PALEO SERVICES LIMITED

BIOSTRATIGRAPHIC ZONATION

IOE BLOW RIVER YT E-47
YUKON TERRITORY

by

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IOE BLOW RIVER YT E47

SUMMARY

The IOE Blow River YT E-47 well was drilled in an area of intense metamorphism, and organic material when found is highly carbonized or altered. Identifications are therefore almost impossible to make with any degree of certainty for the very rare specimens encountered.

Five species of terrestrial palynomorphs were found, belonging to long-ranging types which occur from the Tertiary into the Jurassic. Comparison with existing range charts suggests that the section below 4120' is probably Lower Cretaceous and that it may extend down to 5450'. Below 5650' there is a possibility that the palynomorphs have a lower range limit similar to that in the Gulf Mobil Reindeer G-04 well; this part of the section could be interpreted as equivalent to the upper 370' of Jurassic in that well.

Two species of arenaceous foraminifera were identified that occur in the Sverdrup Basin in association with Berriasian to Upper Jurassic sediments. If the rule of first occurrence is valid in the present area, this section could well be Lower Cretaceous, although there are no other supporting data from this borehole. However, one of the foraminifera occurs consistently in the Lower Cretaceous in the general Mackenzie Delta area, in a position stratigraphically higher than in the Alaskan section. A possible interpretation has been placed on the Biostratigraphic Log, although the evidence suggests it might be more scientific to assign the entire well to Lower Cretaceous - Jurassic.

The environment of deposition appears to have been terrestrial, with some minor indications of brackish to littoral conditions. The lack of fossil recovery is due mainly to alteration and probably in some degree to the original environment of deposition.

INTRODUCTION AND METHOD OF STUDY

Sample material and slides were provided through the generosity of Imperial Oil Limited. More than 300 slides were examined with exceedingly poor results.

Such forms as could be identified have been compared with range charts prepared for other wells in this project, and a possible interpretation has been made from very slender evidence. It is shown on the Biostratigraphic Summary, Plate I, but must be regarded as a possibility only.

BIOSTRATIGRAPHIC ZONATION

The Biostratigraphic Log (1) has been prepared at the mechanical scale of 1" = 100' to facilitate comparison with various types of electrolog. Possible age determinations are suggested in the first column. Mechanical logs representing Spontaneous Potential and Resistivity enclose a column giving the gross lithology. The extent of sample control for both palynomorph and microfossil samples examined is shown in an adjacent column.

Ordinarily the zonation column presents the ranges of microfossil and palynomorph zones. However, at 1820' only two specimens of foraminifera were found. Their presence is indicated as a possible zone for comparison with other logs.

Generalized environments of deposition are shown as a single curve ranging from terrestrial (1) to brackish (2) and littoral (3) as in previous reports. The few organic remains found probably indicate a predominantly terrestrial environment with some minor incursions of brackish and/or littoral forms.

PALYNOLOGY

SUMMARY

Few palynomorphs were recovered in recognizable condition from the IOE Blow River YT E-47 well. This poor preservation appears to be due to the very high degree of metamorphism. The species identified are known from Cretaceous and Jurassic sediments and are not definitive. However, an attempt has been made on the slender evidence obtained to suggest a possible division between Cretaceous and Jurassic. Admittedly it is an educated guess.

MATERIAL AND METHODS

Imperial Oil Limited kindly provided a set of palynomorph slides for the IOE Blow River YT E-47 well. The material was badly altered and few palynomorphs were well enough preserved to provide positive identifications. In all, 186 slides selected at 100' intervals or less were given an hour's examination each in the search for diagnostic material. The forms identified are listed in the section under Discussion of Zonation, since recovery was not sufficient to warrant preparation of a chart.

SUMMARY OF AGE AND ENVIRONMENT

Lower Cretaceous	Terrestrial	4120'?
Upper Jurassic	Terrestrial	5650'?

DISCUSSION OF ZONATION

The following species were rare in numbers and poorly preserved:

Alisporites sp.	(4120-32' (5023' (9850'
Vitreisporites pallidus (Reissinger) Potonié	5450'
Cyathidites minor Couper	5450'
Classopollis torosus (Reissinger) Balme	5650'
Stereisporites antiquasporites (Wilson and Webster) Dettmann	5684'

Species of *Alisporites* have been found in the Gulf Mobil East Reindeer G-04 well in Lower Cretaceous to 'Jurassic' sediments. (That particular well contained terrestrial and marine palynomorphs assigned to Lower Cretaceous age, but with an associated benthonic microfauna of Jurassic age in Alaska.) Similarly, its range in Shell Aklavik A-37 encompassed Lower Cretaceous through Jurassic. IOE Tuk F-18 contained the genus in sediments of Lower Cretaceous age. The distribution of *Alisporites* sp. in the IOE Blow River YT E-47 well could be from Lower Cretaceous through Jurassic, on the basis of comparison with these other boreholes.

Vitreisporites pallidus exhibits a similar range in the Lower Cretaceous and Jurassic in the Gulf Mobil East Reindeer G-04 and Shell Aklavik

A-37 boreholes. However, in IOE Tuk F-18 this species is first encountered in the Maestrichtian (4950') where it has its maximum occurrence (5150-5673') and is not found below 9465', which is in the Middle Albian. *V. pallidus* appears, therefore, to have a range of Maestrichtian to Jurassic, from comparison with adjacent control points.

Cyathidites minor exhibits a range of Cretaceous-Jurassic(upper half) in the Gulf Mobil East Reindeer G-04 well and Upper Albian through Jurassic in the Shell Aklavik A-37 well; it occurs in the Middle Albian of the IOE Tuk F-18 well (8810-10050'). Therefore, *C. minor*, on the basis of these ranges, occurs from Lower Cretaceous into the upper half of the Jurassic in these wells.

Classopollis torosus was present in the Upper Albian to Jurassic(upper quarter) in the Gulf Mobil East Reindeer G-04 well, and from Upper Albian through Jurassic in the Shell Aklavik A-37 well. In the IOE Tuk F-18 well it was present in the lower Upper Cretaceous and Lower Cretaceous below 8150'. *C. torosus* could range from lower Upper Cretaceous to the upper quarter of the Jurassic.

