the productivity and giving rise to spurious influxes of species.

Dinoflagellates dominate the assemblages in both numbers and diversity of species, except between 940 and 1,030 feet. In this interval, numerical abundance of spores and pollen and of dinoflagellates and acritarchs is approximately equal; the number of spore and pollen species rises markedly only to decline as abruptly below 1,030 feet. This influx of continental material may signal a shallowing of the water depths, although the depositional environment remains marine through the examined portion of the well. A second interpretation is that water depths did not decrease but that the river system bringing the continental material was directed more towards the depositional site so that more material from land plants became

available for incorporation into the assemblages.

Setting of casing at 928 feet also may have contributed to this apparent increase in spores and pollen. The quality of the residues improves markedly in the first sidewall core at 945 feet and in the first washed cuttings at 960 feet.

Cretaceous Assemblages
(foraminifers and associated microfaunas)
by T.P. Chamney

I.O.E. Kanguk I-24
69°53'40"N, 131°05'12"W, figure 1b, loc. 2

Depth 3,924-3,930 ft., core,
GSC loc. C-19204

radiolaria, indicating "Radiolaria Zone"
Spumellaria spp., abundant
? *Bathysiphon* sp., few
vertebrate bone
brown to orange-brown translucent, common
pyrite spheres, ?megaspore cases
age: Santonian
environment: marine, restricted

Depth 3,930-3,936 ft., core,
GSC loc. C-19205

Spumellaria spp., very abundant indicating
"Radiolaria Zone", predominately
disc forms
age: Santonian
environment: marine, restricted

Depth 4,561-4,564 ft., core,
GSC loc. C-19206

Ammodiscus sp., few
? *Gaudryina* sp., rare
Reophax sp., rare
Haplophragmoides ex gr. *H. arenatus* Cushman,
common
H. ex gr. *H. coahuilaensis* Conkin, common
H. ex gr. *H. excavata* Cushman and Waters, few
megaspore IA var. sp. 3, few
pyrite (?replacement), very abundant
age: Early Cretaceous, ?Aptian to
Early Albian
environment: marine, restricted

Depth 4,593 ft., core,
GSC loc. C-19207

? *Haplophragmoides* sp., few
pyrite (?replacement)= ?megaspores IA spp.,
common
?algal oogonia, pyritized, few, ? *Trocholiscus*
sp.
quartz grains, coarse, frosted, pitted,
common
age: indeterminate, ?Devonian
environment: nonmarine to brackish

Depth 5,247-5,254 ft., core,
GSC loc. C-19209

?cast of smooth ostracode, rare
?algal oogonia, pyritized, few ? *Trocholiscus*
sp.

pyrite (?replacement), abundant, ?megaspore cases
age: indeterminate, ?Devonian

I.O.E. Nuvorak O-09

69°58'55"N, 130°30'56"W, fig. 1b, loc. 1

Depth 1,986-1,990 ft., core,
GSC loc. C-19631

?*Haplophragmoides* sp. indet. (rare)
pyritized discoid radiolaria (few)
megaspores IA var. 1 (amber) (abundant)
?faecal pellets (few)
vertebrate bone (amber color) (few)
yellow and orange "amber" (common)
age: Mesozoic undifferentiated
environment: restricted marine to brackish

Depth 3,454-3,464 ft., core,
GSC loc. C-19634

Haplophragmoides ex gr. *H. globosa* Lozo (few)
age: Early Cretaceous, ?Aptian
biostratigraphic equivalent: Gething Formation
environment: restricted marine

Depth 3,464-3,474 ft., core,
GSC loc. C-19635

?*Glomospirella* sp. indet. (rare)
Haplophragmoides ex gr. *H. globosa* Lozo (few)
?Verneuilinoides sp. indet. (rare)
Siphonotextularia sp. (rare)
pyrite (few)
age: Early Cretaceous, ?Aptian
biostratigraphic equivalent: silty zone
environment: restricted marine

Depth 3,474-3,484 ft., core,
GSC loc. C-19636

Haplophragmoides ex gr. *H. globosa* Lozo (few)
Saccammina sp.
Gavelinella ex gr. *G. norrisi* (Mellon and Wall) (rare)
Haplophragmoides sp. (rare)
megaspore IA var. sp. 1 (common)
wood, pyritized (few)
pyrite forms (discs, etc.) (abundant)
age: Early Cretaceous, ?Aptian
biostratigraphic equivalent: Lower Christopher Formation or upper Isachsen Formation

Comments: The operator's report on file with the Department of Indian and Northern Affairs shows the strata below 3,410 feet in the borehole to be Late Devonian (Frasnian) in age (based on palynology). However, from the present micropaleontological study it appears that beds down to 3,484 feet are Early Cretaceous (Aptian) in age. Also indicated is a much more massive Aptian, silty zone (Isachsen Formation) sandstone build-up in the vicinity of the Nuvorak O-09 borehole than that of the Nicholson wells to the east or the Natagnak wells to the west and south. The abundant plant fragments (pyritized) associated with foraminifers indicate that the sands are of deltaic origin.

I.O.E. Natagnak H-50

69°49'27"N, 131°40'11"W, figure 1b, loc. 3

Depth 5,642-5,647 ft., core,
GSC loc. C-19623

Saccammina sp. 2 (common)
Bathysiphon sp. (few)
Haplophragmoides sp. 87 (common)
Ammodiscus cf. *A. planus* Loeblich
Hyperammina sp. 7 (abundant)
age: Late Cretaceous, ?Santonian
biostratigraphic equivalent: pale shale-bituminous shale zone equivalent
environment: restricted marine

Depth 5,651-5,656 ft., core,
GSC loc. C-19624

Verneuilina sp. (common)
Ammodiscus sp. (few)
Trochammina sp. 52 (few)
T. sp. 50 (rare)
Haplophragmoides spp. 5 (common)
spheres, ?megaspores IA sp. 1 (common)
vertebrate bone, teeth sp. 10 (few)
coproliths (common)
pyrite (common)
age: Late Cretaceous, ?Santonian
biostratigraphic equivalent: bituminous shale zone equivalent (upper part)
environment: restricted marine

Depth 5,656-5,660 ft., core,
GSC loc C-19625

Plectina sp. 3 (few)
Spiroplectammina sp. 1C (abundant)
Haplophragmoides sp. 15 and varieties (abundant)
Trochammina sp. 52 (few)
Glomospira sp. 1C (common)
Ammodiscus planus Loeblich (few)
Hyperammina sp. (few)
Inoceramus sp. prisms (common)
age: Late Cretaceous, ?Turonian
biostratigraphic equivalent: ?bituminous shale zone equivalent
environment: marine, restricted in part

Depth 5,660-5,665 ft., core,
GSC loc. C-19626

Spiroplectammina sp. 1C (abundant)
Textularia sp. (few)
Hyperammina sp. (few)
Dorothia (*Marssonella*) sp. 15 (rare)
Saccammina sp. 2
Ammodiscus planus Loeblich (few)
Trochammina sp. (rare)
Haplophragmoides spp. (common)
Inoceramus sp., prisms (abundant)
vertebrate bone, black (common)
pyrite (few)
megaspore IA sp. 1 (few)
age: Late Cretaceous, ?Turonian
biostratigraphic equivalent: ?bituminous shale zone in part
environment: open marine

Depth 5,665-5,671 ft., core,
GSC loc. C-19627

Haplophragmoides ex gr. *H.* sp. G113 (few)
H. ex gr. *H. gigas minor* Nauss (few)
H. sp., minute (common)
Reophax sp. (rare)
Amodiscus planus Loeblich (few)
Trochammina sp. 50 (few)
T. sp. 52 (few)
?Lenticulina sp. (rare) (?fragment)
Inoceramus sp., prisms (common)
vertebrate bone, brown and black (few)
pyrite (few)
age: Late Cretaceous, ?Turonian
biostratigraphic equivalent: ?bituminous
shale zone in part
environment: marine, access to open marine

Depth 6,001-6,011 ft., core,
GSC loc. C-19628

Haplophragmoides spp. (common)
Bathysiphon anomaloceelia Tappan (few)
Reophax tundraensis Chamney (rare)
coal-carbon fragments (few)
bitumen fragments (few)
age: Early Cretaceous, Aptian
biostratigraphic equivalent: upper sand-
stone division equivalent
environment: restricted marine

Depth 6,031-6,041 ft., core,
GSC loc. C-19629

Serovaina sp.
Gaudryina ex gr. *G. subcretacea* Cushman and
aff. *G. barrowensis* Tappan (common)
Haplophragmoides spp. (abundant)
Trochammina sp. (few)
Textularia ex gr. *T. areoplecta* Tappan
(rare)
Gaudryina sp. (few)
megaspore, trilete sp.
age: Early Cretaceous, Aptian
biostratigraphic equivalent: upper sand-
stone division
environment: open marine

Amoco-Ulster-Scurry Inuvik D-54
68°23'12"N, 133°44'24"W, figure 1b, loc. 10

Depth 80-220 ft., cuttings,
GSC locs. C-16788, C-17002 to
C-17005

Lenticulina macrodisca Reuss
Dictyometra sp. 9 (pyritized)
Saracenaria sp.
Glomospirella ex gr. *G. paramodiscus*
McGill and Loranger
?Dorothia sp.
Haplophragmoides ex gr. *H. spissum* Stelck
and Wall
Marginulinopsis spp.
Hippocrepina cf. *H. bardsdalei* Tappan
age and correlation: Albian, Early to
early Middle, equivalent to biostra-
tigraphic subdivision 14C of Reindeer
D-27 (Chamney, 1971) and Martin House
Formation of the Snake-Peel Rivers

area in the Yukon
environment: intermittent access to
open-marine conditions

Depth 220-290 ft., cuttings,
GSC locs. C-16792 and C-17006

Bathysiphon spp. (*Hyperammina* spp. in part)
Gaudryina sp. (short tricarinate)
G. ex gr. *G. canadensis* Cushman
Hippocrepina sp.
age and correlation: Albian, Early to
early Middle as above but possibly
slightly older
environment: restricted marine

Depth 290-350 ft., cuttings,
GSC locs. C-16821 and C-17007

Gavelinella sp.
Saracenaria sp.
Marginulinopsis ex gr. *M. collinsi* Mellon
and Wall
Amodiscus cf. *A. mangusi* Tappan
Gaudryina subcretacea Cushman
Hyperammina spp.
Ammobaculites ex gr. *A. fragmentarius* Cush-
man (very coarsely agglutinated)
?Verneuilinoides sp.
Trochamminoides sp.
age: Albian, Early, older than 14C.
220-350 ft. can be provisionally
designated as 14 or as the more
open marine facies of upper 15 of
Chamney, 1971
environment: open marine but near
shore (?shallow)

Depth 350-450 ft., cuttings,
GSC locs. C-17008 to C-17010

Trochammina n. sp. (small, moderately
high spired, *?Recurvoides* sp.)
?Marginulina cf. *M. inepta* (Reuss)
Dentalina strangulata (Reuss)
Saracenaria valanginiana Bartenstein and
Brandt
Gavelinella ex gr. *G. awunensis* Tappan
Glomospirella cf. *G. paramodiscus* McGill
and Loranger
Hyperammina spp., very common
Hippocrepina spp.
Saccamina cf. *S. lathrami* Tappan
Gaudryina cf. *G. barrowensis* Tappan
?Conorbina sp.
echinoid spine
age and correlation: Albian, Early; on
the basis of the very abundant *Hyper-*
amminoides spp. tentatively referred
to subdivision 15 of Chamney, 1971
environment: continuous access to open-
marine conditions but near-shore,
shallow

Depth 450-650 ft., cuttings,
GSC locs. C-16798, C-17011 to
C-17015, C-17018

Arenobulimina cf. *A. paynei* Tappan
Lenticulina spp.