Stereisporites antiquasporites was recognized in the Cretaceous-Jurassic of the Gulf Mobil East Reindeer G-04 well and the Upper Albian through Jurassic of the Shell Aklavik A-37 well. The same species was present in the Albian in the IOE Tuk F-18 well. The range of these species contributes little to the age determination of this section.

Although these forms occur in facies floras in the Tertiary of this general geographic area, evidence from microfossils suggests that we are dealing with the floras of Lower Cretaceous to Jurassic age. Comparison of the ranges of these species with adjacent control points suggests that from 4120' at least the age is Lower Cretaceous, and that 5650' could be as low as the top quarter of the Jurassic in the Gulf Mobil East Reindeer G-04 well. This interpretation, of course, assumes that the specimens recovered were *in situ*. The evidence is far from being conclusive and the ages suggested must be considered provisional to say the least.

IDENTIFICATIONS

Species names and numbers used in charts.

Terrestrial palynomorphs

1. *Stereisporites antiquasporites* (Wilson and Webster) Dettmann
2. *Taxodiaceaepollenites hiatus* (Potonié) Kremp
3. *Classopollis torosus* (Reissinger) Balme
4. *Cicatricosisporites hallei* Delcourt and Sprumont
5. *Alisporites bilateralis* Rouse
6. *Cingutriletes clavus* (Balme) Dettmann
7. *Gleicheniidites senonicus* Ross
8. *Cedripites cretaceus* Pocock
9. *Cerebropollenites mesozoicus* (Couper) Nilsson
10. *Perinopollenites elatoides* Couper
11. *Concavissimisporites punctatus* (Delcourt and Sprumont) Brenner
12. Recycled Carboniferous and Devonian spores
13. *Alisporites grandis* (Cookson) Dettmann
14. *Lycopodiumsporites marginatus* Singh
15. *Cicatricosisporites annulatus* Archangelski and Gamerro
16. *Deltoidospora hallei* Miner
17. *Cicatricosisporites* cf. *A. exilioides* (Maljavkina) Bolchovitina
18. *Tigrisporites scurrandus* Norris
19. *Osmundacidites wellmanii* Couper
20. *Cicatricosisporites australiensis* (Cookson) Potonié
21. *Cicatricosisporites hughesi* Dettmann
22. *Cyathidites minor* Couper
23. *Ginkgocycadophytus nitidus* (Balme) de Jersey
24. *Podocarpidites multesimus* (Bolchovitina) Pocock
25. Recycled Permo-Triassic pollen
26. *Vitreisporites pallidus* (Reissinger) Potonié
27. *Ephedripites multicostatus* Brenner
28. *Neoraistrickia robusta* Brenner
29. *Cicatricosisporites augustus* Singh
30. *Phyllocladidites inchoatus* (Pierce) Norris
31. *Lycopodiumsporites austroclavatidites* (Cookson) Potonié
32. *Hymenozonotriletes* cf. *H. mesozoicus* Pocock
33. *Cyathidites australis* Couper
34. *Laevigatosporites ovatus* Wilson and Webster
35. *Cicatricosisporites pseudotripartitus* (Bolchovitina) Dettmann
36. *Lycopodiumsporites reticulumsporites* (Rouse) Dettmann
37. *Kuylisporites lunaris* Cookson and Dettmann
38. *Aequitriradites spinulosus* (Cookson and Dettmann) Cookson and Dettmann
39. *Foraminisporis wonthaggiensis* (Cookson and Dettmann) Dettmann
40. *Sestrosporites pseudoalveolatus* (Couper) Dettmann
41. *Rouseisporites laevigatus* Pocock
42. *Araucariacites australis*
43. *Klukisporites pseudoreticulatus* Couper
44. *Polycingulatisporites reduncus* (Bolchovitina) Playford and Dettmann
45. *Schizosporis parvus* Cookson and Dettmann
46. *Parvisaccites radiatus* Couper
47. *Classopollis minor* Pocock

48. *Circulina parva* Brenner
49. *Converrucosisporites variverrucatus* (Couper) Norris
50. *Coronatispora valdensis* (Couper) Dettmann
51. *Callialasporites* cf. *C. dampieri* (Balme) Dev
52. *Biretisporites potoniei* Delcourt and Sprumont
53. *Leptolepidites* cf. *L. psarosus* Norris
54. *Distaltriangulisporites perplexus* (Singh) Singh
55. *Appendicisporites jansonii* Pocock
56. *Deltoidospora juncta* (Kara-Murza) Singh
57. *Trilobosporites* cf. *T. marylandensis* Brenner
58. *Trilobosporites trioreticulosus* Cookson and Dettmann
59. *Contignisporites multimuratus* Dettmann
60. *Rouseisporites reticulatus* Pocock
61. *Eucommiidites troedssonii* Erdtman
62. *Exesipollenites tumulus* Balme
63. *Pilosisporites trichopapillosus* (Thiergart) Delcourt and Sprumont
64. *Tripartina* cf. *T. variabilis* Maljavkina
65. *Contignisporites glebulentus* Dettmann
66. *Trilobosporites* cf. *T. apiverrucatus* Couper
67. *Densoisporites microrugulatus* Brenner
68. *Concavissimisporites parkini* (Pocock) Singh
69. *Reticulisporites* 1
70. *Contignisporites dorsostriatus* (Bolchovitina) Dettmann
71. *Todisporites major* Couper
72. *Callialasporites* 1
73. *Marattisporites scabratus* Couper
74. *Leptolepidites epacrornatus* Norris
75. *Perinopollenites* 1
76. *Cristatisporites* 1
77. *Contignisporites cooksoni* (Balme) Dettmann
78. *Podocarpidites* cf. *P. rousei* Pocock
79. *Antulsporites* 1
80. *Chasmatosporites* 1
81. *Ovalipollis canadensis* Pocock
82. *Dictyophyllidites harrisii* Couper
83. *Cirratriradites* cf. *Leiotriletes incertus* Bolchovitina
84. *Camarozonosporites* 1
85. *Acanthotriletes* 1
86. *Calamospora mesozoica* Couper
87. *Rubinella* 1
88. *Annulispora* 1
89. *Foraminisporis asymmetricus* (Cookson and Dettmann) Dettmann
90. *Protohaploxypinus chaloneri* Clarke
91. *Striatopodocarpidites* 1
92. *Alisporites* cf. *A. parvus* de Jersey
93. *Klausipollenites* 1
94. *Alisporites* 2
95. *Ovalipollis* 1
96. *Platysaccus* 1
97. *Taeniaesporites* 1
98. *Inaperturopollenites* 1
99. *Taeniaesporites novimundi* Jansonius