Ammobaculites n. sp. (moderately coarse)
Haplophragmoides cf. *H. topogorukensis* Tappan
Marginulina n. sp.
Conorboides ex gr. *C. umiatensis* Tappan
Saracenaria spp.
Marginulinopsis sp.
Oolina sp.
Siphotextularia ex gr. *S. rayi* Tappan
Miliammina ex gr. *M. sproulei* Nauss
Textularia sp.
Pseudonodosaria sp.
Ammodiscus ex gr. *A. mangusi* Tappan
 age and correlation: Albian/Aptian transition, probably marine Aptian facies of the upper part of subdivision 16 (*Siphotextularia* spp. zone) of Chamney, 1971

Depth 650-750 ft., cuttings,
 GSC locs. C-17016 and C-17017

Gaudryina ex gr. *G. tappanae* Chamney
Trochammina sp. (small "nucleate" forms)
Glomospira ex gr. *G. subarctica* Chamney
Conorboides ex gr. *C. umiatensis* Tappan (very abundant repeated occurrence)
Marginulina ex gr. *M. sulcifera* (Reuss)
 ?n. gen. (aff. *Lituotubella*) sp.
Globovalatolites alaskensis Tappan
Lagena ex gr. *L. apiculata* (Reuss)
Saracenaria spp.
Lenticulina spp.
Vaginulinopsis sp.
Dentalina sp.
 age and correlation: Aptian/Barremian transition, possibly condensed marine Barremian, equivalent to subdivision 17 of Chamney, 1971
 environment: good open-marine conditions

Depth 750-870 ft., cuttings,
 GSC locs. C-17019 to C-17022

Globovalatolites ex gr. *G. alaskensis* Tappan
Conorbina-Conorboides spp. consortium
 lagenid foraminifers (very common)
Siphotextularia spp.
 ostracodes
Reophax ex gr. *R. liasica* Franke (very coarsely agglutinated)
Reophax (Proteonina) n. sp. (large, coarse)
 ?n. gen. (aff. *Bathydiscus*) sp.
Haplophragmoides ex gr. *H. goodenoughensis* Chamney
Ammobaculites ex gr. *A. alaskensis* Tappan
Textularia sp.
Gaudryina cf. *G. topogorukensis* Tappan
 age and correlation: Neocomian, ?Late Neocomian (Barremian-Hauterivian); tentatively designated as a new biostratigraphic subdivision 18 in the Mackenzie Delta region: continued access to open-marine conditions but the coarse agglutinated benthonic forms of the lower part indicate near-shore, slightly turbid conditions

Depth 870-1,050 ft., cuttings,
 GSC locs. C-16873, C-17023 to C-17027

?*Gryphea* sp. (shell fragments)
Reophax ex gr. *R. metensis* Franke
Astacolus (Marginulinopsis) calliopsis Tappan
Saracenaria spp.
 ?*Serovaina* sp. (minute)
Ammodiscus cf. *A. orbis* Lalicker
Marginulina ex gr. *M. utricula* Terquem and Berthelin
 ostracodes sp. (?*Monoceratina* sp.)
Marginulinopsis sp. (ribbed, short)
Haplophragmoides cf. *H. canui* Cushman
Arenoturrispirulina intermedia Chamney
Hippocrepina sp.
 ?*Thuramminoides* sp.
 sponge axons
 age and correlation: Jurassic, Late to ?Middle. This undesigned biostratigraphic subdivision is unconformably overlain by upper Neocomian

Depth 1,050-1,110 ft., cuttings,
 GSC locs. C-17028 and C-17029

algal oogonia:
Chovaneella sp. ("pagoda" forms)
Sycidium sp.
 ?*Trochiliscus* sp.
 cricoconarids:
 ?*Styliolina* sp. (very large)
 ?*Tentaculites-Nowakia* sp.
 age and correlation: Devonian, ?Middle, equivalent in part to "Methy" Formation

Devonian, Jurassic, Cretaceous and Tertiary assemblages (palynomorphs; foraminifers and associated microfaunas; corals, stromatoporoids) by W.W. Brideaux, T.P. Chamney, and A.E.H. Pedder

I.O.E. Mayogiak J-17
 69°26'42"N, 132°48'12"W, figure 1b, loc. 5

Depth 3,855-7,163 ft., core,
 GSC locs. C-24293 to C-24297

Figure 5 shows the occurrences of palynomorphs from core in this stratigraphic interval (occurrences of foraminifers in cuttings follow).

age, 3,855-3,879 ft.: Paleocene
 3,879-3,919 ft.: transitional
 Cretaceous
 7,146-7,163 ft.: Late Cretaceous, Maastrichtian

Comments (W.W.B.): Three general palynologic divisions may be recognized about the Cretaceous-Tertiary boundary. These are of the following ages: a general Maastrichtian age; a transitional, late Maastrichtian-early Paleocene age; and a general Paleocene age. The Paleocene assemblage in the Mayogiak J-17 well is similar to an assemblage found at depths of 9,256 to 9,271 ft. in the I.O.E. Taglu G-33 well (this paper); both appear to be older than samples from the type Reindeer Formation.

Depth 3,900-3,950 ft., cuttings,
 GSC loc. C-22716

LEGEND		BIOSTRATIGRAPHY		PALEOCENE		TRANSITIONAL		CRETACEOUS (MAASTRICHTIAN)		MAASTRICHTIAN	
×	Present	G.S.C. LOCATION NUMBER	SAMPLE INTERVAL (Feet)	C-24293	C-24294	C-24295	C-24296	C-24297			
S	Single spec.										
R	2-3										
F	3-10										
O	10-25										
A	25-										
D	Dominant										
dr	Derived										
NOTE:											
* - Dinoflagellate cyst (s)											
T A X O N											
P A L Y N O M O R P H S	<i>Alnipollenites verus</i> Potonié ex Potonié	F	S								
	bisaccate pollen, Pinaceous	F									
	<i>Cargapollenites</i> sp.	S									
	fungal elements	O	O	R							
	* Lower Cretaceous dinoflagellates	dr	dr							dr	
	Lower Cretaceous spores	dr	dr	dr	dr						
	<i>Tricolporites</i> spp.	R									
	<i>Momipites</i> sp.	S									
	plant debris	A	D	D	D	D					
	<i>Polyporopollenites</i> sp.	R									
	<i>Pterocaryapollenites</i> sp.	R									
	<i>Retitricolporites</i> sp.	S									
	<i>Sequoiapollenites</i> spp.	O	S			R	S				
	<i>Syncolporites</i> sp.	S									
	<i>Taxodiaceapollenites</i> spp.	A	A	F	A	R					
	<i>Tiliaepollenites</i> spp.	F			S						
	<i>Tricolporites</i> spp.	R	S								
	<i>Triporopollenites</i> spp.	A	R		F						
	various trilete spores	F	F		O	F					
	various triporate pollen	F									
	<i>Aquilapollenites</i> spp.		R			S					
	<i>Betulaceoipollenites</i> sp. AA		R	S	F	R					
	Carboniferous spores	dr	dr	dr	dr	dr					
	<i>Cranwellia</i> sp.	S		S							
	Lower Cretaceous bisaccate pollen	dr									
	Permo-Triassic bisaccate pollen	dr									
	<i>Retitricolporites</i> sp.	R									
	<i>Stereisporites</i> spp.	R		R							
	<i>Triatropollenites</i> sp.	S									
	<i>Triporetetes</i> spp.	S		R							
	<i>Triporopollenites</i> sp. AA	O	F	F	F	F					
	<i>Triporopollenites</i> sp. AB	O	F	F							
	<i>Aquilapollenites</i> sp. 1		R	R							
	bisaccate pollen		O	O	A						
	<i>Cicatricosisporites</i> spp.		R	F							
	* <i>Cleistosphaeridium</i> spp.		R		S						
	<i>Deltoidospora</i> spp.		O	A	R						
	*dinoflagellate cysts, unident.		R								
	* <i>Spiniferites ramosus</i> (Ehren) Sarjeant		S		R						
	<i>Ulmoidipites</i> sp.		S								
<i>Aquilapollenites</i> sp. 2			R								
<i>Aquilapollenites</i> sp. 3			S								
<i>Aquilapollenites</i> sp. 4			R								
<i>Aquilapollenites</i> sp. 5			S								
<i>Aquilapollenites</i> sp. 6			S								
<i>Cycadopites</i> spp.			F								
* <i>Deflandrea</i> spp.			R								
* <i>Diconodinium</i> ? sp.			S								
<i>Lacvigatosporites</i> spp.			F								
<i>Proteacidites</i> sp.			S								
<i>Tiliaepollenites</i> sp.			S								
<i>Gleicheniidites senonicus</i> Ross			R								
<i>Alisporites</i> spp.					F					F	
<i>Podocarpidites</i> spp.					R					R	
* <i>Pterospermopsis</i> sp.										S	

GSC

Figure 5. Occurrences of species in core from the I.O.E. Mayogiak J-17 well

Haplophragmoides sp.
?spines, echinoid (few)
pelecypod fragments (common)
plant cuticle (few)
coal fragments (few)
"amber", yellow and orange (few)
age: Late Cretaceous, ?Maastrichtian
biostratigraphic equivalent: below the
Anomalinoidea solis Zone of the
Schrader Bluff Formation
environment: fresh to brackish

Depth 4,050-4,100 ft., cuttings,
GSC loc. C-22719

Ammobaculites sp. (rare)
Ammodiscus sp. (rare) elongate form
Haplophragmoides sp. (few)
Hyperammina sp. (rare)
?Lagena sp. (rare)
Trochammina sp. (rare)
?Verneulinoides sp. (rare)
siliceous spheres, ?radiolaria (common)
age: Late Cretaceous
environment: marine, access to open
marine

Depth 4,100-4,150 ft.,
cuttings, GSC loc C-22720

Ammodiscus sp. (rare)
Gyroidina sp. (rare)
Haplophragmoides sp. (few)
Hippocrepina (*Hyperamminoides*) sp. (few)
pelecypod fragments (few)
"amber", yellow, pink and orange (common)
siliceous spheres (common)
age: Late Cretaceous, ?Maastrichtian
environment: marine, access to open marine

Depth 7,146-7,163 ft., core,
GSC loc. C-24297

Haplophragmoides sp. (rare)
megaspore, IB var. sp. 6 (few)
age: Cretaceous, ?Late
environment: restricted marine

Depth 8,844-8,857.5 ft., core,
GSC loc. C-24301

Ammodiscus mackenziensis Chamney (common)
Dentalina sp. (common)
?Glomospirella sp. (rare)
?Gutulina sp. (rare)
Haplophragmoides spp. (common)
H. ex gr. H. canui Cushman (few)
Lenticulina ex gr. *L. dilecta* Loeblich and
Tappan (few)
?Lingulina sp. (rare)
Reophax tundraensis Chamney (common)
Saracenaria sp. (few)
Thuramminoides septagonalis Chamney (few)
pelecypod fragments (common)
gastropod sp. 8 (few)
age: Late Jurassic to earliest Cretaceous
biostratigraphic equivalent: Husky-Deer
Bay Formations
environment: marine, slope

Depth 8,982-8,995 ft., core,
GSC loc. C-24302

Ammobaculites alaskensis Tappan (abundant)
Ammodiscus ex gr. *A. aspera* Terquem (few)
A. cf. A. orbis Lalicker (common)
Arenoturrispirillina cf. *A. intermedia*
Chamney (rare)
A. jeletzkyi Chamney (few)
Glomospirella spp. (common)
Haplophragmoides canui Cushman (common)
Hyperammina sp. (common)
Trochammina cf. *T. inflata* Montague (few)
age: Late Jurassic
biostratigraphic equivalent: Husky
Formation
environment: marine, slope to littoral

Depth 8,995-9,021 ft., core,
GSC loc. C-24306

agglutinated foraminifers as in C-24302
(8,982-8,995 ft.)
Lenticulina sp. (few)
Reophax sp. (few)
age: Late Jurassic
biostratigraphic equivalent: Husky
Formation
environment: marine, littoral

Depth 9,021-9,034 ft., core,
GSC loc. C-24309

agglutinated (very abundant) and some
calcareous foraminifers as in C-24306
(8,995-9,021 ft.)
Arenoturrispirillina cf. *A. waltoni* Cham-
ney (rare)
Gravellina milleri (Tappan) (few)
age: Late Jurassic
biostratigraphic equivalent: middle
Husky Formation
environment: marine, restricted

Depth 9,034-9,056 ft., core,
GSC loc. C-24310

agglutinated (very abundant) and some
calcareous foraminifers as in C-24309
(9,021-9,034 ft.)
Ammobaculites cf. *A. vetusta* (Terquem and
Berthelin) (common)
age: Jurassic, ?Middle
biostratigraphic equivalent: Husky
Formation, ?lower
environment: marine, restricted

Depth 9,366-9,375 ft., core,
GSC loc. C-24311

Haplophragmoides spp. (abundant), predom-
inantly dwarfed forms
H. ex gr. H. canui Cushman (few)
glauconite (few)
pyrite (common)
age: Jurassic, Early to ?Middle
biostratigraphic equivalent: Bug Creek
or North Branch Formations
environment: marine, turbid or very
restricted

Depth 9,544-9,544.5 ft., core,
GSC loc. C-12553

Amphipora sp. (not sectioned)
Spongonaria sp. cf. *S. filicata* Crickmay
age: Early Devonian, probably Emsian

I.O.E. Tuktuk 0-19
69°18'55"N, 132°48'07"W, figure 1b, loc. 4

Depth 6,513-6,543 ft., core,
GSC loc. C-24531

Ammobaculites ex gr. *A. alaskensis* Tappan
(common)
Dentalina sp. (few)
Haplophragmoides spp. (abundant)
H. ex gr. H. canui Cushman (common)
ostrocodes: smooth "*Candona*" sp. (few)
ribbed sp. (rare)
megaspore IB var., sp. 1 (few)
age: Jurassic-Cretaceous boundary
biostratigraphic equivalent: upper Husky
Formation
environment: marine, ?shelf

Depth 6,883-6,913 ft., core,
GSC loc. C-24532

Ammobaculites spp. (few)
Gravellina cf. *G. milleri* (Tappan)
Haplophragmoides canui Cushman (common)
Reophax (*Proteonina*) sp.
age: Late Jurassic
biostratigraphic equivalent: Husky
Formation
environment: marine, littoral to shelf

Depth 7,350 ft., core,
GSC loc. C-16001

Alveolites? sp. (not sectioned)
Spongonaria richardsonensis Crickmay
age: Early Devonian; probably Emsian

Depth 7,364 ft., core,
GSC loc. C-16002

Amphipora sp., as in C-16003
age: Late Silurian to Late Devonian

Depth 7,367.5 ft., core,
GSC loc. C-16003

Amphipora sp.,
Pachyfavosites sp. indet.
Neostriophyllum sp., broad sense
age: Early Devonian, most likely Seigen-
ian or Emsian

Comments (A.E.H.P.): The species included in the
genus *Spongonaria* were previously known only from
Emsian (the youngest of the three Rhenish Lower
Devonian stages) strata in the Yukon Territory,
although the genus is similar to *Zelolasma*, which
occurs in Siegenian (middle stage of the Rhenish
Lower Devonian) or Emsian beds in eastern Australia.
The occurrence of a distinct species of *Amphipora*
in several of the lots and the restricted range of
Spongonaria in the Yukon suggest that the ages of

all these samples fall within a narrow time interval.

The Devonian rocks providing the collections should be correlated with the lower Ogilvie Formation of the Yukon, but certainly not with the youngest beds of that formation which, in the Mount Burgess area, are as young as Givetian. They also can be correlated with at least part of the Gossage and Bear Rock Formations of the northwestern District of Mackenzie.

Triassic Assemblages (molluscs) by E.T. Tozer

Panarctic Amund Central Dome H-40

78°19'28.333"N, 96°15'50.808"W, figure 1a, loc. 25

Depth 5,169-5,179 ft., core,
Blaa Mountain Formation,
GSC loc. C-8199

Monotis ochotica (Keyserling)
smooth ammonoids (arcestids?) indet.
age: Late Norian

Depth 5,179-5,189 ft., core,
Blaa Mountain Formation,
GSC loc. C-8200

Monotis ochotica (Keyserling)
age: Late Norian

Comments: This fauna occurs in the Heiberg Formation of Cornwall and Brock Islands.

Elf Wilkins E-60

77°59'19"N, 111°21'45"W, figure 1a, loc. 26

Depth 2,532 ft., core,
Borden Island Formation,
32 ft. below top, 38 ft.
above base, GSC loc. C-21786

Lingula sp.
age: undetermined

Depth 2,534 ft., core,
Borden Island Formation,
34 ft. below top, 36 ft.
above base, GSC loc. C-21787

Gryphaea sp.
pectenid indet.
Oxytoma sp. cf. *O. mojsisovicsi* and *O. cygnipes* Young and Bird
age: Late Triassic or Early Jurassic,
probably Sinemurian

Depth 3,434 ft., core,
Schei Point-Blaa Mountain
Formations, GSC loc. C-21788

Lima (Plagiostoma) sp.
age: Middle or Late Triassic (Ladinian
or Karnian)

Depth 3,443 ft., core,
Schei Point-Blaa Mountain
Formations, GSC loc. C-21790

bivalves indet.; similar species in Schei
Point Formation, Cameron Island
age: probably Middle or Late Triassic
(Ladinian or Karnian)

Panarctic Drake Point N-67

76°26'46.46"N, 108°55'01.80"W, figure 1a, loc. 27

Depth 4,083-4,084 ft., core,
Schei Point Formation, 323-324
ft. below top, 486-487 ft. above
base, GSC locs. 89049, 89050

Halobia sp.
Meleagrinnella cf. *M. antiqua* Tozer
age: probably Late Triassic

Depth 4,090 ft., core,
Schei Point Formation, 330 ft.
below top, 480 ft. above base,
GSC loc. 89051

Halobia sp.
age: Late Triassic; Karnian or Early or
Middle Norian

Depth 4,098 ft., core,
Schei Point Formation, 338 ft.
below top, 472 ft. above base,
GSC loc. 89052

nuculid bivalve indet.
halobiid bivalve indet.
age: definitely Triassic, probably Late
Triassic

Comments: The faunal facies represented by these specimens is that of the upper (Karnian) part of the Blaa Mountain Formation and the lower (Lower or Middle Norian) part of the Heiberg Formation.

Triassic Assemblages (microfossils and
palynomorphs) by D.R. Clowser, R.E. Dunay,
M.J. Fisher, P.J. Rauwerda and P.F. Sherrington
of Robertson Research (North America) Limited

Elf Cape Norem A-80

77°29'13"N, 110°27'05"W, figure 1a, loc. 28
(Note GSC Paper 72-38, p. 18)

Depth 4,710-9,744 ft., cut-
tings and core; Savik Forma-
tion, 3,410-5,472 ft.; Bor-
den Island Formation, 5,472-
5,512 ft.; Heiberg Formation,
5,512-6,175 ft.; Schei Point
Formation, 6,175-8,430 ft.;
Blind Fiord Formation, 8,430-
T.D.; GSC locs. C-14695 to
C-14771, C-21813 to C-21819,
C-24742 to C-24795

Figure 6 shows the distribution of taxa in
this stratigraphic interval
age, 4,710-6,420 ft.: Late Triassic,
Karnian-Rhaetian
6,420-7,420 ft.: Middle to Late
Triassic, Ladinian-Karnian
7,420-8,550 ft.: Early to Middle
Triassic, Spathian to Anisian
8,550-9,744 ft.: Early Triassic,
?Smithian-Spathian

Comments: 4,710-6,420 feet, *Nodosaria shublikensis/*
mitis Assemblage Zone:

Micropaleontology: A fairly diverse foraminiferal assemblage consisting of both calcareous and arenaceous forms was found down to 6,400 feet. Typical Triassic species encountered in this interval include, in order of appearance: *Nodosaria shublikensis/mitis* aff. *N. nordvikensis*, *Astocolus conmodatus*, *Nodosaria* aff. *N. liratella*, *Trochamminoides* aff. *T. vertens*, *Pseudoglandulina lata*, *Vaginulinopsis* aff. *V. aculus*, *Pseudoglandulina simpsonensis* and *Gaudryina* sp. 5, all characteristic of the *N. shublikensis/mitis* Assemblage Zone. A number of Jurassic elements also occur in this interval, usually as individuals, but sometimes in greater numbers: *Haplophragmoides* aff. *H. kingakensis/barrowensis*, *'Involutina' aspera/silicea*, and *Ammobaculites* cf. *A. alaskensis/barrowensis*. Other forms with Jurassic affinities include *Marginulinopsis phragmites*, *Lagena aphela*, *Lenticulina* aff. *L. toarcense*, *Vaginulina* cf. *V. sherborni*, and *Gaudryina* aff. *G. kelleri*. The former group may be in situ, representing an extended range down from the Jurassic, but the latter group probably is caved from the overlying Jurassic.