100. *Lueckisporites* 1
101. *Cordaitina* 1
102. *Protohaploxypinus* 2
103. *Cedripites* 2
104. *Cyclogranisporites* 1
105. *Lueckisporites* 2
106. *Cuttulapollenites* 1
107. *Tsugaepollenites jonkeri* Jansonius
108. *Anaplanisporites* 1
109. *Cedripites* 1
110. *Sulcatisporites* cf. *S. institatus* Balme
111. *Stereisporites* 1
112. *Falcisporites nuthallensis* (Clarke) Balme
113. *Cycadopites follicularius* Wilson and Webster
114. *Densoisporites* cf. *D. nejburgi* (Schulz) Balme
115. *Protohaploxypinus samoilovitchi* (Jansonius) Hart
116. *Platysaccus* 2
117. *Taeniaesporites* 3
118. *Punctatisporites* 1
119. *Punctatosporites* cf. *P. minutus* Ibrahim
120. *Apiculatisporis* 1
121. *Alisporites* 3
122. *Illinites klausi* Clarke
123. *Taeniaesporites* cf. *T. labdacus* Klaus
124. *Taeniaesporites albertae* Jansonius
125. *Taeniaesporites hexagonalis* Jansonius
126. *Nevesisporites* 1
127. *Nevesisporites* 2
128. *Lundbladispora* 1
129. *Gnetaceaepollenites steevis* Jansonius
130. *Gnetaceaepollenites paenesaccatus* Jansonius
131. *Klausipollenites fastidiosus* Jansonius
132. *Kraueselisporites* 1
133. *Kraueselisporites* 2
134. *Raistrickia* 1
135. *Gnetaceaepollenites multistriatus* Jansonius
136. *Taeniaesporites* cf. *T. nubilis* (Leschik) Clarke
137. *Apiculatisporis* 2
138. *Grandispora* 1
139. *Gnetaceaepollenites scotti* Jansonius
140. *Schizosporis scissus* (Balme and Hennelly) Hart
141. *Taeniaesporites noviaulensis* Leschik
142. *Grandispora* 2
143. *Pretricolpopollenites* 1
144. *Ceratosporites* 1
145. *Lophotriletes* 1
146. *Endosporites* 1
147. *Aratrisporites* 1
148. *Endosporites* 2
149. *Striatites richteri* (Klaus) Jansonius
150. *Paravittatina* 1
151. *Pilosisporites* 1

152. *Rugubivesiculites reductus* Pierce
153. *Camarozonosporites insignis* Norris
154. *Appendicisporites bilateralis* Singh
155. *Appendicisporites cristatus* (Markova) Pocock
156. *Tricolpopollenites micromunus* Groot and Penny
157. *Psilatricolpites parvulus* (Groot and Penny) Norris
158. *Sequoiapollenites* sp.
159. *Appendicisporites bifurcatus* Singh
160. *Appendicisporites* cf. *jansonii* Pocock
161. *Schizosporis grandis* Pocock
162. *Penetetrapites mollis* Hedlund and Norris
163. *Appendicisporites matesovai* (Bolchovitina) Norris
164. *Cupuliferoipollenites minutus* (Brenner) Singh
165. *Tricolpites sagax* Norris
166. *Liliacidites dividuus* (Pierce) Brenner
167. *Klukisporites foveolatus* Pocock
168. *Costatoperforosporites foveolatus* Deak
169. *Appendicisporites erdtmanii* Pocock
170. *Schizosporis spriggi* Cookson and Dettmann
171. *Rugubivesiculites rugosus* Pierce
172. *Ornamentifera* cf. *echinata* (Bolchovitina) Bolchovitina
173. *Todisporites minor* Couper
174. *Foveotriletes subtriangularis* Brenner
175. *Antulsporites distaverrucosus* (Brenner) Archangelsky and Gamerro
176. *Clavatipollenites minutus* Brenner
177. *Cicatricosisporites* cf. *subrotundus* Brenner
178. *Spheripollenites scabratus* Couper
179. *Cicatricosisporites* cf. *hughesi* Dettmann
180. *Trilobosporites marylandensis* Brenner
181. *Cicatricosisporites subrotundus* Brenner
182. *Cicatricosisporites potomacensis* Brenner
183. *Baculatisporites comaumensis* (Cookson) Potonié
184. *Appendicisporites tricornitatus* Weyland and Greifeld
185. *Pilosisporites verus* Delcourt and Sprumont
186. *Appendicisporites potomacensis* Brenner
187. *Acanthotriletes varispinosus* Pocock
188. *Appendicisporites problematicus* (Burger) Singh
189. *Cicatricosisporites* cf. *pseudotripartitus* (Bolchovitina) Dettmann
190. *Appendicisporites* cf. *bilateralis* Singh
191. *Trilobosporites* cf. *perverulentus* Dettmann
192. *Pilosisporites* cf. *trichopapillosus* (Thiergart) Delcourt and Sprumont
193. *Contignisporites multimuratus* Dettmann
194. *Contignisporites* cf. *multimuratus* Dettmann
195. *Cicatricosisporites* cf. *australiensis* (Cookson) Potonié
196. *Trilobosporites minor* Pocock
197. *Deltoidospora psilostoma* Rouse
198. *Sestrosporites* cf. *pseudoalveolatus* (Couper) Dettmann
199. *Matonisporites phlebopteroides* Couper
200. *Callialasporites dampieri* (Balme) Sukh Dev
201. *Trilobosporites apiverrucatus* Couper
202. *Cicatricosisporites* cf. *potomacensis* Brenner
203. *Taurocusporites segmentatus* Stover