Ostracodes are rare down to 6,400 feet and are represented by species of *Hungarella*, usually as single occurrences. The single occurrence of *Notocythere media* at 5,530 feet is of interest as the species is an indicator of the Upper Norian in Europe.

Palynology: The interval 4,710 to 5,200 feet is numerically dominated by palynomorphs suggestive of an Early Jurassic, Middle-Late Liassic age. At 4,710 feet, however, a single specimen of *Ovalipollis breviformis* may indicate the presence of Late Triassic strata at this depth. This is substantiated by occurrences of *Ricciisporites tuberculatus* at 4,890 feet, and of *Semiretisporis lundbladii* at 4,990 feet.

Below 5,200 feet, an increase in the frequency of Late Triassic species is coincident with an increase in the degree of carbonization. Jurassic morphotypes also are noticeably less common below this depth and this may suggest that the Jurassic assemblages of Pliensbachian-Toarcian age in the overlying interval, 4,710 to 5,200 feet, are in situ and that the rare Triassic species are the result of reworking. The associated microfauna indicates that the interval below 4,700 feet is of Triassic age and it is presumed, therefore, that the Jurassic assemblages recorded from the interval have resulted from caving. Consequently, the age of this uppermost section has been determined as Rhaetian.

The record of the dinoflagellate RHNO 2 at 5,290 feet is considered to mark the highest occurrence of Norian strata in the well and the Norian-Rhaetian boundary has been drawn at about 5,260 feet. Occurrences of the dinoflagellate RHNO 4 at 5,340 and 5,490 feet confirm a possible Late Norian age to the latter depth and this marine assemblage is associated with a typical Norian-Rhaetian spore/pollen palynoflora including *Ovalipollis breviformis*, *Ricciisporites tuberculatus*, *Semiretisporis lundbladii*, *Cingulizonates rhaeticus*, *Triancoraesporites ancorae*, *Zebrasporites interscriptus*, *Polycingulatisporites crenulatus* and

Camerozonosporites rudis, together with species more commonly restricted to Norian and older sections: *Protodiploxypinus*, *Alisporites aequalis*, *A. sp. 1*, *Verrucosisporites morulae*, *Leptolepidites circulus* and *Pseudillinites* sp. NO 1. A sample from core at 5,505 to 5,540 feet yielded an impoverished assemblage which included, in addition to abundant *Ricciisporites tuberculatus* and an indeterminable *Lunatisporites*, common *Micrhystridium* spp. with the dinoflagellates RHNO 2 and NO 4 var. This assemblage has been recorded previously from Middle Norian horizons but may possibly range into the Upper Norian. Tozer (in Norford et al., 1973, p. 18) has identified Middle Norian pelecypods from core at 5,530 feet. Below 5,540 feet, the assemblages are of an Early Norian aspect with *Lunatisporites* sp. NO 3, *Cyclogranisporites* cf. *C. arenosus*, *Camerosporites verrucatus* and *Semiretisporis* cf. *S. denmeadi* in evidence.

The Karnian-Norian boundary has been determined at about 5,820 feet, immediately above an assemblage including *Paracirculina quadruplicis* and *Protodiploxypinus schizeatus*. The occurrence below this of *Duplicisporites* sp. at 5,890 feet, *Lunatisporites acutus* and *Sulcatisporites* cf. *S. kraeuseli* at 5,940 feet, *Podosporites amicus* and *Protodiploxypinus gracilis* at 6,090 feet, and *Schizosaccus keuperi* and aff. *Vallasporites ignacii* at 6,190 feet also indicate that the interval below 5,820 feet is of Karnian age.

Within this interval, the palynofloras become relatively impoverished and, as a consequence, the biostratigraphical subdivision becomes less precise. The base of the Karnian interval has been drawn, somewhat arbitrarily, at about 6,420 feet, immediately above the last occurrence of *Protodiploxypinus sitlei*, which is a common component of Middle or late Early Triassic palynofloras.

Environment of deposition: The microfaunal assemblage contains a relatively diversified microfauna consisting of both arenaceous and calcareous forms. Its general character suggests deposition in mainly inner sublittoral environments, with occasional shallowing towards littoral depositional environments.

Comments: 6,420 to 7,420 feet, *Hungarella* I and II Assemblage Zones:

Micropaleontology: The foraminiferal element of the microfauna is represented largely by an impoverished fauna of *N. shublikensis/mitis* Zone aspect. New species appearing in this interval are mostly nodosariid forms, usually recorded as single occurrences, and which may have caved from higher horizons.

As foraminifers become relatively scarce, ostracodes appear in some abundance, the top 400 feet being dominated by species of the metacopid genera *Hungarella* and *Healdia*. This interval is designated the *Hungarella* II Assemblage Zone characterized by the association of *Hungarella* spp. 1 and 2, *Healdia* sp. 1, *Kirkbyacea* indet. gen. sp. 1, and *Leviella* sp. 1.

Below 6,800 feet, ostracodes remain abundant with many of the elements of the *Hungarella* II Zone persisting. A number of species are confined to this

interval, including *Hungarella?* sp. 11, *Paracypris* spp. 1, 3 and 6 and *Hungarella* sp. 6, and the fauna is sufficiently distinctive to be designated the *Hungarella* I Assemblage Zone.

Palynology: Between 6,420 and 7,420 feet, the palynofloras are extremely impoverished and comprise relatively non-diagnostic species. *Protodiploxypinus sittleri*, which occurs at 6,440 and 6,490 feet, is indicative of a Middle Triassic or older age, while *Sahnisporites* sp. K 2 (present at 6,490 ft.), spore type LAK 7 (present at 6,790 ft.), and *Tigrisporites* cf. *T. halleinis* (present at 7,340 ft.) are more suggestive of a younger, Ladinian to Karnian, age. The interval between 6,450 and 7,420 feet is considered, therefore, to be of Ladinian to Early Karnian age, while the virtually palynologically barren section, 6,800 to 7,420 feet, should perhaps be considered to be of indeterminate age. The microfaunal evidence is in general agreement although the *Hungarella* II Zone is more commonly of Late Karnian to Norian age, and the *Hungarella* I Zone is thought to range into the Ladinian.

Environment of deposition: Below 6,400 feet, a diversified, mainly metacopid ostracode assemblage associated with the occurrence of calcareous silty sediments indicates an inner sublittoral environment of deposition for the upper section of this interval.

The character of the microfaunal assemblages below 6,800 feet is, in general, similar to that of the overlying interval; the sediments in the sequence also indicate deposition in inner sublittoral environments.

Comments: 7,420 to 8,550 feet *Nodosaria liratella* Assemblage Zone:

Micropaleontology: Foraminiferal faunas are sparse and probably are derived mainly from cavings, despite the presence of a casing shoe at 7,148 feet. The species first appearing in this interval are mainly nodosariid forms, usually as single occurrences. The record at 8,170 feet of *Saracenaria trollopei*, a Cretaceous (Albian) form, strongly suggests contamination of the samples from an external source. In previously worked samples from the same well, the minute nodosariid species *Nodosaria liratella* was recorded consistently from samples in this interval, which was designated the *N. liratella* Assemblage Zone. This species was not recorded in the present samples (apart from two individuals at the top of the studied section), and associated species such as *Bolivina lathetica*, *Ammodiscus* sp. 6, and *Trochammina* sp. 2, were encountered only rarely.

Ostracodes from this section, although not as abundant as in the *Hungarella* Zones, seem to form a distinctive assemblage, characterized by the association of *Cytherella?* sp. 4, *Hungarella* sp. 19, and common *Hungarella* sp. 6. This assemblage has been found elsewhere to be characteristic of the Middle Triassic, and of the upper part of the Lower Triassic.

Palynology: The palynofloras recorded below 7,420 feet include common *Aratrisporites* spp., with

Kraeuselisporites spp., *Lundbladispota* sp. SKAN 2, *Lycopodiacidites* sp. SKAN 1, *Nevesisporites fossulatus*, *Protoconiferus landianus*, *Duplexisporites problematicus* and *Infernopolles* sp. AN 1, suggestive of an Anisian or older age, together with single occurrences of *Ovalipollis* cf. *O. ovalis*, aff. *Enzoniasporites* sp., *Carnisporites mesozoicus*, *Camerosporites* sp. and *Conbaculatisporites mesozoicus*, all indicative of a Late Ladinian to Karnian age. The older age is certainly more consistent with the microfaunal evidence, however, and the rare, younger Triassic morphotypes are presumed to have caved. The upper boundary of the Anisian Stage therefore has been delineated at about 7,420 feet.

Core at 8,366 to 8,402 feet yielded an assemblage of late Early Triassic to lower Middle Triassic, Spathian to Early Anisian, aspect. Constituent species include *Anguisporites tenuis*, *Densosporites nejburgii*, *Guttulapollenites nanthonicus*, *Kraeuselisporites apiculatus*, *Lunatisporites novimundi*, *Equisetosporites steevesi*, *Monosulcites* sp. K, *Striatissaccus noviaulensis*, *Striatoabietes aytugii*, *Striatopodocarpites "annulatus"*, *S. pantii* and *S. rugosus* in addition to *Aratrisporites* spp., *Nevesisporites fossulatus*, *Lycopodiacidites* sp. SKAN 1 and *Infernopolles* sp. AN 1 previously recorded from the overlying section. The distinctive nature of this assemblage, which contains elements suggestive of both Spathian and Anisian ages, has necessitated the separation of the interval 8,300 to 8,550 feet to which an age of Spathian-Early Anisian has been assigned.

The occurrence of *Lueckisporites virkkiae* at 8,390 feet is of some interest. This species, generally considered to be restricted to the Permian, has proven to be a persistent, if minor, component of Early and Middle Triassic palynofloras from the Canadian Arctic Islands. In the general absence of other nominally Permian morphotypes in the assemblages, reworking perhaps should be discounted and the range of the species be extended into the Triassic, up to and including the Early Anisian.

Environment of deposition: The microfaunas below 7,480 feet appear to be derived in part from cavings and are in general poor, both in species and specimens. A mainly littoral depositional environment is suggested.

Comments: 8,550 to 9,744 feet (T.D.):

Micropaleontology: The foraminiferal fauna is a mixture of caved forms from higher intervals, contamination such as the Albian *Lenticulina* cf. *L. polygona* at 9,000 feet and in situ representatives of the *Nodosaria liratella* fauna as described for the superjacent interval. The in situ fauna is restricted mainly to agglutinated forms. No Permian species were encountered.

Ostracodes continue to occur in reasonable numbers down to about 9,000 feet, being represented mainly by the Lower and Middle Triassic assemblage described for the *N. liratella* Assemblage Zone. No diagnostic ostracodes or foraminifers were recovered from the bottom core of the well.