204. *Appendicisporites* cf. *A. macrorhiza* (Maljavkina) Bolchovitina
205. *Chomotriletes fragilis* Pocock
206. *Cicatricosisporites purbeckensis* Norris
207. *Microreticulatisporites* cf. *uniformis* Singh
208. *Ischyosporites punctatus* Cookson and Dettmann
209. *Retitricolpites vulgaris* Pierce
210. *Reticulisporites elongatus* Singh
211. *Foveosporites canalis* Balme
212. *Striatopollis paraneus* (Norris) Singh
213. *Liliacidites textus* Norris
214. *Cirratriradites teter* Norris
215. *Lycopodiumsporites expansus* Singh
216. *Appendicisporites unicus* (Markova) Singh
217. *Quadrapollenites* cf. *vagus* Stover
218. *Nyssapollenites albertensis* Singh
219. *Tricolpites fissilis* Couper
220. *Betulaceoipollenites* 1
221. *Proteacidites thalmanii* Anderson
222. *Liliacidites mirus* Srivastava
223. *Triorites inferius* Dutta and Sah
224. *Duplopollis carlquistii* Drugg
225. *Aquilapollenites calvus* Tschudy and Leopold
226. *Conclavipollis* 1
227. *Cicatricosisporites* cf. *ludbrooki* Dettmann
228. *Tricolporopollenites* 1
229. *Sigmopollis hispidus* Hedlund
230. *Neoraistrickia truncata* (Cookson) Potonié
231. *Loranthacites macrosolenoides* Mtchedlishvili
232. *Aquilapollenites trialatus* Rouse
233. *Aquilapollenites quadrilobus* Rouse
234. *Aquilapollenites catenireticulatus* Srivastava
235. *Ornamentifera baculata* Singh
236. *Schizosporis reticulatus* Cookson and Dettmann
237. *Syncolporites* cf. *lisamae* van der Hammen
238. *Aquilapollenites venustus* Srivastava
239. *Sequoiapollenites paleocenicus* Stanley
240. *Hazaria canadiana* Srivastava
241. *Triatriopollenites costatus* Norton
242. *Grewipollenites canadensis* Srivastava
243. *Proteacidites retusus* Anderson
244. *Foveotricolporites rhombohedralis* Pierce
245. *Sigmopollis* 1
246. *Aquilapollenites reductus* Norton
247. *Aquilapollenites attenuatus* Funkhouser
248. *Symplocoipollenites vestibulum* (Potonié) Potonié
249. *Aquilapollenites bertillonites* Funkhouser
250. *Foraminisporis* cf. *asymmetricus* (Cookson and Dettmann) Dettmann
251. *Caryapollenites* cf. *veripites* Wilson and Webster
252. *Stereisporites australe* (Cookson)
253. *Cercidiphyllites brevicolpatus* Mtchedlishvili
254. *Tricolporopollenites* 2
255. *Zlivisporis* cf. *novamexicanum* (Anderson) Leffingwell

256. *Kuylisporites scutatus* Newman
257. *Aquilapollenites clavireticulatus* (Samoilovitch) Tschudy
258. *Aquilapollenites amygdaloides* Srivastava
259. *Umbosporites callosus* Newman
260. *Lusatisporis dettmannae* Srivastava
261. *Aquilapollenites rigidus* Tschudy and Leopold
262. *Marcellopites basilicus* Srivastava
263. *Senipites drumhellerensis* Srivastava
264. *Liburnispiris adnacus* Srivastava
265. *Tricolpites reticulatus* Cookson
266. *Liliacidites morrinensis* Srivastava
267. *Tubulifloridites aedicula* Srivastava
268. *Cingulatisporites dakotaensis* Stanley
269. *Coriaripites* cf. *alienus* Srivastava
270. *Balmeisporites* 1
271. *Erdtmanipollis pachysandroides* Krutzsch
272. *Kuylisporites lunaris* Cookson and Dettmann
273. *Aquilapollenites turbidus* Tschudy and Leopold
274. *Faguspollenites granulatus* (Martin and Rouse) Srivastava
275. *Tetracolpites* 1
276. *Trudopollis meekeri* Newman
277. *Polyporina globosa* Sah
278. *Callistopollenites* 1
279. *Pulcheripollenites krempi* Srivastava
280. *Symplocoipollenites morrinensis* Srivastava
281. *Proteacidites magnus* Samoilovitch
282. *Caryapollenites paleocenicus* (Stanley) Srivastava
283. *Triporopollenites* 1
284. *Cupuliferoipollenites* 1
285. *Hazaria sheoperii* Srivastava
286. *Triporopollenites* 2
287. *Alnipollenites* 1
288. *Stereisporites regius* (Drozhastchich)
289. *Wodehousia spinata* Stanley
290. *Hamulatipollis* 1
291. *Tricolpites hians* Stanley
292. *Triporina globosa* Chlonova
293. *Triprojectus unicus* (Chlonova) Mtchedlishvili
294. *Syncolpites porosus* Mtchedlishvili
295. *Aquilapollenites senonicus* (Mtchedlishvili) Tschudy and Leopold
296. *Leiotriletes* 1
297. *Punctatisporites* 2
298. *Endospirites* 3
299. *Stenozonotriletes* 1
300. *Stenozonotriletes* 2
301. *Reticulatisporites* 1
302. *Densoisporites* 1
303. *Cirratriradites* 1
304. *Inaperturopollenites* 2
305. *Stenozonotriletes* 3
306. *Hystricosporites* 1
307. *Acanthotriletes* 2

308. *Granulatisporites* 1
309. *Hymenozonotriletes* 1
310. *Calamospora* 1
311. *Retusotriletes* 1
312. *Perotriletes* 1
313. *Trilobosporites purverulentus* (Verbitskaya) Dettmann
314. *Cicatricosisporites spiralis* Singh
315. *Trilobosporites* cf. *obsitus* Norris
316. *Callialasporites trilobatus* (Balme)
317. *Trilobosporites* cf. *hannonicus* Delcourt and Sprumont
318. *Eucommiidites minor* Groot and Penny
319. *Fraxinoipollenites variabilis* Stanley
320. *Ulmus* 1
321. *Alnipollenites* 1 (=287 of previous reports)
322. *Tilia danei* Anderson
323. *Pterocarya levis* Stanley
324. *Carpinus subtriangula* Stanley (= 283+286 of previous reports)
325. *Aquilapollenites* cf. *reticulatus* Stanley
326. *Pinus* 1
327. *Podocarpus maximus* Stanley
328. *Ericipites* 1
329. *Pororeticulites* 1
330. *Pistillipollenites mcgregorii* Rouse
331. *Triorites* 1
332. *Pediastrum* sp.
333. *Aquilapollenites spinulosus* Funkhouser
334. *Aquilapollenites* cf. *amygdaloides* Srivastava
335. *Costatoperforosporites fistulosus* Deak
336. *Cicatricosisporites auritus* Singh
337. *Rogalskisporites cicatricosus* (Rogalska) Danse, Corsin and Levin
364. *Stephanoporites* 1
365. *Liliacidites leei* Anderson
366. *Rubinella major* (Couper) Norris
367. *Azolla* sp.

Marine palynomorphs

M1. *Oligosphaeridium complex* (White) Davey and Williams
M2. *Astrocysta cretacea* (Pocock) Davey
M3. *Micrhystridium* 1
M4. *Odontochitina striatoperforata* Cookson and Eisenack
M5. *Apteodinium* cf. *A. reticulatum* Singh
M6. *Leiofusa bernesga* Cramer
M7. *Hystrichosphaeridium cooksoni* Singh
M8. *Gonyaulacysta tenuiceras* (Eisenack) Sarjeant
M9. *Veryhachium europaeum* Stockmans and Williere
M10. *Meieurogonyaulax* cf. *M. stoveri* Millioud
M11. *Baltisphaeridium crameri* Singh
M12. *Scriniodinium* cf. *S. eurypylum* Manum and Cookson
M13. *Micrhystridium stellatum* Deflandre
M14. *Pseudoceratium* cf. *P. regium* Singh
M15. *Leiofusa jurassica* Cookson and Eisenack
M16. *Chlamydophorella nyei* Cookson and Eisenack
M17. *Palaeostomocystis* 1
M18. *Cyclonephelium distinctum* Deflandre and Cookson
M19. *Pseudoceratium pelliferum* Goht
M20. *Tanyosphaeridium* sp. Singh
M21. *Canningia colliveri* Cookson and Eisenack
M22. cf. *Aptea polymorpha* Eisenack
M23. *Cleistosphaeridium polypes* (Cookson and Eisenack) Davey
M24. *Baltisphaeridium whitei* (Deflandre and Courtville) Sarjeant
M25. *Cribroperidinium orthoceras* (Eisenack) Davey
M26. *Diplotesta angelica* Cookson and Hughes
M27. *Gardodinium elongatum* Singh
M28. *Oligosphaeridium anthophorum* (Cookson and Eisenack) Davey
M29. *Hystrichosphaera cingulata* (Wetzel) Deflandre and Cookson
M30. *Gonyaulacysta* sp. B Singh
M31. *Gonyaulacysta* cf. *G. striata* Clarke and Verdier
M32. *Carpodinium* 1
M33. *Palaeoperidinium* cf. *P. ventriosum* (Wetzel) Deflandre
M34. *Oligosphaeridium albertense* Pocock
M35. *Broomea jaegeri* Alberti
M36. *Odontochitina operculata* (Wetzel) Deflandre
M37. *Hystrichosphaera ramosa* (Ehrenberg) Wetzel
M38. *Cyclonephelium* cf. *C. vannophorum* Davey
M39. *Pseudoceratium* cf. *P. expolitum* Brideaux
M40. *Apteodinium* cf. *A. granulatum* Eisenack
M41. *Deflandrea pirnaensis* Alberti
M42. *Pterospermopsis australiensis* Deflandre and Cookson
M43. *Cantulodinium* 1
M44. *Oligosphaeridium* cf. *O. diastema*
M45. *Dinogodinium cerviculum* Cookson and Eisenack
M46. *Oligosphaeridium* cf. *O. pulcherrimum* (Deflandre and Cookson) Davey and William
M47. *Veryhachium reductum* (Deunff) de Jeckowsky
M48. *Palaeostomocystis fragilis* Cookson and Eisenack
M49. *Botryococcus* 1
M50. *Gardodinium eisenacki* Alberti

M51. *Doidyx* 1
M52. *Sirmiodinium grossi* Alberti
M53. *Tasmanites suevicus* (Eisenack) Wall
M54. *Pareodinia ceratophora* Deflandre
M55. *Fromea amphora* Cookson and Eisenack
M56. *Cleistosphaeridium* cf. *C. ancoriferum* (Cookson and Eisenack) D.,D.,S.& W.
M57. *Scriniodinium* 1
M58. *Ctenidodinium* 1
M59. *Endoscrinium* cf. *E. campanula* (Gocht)
M60. *Gonyaulacysta* cf. *G. jurassica* (Deflandre)
M61. *Tenua* 1
M62. *Baltisphaeridium* 1
M63. *Gonyaulacysta* 1
M64. *Meioeurogonyaulax* 1
M65. *Wanaea digitata* Cookson and Eisenack
M66. microforaminifera
M67. *Pareodinia* 1
M68. *Gonyaulacysta* cf. *G. granuligera*
M69. *Xenicodinium* 1
M70. *Palaeohystrichophora* cf. *P. multispina*
M71. *Diconodinium* 1
M72. *Diconodinium* 2
M73. *Baltisphaeridium* 2
M74. *Micrhystridium* cf. *inconspicuum* (Deflandre) Deflandre
M75. *Micrhystridium stipulatum* Jansonius
M76. *Micrhystridium* 2
M77. chitinozoa
M78. *Micrhystridium* 3
M79. *Baltisphaeridium* 3
M80. *Deflandrea diebeli* Alberti
M81. *Oligosphaeridium pulcherrimum* (Deflandre and Cookson) D.,D.,S.& W.
M82. *Canningia reticulata*
M83. *Areoligera* sp.
M84. *Deflandrea* cf. *victoriensis* Cookson and Manum
M85. *Cleistosphaeridium armatum* (Deflandre) Davey
M86. *Surculosphaeridium longifurcatum* (Firtion) D.,D.,S.& W.
M87. *Exochosphaeridium phragmites* D.,D.,S.& W.
M88. *Pterodinium perforatum* (Clarke and Verdier) Davey and Verdier
M89. *Spinidinium vestitum* Brideaux
M90. *Gonyaulacysta* cf. *fetchamensis* D.,D.,S.& W.
M91. *Hystrichodinium pulchrum* Deflandre
M92. *Baltisphaeridium multispinosum* Singh
M93. *Dinopterygium cladoides* Deflandre
M94. *Hystrichosphaeridium stellatum* Maier
M95. *Polysphaeridium laminaspinosum* D.,D.,S.& W.
M96. *Exochosphaeridium* cf. *scitulum* Singh
M97. *Systematophora turonica* (Alberti)
M98. *Circulodinium* cf. *deflandrei* Alberti
M99. *Perisseiasphaeridium* sp.
M100. *Broomea pellifera* Alberti
M101. *Muderongia simplex* Alberti
M102. *Circulodinium* cf. *hirtellum* Alberti