Palynology: The Early Triassic aspect of the palynofloras is accentuated below 8,550 feet by the occurrences of *Protohaploxyipinus pellucidus*, *Platysaccus queenslandi* and of further species of the cavate trilete genus *Densosporites*. Core at 9,731 to 9,744 feet yielded a rich assemblage in which species also recorded from core at 8,366 to 8,402 feet form a conspicuous element. These include *Densosporites nejburgii*, *Guttulapollenites hannonicus*, *Kraeuselisporites apiculatus*, *Lunatisporites novimundi*, *Equisetosporites steevesi*, *Lueckisporites virkkiae*, *Monosulcites* sp. K, *Striatissaccus noviaulensis* and *Striatopodocarpites pantii* together with *Aculeisporites variabilis*, *Densosporites complicatus*, *D. playfordi*, *Klausipollenites vestitus*, *Kraeuselisporites saeptatus*, *Lunatisporites hexagonalis*, L. sp. SK 2, *Protohaploxyipinus bharadwajii*, *P. glabrescens*, *P. samoilovichii*, *Striatissaccus* sp. SK 5, *S. ovatus* and *Triadisporea crassa*, which are more suggestive of an Early Triassic age.

The absence of the *Striatoabieites duivenii* group and *Endosporites papillatus* suggests that this assemblage is younger than Griesbachian. The absence of *Aratrisporites* spp. and the *Striatoabieites ayugii* group also suggest that the assemblage is older than Spathian. The presence of *Triadisporea crassa* and the variety and abundance of the *Protohaploxyipinus* and *Striatissaccus* groups further suggest that this assemblage is of probable Smithian age although a Dienerian age cannot be excluded entirely.

Environment of deposition: Littoral depositional environments are dominant down to 8,600 feet at which depth a change in colour of the sediments from grey to red may indicate greater influence of supralittoral conditions below this level. The sandstones below 9,100 feet are practically barren of microfauna and are thought to represent mainly supralittoral environments, although the abundance of acritarchous microplankton in the core between 9,731 and 9,744 feet is indicative of nearshore, high-energy depositional environments.

Carboniferous and Permian Assemblages
(brachiopods) by J.B. Waterhouse

Socony Mobil-W.M. Blackie No. 1 Y.T. M-59
65°58'54.92"N, 137°11'10.87"W, figure 1b, loc. 13
(Note GSC Paper 71-15, p. 8-9)

Depth 1,961 ft., core,
Hart River Formation,
GSC loc. C-4351

Tornquistia sp.

Depth 1,965.5 ft., core,
Hart River Formation,
GSC loc. C-4353

?*Tornquistia* sp.
Attenuatella sp.

Depth 1,974 ft., core,
Hart River Formation
GSC loc. C-4354

?*Tornquistia* sp.
age: 1,961 to 1,974 ft.: Early Permian,
Sakmarian

Comments: The determinations of *Tornquistia* lack certainty because, in spite of lengthy preparation, no dorsal interiors could be found to reveal the diagnostic double septa. However, the identification seems likely in view of the presence of *Attenuatella*. Both point to a Sakmarian age, of the Et and Ea Zones (Bamber and Waterhouse, 1971) of the Jungle Creek Formation.

Depth 6,319 ft., core,
unnamed shale unit,
GSC loc. C-2987

"*Leiorhynchus*" *carboniferum* Girty

Depth 6,325 ft., core,
unnamed shale unit,
GSC loc. C-2988

Quadratia cf. *Q. hirsuteformis* (Walcott)

Depth 6,336 ft., core,
unnamed shale unit,
GSC loc. C-2989

?*Quadratia* sp.
age: 6,319 to 6,336 ft.: Early Carboniferous, Chesteran

Comments: These species are typical of the Aq Zone (Bamber and Waterhouse, 1971) in the northern Yukon, of Chesteran age, or late Viséan according to the European time-scale.

Devonian Assemblages (corals and stromatoporoids)
by A.E.H. Pedder

Murphy-B.O.C. Arrowhead River No. 1
60°50'25"N, 122°05'50"W, figure 1b, loc. 19

Depth 5,791.5 ft., core,
Sulphur Point Fm., 253.5 ft.
above base, 97.5 ft. below top,
GSC loc. C-8998

Temnophyllum richardsoni (Meek)?
age: Middle Devonian, late Givetian,
Stringocephalus aleskanus to
Lower *hermanni-cristatus* Zone?

Depth 6,195 ft., core,
Pine Point Fm., 140 ft.
above base, 150 ft. below
top, GSC loc. C-9002

Exilifrons sp. nov.
age: Middle Devonian, Eifelian,
probably *dysmorphostrota* Zone

Imperial Sun Arrowhead I-46
60°45'37"N, 122°22'47"W, figure 1b, loc. 18
(Note GSC Papers 70-15, p. 15-17 and 71-15, p. 16-17)

Depth 6,474.1 ft., core,
Sulphur Point Fm., 20.5 ft.
above base, 62.5 ft. below top,
GSC loc. C-8946

stromatoporoids, not studied
Thamnopora sp.

Grypophyllum mackenziense (Pedder)
age: Middle/Late Devonian, *mackenziense*
Zone

Imperial Norman Wells No. 37x
65°16'57"N, 126°51'50"W, figure 1b, loc. 14
(Note GSC Paper 71-15, p. 21)

Depth 1,369 ft., core,
Ramparts Fm. (broad sense),
70 ft. above base, 346 ft.
below top, GSC loc. C-9905

Grypophyllum mackenziense (Pedder)
age: Middle/Late Devonian, *mackenziense*
Zone

Briggs Rabbit Lake No. 2
60°54'53"N, 118°49'37"W, figure 1b, loc. 21

Depth 2,707 ft., core,
Pine Point Fm., 121 ft. above
base, 7 ft. below top,
GSC loc. C-7672

Thamnopora sp.
Alveolites sp.
Psydracophyllum lonsdaleiaforme Pedder
age: Middle Devonian, Late Eifelian,
dysmorphostrota Zone

Depth 2,717 ft., core,
Pine Point Fm., 111 ft. above
base, 17 ft. below top,
GSC loc. C-7673

Thamnopora sp.
rugose coral, indet.
age: Silurian or Devonian

Briggs N.E. Tathlina Lake No. 1
60°46'01"N, 117°19'45"W, figure 1b, loc. 23

Depth 2,156 ft., core,
Watt Mountain Fm., 4 ft. above
base, 26 ft. below top,
GSC loc. C-9897

Alaiophyllum sp. nov.
gastropod moulds, indet.
age: Middle Devonian, probably Givetian

Depth 2,159 ft., core,
Watt Mountain Fm., 1 ft. above
base, 29 ft. below top,
GSC loc. C-9898

Chaetetes sp.
age: Ordovician to Permian

Briggs N.E. Tathlina Lake No. 9
60°43'12"N, 117°22'17"W, figure 1b, loc. 22

Depth 2,396 ft., core,
Sulphur Point Fm., 104
ft. above base, 6 ft.
below top, GSC loc.
C-9899

fragment of a large pseudopunctate
brachiopod, possibly *Megastrophia* sp.
age: Middle Devonian?

Depth 2,399 ft., core,
Sulphur Point Fm., 101 ft.
above base, 9 ft. below top,
GSC loc. C-9900

stromatoporoids, not studied
Dendrostella sp. cf. *D. disjuncta* (Whiteaves)
age: probably Middle Devonian, Givetian

Depth 2,414 ft., core,
Sulphur Point Fm., 86 ft.
above base, 24 ft. below top,
GSC loc. C-22943

stromatoporoid, not studied
Syringopora sp.
Grypophyllum sp. cf. *G. mackenziense* (Pedder)
age: probably Middle/Late Devonian,
mackenziense Zone?

Depth 2,438 ft., core,
Sulphur Point Fm., 62 ft.
above base, 48 ft. below top,
GSC loc. C-9902

Stachyodes sp., broad sense
Thamnopora sp.
Psydracophyllum sp.
age: Middle Devonian, probably Late
Eifelian or Givetian

Depth 2,486 ft., core,
Sulphur Point Fm., 14 ft.
above base, 96 ft. below top,
GSC loc. C-9904

Thamnopora sp.
Dohmophyllum or *Psydracophyllum* sp.
age: Early Devonian (Siegenian) to
Middle Devonian (early Givetian?)

Placid Chevron Kakisa J-65
60°44'42"N, 117°27'07"W, figure 1b, loc. 24
(Note GSC Paper 71-15, p. 20)

Depth 2,589 ft., core,
Sulphur Point Fm., 66 ft.
above base, 128 ft. below top,
GSC loc. C-24150

Grypophyllum sp. indet.
age: Middle Devonian, Givetian

Union-Pan Am. Trainor L-59
60°28'33"N, 120°40'50"W, figure 1b, loc. 20
(Note GSC Papers 70-15, p. 10 and 71-15, p. 18-20)

Depth 5,853 ft., core,
Sulphur Point Fm.,
GSC locs. C-3985 and C-19211

Grypophyllum cf. *G. wedekindi* Middleton
Stachyodes sp. cf. *S. thomasclarki* Stearn
age: probably Middle/Late Devonian,
mackenziense Zone

Comments: *Psydracophyllum lonsdaleiaforme* (GSC loc.
C-7672) and the new species of *Exilifrons* (GSC loc.
C-9002) are regarded as reliable indices to the late
Eifelian *dysmorphostrota* Zone, which, at the surface,

occurs in the pre-*Leiorhynchus castanea*-bearing beds of the Headless, Nahanni and Hume Formations. It is thus probable that the subsurface Pine Point of the Rabbit Lake and Arrowhead River areas is just older than the *Leiorhynchus castanea*-bearing beds of the Pine Point Formation of the Great Slave Lake area. *Psydracophyllum lonsdalei*forme has been reported also from the subsurface Keg River Formation of the Gulf *et al.* Trout River D-14 well (GSC locs. C-7153, C-7154, GSC Paper 72-38, p. 23).

Good examples of *Grypophyllum mackenziense* occur in the Sulphur Point Formation of the Arrowhead I-46 well (GSC loc. C-8946) and the Ramparts Formation of the Norman Wells 37x well (GSC loc. C-9905). The latter identification extends the range of the *mackenziense* Zone in the Norman Wells 37x well to a depth of 1,369 feet, giving it a total thickness of at least 208 feet (see GSC Paper 71-15, p. 21, for further details). *Grypophyllum mackenziense* also may be present in beds assigned to the Sulphur Point Formation in Briggs N.E. Tathlina Lake No. 9 well (GSC loc. C-22943), but the only specimen available has 17x2 septa and a diameter of 9.2 mm, whereas normally in adult stages the species has 18x2 to 26x2 septa and a diameter ranging from 9.0 to 19.0 mm. *Grypophyllum mackenziense* is believed to be a good megafossil index to the Upper *hermanni-cristatus* Conodont Zone, which on this continent usually is accepted as the latest Middle Devonian Zone. The occurrence of a species comparable with *Dendrostella disjuncta* in GSC locality C-9900 is of considerable interest in that *D. disjuncta*, sensu stricto, is known only from the older *Stringocephalus*-bearing Methy and Winnipegosis Formations of Alberta and Manitoba, respectively.