M103. *Surculosphaeridium* cf. *vestitum* (Deflandre) D.,D.,S.& W.
M104. *Gonyaulacysta* cf. *pachydermis* (Deflandre) D.,D.,S.& W.
M105. *Wanaea* cf. *spectabilis* Cookson and Eisenack
M106. *Baltisphaeridium stimuliferum* (Deflandre) Sarjeant
M107. *Baltisphaeridium multifurcatum* (Deflandre) Klement
M108. *Cyclonephelium* cf. *reticulatum*
M109. *Systematophora schindelwolfi* (Alberti)
M110. *Oligosphaeridium* cf. *albertense* Pocock
M111. *Muderongia tetracantha* (Gocht) Alberti
M112. *Ctenidodinium elegantulum* Millioud
M113. *Dingodinium albertii* D.,D.,S.& W.
M114. *Oligosphaeridium* cf. *anthophorum* (Cookson and Eisenack) D.,D.,S.& W.
M115. *Systematophora* cf. *fasciculigera* Klement
M116. *Hystrichosphaeridium* cf. *readi* D.,D.,S. & W.
M117. *Cannosphaeropsis aemula* (Deflandre) Deflandre
M118. *Broomea exigua*
M119. *Gonyaulacysta* cf. *longispinosa*
M120. *Diconodinium arcticum* Manum and Cookson
M121. *Deflandrea minor* Alberti
M122. *Deflandrea cooksoni* Alberti
M123. *Deflandrea* cf. *granulifera* Manum
M124. *Tenua* 2
M125. *Astrocysta* cf. *cretacea* (Pocock) Davey
M126. *Fromea* 1
M127. *Systematophora* cf. *turonica* (Alberti)
M128. *Deflandrea* cf. *cooksoni* Alberti
M129. *Deflandrea* cf. *magnifica* Stanley
M130. *Diconodinium* 3
M131. *Palambages* A
M132. *Palambages* B
M133. *Schizocystia laevigata* Cookson and Eisenack
M134. *Micrhystridium deflandrei*
M135. *Hystrichosphaeridium recurvatum* (White) Lejeune-Carpentier
M136. *Sirmiodinium* 1
M137. *Deflandrea* 1
M138. *Cannosphaeropsis* 1
M139. *Deflandrea* 2
M140. *Epilidosphaeridia* 1
M141. *Deflandrea granulifera* Manum
M142. *Chytroesphaeridia* 1
M143. *Tenua* 3
M144. *Canningia* cf. *senonica* Clarke and Verdier
M145. *Apteodinium grande* Cookson and Hughes
M146. *Cyclonephelium* cf. *paucispinum* Davey
M147. *Pterospermopsis* 1
M148. *Diconodinium pusillum* Singh
M149. *Deflandrea* cf. *verrucosa* Manum
M150. Scolecodonts
M151. *Ascodinium verrucosum* Cookson and Hughes
M152. *Micrhystridium* cf. *piliferum* Deflandre
M153. *Veryhachium lairdi* (Deflandre) Deunff
M154. *Pseudoceratium expolitum* Brideaux

M155. *Hystrichosphaeridium* cf. *recurvatum* (White) Lejeune-Carpentier
M156. *Microdinium opacum* Brideaux
M157. *Deflandrea* cf. *pirnaensis* Alberti
M158. *Canningia* cf. *aspera* Singh
M159. *Diplotesta* cf. *bidigitata* Manum and Cookson
M160. *Broomea longicornuta* Alberti
M161. *Heliodinium voigti* Alberti
M162. *Cannosphaeropsis* 1
M163. *Muderongia staurota* Sarjeant
M164. *Wetzeliella* cf. *tabulata* Wilson
M165. *Deflandrea* cf. *microgranulata* Stanley
M166. *Deflandrea* cf. *cretacea* Cookson
M167. *Deflandrea* cf. *tenera* Krutzsch
M168. *Cyclonephelium* cf. *lemniscatum* Stanley
M169. *Deflandrea scheei* Manum
M170. *Canningia* cf. *colliveri* Cookson and Eisenack
M171. *Pterodinium* cf. *cornutum* Cookson and Eisenack

M204. *Pterospermopsis eurypteris* Cookson and Eisenack
M205. *Xenicodinium* 2

M209. *Pseudoceratium* cf. *nudum* Gocht
M210. *Wetzeliella* cf. *reticulata* Williams and Downie
M211. *Cannosphaeropsis* cf. *densiradiata* Cookson and Eisenack

MICROPALEONTOLOGY

SUMMARY

Micropaleontological examination of the IOE Blow River YT E-47 borehole yielded meagre results despite reprocessing of promising sections. The two specimens present at 1820' can be correlated to a Berriasian section in the Sverdrup Basin that is associated with Berriasian to Upper Jurassic palynomorphs. Since these forms may be time-transgressive, the age could be Berriasian or possibly younger.

MATERIALS AND METHODS

Imperial Oil Limited kindly provided 123 microfossil preparations, of which 55 were core. Sections that yielded some promising organic remains did not yield additional specimens on resampling. Such material as was observed has been plotted on Table II, which follows this page.