The specimen of *Grypophyllum* in the Kakisa J-65 well is incomplete, poorly preserved and so small that it is almost certainly juvenile. It may be *G. crickmayi* Pedder, which is known in the Sulphur Point Formation of N.W.T. Deep Bay No. 2 well (depth 660-678 ft.), but a definite identification is not possible. It does not seem to be *G. mackenziense* and probably is older than that species.

The *Temnophyllum* from the Sulphur Point Formation of the Murphy-B.O.C. Arrowhead River No. 1 well (GSC loc. C-8998) is worn peripherally, has suspiciously wedge-shaped septa and, therefore, can be referred only questionably to the species *T. richardsoni*. If the identification is upheld, it strongly suggests that this part of the Sulphur Point Formation in the Arrowhead River No. 1 well is older than much of the Sulphur Point of other subsurface sections, as current data indicate that the range of *T. richardsoni* entirely predates that of *Grypophyllum mackenziense*.

Silurian and Devonian Assemblages
(conodonts, spores, brachiopods, pelecypods,
echinoderms, cricoconarids and graptolites)
by D.C. McGregor, B.S. Norford,
A.W. Norris and T.T. Uyeno

B.P. *et al.* Hotspur J-20
76°09'37"N, 104°04'43"W, figure 1a, loc. 30

Depth 4,612 ft., core, probably
Eids Formation, possibly Bird
Fiord Formation, GSC loc. C-10062

leiorhynchid fragments
Conocardium sp.
pelecypod
tentaculitid
dechenellid tail fragment
ostracode
age: Middle Devonian

Depth 6,468 ft., core,
Eids Formation,
GSC loc. C-10061

Icriodus nodosus (Huddle) sensu lato
Acinosporites sp.
?Anapiculatisporites petilus Richardson
Baculatisporites sp.
?Calytosporites velatus (Eisenack) Richardson
Dictyotriletes sp.
Dibolisporites echinaceus (Eisenack)
Richardson
?Retusotriletes dubius (Eisenack) Richardson
?Spinozonotriletes sp.
?Verruciretusispora robusta Owens
schuchertellid? fragment
Schizophoria? sp.
"Camarotoechia" sp.
leiorhynchid
Warrenella? sp.
Atrypa sp.
orthoconic cephalopod fragment
pelecypod
trilobite fragments
age: Middle Devonian

Comments (D.C.M.): The spores in this sample are extremely corroded so that most wall sculpture critical for identification has been obscured. Consequently, most identifications were made with caution. However, the overall aspect of the assemblage leaves little doubt that it is Middle Devonian in age. Closest resemblance in the Arctic Islands appears to be with assemblages from the lower half of the Weatherall Formation on eastern Melville Island and the lower part of the Bird Fiord Formation of north-eastern Bathurst Island. A latest Eifelian or early Givetian age is suggested, but cannot be regarded as conclusive on the present evidence.

Comments (A.W.N.): The *Warrenella?* sp. and *"Camarotoechia"* sp. from 6,468 feet and the dechenellids from 4,612 feet are common fossils in the Bird Fiord and Blue Fiord Formations on Ellesmere and Bathurst Islands, and suggest a Middle Devonian age for the containing beds.

Depth 8,705-8,705.5 ft., core,
probably Bathurst Island Formation,
GSC loc. C-10228

Gasterocoma? bicaula Johnson and Lane

Depth 8,708 ft., core,
probably Bathurst Island
Formation, GSC loc. C-10229

Coenites? sp.
Spinatrypa? sp.
tentaculitid
Gasterocoma? bicaula Johnson and Lane

Depth 8,709.5-8,709.7 ft., core,
probably Bathurst Island Formation,
GSC loc. C-10230

'ghost' of small brachiopod
tentaculitid? fragments
Gasterocoma? bicaula Johnson and Lane

Depth 8,710-8,710.4 ft., core,
probably Bathurst Island Formation,
GSC loc. C-10231

Gasterocoma? bicaula Johnson and Lane

Depth 8,715.1-8,715.4 ft., core,
probably Bathurst Island Formation,
GSC loc. C-10233

macerated brachiopod shell fragments
Gasterocoma? bicaula Johnson and Lane

Depth 8,721.7-8,721.9 ft., core,
probably Bathurst Island Formation,
GSC loc. C-10235

leiorhynchid
coarsely costate spiriferid
undet. fragmentary brachiopod impression
Gasterocoma? bicaula Johnson and Lane

Depth 8,721.9-8,722.2 ft., core,
probably Bathurst Island Formation,
GSC loc. C-10236

leiorhynchid
Atrypa sp.
coarsely costate spiriferid
Gasterocoma? bicaula Johnson and Lane

Depth 8,724.3 ft., core,
probably Bathurst Island Formation,
GSC loc. C-10238

Gasterocoma? bicaula Johnson and Lane

Depth 8,724.3-8,725.0 ft., core,
probably Bathurst Island Formation,
GSC loc. C-10239

Ozarkodina n. sp. A of McGregor and Uyeno,
1972
Panderodus sp.

Depth 8,725-8,725.2 ft., core,
probably Bathurst Island Formation,
GSC loc. C-10240

Nowakia sp. - faint impressions
Gasterocoma? bicaula Johnson and Lane
age, 8,705-8,725.2 ft.: probably late
Early Devonian, late Emsian

Comments (A.W.N.): The interval 8,705 to 8,725.2
feet contains *Gasterocoma? bicaula* Johnson and Lane
(1969), an echinoderm ossicle with dumbbell and
cross-shaped lumens. This form is widely distribu-
ted in northwestern Canada (Norris, 1968), in Nevada
(Johnson, 1971), and elsewhere, and appears to range
in age from late Emsian to early Eifelian. Recent

datings, using conodonts, of beds containing this
form in abundance in northern and northwestern Canada
suggest a late Emsian (late Early Devonian) age. A
few 'two-holers' of different shape have been found
also in beds of Givetian (late Middle Devonian),
Frasnian (early Late Devonian) and younger ages.

Comments (T.T.U.): *Ozarkodina* n. sp. A has been
found on Bathurst Island, in the lower Eids Forma-
tion and in the upper Stuart Bay Formation, directly
associated with *Polygnathus foveolatus* Philip and
Jackson. The latter form is an Emsian, probably
middle to late Emsian, indicator, and a similar age
is assigned to the present collection.

Depth 10,119-10,120 ft., core,
probably Bathurst Island Formation,
GSC loc. C-11481

Cortezorthis sp.
"Camarotoechia" sp.
age: late Early Devonian (Emsian)

Depth 10,127 ft., core,
probably Bathurst Island
Formation, GSC loc. C-11481A

"Camarotoechia" sp.
Spinatrypa? sp. - a very young form
undet. spiriferid - tiny young form

Depth 10,128-10,129 ft., core,
probably Bathurst Island Formation,
GSC locs. C-11482 and C-11483

leiorhynchid
bactritid?
age: late Early Devonian (Emsian)

Depth 10,131.5 ft., core,
probably Bathurst Island
Formation, GSC loc. C-11484

Cortezorthis sp.
leiorhynchid
age: late Early Devonian (Emsian)

Depth 10,132.5 ft., core,
probably Bathurst Island
Formation, GSC loc. C-11485

large undet. brachiopod fragment
"Camarotoechia" sp.
Tentaculites sp.
age: late Early Devonian (Emsian)

Depth 10,134 ft., core,
probably Bathurst Island
Formation, GSC loc. C-11486

Cortezorthis? sp.
leiorhynchid
age: late Early Devonian (Emsian)

Comments (A.W.N.): A single faunal assemblage
appears to be represented in the interval 10,119
to 10,134 feet. The most diagnostic element in the
assemblage is the brachiopod *Cortezorthis* sp., which
is similar to *Cortezorthis bathurstensis* Johnson and

Talent (1967) described from two localities near the top of the Stuart Bay Formation on Bathurst Island. The occurrences of *C. bathurstensis* are dated tentatively as early Emsian by Johnson and Talent and the closely similar *Cortezorthis* sp. in the present collection is probably about the same age.

Depth 11,300-11,310 ft., core,
Cape Phillips Formation, GSC
locs. C-12534 and C-12535

indeterminate brachiopods

Monograptus sp.

age: Early Silurian to Early Devonian

Depth 11,313-11,318 ft., core,
Cape Phillips Formation, GSC
loc. C-12533

?*Linograptus* sp.

Monograptus aff. *M. kosoviensis* Bouček

age: Late Silurian, Ludlovian or
Pridolian, probably Pridolian

Depth 11,916-11,920 ft., core,
Cape Phillips Formation,
GSC loc. C-12536

Monograptus aff. *M. angustidens* Přibyl
(sensu Jackson and Lenz, 1969)

?*M.* cf. *M. paraformosus* Jackson and Lenz

age: Late Silurian, most probably
latest Ludlovian

Depth 12,523-12,535 ft., core,
Cape Phillips Formation,
GSC loc. C-12554

?*Cyrtograptus* sp.

Monograptus spp.

M. ex gr. *M. priodon* (Bronn)

Retiolites sp. or *Stomatograptus* sp.

age: late Early Silurian or early
Middle Silurian, latest Llandoveryan
or earliest Wenlockian

Comments: All the material is poorly preserved and firm identification of the graptolites is very difficult. Nevertheless, all three cores can be dated confidently as Silurian.

Specimens from 11,313 to 11,318 feet almost certainly represent *Linograptus*, which indicates a Ludlovian or Pridolian age. Short, initial fragments from 11,916 to 11,920 feet possibly could represent young stages of *Cyrtograptus* (latest Llandoveryan to Wenlockian) or of *Monograptus spiralis* (Geinitz) (latest Llandoveryan) but are thought more likely to belong to *Monograptus paraformosus*. The graptolite here identified as *Monograptus* aff. *M. angustidens* possibly could be a distorted specimen of the *M. priodon* (Bronn) group (latest Llandoveryan to Wenlockian) but closely resembles a form described by Jackson and Lenz (1969, p. 21-23) from the Porcupine River, from the same zone as *Monograptus paraformosus*. There is a slight possibility that the interval 11,916 to 11,920 feet is latest Llandoveryan or Wenlockian but it is much more likely to be the same as the development on Porcupine River: latest Ludlovian. Such

interpretation fits better with the latest Llandoveryan or earliest Wenlockian dating of 12,523 to 12,535 feet.

Silurian to Devonian Assemblages (conodonts) by T.T. Uyeno

Aquitaine Hudson Walrus A-71

58°30'02.29"N, 87°10'48.75"W, figure 1a, loc. 34

(Note GSC Paper 72-38, p. 24-25)

Some collections are the property of S.N.P.A. and are stored in Pau.

Depth 2,670-2,682 ft., core,

Kwataboahagan Formation,

164-176 ft. below top,

78-90 ft. above base, GSC

locs. C-23073 to C-23078

Polygnathus linguiformis mucronatus

Wittekindt sensu lato

P. linguiformis linguiformis Hinde,

γ morphotype of Bultynck, 1970

Icriodus nodosus (Huddle) sensu lato (cf. *I.*

nodosus n. subsp. A of Bultynck, 1970)

Angulodus cf. *A. demissus* Huddle

A. cf. *A. walrathi* (Hibbard)

Coelocerodontus devonicus (Stauffer)

Hindeodella? adunca Bischoff and Ziegler

Panderodus sp.