The organic material recovered was generally poor because of the high degree of metamorphism. The foraminifera were arenaceous and benthonic in habitat, which indicates a possibility of facies-controlled distributions that are probably time-transgressive.

SUMMARY OF ZONES

Haplophragmoides canui 1820'

DISCUSSION OF ZONATION

Some poorly preserved foraminifera?, possibly *Haplophragmoides* sp.? were present at 120' and 170'--which may have some environmental significance but cannot be used to determine stratigraphic position. A possible *Trochammina* sp.? may be present at 320', but it too is badly metamorphosed and cannot be used. Two fairly well preserved specimens, *Haplophragmoides canui* Cushman and *Lituotuba* cf. *gallupi* Chamney, were found at 1820'. These forms are both arenaceous, with quite wide geographical distributions. They appear to be facies-controlled in the general Mackenzie Delta area. *H. canui* has been used in the Alaskan sections and in the Sverdrup Basin as an indicator for the Upper Jurassic. However, its occurrence (in abundance) with well-developed palynomorphs of Lower Cretaceous age (as in Shell Aklavik A-37) suggests that it may have transgressed with other associated forms fairly high into the Lower Cretaceous section. In the Sverdrup Basin *H. canui* is associated with *L. gallupi* and appears to have a range of Lower Cretaceous (Berriasian) into Late Jurassic (Tithonian-Oxfordian). The two have been found in association in the Upper Jurassic in the Cape Norem A-80 borehole, in sections containing Berriasian to Upper Jurassic palynomorphs. In that well the evidence favoured an Upper Jurassic age for the fauna. However, it has been demonstrated in previous reports that the majority of forms are facies-controlled and have moved stratigraphically upward in their transgressive migration from the north. This evidence would suggest that the section in the Blow River YT E-47 borehole can be considered Berriasian to Upper Jurassic, with the probability that deposition took place in the upper part of that age range.

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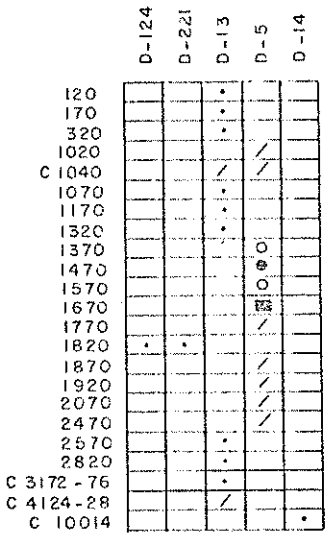
II

MICROFOSSIL DISTRIBUTION CHART

I.O.E. BLOW RIVER YT E-47



LEGEND

>100	■
51-100	△
21-50	⊕
6-20	○
2-5	/
1	·

IDENTIFICATIONS

D51. *Bathysiphon* sp.
D52. *Cyclammina?* sp.
D53. *Haplophragmoides* sp.
D54. *Trochammina* sp. (*T. ribstonensis* at 610')
D55. *Reophax* sp.
D56. *Gaudryina tappanae* Chamney
D57. *Textularia* sp.
D58. *Saccammina sphaerica* Brady
D59. *Textularia torquata* Parker
D60. *Ammobaculites reophacoides* Bartenstein
D61. *Trochammina squamata* (Jones and Parker)
D62. *Haplophragmoides topagorukensis* Tappan
D63. *Ammodiscus mackenziensis* Chamney
D64. *Bathysiphon brosgei* Tappan
D65. *Glomospirella arctica* Chamney
D66. *Verneuilinoides borealis* Tappan
D67. *Haplophragmoides inflatigrandis* Chamney
D68. *H. duoflatis* Chamney
D69. *H. goodenoughensis* Chamney
D70. *Saccammina* sp.
D71. *Glomospira subarctica* Chamney
D72. *Trochammina stefanssoni* Tappan
D73. *T. rainwateri* Cushman and Applin
D74. *Triplasia aequalis* (Roemer)
D75. *Hypocrepina* cf. *H. barksdalei* (Tappan)
D76. *Thuramminoides septagonalis* Chamney
D77. *Bathysiphon granulocoelia* Chamney
D78. *Reophax tundraensis* Chamney
D79. *Trochammina conicominuta* Chamney
D80. *Textularia topagorukensis* Tappan
D81. *Haplophragmoides coronis* Chamney
D82. *Glomospirella arctica* Chamney
D83. *G. elongata* Chamney
D84. *Trochammina eilete* Tappan
D85. *Ammobaculites* sp.
D86. *Siphotextularia? rayi* Tappan
D87. *Hyperammina* sp.
D88. *Miliammina* sp.
D89. *Marginulina* sp.
D90. *Lagena apiculata* Reuss
D91. *Buccicrenata italica* Dieni and Massari
D92. *Haplophragmoides rota* Nauss
D93. *Ammobaculites fragmentarius* Cushman
D94. *Gaudryina subcretacea* Cushman
D95. *Lenticulina gryci* Tappan
D96. *Bulimina* sp.
D97. *Reophax troyeri* Tappan
D98. *Lenticulina* cf. *L. bayrocki* Mellon and Wall
D99. *Gaudryina barrowensis* Tappan
D100. *Verneuilinoides fischeri* Tappan