Neoprioniodus armatus (Hinde)

Diplododella sp.

?*Ozarkodina* sp. (fragmentary)

Scelopodus devonicus Bischoff and Sannemann

age: probably Middle Devonian, Eifelian

Depth 3,005-3,100 ft., cuttings,

Severn River Formation,

S.N.P.A. samples

Panderodus spp.

P. simplex (Branson and Mehl)

P. cf. *P. simplex* (Branson and Mehl)

P. cf. *P. unicostatus* (Branson and Mehl)

Ozarkodina typica Branson and Mehl

age: probably Silurian

Depth 3,105-3,150 ft., cuttings,

Severn River Formation,

S.N.P.A. samples

Ozarkodina adiutricis Walliser

Neospathognathodus sp. (fragmentary) proba-

bly *N.* sp. ex aff. *N. celloni* (Walliser)

(see Walliser, 1964, Pl. 14, figs. 17,
18).

?*N.* sp. (highly fragmentary) probably *N.*

latus Nicoll and Rexroad

?*Apsidognathus* sp. (highly fragmentary)

probably *A. tuberculatus* Walliser

Panderodus simplex (Branson and Mehl)

P. unicostatus (Branson and Mehl)

P. cf. *P. unicostatus* (Branson and Mehl)

Plectospathodus cf. *P. extensus* Rhodes

Roundya cf. *R. detorta* Walliser

indet. fragments (possibly including

Icriodella or *Icriodina* sp.)

age: Early Silurian, late Llandoveryan

celloni Zone

Depth 3,155-3,200 ft., cuttings,
Severn River Formation,
S.N.P.A. samples

Panderodus unicostatus Branson and Mehl
?Spathognathodus sp. (highly fragmentary)
Ligonodina sp. (fragmentary)
indeterminate fragments
age: Middle Ordovician-Early Devonian

Depth 3,200 ft., cuttings,
Severn River Formation,
S.N.P.A. samples

Icriodus cf. *I. nodosus* (Huddle) sensu lato
Panderodus spp.
Trichonodella sp.
age: Devonian, probably Middle Devonian

Depth 3,320-3,325 ft., cuttings,
Severn River Formation,
S.N.P.A. samples

Ozarkodina sp.
O. cf. *O. adiutricis* Walliser
Panderodus unicostatus (Branson and Mehl)
P. cf. *P. simplex* (Branson and Mehl)
age: probably Silurian, probably
celloni Zone

Depth 3,330-3,335 ft., cuttings,
Severn River Formation,
S.N.P.A. samples

Ozarkodina sp. (fragmentary)
Panderodus simplex (Branson and Mehl)
P. unicostatus (Branson and Mehl)
Roundya cf. *R. detorta* Walliser
age: probably Silurian

Depth 3,345 ft., cuttings,
Severn River Formation,
S.N.P.A. samples

Trichonodella cf. *T. papilio* Nicoll and
Rexroad
Hindeodella? sp. (juvenile form)
Panderodus sp. (fragmentary)
indeterminate fragment
age: probably Silurian

Depth 3,350 ft., cuttings,
Severn River Formation,
S.N.P.A. samples

?Neospathognathodus sp. [highly fragmentary;
may possibly be *N.* sp. ex aff. *N. cel-*
loni (Walliser)]
Panderodus simplex (Branson and Mehl)
indeterminate fragments
age: probably Silurian, probably
celloni Zone

Depth 3,335-3,365 ft., cuttings,
Severn River Formation,
S.N.P.A. samples

Ozarkodina sp. (juvenile, fragmentary)
Panderodus spp. (fragmentary)
P. simplex (Branson and Mehl)

?Ligonodina sp.
Roundya sp. (all specimens highly fragmen-
tary)
age: probably Silurian

Depth 3,390 ft., cuttings,
Severn River Formation,
S.N.P.A. samples

Panderodus simplex (Branson and Mehl)
P. sp.
indeterminate fragment
age: probably Silurian

Depth 3,395 ft., cuttings,
Severn River Formation,
S.N.P.A. samples

Ozarkodina sp. (vaguely resembling
O. adiutricis Walliser)
indeterminate fragments
age: possibly Silurian

Depth 3,405 ft., cuttings,
Severn River Formation,
S.N.P.A. samples

Ozarkodina cf. *O. typica* Branson and Mehl
indeterminate fragments
age: probably Silurian

Depth 3,505-3,540 ft., cuttings,
Severn River Formation,
S.N.P.A. samples

Polygnathus sp. (possibly *P. varcus* Stauffer)
?Neospathognathodus sp. (highly fragmentary)
age: Silurian to Devonian

Depth 3,917-3,924 ft., core,
Severn River Formation,
GSC locs. C-4310 to C-4312,
C-4319, C-23079, C-23081 and
S.N.P.A. samples

Ozarkodina aff. *O. adiutricis* Walliser
O. sp. (cf. *O.* aff. *media* Walliser of
Pollock et al., 1970)
Panderodus sp.
P. simplex (Branson and Mehl)
Lonchodina? cf. *L?* sp. or Rexroad (1967,
Pl. 3, fig. 5)
?Neoprioniodus sp.
age: probably Early Silurian, possibly
late early to middle Llandoveryan

Comments: Four cores were taken during the drilling
of the well. Core 1 (1,432-1,444 ft.) did not yield
any conodonts. Two fragmentary icriodids were found
previously in core 2 (2,000-2,002 ft.) that was dated
by means of spores as late Givetian or early Frasnian
(GSC Paper 72-38, p. 24).

All the samples from core 3 (2,670-2,682 ft.)
yielded conodonts. Most samples yielded faunules
that are identical or very similar to those from the
Elm Point Formation in southern Manitoba (Norris and
Uyeno, 1972) and the Murray Island Formation of the
James Bay Lowlands but, unlike these formations,
they lack the critical species, *Polygnathus angusti-*

costatus Wittekindt, that indicates an Eifelian (probably Late Eifelian) age. In the western District of Mackenzie, however, forms very similar, if not identical, to those herein assigned to *Polygnathus linguiformis mucronatus* (sensu lato) occur in positions stratigraphically lower than the first occurrence of *P. angusticostatus*. This suggests that conodonts from core 3 perhaps may be slightly older than Late Eifelian.

Conodonts were obtained from cuttings in the interval between cores 3 and 4, by J. Le Fèvre of the SNPA, Pau, France. The interval 3,105 to 3,150 feet yielded diagnostic conodonts of the late Llandoveryan *Neospathognathodus celloni* Zone. Because these conodonts are from cuttings, this age should be considered only as the youngest possible age for the enclosing strata. Conodonts of the *celloni* Zone have been obtained from the Severn and Ekwan River Formations of the Hudson and James Bay Lowlands. Two other intervals yielded probable *celloni* Zone conodonts: 3,320 to 3,325 feet and 3,350 feet. Several yielded *Panderodus simplex* which, insofar as is known, is restricted to the Silurian.

Core 4 (3,917-3,924 ft.) contains *Panderodus simplex* and a species, assigned to *Lonchodina*?, that is close to a species found in the Brassfield Formation of the Cincinnati Arch area (Rexroad, 1967). This leads to a suspicion that perhaps the bottom of this well may be in upper lower to middle Llandoveryan strata but corals from core 4 identified by Pedder indicate a late Llandoveryan or Wenlockian age (GSC Paper 72-38, p. 25).

Some intervals of cuttings yielded conodonts that are obviously out of place, as at 3,200 feet and 3,505 to 3,540 feet.

Probable Late Eifelian conodonts occur as low as 2,682 feet and conodonts at least as old as late Llandoveryan occur at 3,105 to 3,150 feet. In view of these facts, it seems reasonable to assume a major unconformity somewhere between these horizons. This is especially so when considering the Siluro-Devonian stratigraphic column on the adjacent mainland, which includes substantial thickness of rocks of intervening ages.

Ordovician to Silurian Assemblages (conodonts)
by T.T. Uyeno and C.R. Barnes

Sun-King Resources-Panarctic Kitson River C-71
76°10'12.54"N, 112°58'55.92"W, figure 1a, loc. 29

Depth 3,033.6-3,066 ft., core,
probably Allen Bay Formation,
GSC locs. C-7683 to C-7692

Panderodus simplex (Branson and Mehl)
P. unicostatus unicostatus (Branson and Mehl)
P. gracilis (Branson and Mehl)
Spathognathodus? sp. (fragmentary)
Ozarkodina cf. *O. typica* Branson and Mehl (juvenile form)
Neoprioniodus sp. (probably conspecific with that of Pl. 2, fig. 14 of Liebe, 1962)
Trichonodella sp.

Lonchodina cf. *L. detorta* Walliser (juvenile form)
age: probably Early Silurian

Comments (T.T.U.): The general aspect is Silurian. Juvenile forms resembling *Lonchodina detorta* and *Ozarkodina typica* are present and these species are restricted to the Silurian in the Carnic Alps and in the midwestern United States. The presence of Liebe's (1962) *Neoprioniodus* sp. is difficult to assess accurately at this time without access to his dissertation, but his species has been reported from the Alexandrian and Niagaran Series of the Illinois Basin. Pollock *et al.* (1970) erected a new zone, *Panderodus simplex* Assemblage Zone, which corresponds with the lower part of Walliser's (1964) Bereich I (=lower part of Llandovery). It is characterized by the general paucity of conodonts, the only common species being *Panderodus simplex* and *P. unicostatus*. Because no diagnostic Ordovician nor younger Silurian conodonts are present, the present fauna is assigned tentatively to the *P. simplex* Assemblage Zone and, therefore, tentatively dated as Early Silurian (lower part of Llandovery).

Depth 5,011-5,062 ft., core,
Cornwallis Group, GSC loc.
C-7682

Microcoelodus sp. (probably n. sp.)
M. unicornis? of Branson and Mehl, 1933
M. cf. M. gracilis (Branson and Mehl)
age: Middle Ordovician, Porterfieldian

Comments (T.T.U.): Probably corresponding to Fauna 5 of Sweet *et al.*, 1971; of Porterfieldian age.

Depth 5,664-5,683 ft., core,
Cornwallis Group, GSC loc.
C-23942

Prioniodus sp. A of Sweet *et al.*, 1971
indeterminate simple cone
age: early Middle Ordovician, Chazyan

Comments (C.R.B.): The form species *Prioniodus* sp. A (Sweet *et al.*, 1971, Pl. 1, figs. 26, 28) is present in Fauna 4 of Sweet *et al.* (1971) and also is known from the upper Ship Point Formation of the Foxe Basin and probably also from the lower Bay Fiord Formation on Bathurst Island (Barnes, in press).

Depth 9,030-9,037 ft., core,
GSC loc. C-23943

Acodus oneotensis (transition series)
Chosonodina herfurthi Muller
Paltodus cf. *P. variabilis* Furnish
Scandodus cf. *S. furnishi* Lindstrom
Scelopodus quadruplicatus Branson and Mehl
age: Early Ordovician, mid-Arenigian

Comments (C.R.B.): *Chosonodina herfurthi* appears to have a relatively short stratigraphic range, corresponding to that of Fauna C of Ethington and Clark (1971, p. 72). Most of the other form species are common in Fauna D of those authors and are present in the Marathon Formation of Colorado, in the lower Arbuckle Group of Oklahoma, and in the Oneota

Formation of the Upper Mississippi Valley. A Canadian (mid-Arenigian) age is indicated.

Ordovician to Silurian Assemblages
(graptolites, arthropods and corals)
by B.S. Norford

Sun-King Resources-Panarctic Allison River N-12
75°11'52.405"N, 98°35'42.632"W, figure 1a, loc. 31

Depth 9,450-9,469.25 ft., core,
Cape Phillips Formation,
GSC locs. C-18150 to C-18157

indeterminate cephalopods and brachiopods
Caryocaris sp.
?Linograptus sp.
Monograptus spp.
M. cf. M. bohemicus tenuis Bouček
age: Late Silurian, Ludlovian

Comments: All eight collections represent the same fauna. The age is Late Silurian (Kopaninian) and indicates correlation with the northern Yukon *Monograptus leintwardinesis primus* Zone of Lenz and Jackson (1971, p. 4-5).

Pan American A-1 Mattson Creek No. 1
61°02'28"N, 123°48'30"W, figure 1b, loc. 17

Depth 10,329-10,330 ft., core,
Mount Kindle Formation, 843-844
ft. below top, GSC loc. C-24550

Cystihalysites sp.
?Palaeofavosites sp.
age: Silurian

Husky H.B. et al. Willow Lake O-27A
62°16'48"N, 121°04'21"W, figure 1b, loc. 15

Depth 2,527-2,530 ft., core,
Mount Kindle Formation, 43-46
ft. below top, 90-93 ft. above
base, GSC loc. C-26292

?Favistina sp.
age: probably Middle or Late Ordovician

Depth 2,543-2,554 ft., core,
Mount Kindle Formation, 59-70
ft. below top, 66-77 ft. above
base, GSC locs. C-26294 to C-26295

echinoderm and trilobite debris
Lobocorallium sp.
Palaeophyllum sp.
?Palaeophyllum sp.
Catenipora sp.
Palaeofavosites sp.
?Palaeofavosites sp.
age: Late Ordovician

Husky H.B. et al. Willow Lake G-32
61°21'22"N, 120°51'13"W, figure 1b, loc. 16

Depth 2,505-2,515 ft., core,
Mount Kindle Formation, 117-127
ft. below top, 39-49 ft. above base,
GSC locs. C-26286 and C-26287

echinoderm debris
Palaeophyllum sp.
streptelasmid coral
Calapoezia sp.
Catenipora sp.
Palaeofavosites sp.
Sarcinula sp.
age: probably Late Ordovician

Depth 2,515-2,525 ft., core,
Mount Kindle Formation, 127-137
ft. below top, 29-39 ft. above
base, GSC locs. C-26288 and C-26289

echinoderm and brachiopod debris
Bighornia sp.
Favistina sp.
Palaeophyllum sp.
streptelasmid coral
Calapoezia sp.
Catenipora sp.
?Palaeofavosites sp.
age: Late Ordovician

Depth 2,525-2,532 ft., core,
Mount Kindle Formation, 137-
144 ft. below top, 22-29 ft.
above base, GSC locs. C-26290
and C-26291

echinoderm debris
Bighornia sp.
Palaeophyllum sp.
undetermined rugose and tabulate corals
Catenipora sp.
Palaeofavosites sp.
age: Late Ordovician

Ordovician Assemblages (conodonts)
by C.R. Barnes

Aquitaine et al. Rowley M-04
69°03'58.48"N, 79°03'48.32"W, figure 1a, loc. 33
(Note GSC Paper 72-38, p. 26-27)

Depth 1,140.4-1,141.1 ft., core,
GSC loc. C-23082

Acodus auritus Harris sensu formae
Belodella n. sp. sensu formae
Chosonodina? sp. A sensu formae of Sweet
et al. (1971)
Drepanoistodus cf. *D. homocurvatus* Lindström
Multioistodus compressus Harris and Harris
Oistodus n. sp.
Oulodus n. sp.
Phragmodus n. sp. A of Sweet et al. (1971)
Scelopodus? sp.

Depth 1,145.7-1,146.2 ft., core,
GSC loc. C-23083

Acodus auritus Harris sensu formae
Belodella n. sp. sensu formae
Drepanoistodus cf. *D. homocurvatus* Lindström
Oulodus n. sp.
Phragmodus n. sp. A of Sweet et al. (1971)
hyaline prioniodiniiform elements

Depth 1,148.0-1,148.8 ft., core,
GSC loc. C-23084

Acodus auritus Harris sensu formae
Belodella n. sp. sensu formae
Drepanoistodus cf. *D. homocurvatus* Lindström
Multioistodus compressus Harris and Harris
Oistodus n. sp.
Oneotodus cf. *O. ovatus* (Stauffer) sensu
formae
Oulodus n. sp.
Phragmodus n. sp. A of Sweet *et al.* (1971)
Scolopodus sp.
age, 1,140-1,149 ft.: Middle Ordovician,
late Whiterockian to Porterfieldian

Depth 1,351.8-1,353.0 ft., core,
GSC locs. C-18107 and C-18108

Acodus n. sp. sensu formae
A. auritus Harris and Harris sensu formae
Drepanodus sp. sensu formae
Drepanoistodus cf. *D. homocurvatus* Lindström
Stolodus stola (Lindström)

Depth 1,355.3-1,356.0 ft., core,
GSC loc. C-18109

Acontiodus n. sp. sensu formae (of Ethington
and Clark, 1965)
Cordylodus sp. sensu formae
Drepanodus subarcuatus Furnish
Drepanoistodus homocurvatus Lindström
Oistodus n. sp. sensu formae
Paltodus sp.
Stolodus stola (Lindström)

Depth 1,370.0-1,370.5 ft., core,
GSC loc. C-18110

Acontiodus cf. *A. staufferi* Furnish sensu
formae
fibrous conodont indet.

Depth 1,370.5-1,371.2 ft., core,
GSC loc. C-18111

Cordylodus sp. sensu formae
Erismodus? sp. sensu formae
Oistodus sp. sensu formae
Scolopodus cf. *S. gracilis* Ethington and
Clark
S. quadruplicatus Branson and Mehl
age, 1,351-1,372 ft.: late Early Ordovi-
cian to early Middle Ordovician

Depth 1,416.3 ft., core,
GSC loc. C-22952

Acodus auritus Harris sensu formae
Drepanoistodus cf. *D. homocurvatus* Lindström

Depth 1,430.5 ft., core,
GSC loc. C-22953

Acodus auritus Harris sensu formae
Acontiodus cf. *A. staufferi* Furnish sensu
formae
Drepanoistodus cf. *D. homocurvatus* Lindström

Scandodus sp. sensu formae
Scolopodus quadruplicatus Branson and Mehl
Stolodus stola (Lindström) (3)
age, 1,416-1,431 ft.: late Early Ordovician
to early Middle Ordovician, late
Canadian to Chazyan

Comments: Conodont identifications listed are mul-
tielement-taxa except for form-taxa designated by
the suffix sensu formae. Samples from GSC localities
C-23082 to C-28084 (1,140 to 1,149 ft.) yielded a
diverse fauna that has been recognized previously
from the upper Ship Point Formation. The fauna, with
the distinctive new species of *Phragmodus*, *Belodella*,
and *Oulodus*, is Fauna 4 of Sweet *et al.* (1971), and
these elements from the Arctic are discussed and il-
lustrated by Barnes (in press). The age of the fauna
is upper Whiterockian to Porterfieldian (i.e., Chaz-
yan; upper Llanvirnian to lowermost Caradocian).

The fauna found in GSC localities C-18107 to
C-18111 (1,351 to 1,372 ft.) is sparse and several
specimens are fragmentary. The fauna is comparable
to more abundant faunas identified from outcrops of
the Ship Point Formation and of the Eleanor River
Formation of Devon Island. However, the stratigra-
phically more restricted components (*Acodus auritus*,
Stolodus stola, *Drepanodus subarcuatus*, *Acontiodus*
cf. *A. staufferi*, *Scolopodus* cf. *S. gracilis*) are
all known from strata of late Early Ordovician (Are-
nigian) and early Middle Ordovician (Llanvirnian;
Whiterockian) age. The species present in GSC local-
ities C-22952 and C-22953 (1,416 to 1,431 ft.) indi-
cate late Canadian to Chazyan (late Arenigian to
Llandeilian) but compare closely with the conodonts
from GSC localities C-18107 to C-18111.

Cambrian Assemblages
(trilobites, brachiopods and hyolithids)
by W.H. Fritz

Mobil Colville E-15
67°14'18.2"N, 126°18'25.6"W, figure 1b, loc. 12
(Note GSC Paper 73-1B, p. 183-187)

Depth 4,755-4,760 ft., core,
Mount Cap-Old Fort Island
Formation, GSC locs. C-23669
to C-23672

Amecephalus sp.
?"Albertella" levis Walcott
Glossopleura sp.
undet. trilobite
Micromitra sp.

Depth 4,811-4,819 ft., core,
Mount Cap-Old Fort Island
Formation, GSC locs. C-23673
to C-23676

Amecephalus sp.
Caborella? sp.
Hyolithes sp.

Depth 4,824-4,830 ft., core,
Mount Cap-Old Fort Island
Formation, GSC locs. C-23677
to C-23682

Amecephalus sp.
Hyolithes sp.
Micromitra sp.

Depth 4,837 ft., core,
 Mount Cap-Old Fort Island
 Formation, GSC loc. C-23683

Amecephalus sp.
Hyolithes sp.

Depth 4,845-4,856 ft., core,
 Mount Cap-Old Fort Island
 Formation, GSC loc. C-23650

cf. *Elrathella* sp.
Hyolithes sp.
 age, 4,755-4,856 ft.: early Middle Cambrian

Comments: A wide tail associated with heads of
Amecephalus at 4,826 feet (GSC loc. C-23679) and,
 at 4,819 feet (GSC loc. C-23676), a head of *Cabor-*
cella? with a relatively wide glabella, indicate but
 do not prove the existence of high *Albertella* Zone
 or *Glossopleura* Zone at these depths.

Depth 4,900 ft., core,
 Mount Cap-Old Fort Island
 Formation, GSC loc. C-23684

Olenellus sp.
Micromitra sp.

Depth 4,902 ft., core,
 Mount Cap-Old Fort Island
 Formation, GSC loc. C-23685

Olenellus puertoblancoensis (Lochman)
 age, 4,900-4,902 ft.: late Early Cambrian,
Bonnia-Olenellus Zone

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