D101. *Verneuilinoides* sp.
D102. *Spiroplectammina* cf. *S. semicomplanata* (Carsey)
D103. *Vaginulina* sp.
D104. *Spiroplectammina* sp.
D105. *Arenobulimina paynei* Tappan
D106. *Conorbina* sp.
D107. *Trochammina diagonis* (Carsey)
D108. *Ammodiscus thomsi* Chamney
D109. *Arenoturrispirellina* sp.
D110. *Lagena* sp.
D111. *Glomospira* sp.
D112. *Sarcenaria projectura* Stelck and Wall
D113. *Marginulinopsis collinsi* Mellon and Wall
D114. *Globulina lacrima* Reuss subsp. *canadensis* Mellon and Wall
D115. *Dentalina* sp.
D116. *Nodosarella* sp.
D117. *Dentalina catenula* Reuss
D118. *Pseudoglandulina* sp.
D119. *Oolina globosa* (Montagu)
D120. *Marginulina* cf. *M. bergquisti* Tappan
D121. *Astacolus* sp.
D122. *Ammobaculites barrowensis* Tappan
D123. *Reophax metensis* Franke
D124. *Haplophragmoides canui* Cushman
D125. *Haplophragmoides barrowensis* Tappan
D126. *Ammobaculites alaskensis* Tappan
D127. *Haplophragmoides kingakensis* Tappan
D128. *Lenticulina* cf. *L. prima* (d'Orbigny)
D129. *Lenticulina* sp.
D130. *Glomospira gordialis* (Jones and Parker)
D131. *Involutina cheradospira* (Loeblich and Tappan)
D132. *Ammobaculites cobbani* Loeblich and Tappan
D133. *Haplophragmoides linki* Nauss
D134. *Lenticulina* cf. *L. toarcense* Payard
D135. *Trochammina topagorukensis* Tappan
D136. *Guttulina* sp.
D137. *Reophax densa* Tappan
D138. *R. liasica* Franke
D139. Fusulinids
D140. *Glomospira* sp.
D141. *Triplasia kingakensis* Loeblich and Tappan
D142. *Rectoglandulina* cf. *R. turbinata* (Terquem and Berthelin)
D143. *Bathysiphon anomalocoelia* Tappan
D144. *Reophax suevica* Franke
D145. *Ammobaculites vetusta* (Terquem and Berthelin)
D146. *Astacolus pediacus* Tappan
D147. *Globulina topagorukensis* Tappan
D148. *Lagena* sp.
D149. *Thurammina?* sp.
D150. *Involutina* sp.
D151. *Webbinelloidea* sp.
D152. *Marginulina* sp.

D-153. *Cyclammina arctica* Petracca
D-154. *C.* cf. *C. ezoensis* Asano
D-155. *C. borealis* Petracca
D-156. *Gyroidina* cf. *G. orbicularis planata* Cushman
D-157. *Gaudryina* sp.
D-158. *Ammobaculites midwayensis* Plummer
D-159. *Ammomarginulina* sp.
D-160. *Bathysiphon vitta* Nauss
D-161. *Saccammina lathrami* Tappan
D-162. *Glomospirella* cf. *G. gaultina* (Berthelin)
D-163. *Haplophragmoides* cf. *H. bonanzaensis* Stelck and Wall
D-164. *Ammobaculites wenonahae* Tappan
D-165. *Ammodiscus rotalarius* Loeblich and Tappan
D-166. *Miliammina manitobensis* Wickenden
D-167. *Haplophragmoides* cf. *H. excavata* Cushman and Waters
D-168. *Gaudryina* cf. *G. bearpawensis* Wickenden
D-169. *Saccammina* cf. *S. alexanderi* (Loeblich and Tappan)
D-170. *Lituotuba* sp.
D-171. *Gaudryina* cf. *G. nanuskukensis* Tappan
D-172. *Spiroplectammina webberi* Tappan
D-173. *Flabellammina* sp.
D-174. *Ammobaculites erectus* Crespin
D-175. *Uvigerinammina* cf. *U. manitobensis* (Wickenden)
D-176. *Arenoturrispirillina* cf. *A. waltoni* Chamney
D-177. *Trochammina umiatensis* Tappan
D-178. *Gaudryina canadensis* Cushman
D-179. *Lenticulina* cf. *L. macrodisca* (Reuss)
D-180. *Psamminopelta* cf. *P. bowsheri* Tappan
D-181. *Flabellammina magna* Alexander and Smith
D-182. *Nodosaria* sp.
D-183. *Reophax texanus* Cushman and Waters
D-184. *Globulina* sp.
D-185. *Marginulinopsis* sp.
D-186. *Neobulimina* cf. *N. canadensis* Cushman and Wickenden
D-187. *Gavelinella* sp.
D-188. *Quinqueloculina* cf. *Q. sphaera* Cushman
D-189. *Ammodiscus thomsi* Chamney
D-190. *Trochammina sablei* Tappan
D-191. *Gaudryina topagorukensis* Tappan
D-192. *G. milleri* Tappan
D-193. *Trochammina gryci* Tappan
D-194. *Gaudryina leffingwelli* Tappan
D-195. *Triplasia* sp.
D-196. *Dorothea? squamosa* (Terquem and Berthelin)
D-197. *Glomospira pattoni* Tappan
D-198. *Lituotuba* cf. *L. irregularis* Tappan
D-199. *Involutina aspera* Tappan
D-200. *Nodosaria* cf. *N. detruncata* Schwager
D-201. *Marginulina* cf. *M. prima* d'Orbigny
D-202. *Textularia aeroplecta* Tappan
D-203. *Cornuspira* sp.
D-204. *Nodosaria liassica* (Barnard)

D-205. *Eoguttulina liassica* (Strickland)
D-206. *Lenticulina* cf. *L. excavata* (Terquem)
D-207. *Lagena aphela* Tappan
D-208. *Marginulina* cf. *M. calva* Tappan
D-209. *Brotzenia* sp.
D-210. *Frondicularia* cf. *F. lustrata* Tappan
D-211. *Pelosina* sp.
D-212. *Verneuilina* sp.
D-213. *Haplophragmoides* 1
D-214. *Cyclammina* 2
D-215. *Cyclammina* 1
D-216. *Cyclammina* 3
D-217. *Bathysiphon eocenicus* Cushman and Hanna
D-218. *Ammodiscus cretaceus?* Reuss
D-219. *Ammobaculites paleocenicus* Cushman
D-220. *Glomospira corona* Cushman and Jarvis
D-221. *Hyperammina* cf. *H. acicula* (Parr) fide Crespin
D-222. *Lituotuba gallupi* Chamney

D-1. Pelecypod
D-2. Gastropod
D-3. Megaspores
D-4. Ostracods
D-5. Plant fragments
D-6. Cartilage
D-7. Radiolaria?
D-8. Bryozoa
D-9. *Dictyomitra* sp.
D-10. Echinoid
D-11. Shell fragments indet.
D-12. Spines indet.
D-13. Foraminifera? indet.
D-14. Ostracod? indet.

APPENDIX

SELECTED REFERENCES

Palynology

Micropaleontology

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ADDENDUM

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